

An Analysis of Break Time Active Play in
Irish Primary Schools

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An Analysis of Break Time Active Play in
Irish Primary Schools

By

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Declaration

I hereby certify that this material, which I now submit for assessment leading to the award of Masters of Sports Studies by research is entirely my own work and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

Susan Mann

Signed:.....

8 August 2008

Date:.....

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ABSTRACT

An Analysis of Break Time Active Play in Irish Primary Schools

Researcher - Susan Marron

School break time is one of the few times of the day for children to engage in self-directed play with peers. The primary school curriculum recommends breaks of 10 minutes duration per day and a daily recreation period of 30 minutes.

A survey questionnaire examined the policies and practices that influence the physical activity (PA) break time habits of children in 391 Irish primary schools. The response rate was 54.5%. Children's PA levels were observed in three Irish primary schools at break time using the SOPLAY system of observation (McKenzie, 2002).

The study found that boys were more active than girls at break time. The highest proportion of children was sedentary (39.3%) with the lowest proportion in the vigorous activity category (26.4%). Small schools (<101 pupils) were more likely to have adequate playground space ($p=0.045$). Analysis indicate that medium and large size schools (> 100 pupils) were less likely to provide school equipment to children to play with at all break times ($p<0.05$). Small schools (<101 pupils) experience fewer barriers than larger schools specifically with respect to storage space, equipment cost or risk of equipment loss/damage and provision of loose equipment ($p<0.05$). Boys schools were more likely than girls schools to provide loose equipment at all break times ($p<0.05$).

Given the 40% PA break time threshold proposed by Ridgers and Stratton (2005), Irish primary schools should recognise the value of break time in providing 16 minutes of PA. This study suggests that safety is a barrier to PA promotion in relation to restrictive playground size and equipment. Schools promote certain practices at break time that influence children's PA behaviour from implicit and or explicit policies. While the school is not solely responsible for children's PA levels, simple strategic changes in practices may encourage and stimulate more children to be active.

1 INTRODUCTION

1.1 Physical Activity Opportunities

The psychologist, Jerome Bruner (1983, p.121) suggested that play, action and movement make up the “culture of childhood”. Despite this, there are claims that children’s opportunities for physical activity (PA) are being threatened by changes to their physical and social environments and some children are experiencing inactive lifestyles from an early age (Doherty and Bailey, 2003).

As our modern lifestyle makes opportunities for energy expenditure through transport and active play less likely, promoting PA amongst children becomes a challenge. In the past 30-40 years it has become more difficult for children to achieve energy balance. Children with a genetic predisposition for storage of body fat in this environment will face a particularly hard challenge (Fox, 2004). There is strong evidence of negative health implications accruing from physically inactive lifestyles in youth (Centre for Disease Control and Prevention, [CDC] 1996).

Children’s traditional playgrounds, their gardens, streets and vacant spaces are often less accessible than in the past (Evans, 2000). “Activity is increasingly hard to come by” (Fox, 2004 p.36). Child safety concerns limit play outdoors. The social and physical benefits of walking to school are being reduced by reliance on the car (Dora, 1999). Home has become a more significant part of children’s leisure but may not be a place conducive to outdoor play. Outdoor play is competing with sedentary activities like television-watching and computer games.

1.2 Where do Children Accumulate their Physical Activity at School?

The school environment offers children opportunities to be physically active. During the typical school day, children have three distinct opportunities in which they can be active: PE, recess/break time, and outside of school (either before or after school). Irish studies also report children accumulating PA in extra curricular school sport (Deenihan, 2005; Murray and Millar, 2005). Of these three distinct

opportunities, break time and outside of school are considered discretionary periods because children are able to make some choices about their participation in activities (Beighle, Morgan, Le Masurier and Panprazi, 2006).

School break time, or recess in the U.S. constitutes one of the few places and times of the day where children can still engage in self-directed play with peers. However there is limited research on how active Irish children are during these breaks and what influences their PA.

The primary school curriculum (Government of Ireland, 1999a) recommends a break of 10 minutes duration per day and a daily recreation period of 30 minutes. In this study, the former is referred to as ‘morning break’ and the latter as ‘lunch break’. It is common practice that most Irish primary school children bring a light lunch, prepared at home, to school.

This study examines the policies and practices in the school setting which influence break time habits of children in a sample of Irish primary schools. Children’s physical activity levels were observed in three primary schools at break time.

1.3 Why are Children’s Physical Activity Habits at School Break Time of Interest?

Children’s PA habits at school break time are of interest for the following topical reasons:

The debate in relation to evidence of increased childhood obesity as highlighted in the National Taskforce on Obesity Report (Government of Ireland, 2005) and related to this, the amount of time spent viewing television, with its double effect of inactivity and also exposure to food advertising and consequent impact on children’s food choices, behaviour and attitudes (Rodd and Patal, 2005).

The concern over the lack of status of PE in Irish primary schools by the Houses of the Oireachtas Report (Government of Ireland, 2005a).

The debate over the role of specialist versus general PE teachers in Irish primary schools (Government of Ireland, 2005a).

The ever-increasing curricular pressure in schools (Fox, 2004).

The buying of school lands for commercial development (Irish Times, 2006).

Reports of 'no running' policies during break time in 40% of schools in the south of the country (Murray and Millar, 2005) and the media attention afforded to the topic (RTE, 2005).

The Campaign for Commercial Free Education in schools (Kerr, 2006)- an organisation formed to object to supermarket chains links to schools through collecting tokens when grocery shopping in exchange for sports equipment. The provision of equipment should be the responsibility of the Department of Education and Science.

The study is of interest to the researcher as an educator of primary school pre-service teachers and with a background as a Physical Education teacher.

There are considerable benefits to maximising the opportunities available to children to be physically active at break time and to stimulating children to be physically active who might otherwise choose not to be so. Children at break time should be free to play as they so wish without endangering themselves or others. Play at break time is not without adult presence and supervision but teachers want children to be independent, to make their own decisions and to play together (Evans, 2000).

1.4 Aims of the Study

To ascertain the environmental factors and policies that influence children's physical activity during school break time.

To observe the physical activity habits of primary school children during break time.

To examine whether differences exist in break time active play between schools with different policies or environments.

In order to achieve these aims a comprehensive review of literature will be undertaken in Chapter 2. PA will be defined for the purpose of this study. International PA guidelines for children will be examined and the strengths and limitations of PA methods of assessment will be discussed. Findings from studies, both nationally and internationally, of children's levels of PA will be reported. Emphasis will be placed on home and school as well as structured and unstructured PA environmental enablers and barriers to children's PA accrual. Methods for PA promotion at school at break time, internationally, will be explored. PA initiatives in Irish primary schools will be reported.

The study uses two methods to investigate the aims of this study. Firstly, a survey questionnaire was sent to Irish primary school principals to establish practices and policies that influence children's PA levels at break time. Secondly, the SOPLAY (System for Observing Play and Leisure Activity in Youth) (McKenzie, 2002) system of observation was used to assess children's PA habits at break time in three Irish primary schools with different practices and policies as ascertained from questionnaire returns. Findings will be presented firstly in relation to Irish children's PA habits and secondly with regard to practices and policies existing affecting break time active play in a large sample of Irish primary schools. Recommendations will be suggested for schools that wish to promote and increase PA and enjoyment at break time.

1.5 Limitations

Some aspects of the study need to be considered in terms of the limitations they impose on the evaluation of the findings. These are summarised as follows:

The findings from the three observation schools may not be generalised to all schools, as they cannot claim to be truly a representative sample. The schools

were selected from questionnaire returns primarily due to the variations in their practices and policies towards break time play.

The observation study did not allow for seasonal variability. Observations were carried out from March to May.

Lunch time duration in one observation school (school A) did not allow sufficient time for two scans to be carried out and scores aggregated to calculate an average, as suggested in the SOPLAY system of observation protocol (McKenzie, 2002).

Requests to Dr. Thom McKenzie, the author of the SOPLAY system, for the official responses to segment three of the SOPLAY pre-coded behavioural vignettes on DVD, resulted in an email confirming they were unavailable. Intra-reliability for segment three could not be completed so observers completed inter-reliability using observers' scores.

McKenzie (1991) proposed that video technology should be used to assess accuracy and to reduce observer drift. However, the Ethics Committee at Waterford Institute of Technology requested that video footage must block out the identity of children which proved impossible.

Observers were present for training as well as data collection over a five-day period in school A and a three-day period at schools B and C. Although observers were not hindering play by their observation positions in the yards they were nonetheless visibly present and a novelty to the children. The possible influence of this could be reflected in the observations scores. Initially, some children asked questions but were soon content to disperse.

Reactivity or 'novelty effect' was considered evident among supervisors at break time in one school that again may be reflected in the observation scores. On occasions teachers were observed to prompt play and to organise short activities, which appeared to be a novelty to children and not habitual play.

In one school observed, despite being chosen for its positive PA promotional practices as indicated on the questionnaire responses, it was the opinion of the

observers that equipment provided to children was novel and relatively unused in appearance. Reactivity could possibly be reflected in observation findings.

The current study had a reasonable response rate 54.5% (n=213) to the questionnaire survey. It is assumed that the respondents answered the questionnaire honestly and accurately, but the possibility of bias must be considered.

2 LITERATURE REVIEW

2.1 Introduction

The current work examines outdoor free or unstructured physical activity (PA) in primary school children at break time which is supervised. Break time is the combination of morning break and lunch break. It is an important part of the school day in many countries (Pellegrini and Bjorklund, 1997). School playgrounds during break time provide potential opportunities for children to be active during the day. However there is limited research on how active Irish children are during these breaks and what influences their PA.

This chapter will initially define what PA means and identify methods of assessing PA in children. Research studies will be summarised in relation to recommended PA guidelines for children aged 5-12 years to establish the PA levels of children both internationally and nationally within the context of children's movement patterns. Literature will be examined to identify variables that influence children's movement patterns and PA accrual both inside and outside the home with emphasis on the environment. The role of the primary school as a setting to promote PA will be researched and studies will be summarised in relation to children's PA at school break time. Strategies to increase PA promotion at break time will be investigated and principal findings reported. Both national and international studies will be reviewed. Tables will be used to present summarised data and core elements from these tables will be discussed to enhance clarity. Terms are defined in Appendix 1.

2.2 Physical Activity

2.2.1 *What is Physical Activity?*

Physical activity is defined as any bodily movement produced by contraction of skeletal muscle that subsequently produces energy expenditure (Caspersen, Powell, and Christenson, 1985). PA is a complex behaviour which encompasses activity arising at work and play, on household tasks, self-care, transportation and discretionary leisure time, including exercise and sports (Bouchard and Shepard, 1992). Physical fitness is a trait or characteristic that people have or achieve that

relates to the ability to perform PA (Caspersen, Powel and Christenson, 1985). PA may contribute to the physical fitness level that one achieves but it is partly a function of heredity (Biddle and Mutrie, 2001). While physical fitness is more easily measured than PA which is behaviour, it is not the focus of the current study and therefore is not discussed in detail here.

Caspersen et al. (1985) refers to health-related and performance (skill) related components of physical fitness. The performance related aspects of fitness are related to athletic ability in sport. These include agility, balance, co-ordination, power, reaction, time and speed. Biddle and Mutrie (2001) state that there is no evidence linking the improvement in these motor fitness qualities to health outcomes such as the reduction of risk for chronic disease. These qualities are important for skill and self esteem in sport and especially in competitive sport. It should be pointed out that fundamental skill development is a basic requirement for children to enjoy sport and experience success and is a vital ingredient for continued long-term participation in PA. The health-related components of physical fitness are cardiovascular fitness, muscular strength and endurance, muscle flexibility and body composition (Caspersen et al., 1985). The development of these components of health-related fitness has been associated with specific health outcomes or the prevalence of disease (Biddle and Mutrie, 2001).

For this study, it is important to clarify that exercise is considered a subcategory of PA and has been defined as planned, structured, and repetitive movements which result in the improvement and/or maintenance of one or more facets of physical fitness (cardiovascular fitness, muscular strength and endurance, body composition, and/or flexibility) (Caspersen et al., 1985). Another sub-category of PA is sport. It is usually structured and competitive. Livingstone, Robson, Wallace and Mc Kinley (2003) maintain that in Europe, the term sport is often used in a broader sense to include both exercise and leisure-time activities.

Elements of PA in children include play, PA involving unstructured sport, structured sport, and active living including walking and cycling as transport, and active household jobs. The author will be specifically concerned with active free play at school break time.

2.2.2 *What is Play?*

Play is a means by which children learn about the world without being taught. It happens when children bring their own knowledge under their own control and ‘pretend’ (Ouvry, 2000). There are various types of play. Movement in play is referred to as exercise play (Smith, 2005) or physically active play (Pellegrini and Smith, 1998) which is the focus of this study. Physically active play is defined as playful activity that involves large body activity. It includes running, climbing and other large body or large muscle activity including rough-and tumble play e.g. play fighting and play chasing (Smith, 2005).

Piaget (1951) recognised the rich learning environment provided in play. He developed three major stages for play development that are still used today. These stages are practice or functional play, symbolic play and games-with-rules. An example of functional play would be grasping and reaching for something with combinations and repetitions. In symbolic play, children use gestures and words to imitate real events or persons, as for example make believe. In games-with-rules, children behave and conform to external rules. The stages correspond to Piaget’s sensory-motor, preoperational and concrete operational forms of intelligence (Pellegrini and Blatchford, 2000) and occur, in order, from early to late infancy to early childhood (before age 6), to late childhood (before age 12) (Piaget, 1951).

Froebal (1887, p.54), the originator of the first kindergarten in Germany in 1837, regarded play as the “highest phase of child development”. Froebal emphasised play not only for physical development but also for the total development of the child. Pellegrini and Smith (1993) described children’s PA play as developing sequentially with age. The first phase involves babies repetitive movements like kicking legs or waving arms with no apparent function. At primary school level, exercise play and ‘rough and tumble’ (R&T) are common. Examples of such activities include running around, jumping and climbing. These activities can be done alone or with others but are generally whole-body actions (Scarlett, Naudeau, Salonijs-Pasternak and Ponte, 2005). R&T play was considered mostly friendly, non-aggressive and noisy, and composed of physically vigorous behaviour (Smith, 2005).

Play takes place in many settings, both indoors and outdoors. Outdoor opportunities include regional and community parks, neighbourhood open spaces, incidental open spaces, gardens, streets and playgrounds. Play may be with or without equipment. Formal settings include facilities in childcare centres and schools and more recently indoor play centres. Children best accumulate PA in unstructured environments where they are free to interact with their peers (Pate, Baranowski, Dowda and Trost, 1996).

The importance of access to quality play opportunities for children is recognised nationally and internationally. In 1989, Ireland signed the United Nations Convention on the Rights of the Child. It specified, “The State recognized the right of the child to rest and leisure, to engage in play and recreational activities appropriate to the age of the child and to participate freely in cultural life and the arts” (Office of the High Commissioner for Human Rights, 1989, Article 31, UN Convention on the Rights of the Child).

The National Children’s Office launched in November 2000, sets out the rights of children in Ireland. It seeks to address the many ways in which the lives of children can be improved. A National Play Policy (Government of Ireland, 2004a), ‘Ready, Steady, Go’, acknowledges the importance of play in children’s lives, in schools, healthcare and childcare facilities. Special actions to help marginalised groups of children are outlined. It sets out a framework for an expansion in public play facilities and the creation of more child-friendly environments. Statutory agencies including the Health Service Executive [HSE], schools, Gardaí, and particularly parents are all essential stakeholders in creating a healthy environment in which children can learn and develop through play.

2.2.3 Why is PA Important?

Physical activity that children accumulate at school break time is the focus of this study. However is PA beneficial to our health? The health benefits of PA for adults are well established and will be examined briefly. However, the associations between PA and health status in children are weaker than those reported in adults (Boreham and Riddoch, 2001). This may be due to lack of large-scale longitudinal studies and difficulties in measuring health, fitness and

activity in children. Further difficulties arise with the onset of puberty in the adolescent period as the body changes and shifts in activity and lifestyle patterns take place, all of which can affect relationships. Sleaf, Warburton and Waring (2000) suggest that in relation to children there may not have been enough time for health problems to develop, unlike in adults, with the exception of childhood obesity.

Risk factors for cardiovascular disease appear to track from childhood into adulthood (Baranowski et al., 1992). If this is the situation it is important to briefly outline the positive and negative benefits of PA in adults. They include reduced risk of coronary heart disease mortality, decreased risk of stroke, excessive weight and obesity, some cancers, diabetes, osteoporosis, high blood pressure, anxiety and depression (CDC, 1996; Boreham and Riddoch, 2001; Biddle and Mutrie, 2001; Bauman, 2004; Murphy, Nevill, Murtagh and Holder, 2007). As in adults, PA is also associated with positive health benefits both physiological and psychological in children (Baranowski et al., 1992; National Heart Alliance, 2006). Regular PA in childhood strengthens bone and connective tissue and yields greater maximum bone density in adult life, helps develop coordination and fundamental movement skills and controls psychological feelings such as anxiety and depression and enhances self-esteem (Boreham and Riddoch, 2001; Bauman, 2004). Children's participation in team sports can lead to social and moral development (National Heart Alliance, 2006).

Perhaps the most widely cited health benefit from PA in recent years is the reduced risk of obesity. In Ireland, 39% of adults are overweight and 18% are obese. One in five children aged 5-12 years is overweight or obese (Irish Universities Nutrition Alliance, 2005). Excess body weight is the most common childhood disorder in Europe (International Obesity Task Force, 2002). Reversal of the increasing rate of obesity is a public health priority in Ireland (Department of Health and Children, 2005).

2.2.4 Do Health Behaviours Track from Childhood to Adulthood?

Pate et al. (1996), in a 3-year tracking study of 3-4 year old children (n=47) using heart rate monitors, concluded that PA behaviour tends to track during early

childhood. In this sample, less active children tended to remain less active than the majority of their peers. Telama, Yang, Viikari, Välimäki, Wanne and Raitakari (2005) carried out a 21-year tracking study using self-report questionnaires in Finland. It started in 1980 in cohorts of children with a starting age of 8 years. The study concluded that a high level of PA at ages 9 to 18, especially when it involved continuous PA rather than a specific sport, significantly predicted a high level of adult PA. The involvement of children in PA during their school years may lead to a high level of motor skills that in turn increase the probability of being active in later life (Telama et al., 2005). A clear gender difference was found, with boys' PA tracking with age increase better than girls.

Even if research shows that with the exception of obesity the immediate health benefits of PA to children may not be apparent, it has been argued that a primary strategy for improving the long-term health of children is to create a lifestyle pattern of regular enjoyable PA. Identifying the PA levels of children is thus of significance to public health policy makers. Before identifying the PA levels of children it is necessary to examine how PA is measured.

2.2.5 How is Physical Activity Measured in Children?

This study is concerned with measuring PA. Studies examined throughout the review of literature will use many PA assessment methods of children and care should be taken when comparing studies due to the strengths and limitations of various methods of assessment as identified by Sirard and Pate (2001). The assessment of physically active behaviour is a challenge, particularly with children and youth (Klasson-Heggebø and Anderssen, 2003). To assess children's current levels of PA and to assess the effectiveness of intervention programmes designed to increase PA, accurate assessment methods are required (Sirard and Pate, 2001). Thirty different procedures for assessing PA have been reported (Livingstone et al., 2003).

Baranowski et al. (1992) identified that each PA assessment method had some combination of problems. Costs to implement assessment methods are always a concern. The age of the sample as well as the location, ethnic and cultural make up of the group are all issues affecting choice of appropriate assessment methods.

Bailey, Olson, Pepper, Porszasz, Barstow and Cooper (1995) explained that many problems arose in the accurate description and quantification of energy expenditure in non-laboratory settings under natural conditions.

Assessment methods are similar for children and adults. Appropriateness for certain paediatric populations however, may limit the validity of findings, particularly in young children (Baranowski et al., 1992). Children also have different patterns of activity to adults (Bailey et al., 1995). This requires that different intervals of assessment and/or outcome measures be used to assess their levels of activities (Welk, Corbin and Dale, 2000; Belton, 2006). Methods range from self-reported subjective methods, to objectively measured physiological estimates of PA.

2.2.6 Subjective Methods Measuring Physical Activity

Self-reported methods include recall questionnaires, frequency questionnaires, diaries and proxy measures (Baranowski et al., 1992). The main benefit of self-report measures is the ability to collect data from a large number of people at low cost (Sallis and Saelens, 2000). Self-report methods tend to detect much higher levels of PA than those detected using observation (Baranowski et al., 1992). Sirard and Pate (2001) report that surveys and other subjective techniques used as criterion measures carry the least compelling validation results. In population self-report surveys, PA assessment usually occurs as part of a multipurpose health survey and this may affect the breadth and depth of knowledge that can be provided to monitor total PA (Troiano et al., 2001).

One of the most accurate subjective PA assessment methods in adults is considered to be the activity diary (Sirard and Pate, 2001). Diary measures were reported to have the strongest validity of 18 self-report methods of assessment on PA in children reviewed, but the burden on subjects is very high (Sallis, 1991; Sirard and Pate, 2001). Children's cognitive development is less developed than that of youths and adults, resulting perhaps in a lesser ability to effectively use self-report questionnaires (Welk et al., 2000; Belton, 2006). Sallis (1991) proposed the development of a self-report system appropriate to young children 10 years of age or younger with the definition of terms clearly defined for young

children and drawings included. Belton (2006) devised a DVD for young Irish children to help in PA self-report recall.

Teachers or parents in certain situations can use proxy reports where children are too young to report their own behaviour (Sallis, 1991). Sirard and Pate (2001) however reported mixed findings when direct observation was carried out to validate teacher or parents' ratings of children's activity. Information was also found to be limited for this PA assessment system in children and adolescents. Troiano, Macera and Ballard-Barbash (2001) highlighted the increased interest in measuring levels of inactivity or time spent at sedentary pursuits. Proxy assessment e.g. number of hours watching television may do this. Prentice (1995) maintained that subtle changes in levels of discretionary PA may be too small to be ever picked up by a surveillance system, but in aggregate could affect energy balance.

Validity was found to be stronger for interview measures compared to self-report questionnaires in a review study of methods used in the 1990s (Sallis, Prochaska and Taylor, 2000), with reliability higher for respondents' recall of total and vigorous activity scores compared to moderate PA scores. However self-report of vigorous activity levels in children was overestimated compared to objectively measured estimates of activity (Riddoch, Anderson, Wedderkopp, Harro, Klasson-Heggebø, Sardinha, 2004). In contrast moderate-intensity activity in children, when objectively measured, was higher than that self-reported. An explanation is that moderate activity tends to be more sporadic, non-planned and perhaps less memorable and quantifiable in children (Riddoch et al., 2004).

Trost et al. (2002) regarded self-report assessment to be inappropriate for children, as one could not accurately assess children's patterns of PA which occur in short bouts within a day or over several days. Troiano et al. (2001) concluded that most studies revealed 'gross overestimation' of PA on self-reports of young people over 9 years of age and adults, and may not be suitable to assess absolute amount of PA. Self-reports may be most useful in assessing the context and type of physical activities (Sallis and Saelens, 2000). In summary there is much debate in relation to the accuracy of children's self-report PA assessment methods of

children and caution is advised in interpretation of studies findings using these methods.

2.2.7 Objective Methods Measuring Physical Activity

Valid and reliable measures are needed in order to quantify children's PA and direct observation of the individual's movement should be used as the gold standard for PA research (Sirard and Pate, 2001). Objective methods used to measure PA include pedometer step counts, accelerometers, heart rate monitoring (HR monitoring) and double labelled water (DLW). Direct observation, doubly labelled water (DLW) and indirect calorimetry are considered the primary standards for assessment of PA in children and adolescents (Sirard and Pate, 2001). These methods are the most valid and reliable measures.

The DLW technique assesses total caloric expenditure (EE) by estimating carbon dioxide production using isotope dilution during a minimum of 3 days. Energy expenditure (EE) is a physiologic consequence of PA and is directly linked to health and disease prevention (Sirard and Pate, 2001). Some PA assessment methods allow energy expenditure estimates using multiples of resting metabolic rate (MET). MET values are not reported to be well established for children's activities (Ainsworth, Haskell, Leon, Jacobs, Montoye, Sallis and Paffenbarger, 1993) and consequently the estimates using these calculations may not be very accurate and should be interpreted with caution (Welk et al., 2000). Measures or estimates of resting metabolic rate and the thermic effect of food are required to separate activity energy expenditure from total energy expenditure measured by double labelled water (DLW) (Troiano et al., 2001). This method is limited by financial (Troiano et al., 2001) and technical constraints (Livingstone et al., 2003). Other assessment methods may also be required in DLW for information related to behaviour such as type of activity, frequency, duration and intensity (Bailey et al., 1995).

Motion sensors detect body movement and provide estimate of PA (Sirard and Pate, 2001). These devices reduce the subjectively inherent in survey methods and can be used with large groups of individuals. Pedometers indicate step counts which in turn indicate volume or duration of activity. A pedometer is a small

device is strapped to a child. Pedometers cannot provide detail on frequency or intensity of PA. However they are a low cost objective method of assessing PA (Welk et al., 2000). Pedometers are re-usable and nonreactive (Sirard and Pate, 2001).

Accelerometers are more sophisticated electronic devices that measure accelerations produced by body movement that places stress on the musculoskeletal system. Accelerometers can capture frequency and duration of distinct bouts of PA over periods of time and can measure intensity (Troiano et al., 2001). The Caltrac® monitor was one of the first commercially available accelerometers and has been the most frequently studied (Sirard and Pate, 2001). It is small and unobtrusive but because of the easy accessibility to its controls children may interfere with the monitors. Newer models include CSA® which is also a single plane accelerometer, however the Tritrac-R3D ® is a 3-dimensional and may provide a more accurate assessment of PA (Sirard and Pate, 2001). However one major disadvantage of the accelerometer is its inability to estimate activities in horizontal plane (e.g. cycling). Trost et al. (2002) concluded that accelerometers are possible alternatives to self-report in moderately sized population level PA surveys. The sample used in the study was 400 youth ranging in age from 6-18 years with counts for seven days. Laboratory and field validations of pedometers and accelerometers yield relatively high correlations using oxygen consumption and direct observations as criterion measures (Sirard and Pate, 2001).

Heart rate telemetry assesses the demand placed on the cardiorespiratory system during a given activity. There is generally a linear relationship between oxygen consumption and heart rate. Interpretation of HR data at the lower intensities should be made with caution because of the increased likelihood of confounding factors (Livingstone et al., 2003, Welk et al., 2000) including emotional stress (Epstein, Paluch, Kalakanis, Goldfield, Cerny and Roemmich, 2001). Heart rate (HR) monitors may need to be worn all day depending on the measurements required. Patterns of activity can be established. The monitors are unobtrusive and they require minimal participant and experimenter burden. It is relatively cost effective for use in small to moderate size studies (Sirard and Pate, 2001).

The disadvantage of multiple measures of assessment is that it is difficult to compare results with studies using different PA assessment methods (Sallis and Saelens, 2000). Lack of consistent measures across time to assess trends is a further challenge in monitoring PA (Troiano et al., 2001).

2.2.8 *Observational Methods Measuring Physical Activity*

Direct observation is the most practical and appropriate criterion measure of PA and patterns of activity. (Sirard and Pate, 2001). Because observational methods are biased by recall or self-reporting ability, these procedures are particularly suitable for young children (Bailey et al. 1995). Observational methods for measuring PA have the benefit of measuring the duration, intensity, and frequency of specific activities (Bailey et al., 1995) as well as the contextual characteristics (McKenzie, 1991; McKenzie, Marshall, Sallis and Conway, 2000). Direct observation techniques are considered among the best criterion measures to validate other assessment tools like self-report and electronic monitoring (McKenzie, 1991; Welk et al., 2000). They can be carried out in natural settings and requires little interference. Objective methods for measuring PA tend to report lower levels of PA compared to observation methods (Baranowski et al., 1992).

Sirard and Pate (2001) reviewed seven methods of direct observation, two of which are specific for observation during physical education (PE) classes and in a variety of settings. Drawbacks included the potential for reactivity in the study participant. Differences in interpretation are evident in studies using direct observation assessment methods (Welk et al., 2000). A clear definition for the meaning of 'bouts' of activity is required. Welk et al. recommend bouts no longer than ten minutes.

McKenzie (1991) highlighted the advantages and disadvantages of direct observation methods. Mc Kenzie, Marshall, Sallis and Conway (1999) validated a direct observational instrument and system for observing the PA patterns of a large number of people in an open area. Activity measures could be transformed into estimates of energy expenditure rate separately for girls and boys. This direct observation system is deemed appropriate for observing the PA patterns as well as the environment of a large number of children e.g. .in a school playground. The

SOPLAY (Mc Kenzie, 2002) direct observation system is an unobtrusive PA assessment method suitable for use with children. It is a relatively inexpensive PA assessment method. Disadvantages include coding of events which may be limited to what is seen or heard. Observers must be trained to be objective in judgements about what they see and to avoid reactivity caused by their presence in the setting. Considerable time and effort are needed to train observers and time is also needed in the environment to achieve inter-reliability, to validate results, and to obtain enough data to permit generalisation of results to other settings or populations. Welk et al. (2000) maintained that because of the large intra-individual variability in activity in children, one or two days of measurements is not sufficient to make conclusions about typical activity patterns. This human involvement in observations and the training and time involved in collecting data can be costly. If long-term studies are conducted, a number of observers need to be trained and observer skill level maintained over several years which would also be costly.

Accurate assessment of both patterns and trends in PA and inactivity is critical, not only for defining the extent to which activity levels are inadequate and/or declining, but also for informing public health policy and evaluating the progress towards meeting health policy objectives (Livingstone, Robson, Wallace and Mc Kinley, 2003). Consideration must be given to all PA assessment methods with consideration to the constraints of the study in question and particularly with consideration of the subjects and the nature of their activity.

2.2.9 How Active are Irish Adults?

Following the identification of the strengths and limitations of PA assessment methods in children in particular it is necessary to identify how active are Irish children and adults. While the focus in the current study is on children's PA to put this into context, it is useful to have a brief picture of adult PA behaviour which is more established (Boreham and Riddoch, 2001), as it is apparent that some health risk factors track for childhood to adulthood and behaviour can track from childhood to adulthood. While disease and mortality are commonly used as measures to establish activity-health relationships in adults, these are rare in children (Livingstone, Robson, Wallace and Mc Kinley, 2003).

The National Health and Lifestyle Survey (SLÁN) (Kelleher et al., 2003) reported that 51% (52% in 1998) of Irish adults engaged in some form of PA. Thirty percent of males (21% in 1998) and 25% of females (20% in 1998) reported no activity participation at all. Participation in PA decreased significantly with age and lower education status. Twenty two percent participated in mild exercise for 20 min \geq four times per week. Thirty two percent participated in moderate exercise \geq three times per week. Eleven percent participated in vigorous exercise \geq three times per week though this was more common in males than females. There was an increase in adult inactivity between 1998 and 2002. The 2006 findings are pending.

The Sports Participation and Health Among Adults in Ireland survey (Fahey, Layte and Gannon, 2004) used a nationally representative sample of 3,080 adults over 18 years. Interviews were used which concluded that 22% of adults were completely inactive in relation to sport or recreational walking. Forty percent of adults reported meeting the WHO (2006) PA guidelines i.e. accumulation of 30 minutes of moderate activity \geq five days per week. Again men were more active than women. The higher socio-economic groups had higher PA levels. Recreational walking was found to be the most popular form of leisure-time PA.

In a Quarterly Household Survey by the Central Statistics Office between June and August 2006 62.8% of persons aged 15 years and over (64.4% females and 61.3% males) reported participating in physical activities in the previous 12 months (n=3,398) (CSO, 2007). Over 22% of active respondents reported participating in PA five or more times per week, while 35.3% participated once or twice per week. Females reported the highest frequency of three or four times per week (34.2%). Thirty nine per cent reported walking as the most frequent form of PA followed by aerobic and keep fit 13%, swimming 8%, golf 7.6% and soccer 7.1%. These figures accounted for 75% of all active persons choices. It should be noted that the findings of this study, with females more physically active than males, is different from other studies. Caution should be made when comparing studies using different methods. In summary it appears that the majority of Irish adults do not achieve PA guidelines and that men are more active than women.

2.3 Physical Activity and Children

2.3.1 What are Children's Movement Patterns?

Children have been described as naturally active (Rowland, 1998). They are often characterised as engaging in short bouts of relatively intense activity interspersed with frequent rest periods (Welk et al., 2000; Wood, 2000; Hussey, Gormley and Bell, 2001) or similarly short bursts of intense PA interspersed with varying intervals of low and moderate intensity with rapid changes in tempo (Bailey et al., 1995; Stratton and Leonard, 2002).

2.3.2 How Active Should Children be?

A growing number of organisations are producing position statements and policy documents on recommended levels of PA which reflects both increasing concern about the health damage due to inactivity (Biddle and Mutrie, 2001) and the increased knowledge about the health benefits of regular PA (Dencker et al., 2006). Guidelines differ from country to country. Two of the largest projects undertaken in terms of recommendations and policies emanate from the World Health Organisation (WHO, 2006) and the Department of Health and Human Services in the US (Biddle and Mutrie, 2001). Appendix 2 shows some of the most widely cited PA recommendations for children, who are the focus of this study. The most accepted recommendation is that children should engage in 60 min. moderate to vigorous physical activity (MVPA) daily.

2.3.3 How Active are Irish Children?

The Health Behaviour in School-Aged Children (HBSC) is a cross-national research study first undertaken in 1982, and conducted every four years. The study involves more than 180,000 children from 41 European and North American countries, all members of the WHO. The surveys are school-based with data collected through self-report questionnaires administered by teachers in the classroom. Three age groups were targeted: 10, 13 and 15 year olds, corresponding to children in 5th class to 5th Year.

Although this is a cross-national research study the same items were not mandatory across all participating countries in 2002. Only 34% of all young

people reported undertaking PA at a level that meets the current guidelines. The PA guideline, following HBSC international protocol defined 'exercising' as 'getting out of breath or sweating \geq four times per week. While it appears that the overall number of inactive young people is growing, there is evidence of an increase in the proportion of youth reporting vigorous activity. It was suggested that the growth of organised activities was at the expense of informal play or recreation (Cavill, 2001).

Ireland ranked highly overall in 4th position (Kelleher et al., 2003). However cross-national trends in PA declined with age in both sexes. This age decline pattern indicated that in some countries the decline was more common between the ages of 11 and 13 than between 13 and 15. Other countries showed no decline. In all countries and across all three age groups in relation to gender, boys were shown to be more physically active than girls (WHO, 2004).

Current trends, published in the HBSC report 2007, in PA levels in an Irish national sample of 10,334 children aged 10-18 show slight changes since the first Irish survey in 1998 (Nic Gabhainn, Kelly and Molcho, 2007). Currently 53% of children and youth (48%, 2002) aged 11-18 years are achieving recommended guidelines (exercise \geq four times per week). Gender break down reveals 63% boys and 43% girls, with a decrease evident with increased age but much more apparent in girls. The age and gender patterns are unchanged since 2002. In 2006, Ireland included for the first time an adapted questionnaire to a national representative sample of middle childhood school children in third and fourth classes 8-9 year olds.

As the focus of the current study is with children aged 5-12 years, Table 2.1 illustrates the principal findings in relation to this age group from adapted information from two studies HBSC 2001/2002 Survey (Kelleher et al., 2003) and HBSC, 2006 (Nic Gabhainn et al., 2007).

Table 2.1 Percentage of Irish Children Aged 8-14 Year Olds Meeting PA Guidelines. Adapted from HBSC 2001/2002 Survey (Kelleher et al., 2003) and HBSC, 2006 (Nic Gabhainn et al., 2007).

HBSC Surveys	% Girls 8-9 year olds	% Boys 8-9 year olds	% Girls 10-11 year olds	% Boys 10-11 year olds	% Girls 12-14 years	% Boys 12-14 years	% All 8-9 years	% All 10-11 years	% All 12-14 years
Ireland									
% Vig ≥4 time/week 2002 (VPA)			56.3	63.6	43	65		59.9	54
% Vig ≥4 time/week 2006	70	74.6	58	71.0	51	68.3	72.3	64.8	59.6
% Vig < weekly 2002			8.3	8.3	8	6.6		8.3	7.3
% Vig < weekly 2006	4.3	6.3	8	7	8	4.3	5.3	7.5	6.15
% Mod ≥ 5 days/week 60 min./day day 2002 (MPA)			59.3	66	43.3	63		62.6	53.1
% Mod ≥ 5 days/week 60 min./day day 2006	77.6	80.6	70.3	81	53	70	79.1	75.6	61.5

Uncompleted boxes indicate 8-9 year old age group was not involved in 2002 survey.

Legend: Vig [VPA]= vigorous physical activity; Mod [MPA]= moderate physical activity; SEE Appendix 1 Definition of Terms.

It is apparent that the middle childhood children (8-9 year olds) are the most active (79.1%) with PA decreasing with age, particularly in girls. Encouragingly, both boys and girls in the 11-14 age groups showed an increase in VPA from 2002 to 2006 and likewise with MPA. An increase in the percentage of children not participating in any VPA weekly is noticeable in 2006: over 5% of the middle age group (8-9 year olds), 7.5% (10-11 year olds), and 6.15% (12-14 year olds).

Consistent with the cross-national findings, many Irish children and youth did not meet guidelines for PA i.e. 60 min. per day of at least moderate intensity on five or more days per week (WHO, 2004). Table 2.1 shows that boys were found to be more active than girls with PA declining with increasing age (Nic Gabhainn et al., 2007; Burns, 2004).

In spite of the variety of assessment methods used to assess children's PA levels across the myriad of studies that have been conducted worldwide, consistent trends are evident. For the sake of clarity and brevity, these findings are summarised in Appendix 3. However the following conclusions can be drawn:

(a) Many children have low PA levels.

Studies in Appendix 3 indicate that a large number of children and youth are inactive and not within recommended guidelines (Hussey et al., 2001; Klasson-Heggebø and Anderssen, 2003; Carrier and Herbert, 2003; Murray and Millar, 2005; Belton, 2006; CFLRI, 2006; Tudor-Locke, Lee, Morgan, Beighle, and Pangrazi, 2006; Spinks, Macpherson, Bain, and Mc Clure, 2007).

(b) PA decreases with age.

Consistently, decrease in PA is evident with increasing age (Myers, Strikmillar, Webber, and Berenson, 1996; Carrier and Herbert, 2003; Klasson-Heggebø and Anderssen, 2003; Cardon and De Bourdeauhuij, 2004; Riddoch et al., 2004; Woods, Nelson, O'Gorman, Kearney and Moyna, et al., 2005; CFLRI, 2006). Trost et al. (2002) found that the greatest age-related differences occurred during the elementary school years rather than during the teenage years. While the teenage years are not the focus of this study and therefore not referred to in Appendix 3, Van Mechelen, Twisk, Post, Snel and Kemper, (2000) in a 15-year longitudinal study in Amsterdam involving 181

subjects that began at age 11, reported the greatest decline during mid-adolescence. Telama, Laakso and Yang (1994) and Sallis (1999) identified the age of greatest decline in PA as the teen years (13-18) but stated that it is possible that large declines are also be seen at younger ages.

(c) Boys are more active than girls, particularly in relation to vigorous PA

Sallis et al. (2000) conducted searches of articles in the English language from 1970 to 1998. The 108 studies evaluated 40 variables for children aged 3-12 years. In 81% of gender comparisons, boys were more active than girls. This is in keeping with other findings reported in Appendix 3 (Myers et al., 1996; Carrier and Herbert, 2003; Klasson-Heggebø and Anderssen, 2003; Cardon and De Bourdeauhuij, 2004; Riddoch et al., 2004; Murray and Millar, 2005; Mota, Silva, Santos, Ribeiro, Oliveira and Duarte, 2005; Woods et al., 2005; CFLRI, 2006; Tudor-Locke et al., 2006). Van Mechelen et al. in a longitudinal study of 13 and 27 year olds proposed that an explanation to the greatest decline in PA in males by age was due to their high level of PA at the starting point of the study compared to lower female levels. This left much more opportunity for the males to reduce the amount and level of PA.

Boys were found to engage in PA more vigorously than girls and scored significantly higher than girls in self-efficacy and in their ability to overcome barriers like fatigue, time constraints, poor weather conditions and homework commitments (Troost et al., 1996, 2002; Van Mechelen et al., 2000; Hussey et al., 2001).

(d) No clear urban-rural differences exist.

It is difficult to be definitive about the PA levels of children from urban and rural environments. Carrier and Herbert (2003) found children to be more physically active in urban areas. Loucaides, Chedzoy and Bennett et al. (2004) found this situation in the summer but the reverse in the winter.

2.3.4 *When do Children Accumulate their Physical Activity?*

Irish primary school children spend 5 hours and 40 minutes at school each day (Government of Ireland, 1999a). This is approximately 25% of their waking hours. Allowing for eating and sleeping time, children have approximately seven hours of waking time (30%) for other discretionary activities. Tudor-Locke et al. (2006) reported

that children's out of school PA (measured as number of steps) represented more than half of the children's daily PA. Beighle et al., (2006), in a study of 270 children aged nine years, reported fewer steps than Tudor-Locke et al. but also found that children accumulated a significant amount of steps outside school, a finding reiterated by Mayers, Strikmiller, Webber, and Berenson (1996). Mota, Santos, Guerra, Ribeiro and Duarte, (2003) reported an average of 90 min./day MVPA for girls and 138 min./day boys but highlighted that while boys tend to accumulate most of their activity after school, girls tend to be more active during school time.

In summary it appears that many 5-12 year old Irish children are not meeting PA guidelines i.e. 60 min. per day of at least moderate intensity on five or more days per week (WHO, 2006) and that a variety of guidelines exist. PA intensities declines with age and boys are more active than girls particularly in terms of vigorous behaviour. The PA patterns of children and youth involve short bouts of moderate levels of PA and perhaps fewer vigorous levels interspersed with rest periods. Identifying ages of greatest decline may be useful but this decline appears evident from 11 years of age. It is not known whether this age decline in PA is primarily environmental or biological (Sallis et al., 2000). Children accumulate their daily PA both at school but particularly outside school. The review of literature will now proceed to examine what variables may influence the PA behaviour and accrual of primary school children.

2.3.5 What are the Correlates of Children's Physical Activity Participation?

Identifying correlates of children's PA is of public health significance (Sallis et al., 2000). To effectively promote PA it is necessary to understand the factors that influence PA in children (Cardon, Van Cauwenberghe, Labarque, Haerens and De Bourdeaudhuij, 2008). Ridgers, Stratton and Fairclough (2006b) reported that opportunities for children to participate in daily PA are dependent on a number of socio-economic, environmental and personal factors. Participation in PA shows clear social class differentials (Owen, Leslie, Salmon and Fotheringham, 2000). Numerous determinants of PA in children have been identified (Sallis, Simons-Morton, Stone et al., 1992; Sallis, Nader et al., 1993; Sallis, McKenzie, Elder et al., 1997; Sallis, Prochaska and Taylor, 2000). The multidimensional nature of PA determinants in young children includes biological/physiological, psychological, social/cultural, and environmental domains.

While it is recognised that PA is a function of a range of variables (McKenzie et al., 1997), there is some academic debate over preferred terminology. Biddle and Mutrie (2001) considered the word determinants of PA as too strong although it is acceptable in the field. Preference was for the terms associations or correlates. Sallis et al. (1993) identified environmental factors as social and physical. Owen et al. (2000) identified environmental contexts that can promote or discourage behaviour that can influence energy expenditure and can correlate positively or negatively with PA. Factors that enable children to be physically active were considered key to health promotion in young people (Welk, 1999). The ESRI report examined factors associated with children's participation in sport and included individual level determinants (Fahey et al., 2005).

Riddoch et al. (2004) reported similar PA levels consistent across four countries in spite of differences in geography, socio-economic circumstances, culture and climate. Thus PA habits in children may be determined by biological as much as by environmental factors. Biological factors include age, gender, ethnicity, and body mass (Sallis et al., 2000). An interesting cultural change experienced in Ireland in recent years is the increase in ethnic children living in Ireland and attending Irish schools which may need to be considered in PA measurement.

Many studies have examined the influence of environmental variables on PA (Sallis et al., 1997; Sallis, Bauman and Pratt, 1998; King et al., 1995; Owen et al., 2000; Foster and Hillsdon, 2004). The environment, in this case is "any aspect of the physical (natural) environment or the man-made (urban or constructed) environment that unconsciously or consciously relates to an individual and their health enhancing physical activity" (Foster and Hillsdon, 2004, p.2). Sallis et al. (1998) referred to the ecological model as people's transactions with their physical and socio-cultural environments. The ecological model involves "the interactions between individuals and their social, policy and physical environment" (Veitch, Bagley, Ball and Salmon, 2006, p.3). The physical environmental factors are essential elements of an ecological model of PA (Sallis et al., 1998).

Reference is made to the behavioural setting in which PA occurs. PA takes place in a specific physical environmental setting that can influence the amount and type of

activity. Some of these environments can encourage or inhibit PA. However social and physical contexts are interlinked to these environments. Sallis et al. (1998) maintained that environmental interventions should be put in place before educational interventions are attempted. Environmental and policy interventions can have excellent population reach (Glanz, Lankenau, Foster, Temple, Mullis and Schmid, 1995). Sallis et al. (1998, p.380) described “policies as organisational statements or rules that are meant to influence behaviour”. Policies can be “explicit or implicit”. The effects of policies can be “intentional or unintentional” (Caspersen and Heath as cited in King et al., 1995, p.500).

An ecological model was selected to guide the current study. It will focus on the Irish primary school environment and principally the playground that is presented to children at break time. The playground is the physical and social setting in which PA behaviour occurs. School policies and practices, both formal and informal, will be examined via a questionnaire survey. The outcomes of an observational study to assess the PA habits of children and the characteristics of three Irish primary schools playgrounds will be discussed in relation to the ecological model.

The environment should not be seen as a panacea for promoting health-enhancing PA (Foster and Hillsdon, 2004). Ewing, Schroeder and Greene (2004) would argue a counter view that social and economic factors are the main or even exclusive determinants of behaviours. In relation to Irish primary schools, school finances either provided by the DES, or privately by parents, may possibly influence the school playground environment that is presented to children at break time particularly in relation to equipment that may be provided to children to play with at break time. Sallis, Prochaska and Taylor (2000) recognised that PA behaviour is a dynamic interaction between the individual and the environment, and is influenced by biological factors including gender and age, psychological factors, behavioural, social and physical environmental factors.

It is also well established that personal factors such as self-efficacy and achievement motivation are important PA determinants. In a study involving 2,225 Belgian and 1,109 Finnish boys and girls, ages 12-15 years, the group that was the most active in sports had the highest perceived competence and achievement motivation (Telama and Nupponen, 2005). Telama and Nupponen reported in a longitudinal study of 9 and 15

year olds to adulthood, that the best predictors of a young adult's PA was school grade for PE and participation in sport club training where children learn and develop motor skills.

However a contrary view has also been expressed. Child self-efficacy was not an influential predictor of exercise behaviour in children (11 year olds) according to Stucky-Ropp and DiLorenzo (1993), perhaps due to modified structures for participating in PA at this stage of a child's development in the U.S. i.e. modified rules, small games situations and less stringent requirements. Similarly, according to Sallis and Saelens (2000) the effect of self-efficacy, perceived competence and attitudes on children's PA is inconclusive. However, Broderick and Shiel, 2000, reported that nearly 10% of 11-year old children considered themselves not good at any of the sports offered by their schools outside school hours. This was cited as a reason for non- participation (boys 11% and girls 7%). Self-efficacy and achievement motivation are not the focus of the current study and are therefore not reviewed in detail here.

2.3.6 What Environmental Contexts Promote Physical Activity in Children?

As children in the current study are aged 5-12 years, their home support environmental structures have a major influence on their PA behaviour. Age groups comparable to the population under investigation in the current study are reviewed in Appendix 4. As discussed previously, these environmental variables should not be interpreted in isolation. Studies of younger (pre-school) and older (secondary school age) children have been excluded.

Time spent outdoors is one of the most consistent physical environmental variables that predict children's PA in a review of studies (Sallis and Saelens, 2000). However it can be concluded from Appendix 4 that many factors influence children's ability to play outdoors. In recent times in Ireland more children attend child-minding services after school that may restrict active play outdoors. Seventy four per cent of parents reported the home 'yard' i.e. garden, as the most frequently reported location for children's active free-play (Veitch et al., 2006). Respondents who lived in an area with an enclosed area or garden were less concerned about having open parks for children's play.

Natural factors such as the weather can present significant environmental barriers to PA, (Sallis Bauman, and Pratt, 1998). Poor weather was reported to have led to the cancellation of PE lessons in Ireland (McGuinness and Shelly, 1995). Ireland's climate undoubtedly influences children's ability to play outdoors at break time in Irish primary schools. Rowland and Hughes (2006) found boys in the UK more active in summer than in winter. Loucaides et al. (2004) reported urban and rural children were both more active outside in summer compared to winter. Garden space and time spent outdoors in summer were positive variables in children's PA levels.

Veich et al. (2006), in a qualitative study, found that parents are important mediators of children's PA and parental safety concerns may restrict children's ability to play in places away from home or outdoors. Children living in cul de sacs appeared to have greater freedom of choice for play because of perceived safety. Urban children appeared to require more transport to places of PA compared to rural children (Loucaides et al., 2004). Myers et al. (1996) commented that more girls than boys reported time spent on indoor chores.

Cardon and De Bourdeaudhuij (2004) reported no differences in steps taken at weekends compared to weekdays. This was surprising given the nature of the school day where children are constrained by being at school. It would appear that active break time and PA after school hours are very important in allowing children to reach daily guidelines. Trost et al. (2002) reported that children were active on weekends as well as weekdays unlike adolescents, while Klasson-Heggebø and Anderssen, (2003) found children were more active on weekdays but suggested that PA be promoted on weekends also.

Girls and boys aged 5-12 years are active at different times of the day, with girls more active in the morning and early afternoon compared to boys, who were more active in the late afternoon and evenings (Mota et al., 2003). It was suggested that the school environment might be influential for girls PA, particularly unstructured play at break times or the motivation from having had a PE lesson. A peak in the activity level was found at lunch break (11.30 hours) in 9 and 15 year old Norwegian children with a further peak seen during the after-school programmes for 9 year olds (Klasson-Heggebø and Anderssen, 2003).

2.3.7 *Does Outdoor Play Equipment and Dog Ownership Promote Physical Activity?*

Baranowski, Thompson, DuRant, J. Baranowski and Pohl (1993) suggested that the availability of activity-enhancing equipment (e.g. climbing equipment, wheeled toys) at home might have an impact on PA. Only for girls was this found to be the case (Stucky-Ropp and DiLorenzo, 1993). Mexican-American children were found to have fewer PA promoting toys than Anglo-American children (Sallis et al., 1993). Parents of children in urban schools reported more exercise equipment available at home than parents of children in rural villages (Loucaides et al., 2004).

The children of the families who owned a dog appeared to have more independence to walk around the streets nearby their homes to take the dog for a walk, walk to a local park or play in the garden with the dog without being under supervision (Veitch et al., 2006). Timperio, Crawford, Telford and Salmon (2004) found that boys aged 5-6 years and 10-12 years whose families owned a dog were more likely to walk or cycle to local PA destinations at least three times per week.

2.3.8 *How Much Time do Children Spend in Sedentary Pursuits?*

The home environment offers children a variety of choices in relation to their leisure time pursuits. Due to the high levels of obesity reported in children and adults, Biddle et al. (2003, p.29) referred to “moral panic” with the “couch kids” culture. Children were found to be less active in the home environment than at school. It was suggested that passive distractions like television-watching and computer games in the home influenced behaviour and choices (Sleap and Warburton, 1992).

Children participate in an array of out-of-school activities in their free time (Sleap and Warburton, 1992; Broderick and Shiel, 2000). The activities occurring most frequently were watching non-sport programmes on television and video, playing computer/console games and watching sport on television, all of which occur more on weekdays than weekends. Activities included participation in club sport, attending and watching matches, reading, doing homework, extra curricular school sport, art, music and dance classes outside school time.

In Ireland, children's participation in after school sport and club sport activities appears to be high (Fahey et al., 2005). Murray and Millar (2005) reported, using a random sample, that 78% of the Irish primary school children were involved in organised sports outside school (n=50). Gender differences were not significant. However concern was expressed for subgroups who are on the margins of sport, children who never take part due to lack of interest, children who take part but may be discouraged due to poor skill level, and children who as they get older drop out of sport.

Completing homework that is sedentary in nature is a necessary part of after school behaviour. WHO (2004) reported 4.2% of 11-year-old Irish girls and boys spent \geq three hours a day on homework on weekdays. This figure was quite low compared to other countries. Three percent of Irish 11-year old girls and 5.2% of boys reported spending \geq three hours a day on homework at weekends. For all age groups in the study scores showed that in all countries girls reported spending longer hours than boys on homework. Regularly active males and females spent similar amounts of time doing homework per day (46 min.) than non-regularly active students who spent significantly longer on homework. Broderick and Shiel (2000) in 11-12 year old children reported 52.2% of boys and 46.7% girls spent 1-2 hours on homework weekly. Gender patterns appear similar to the HBSC (Kelleher et al., 2003) findings for this age group. However, Fahey et al. (2005) found that the number of hours spent completing homework both on weekdays and weekends did not have a significant impact on the frequency of participation in either extra curricular or club sport.

Young people spend a considerable amount of their leisure time being sedentary with television viewing being the most prevalent sedentary behaviour (Marshall, Biddle, Sallis, McKenzie and Conway, 2002). Owen et al. (2000) identified the 'information environment' as a sedentary behaviour setting, including mobile phone usage. Guidelines from the American Academy of Pediatrics (1986) defined those watching two hours of television per day as a "low user" while a "high user" watched more than four hours per day (Biddle, Marshall and Cameron, 2003, p.32). Australian guidelines recommend no more than two hours daily of screen time for children (Commonwealth Department of Health and Aging 2004 as cited in Spinks et al., 2007). The HBSC (WHO, 2004) categorised a high television viewer as, devoting \geq four hours a day for television and \geq three hours a day for computer use. Rodd and Patel (2005) reported that

British children watched on average three hours of television each day. The Broadcasting Commission of Ireland (2003) found that, on average, children watch more than 2.5 hours of television per day. Hussey et al. (2001) reported 77% children spending at least 2-3 hours a day in front of screens (TV, computer and consoles). Harrison, Burns, Murphy, McGuinness and Heslin (2006), in areas of social disadvantage, found lower baseline scores for PA and aerobic fitness and higher BMI in children with high screen time exposure.

The HBSC (WHO, 2004) reported computer use by 11 years olds in the study in Ireland being higher at weekends than weekdays. Boys showed more computer use than girls in all age groups. Computer use shows an increase with age in most countries but particularly between 11 and 13 years. However, in almost all countries and regions, more boys than girls show higher computer use at age 15 compared to age 11. Girls' patterns varied with age between countries. The HBSC showed that in most countries and regions, there were no significant associations between PA and sedentary behaviour for boys. For girls however, PA decreased as television viewing increased. Data was unavailable for Ireland in this international study.

Mayers et al. (1996) found that the number of children watching television/videos did not change with increasing age though the amount of time spent watching did increase with age. The playing of console games decreased with age. There was a decrease in total PA with age and an increase in sedentary activity. Time spent watching television remained constant as adolescents progressed through second level school (Fahey et al., 2005). However it had a negative effect on youths' participation in sport both at extra curricular and club level. Broderick and Shiel (2000) found boys and girls watch similar amounts of television at weekends. However girls showed slightly more television viewing weekdays than boys.

2.3.9 What is the Association Between Screen Time and Physical Activity in Children?

Sedentary behaviour can sometimes compete with and sometimes coexist with PA. Sedentary behaviour alone does not displace PA. Indeed, Marshall et al. (2002) found only small correlations between sedentary behaviours and PA and these were positive (mean $r = 0.22$). Television viewing and videogames playing were largely uncorrelated

with PA (Biddle et al., 2003). There appears to be time for both because it seems that since the 1960s there has been little change in the amount of time children spent in sedentary activities like TV, radio, listening to records, reading comic books, and board games (Biddle et al., 2003). Trost, Pate, Dowda, Saunders, Ward and Felton, (1996) found that television watching was inversely related to PA. Marshall et al. (2002) reported that boys could play video games for \geq one hour per day or watch \geq four hours of television per day and participate in double the amount of the recommended guidelines for PA, while girls could spend \geq three hours day socialising and on the telephone and still engage in PA that exceeded the recommended guidelines for health.

2.3.10 What is the Association Between Screen Time and Body Composition?

Studies have revealed inconsistencies in relation to the hypothesis that limited participation in PA and watching television is related to childhood obesity (DuRant, Baranowski, Johnson, and Thompson, 1994; Dennison, Erb and Jenkins, 2002; Spinks et al., 2007). Determinants are multifactor. Youth sedentariness cannot be accurately represented by a single measure such as, for example, television viewing due to the low inter correlation (Marshall et al., 2002; Telama et al., 2005).

Although these studies were not conducted in the 5-12 year age group, nevertheless pre-school children who were most active tended to watch less television and for shorter durations (DuRant et al., 1994). Spinks et al. (2007) found that 63% of Australian children aged 5-12 years, who spent in excess of the recommended two hours screen time daily were 63% more likely to be overweight or obese than their non-watching counterparts. Robinson (1999) found a relationship with BMI and skinfold measurement. Woods et al. (2005) found that obese adolescents were more than twice as likely to watch more than two hours of television daily. In low-income families of children aged 1-4 years, the prevalence of being overweight (BMI $>85^{\text{th}}$ percentile) was significantly related to the amount of time spent viewing TV/video and was increased when a television was put in a child's bedroom (Dennison et al., 2002). The 'Switch Off Get Active' intervention study reported 55% of 10 year old children (n=312) with a TV in their bedroom (Harrison et al., 2006), with similar findings reported elsewhere (Robinson, 1999; Dennison et al., 2002; Rodd and Patal, 2005; Barnardos Irish Charity Organisation, 2007).

It is clear that children participate in many activities in their free time some of which are active and other activities which are not. Sedentary activities and active activities are competing but apparently can co-exist. However there are children who spend too much time in sedentary pursuits who are not meeting PA recommendations.

2.3.11 Where are Children Active?

Children accumulate PA in structured and unstructured discretionary PA like play or active transport. The home and outdoor environments offer children opportunities to be physically active. Although this study will focus on PA that is accumulated through school break time, it is important to recognise other environmental domains where children accumulate daily PA.

Three main avenues were reported around which structured PA for children can take place (Fahey et al., 2005). These were the PE curriculum in schools, extra curricular sports played in schools, and sports played outside school. A high number of children were reported involved in organised sport outside school time but this decreased as children became older. Children who were involved in club sport appeared to have been involved in other extra club activities like music and singing which suggests there is time for both. A slightly larger number of boys participated in club sport for 3-5 hours at weekends compared to girls (Broderick and Shiel, 2000). Telama and Nupponen (2005) concluded that club sport involvement led to motor skill development which was a good predictor of continued PA involvement.

Sports participation in Ireland is the responsibility of numerous organisations such as the Department of Education and Science in terms of PE in schools, and the Irish Sports Council [ISC] that is provided with funds from the Department of Arts, Sports and Tourism. The ISC provides financial assistance to the sixty national governing bodies [NGBs] of Irish sport (Fahey et al., 2005). The NGBs promote club sport through in recent years a large number of the NGBs have become involved in the promotion of sports programmes in schools (McArdle, 2007). The ISC has also become increasingly involved in the promotion of PA at schools level particularly through their local sports partnerships [LSP] (see Appendix 8).

Broderick and Shiel (2000) reported a high number of children involved in club-organised sports as a leisure time activity (71% boys and 65% girls). Murray and Millar (2005) reported 78% of children involved in club sport. The main reason given for boys and girls not participating in more sport was they were 'already doing enough'. Other reasons did not feature prominently (Fahey et al., 2005). Appendix 5 shows the extent of club and extra curricular sport in Ireland.

Deenihan (2005) reported that 25.9% of Irish primary schools surveyed had structured after-school PE/sports programmes while HSE (2005) reported 70% of schools (n=35) had after school team training sessions. Some of these activities would involve specialist coaches for whose services parents would be expected to pay. Three-quarters of primary school children played some extra curricular sport and often more than twice a week (Lunn, 2007). McKenzie and Kahan (2008) support the positive contribution of extra curricular sport that is developmentally appropriate and enjoyable activities delivered by trained coordinators with sufficient equipment. It should be pointed out that extra curricular sport activities are more common in non-disadvantaged primary schools and of concern is the 25% who never took part in extra curricular sport at school (Lunn, 2007). It would appear that school type and size, as well as status in terms of being non-disadvantaged, may have a bearing on extra curricular sport programmes available to children. Of the 137 schools sampled by Fahey et al. (2005), Lunn classified eleven as disadvantaged. Out of the sample of 5th and 6th class pupils, 10% (n=3,833) attended a designated disadvantaged school. Disadvantaged primary schools offer less extra curricular sport to their pupils and a limited range of sports appear to exist in PE programmes and extra curricular sports programmes in designated disadvantaged schools (Lunn, 2007).

2.3.12 Are Irish School Children Active Commuters?

Children can accumulate PA by walking and cycling. Walking and cycling to school is associated with higher daily PA levels compared with children who travel to school by car (Cooper, Anderson, Wedderkopp, Page and Froberg, 2005; Sirard, Riner, Mc Iver and Pate, 2005). Hussey et al. (2001) reported no differences in the structured physical activities of children but it was suggested that the loss in energy expenditure might be in discretionary PA. Tudor-Locke, Ainsworth and Popkin (2001) reported the decline in

active transport to school over recent decades. This is evident in Ireland as illustrated in Table 2.2.

Table 2.2 Irish Children who Walked or Cycled to School (Central Statistics Office, 2007)

Year	5-12 year olds
1981	51%
1991	44%
2002	27%
2006	25%

The Dublin Transportation Office (2005) reported that almost 50% of primary school children in the greater Dublin Area were driven to school. The Central Statistics Office [CSO] (2007) reported 55% of all Irish primary schoolchildren were driven to school by car compared with 27.7% in 1990. In 2006 24.3% of primary school children walked to school compared to 39.4% in 1990. The 2006 census (CSO, 2007) found that the distance travelled by children to school remained largely unchanged between 2002 and 2006 at one mile (1.2km). It is clear that active commuting has dramatically decreased in Ireland for primary school children from 51% in 1981 to 25% in 2006 (Table 2.2).

Journeys of 15 minutes duration and approximately 1 km distance appear to be the most common (Sleap and Warburton, 1993; Broderick and Shield, 2000; Timperio, Crawford, Telford, and Salmon, 2004; Fahey et al., 2005). It appears that boys walk or cycle to destinations more than girls. Boys participate in more active transport to school than girls (Fulton, Shisler, Yore and Caspersen, 2005; Timperio et al., 2004). With increasing age in 5-12 year olds, boys and girls tend to walk or cycle to more destinations than younger children (Timperio et al., 2004; Veich et al., 2006). Social and economic status (SES) appeared to influence active transport (Hussey et al., 2001; Timperio et al., 2004; Ewing, 2005). Acceptable distances to walk to school were reported greater in higher SES groups. Despite this more children in lower SES groups were found to walk to school.

Barriers cited for not walking and cycling to school included safety and security (Broderick and Shiel, 2000; Dellinger and Staunton, 2002; DTO, 2005), distance (DTO, 2005; Ewing, 2005) and the presence of footpaths, (Ewing, 2005; Fulton et al., 2005).

Safety concerns, busier parental lifestyles and greater choice of schools were factors that determined how children travel to school (Fox, 2004; Broderick and Shiel, 2000). Timperio et al. (2004) did highlight the fact that parental concern for road safety was not unfounded due to the fact that pedestrian and cycling injury was one of the leading causes of injury, death and hospitalisation in Australian children reported in 1998. It would appear that active commuters become more familiar and less threatened by their environment (CDC, 2002).

Ewing (2005) highlighted the link between the built environment and health outcomes. In the US, people living in sprawling counties weighed more whether they walked for exercise or not, and were more likely to be obese and possibly to have high blood pressure compared to people living in more compact communities. The amount of exercise people get from incidental active journeys appears to be the key. Quality of footpaths to walk to school proved to influence significantly walking to school. This argues for safe routes to school (Ewing, 2005). The physical design of the local environment had to be considered and its suitability to promote walking or cycling. Traffic safety alone was not a solution without making environmental changes like road traffic control measures. It should be noted that Loucaides et al. (2004) reported that the parents of children in towns reported transporting their children significantly more frequently to places where they could be physically active than parents of children in village schools (see Appendix 4).

One Irish example of best practice is the Strategic Development Zone Planning Scheme for Adamstown, Dublin (South Dublin County Council, 2003). The Adamstown project has a 'walkable' neighbourhood master plan to encourage walking or cycling to local facilities. Maximum walking distances for all residents to local destinations is stated. All children are to be within ten minutes walk from primary and secondary schools, five minutes from local parks and two minutes from local play facilities. Wider streets are to be shared equally by people and vehicles. Cross-boundary and departmental cooperation were essential ingredients for successful implementation. A further example of good practice is the appointment of a schools travel officer with the Green-Schools initiative. A pilot programme of active transport to school is in operation in the Greater Dublin Area in 50 schools. This programme will continue with further funding for 2007-2008.

In summary, active transport which is discretionary PA, is of importance to children's daily accumulation of PA in relation to daily recommendations. Positive school policies to encourage walking and cycling to and from school, and positive practices by parents from organising safe walking and cycling practices, to organising 'walking buses' are all positive sustainable initiatives. The initiatives improve children's perceptions of safety and knowledge of their environment while and increasing children's PA levels.

2.3.13 What Role does the Family Play in the Promotion of Physical Activity?

Parents are important gatekeepers of children's PA (Evans, 2000) as children depend on parents for transport to structured organised sport, to school, as well as to parks and other venues. As previously described, parents' judgement of suitable environments for safe walking/cycling can influence children's PA levels (Broderick and Shiel, 2000; Dellinger and Staunton, 2002; DTO, 2005).

Parental PA was the most studied social variable in a review of studies (Sallis et al, 2000). A positive association was found with children's PA in 38% of the 29 studies reviewed. The CANPLAY study (Canadian Fitness and Lifestyle Research Institute [CFLRI], 2006) study found the children of parents who consider themselves to be substantially less active than other adults of approximately the same age and sex took 1,400 fewer steps per day than children whose parents consider themselves just as active or are more active than other parents.

The ERSI report (Fahey et al., 2005) found parents' participation in sport had a positive influence on children's sports participation. Telama et al. (1994) concluded that a prerequisite for children's PA in sport was a positive attitude and support from parents. Similarly, parental exercise was found to be significantly associated with children's extracurricular sports participation and cardio respiratory fitness (Cleland, Venn, Fryer, Dwyer and Blizzard, 2005; Fahey et al., 2005; Murray and Millar, 2005). Sibling PA had a positive influence on a child's PA (Sallis et al., 2000).

While older children were not the focus of this study it is worth reporting that as children became older no association was found between parental PA and children's PA in adolescents (ages 13-18 years) (Sallis et al., 2000). However parental support and significant others were consistently related. It is interesting to note that direct help from

parents, including funding, was an important variable (Sallis, 1999) as was the provision of transportation (Stucky-Ropp and DiLorenzo, 1993).

In summary, it can be said that the variables that influence children's PA behaviour are complex and cannot be looked at in isolation. Environmental settings conducive to PA as well as supportive parents and other relevant community and departmental organisations controlling public health policy can enable PA. Children who are physically active appear to have positive perceptions of themselves and their environment. Enjoyment of participation in PA through extra curricular physical activities, club sport, active free play in the home environment, and active commuting can all lead to lifelong participation in PA. Against a background of competition for children's discretionary time with sedentary and active pursuits, children attend school each day where many further practices are at play influencing children's PA behaviour. The review of literature will now concentrate on the influence of variables in the primary school environment with specific reference to children's active play at break time.

2.4 PA and School

2.4.1 Why is the School a Key Setting for Promoting Children's Physical Activity?

Despite the fact that most PA by children is undertaken outside of the school environment (Vincent and Pangrazi, 2002; Myers et al., 1996), schools have long been recognized as key settings both to promote and to contribute to PA guidelines because children spend a large proportion of their time there (Biddle, Sallis, and Cavill, 1998; Tudor-Locke et al., 2006). In Ireland, primary schools are obliged to complete 183 days at school each year (Government of Ireland, 2004b).

It must be recognised that the primary business of schools is in achieving educational outcomes. While schools follow the curriculum and procedure directed by the Department of Education and Science schools can differ with implications for children. Gittelsohn et al. (2003, p.98) define the school climate or environment as "the characteristics that distinguish one school from another and that affect the behaviour of people within the school. The schools climate is dynamic, based on the perceptions of its members, and is influenced by a school's formal and informal organisation, staff morale, and the leadership of the school".

The review of literature illustrated that children's PA experiences and attainment differ depending on their home physical environments. Although all children go to school to be educated Samdal (1998) concluded that the school environment was a variable influencing children's educational achievement. Samdal drew on concepts relating to job satisfaction in the adult work environment which led to satisfaction with life, and applied them to the student's school environment or climate. Student academic achievement could not be achieved unless their environment was secure and they experienced satisfaction with school, leading to positive wellbeing.

Samdal (1998) found that health-enhancing behaviour was likely to lead to academic achievement. In children aged 11 years and older health compromising behaviours, like smoking and use of alcohol, were associated with poor relations with teachers who had too high demands on them as well as students having little involvement in their environment. Using HBSC data of 11, 13 and 15 year olds 1993-1994 survey, from Latvia, Slovakia, Finland and Norway, fellow student support was found to be the strongest predictor of student well being. Low student autonomy was found to be the most important single predictor of smoking and alcohol use in Norway and Finland. Involving meaningful dialogue of students in the daily life of their school increased students' school loyalty, resulting in greater satisfaction with school. The ideal health promoting school should have the components of student autonomy, teacher support, student support, and adequate expectations (Samdal, 1998).

“Schools have an obligation to address health as a foundation for achieving educational goals” (International Union for Health Promotion and Education 2000b, p.111 part 2). Sleaf, Warburton and Waring (2000) outlined the importance of a ‘valued’ active lifestyle by a school. The support of parents, the community and schools are all vital ingredients. Schools operating within the existing workload of teachers can nurture this active lifestyle value. The Ottawa Charter (WHO, 1986) defines health promotion as the process of enabling people to exert control over the determinants of health and thereby improve their health. Health promotion is described as a process which improves the skills and capabilities of individuals to look after themselves. It improves the capacity of groups and communities to act together to take control over the determinants of health. While these groups can control some determinants, others cannot e.g. social, economic and environmental conditions (Nutbeam and Harris, 2004).

A report for the European Commission by the International Union for Health Promotion and Education (2000a, p.17 part one) states that health promotion programmes need to be comprehensive and “holistic”, and no longer targeted solely at defined settings such as a school or with identified population groups. They should link, for example, the school with agencies and sectors dealing with health and should last for several years. School programmes should be implemented in conjunction with the family. Schools are cost effective sites for health promotion. Programmes should focus mainly on cognitive and social outcomes rather than on achieving specific behavioural outcomes. The report states that schools cannot be looked upon to solve health and social problems in isolation. The effects of educational interventions are unlikely to be lasting in the absence of general improvements in the availability and quality of recreational and PE resources and programs. For interventions to be successful, interventions should target multiple mediating variables in the cognitive, social and environmental domains (Sallis et al., 1992).

Cavill (2001) outlined a number of policy areas that required action i.e. the promotion of girls PA, access to suitable outdoor environments which promote PA, considerations of the role of NGBs in exploring opportunities for children’s participation in both school and after-school settings, exploration of the role and support of parents, disadvantaged children to be given equal attention, and finally a whole school approach to health and PA promotion. These policy issues should be considered from home and family, school and community, environmental and national and EU policy levels (Cavill, 2001).

The National Taskforce on Obesity Report (Government of Ireland, 2005b, p.88) recommends that “every child should be enabled through a restructuring of the school day to achieve a minimum of 30 minutes dedicated PA every day in all educational settings”. A Pan-European example of partnership working exists in the Finnish ‘Schools On The Move’ project (Koulutliikkeelle, 2006) that aims to increase the opportunities for children for PA during the school day. Areas being developed as part of the project include PA during breaks, the condition of the schoolyard, PA on the way to school, health-promoting club activities, advice on PA and finally PA in groups and friends. The involvement of children in their projects is prioritised. The schools (n=18

schools, n=5,400 pupils aged 7-12 yrs) are supported by extensive co-operation between the Department of Health, Centre for Sports and PA, and the Department of the Environment in the city of Turku. Evaluation of the project is pending and it will be some time before the report is translated into English.

Some good examples of partnership working also exist in Irish primary schools. Examples include the Playground Games and Markings Project (HSE 2005a), the Munch & Crunch Healthy Lunch policy initiative (HSE, 2005b) and the Green-Schools Active Transport to School project in partnership with the Dublin Transportation Office. Cross policy links are evident in the proposals emanating from the National Play Policy (Government of Ireland, 2004a). Consultation and partnership with parents is recognised (Murray and Millar, 2005; Cox, 2005).

A “vibrant and inspirational” ethos about PA can be incorporated into the whole school planning process. Transmitting positive “vibes” to children about PA in the way staff, parents and children talk and act may be effective (Sleap et al., 2000, p.38). An example of such a vibe is reported by Broderick and Shiel (2000) who found that almost 50% of the children in their study were taught by teachers who themselves participated in sports. Thirty per cent of the children were taught by teachers who engaged in coaching adults in their after school free time.

Exciting school environments may be needed to stimulate PA both inside and outside the school building. The Education Act, 1998 (Government of Ireland, 1998) which governs primary education in Ireland does not make reference to play provision, although the use of play is recommended in teaching Physical Education (PE), Social, Personal and Health Education (SPHE) and Social, Environmental and Scientific Education and Art Education.

Teachers must be aware of the necessity of having children sufficiently active in terms of threshold guidelines in enjoyable PE classes as well as achieving other PE curricular objectives. Children need to be exposed to a balanced PE programme of co-operative, individual, partner and team activities, as well as appropriate competition, thus laying a foundation for present and future PA behaviour (Government of Ireland, 1999b).

2.4.2 *What is the Contribution of Physical Education to Children's Physical Activity?*

The review of literature has reported that children accumulate PA in a number of settings outside school and that many variables are at play influencing this behaviour. Children accumulate PA as well as other important lifelong influencing attributes to continue PA participation at PE lessons. It is necessary to examine the role of PE which is a structured activity, and its contribution to children's PA.

The Irish Primary School Physical Education Curriculum recommends a minimum guideline of 60 minutes of PE per week (Government of Ireland, 1999c). Exposure to six curriculum strands: athletics, aquatics, dance, games, gymnastics, and outdoor and adventure is recommended. The PE curriculum "aims to provide children with learning opportunities through the medium of movement" (Government of Ireland, 1999b, p.2). The importance of play in the learning and developmental process is highlighted. "Play in PE contributes to the child learning to become an effective mover, to think, to interact socially with others and to express feelings" (Government of Ireland, 1999b, p.2).

A particular feature of the new primary school curriculum (Government of Ireland, 1999a) is a two hour discretionary period weekly to allow the school and teacher flexibility to accommodate school and class needs. Examples suggested included allowing extra time to complete a certain task or project in a particular subject. Integration of subjects is also a feature of the new curriculum. The opportunities from integration and the possibilities of the use of discretionary time, if planned efficiently, can open up windows of opportunities for increased time in the week to promoting PE and PA within a school (McKenzie and Kahan, 2008).

From an analysis of information derived from official guidelines on the amount of curriculum time allocated to PE from policy and curriculum documents as well as from additional information sought from government level officials and PE teachers using questionnaires, Hardman (2007, p.6) identified European countries' PE time allocation. Ireland had a weekly timetable allocation for PE at primary school of 30 minutes minimum and 60 minutes maximum. The average across reported countries was 109 minutes (range of 30-240 min.). Across 27 countries Ireland ranked lowest in terms of PE time. No change in time allocation was reported from 1999 to 2006. Table 2.3 illustrates findings from Irish studies in relation to frequency and duration of PE lessons

that appear to be in keeping with the findings of Hardman (2007). One UK study is included.

Table 2.3 Frequency and Duration of PE Lessons in Ireland and the UK.

Source	Sample	Method	Findings
McGuinness & Shelly (1995) Ireland	n=122 schools n=135 teachers of third and sixth classes	<i>Subjective</i> Questionnaire	82% of the teachers taught PE at least once a week, 30% reported lessons of 30-39 minutes duration.
Broderick & Shield (2000) Ireland	n=65 schools n=74 teachers	<i>Subjective</i> Child questionnaire	55% of children PE class once a week; 35% had class twice a week; 7 % had class three times a week.
Deenihan (2005) Ireland	n=3,200	<i>Subjective</i> Self-reported questionnaire	61.9% of primary schools 60 minutes or more than this amount of PE per week, 25.3% reported less, 12.8% did not respond.
Murray and Millar (2005) Cork, Ireland	n=50 (principals)	<i>Subjective</i> Telephoned and interviewed using a structured questionnaire	88% schools had one PE lesson per week, 12% twice per week. 94% class teachers taught PE; in 3 schools a combination of the class teacher and a PE specialist.
Cosgrave (2006) Ireland	n=65 junior and senior infant primary teachers	<i>Subjective</i> Questionnaire	85% of teachers reported infants receiving PE twice per week. 85% of lessons 21-30 min. duration. 68% of infant teachers delivered PE to their classes without assistance. 32% delivered one lesson per week while a coach or specialist teacher taught the other lesson.

Source	Sample	Method	Findings
Murphy (2007) Ireland	n=26 tutors (primary school teachers delivering PE in-service) n=85 teachers	Subjective Questionnaire	62% of tutors reported their school had a school plan for PE. 65% of tutors reported the recommended time for PE per week recorded in this plan was 45-60 min. 50% of tutors indicated teaching >60 min. of PE weekly and 42% 46-60 min. 34% of teachers reported the recommended DES time allocation for PE. 46% of teachers reported 31-45 min. PE time allocation weekly; 12% reported teaching <30 min. weekly. 73% of teachers taught PE once per week; 48 %of teachers taught between 46-60 min. weekly, 34% 31-45 min; 25 taught >60 min. per week. 44% of observed lessons lasted <30 min. Development of motor skills 45.9% of lesson. Passive activities e.g. Watching and talking 18% of lesson. 76% of total time on motor skills, warm-up and game situations.
Waring, Warburton & Coy (2007) UK	5-11 years n= 374	Observational Continuous direct observation Total no. Observations 959	

The time allocation to PE weekly is well reported. However the content of PE programmes in schools apparently varies which has implications for children's enjoyment of PE, skill development and possible PA levels. The dominance of some strands over others depends on the previous professional experience of the teachers.

Fahey et al. (2005), Broderick and Shiel (2000), and. Murphy (2007) in Ireland, and Waring, Warburton and Coy (2007) in the UK, identified the dominance of team sports in activities undertaken in primary schools, with soccer, gaelic football and basketball the most common activities in Irish primary schools. Cosgrave (2006) highlighted the dominance of games even at infant level. Broderick and Shiel (2000) related this dominance of games (55.3% of PE classes) to teachers' confidence at teaching this strand (70% felt competent teaching games), or perhaps to the type of facilities available at the school and their suitability to games. Teachers when questioned about their pre-service education reported games as the most frequent strand taught (McGuinness and Shelly, 1995; Murphy, F., 2007).

Broderick and Shiel (2000) reported that teachers who had not attended any in-career development in PE in the previous three years taught over 70% of children. McGuinness and Shelly (1995) reported this figure as one-quarter of the respondents in their study (n=33). Children should now be exposed to a broader, more balanced PE curriculum by their class teacher with the revision of the PE Curriculum (Government of Ireland, 1999c) and the completion of National in-service in primary schools. Although pre-service primary school teacher education courses vary in duration and between colleges depending on the course followed- online or contact, all courses experience a PE component. The nature of this PE component depends on the college in question. The Oireachtas Report (Government of Ireland, 2005a) recommends that the same level of time be afforded to PE as to other subjects in the colleges of education. Given the limited resources of schools and the competing educational demands placed on schools, developing PE curricula and ensuring suitable teacher skill levels requires policy intervention at government level as well as an increase in time at education colleges.

Schools are coming under increasing pressure to contribute towards the health of children (Deenihan, 2005; Government of Ireland, 2005b). A broad and more varied PE

programme was introduced with the revised PE curriculum in 1999. Waring, Warburton and Coy (2007) accepted that the primary school teachers involved in their study had generally positive views towards the promotion of PA but the majority had limited understanding of how to increase PA in their own school in relation to PE (King et al., 1995; Murphy, F, 2007).

In Ireland national in-service courses in PE were available to practicing teachers from 2004-2006 (Primary Curriculum Support Programme [PCSP], 1997). Schools are presently given continued support in PE from the PCSP if requested. Murphy (2007) identified the increased level of competence in teaching PE reported by teachers (n=85) following this in-service despite earlier findings reported by McGuinness and Shelly, (1995), INTO, (2006a) and Deenihan, (2005). Continuing professional development courses are available to teachers, in PE in the form of evening/weekend workshops and summer courses.

It is encouraging to note that Deenihan (2005) found that 74% of respondents reported that the status of PE in their school had improved in the previous five years. Murray and Millar (2005) found that over 80% of principals and parents rated PE as important. However, there are worrying findings in some Irish studies in terms of PA and its promotion in school practices. McGuinness and Shelly (1995) noted that PE lessons could be cancelled due to the following reasons: unfavourable weather conditions, the indoor hall being in use for other activities and safety hazards. Indiscipline was reported by 24% of respondents in their sample for cancelling PE class while Murray and Millar (2005) reported 16 schools (32%) occasionally cancelling PE. Conversely, two schools (4%) frequently offered an extra class of PE as a reward, with 26 schools (52%) occasionally offering an extra PE class as a reward.

Irish primary schools inspection reports (Department of Education and Science, 2007c) indicated that some schools are restricted in the delivery of PE due to the lack of indoor facilities and very limited yard space. Facilities, particularly inadequate indoor facilities, were reported as barriers to PE provision (McGuinness and Shelly, 1995; Murray and Millar, 2005; Fahey et al., 2005; Deenihan, 2005; Murphy, 2007). It is interesting to note that Fahey et al. reported that facilities in themselves, in terms of quantity rather than quality or to inconvenience of access, did not affect participation in extra curricular

or club sport. Regional variations were apparent in relation to facilities (INTO, 2004) as well as rental costs, distance, and funding for equipment (McGuinness and Shelly 1995). These findings are summarised in more detail in Appendix 6.

While offered in a voluntary capacity by teachers, Murray and Millar (2005) found that 35 (70%) school principals stated that after school activities took place in their schools. Seven schools (14%) had two activity sessions per day and 15 schools (15%) had three sessions. Five schools however (10%) had none. Children in Irish disadvantaged primary schools get less opportunity to play extra curricular sport and are exposed to a narrower range of sports both within PE class and in ECA (Lunn, 2007).

Many Irish primary schools were reported not to be offering 60 min. of PE weekly to pupils. It is clear that PE programmes vary between schools and barriers existed in relation to the implementation of the revised PE curriculum. What is known about the PA levels of children at PE lessons nationally and internationally and the amount of PA accumulated at PE lessons in relation to its contribution to children PA guidelines i.e. 60 min. MVPA daily?

2.4.3 How Active are Children during Physical Education Lessons?

Steps taken during PE class accounted for 8% and 11% of total steps per day for boys and girls respectively (Tudor-Locke et al., 2006). Myers et al. (1996) reported that most PA occurred out of school time. Although children were active for $\frac{1}{3}$ of PE lessons (McKenzie, 1995; McKenzie and Kahan, 2008), PE in Europe generally is not a daily opportunity to accumulate PA (Hardman, 2007).

PE lessons are designed to balance instruction, skill development and class management, in addition to providing a source of PA (Tudor-Locke et al., 2006; McKenzie et al., 1995; McKenzie and Kahan, 2008). One of the aims of the primary school PE curriculum is “to promote enjoyment of and positive attitudes towards physical activity and its contribution to lifelong health-related fitness, thus preparing the child for the active and purposeful use of leisure time” (Government of Ireland, 1999c, p.10). Appendix 7 illustrates how active children are during PE lessons in relation to PA guidelines.

Children appear to be physically active for <40% of PE class time (6-10 minutes) (Waring et al., 2007; McKenzie et al., 1995; Sleaf & Warburton, 1992; Pate, Davis, Robinson, Stone, McKenzie, and Young, 2006). A threshold of 50% is recommended by the Healthy People 2010 objectives, US Department of Health and Human Sciences. Boys were reported to be more active than girls during PE lessons (McKenzie et al., 1995; Waring et al., 2007). McKenzie et al. reported outdoor PE as being more active than indoor lessons. Broderick and Shiel (2000) found that 75% of fifth class children enjoyed PE classes. Eighty one per cent of boys stated that they enjoyed PE as a subject compared with 63% of girls.

Mallam, Metcalf, Kirkby, Voss and Wilkin (2003) found that children who did not have PE class on a specific day compensated with PA at home. Myers et al. (1996) on the other hand found the reverse. Boys were found to be more active the days of PE class (Tudor-Locke et al., 2006; McKenzie et al., 2000; Waring et al., 2007; Mota et al., 2003).

McKenzie and Kahan (2008) emphasised that even when PE lessons were provided daily, PE by itself could not provide the recommended 60 minutes per day of accumulated activity. This has also been the situation reported in the review of Irish literature reported above. Despite the positive contribution of PE to children's enjoyment of PA and skill development, useful in lifelong PA participation, PE does make a contribution to children's PA levels on days when PE lessons occur. However all children potentially receive more opportunities to be physically active daily at break time in school rather than in PE lessons (Kraft, 1989). The need for schoolchildren to be physically active, to talk with their peers and to play freely has been recognised in the scheduling of recess periods or break time.

2.5 PA and Break Time

2.5.1 Is Break Time an Opportunity for Physical Activity?

Most Irish school children spend 5 hours 40 minutes at school each day with 40 minutes for break time that amounts to 11.7% ($\frac{1}{8}$ approximately) of their school day considerably less than the quarter of the British school day referred to by Sleaf and

Warburton (1992). English elementary primary schools typically have a morning and afternoon break of 15-20 minutes duration. Lunch breaks are of 75 minutes duration, of which approximately 45 minutes is devoted in playtime (Sleap and Warburton, 1992; Sleap, Warburton, and Waring, 2000). In rural Australia, it was reported that 1/6 of the school day is break time (Zask, Van Beurden, Barnett, Brooks and Dietrich, 2001). Lack of standardisation across countries in relation to the structure of break time and its purpose makes research on PA accrual limited (McKenzie and Kahan, 2008). Differences should be considered when comparing studies and when referring to the Irish school context.

The nature of break time supervision varies from country to country (Pellegrini and Blatchford, 2000). In general, teachers in Irish primary schools opt to supervise at break time on a roster basis with monetary rewards. Although Special-Needs Assistants assist in yard duties, their role is to look after specific children with special needs. Break time is part of school life for most primary school children and is a time of the schools day where unstructured play occurs. In practical terms, Evans (1996) noted that break time was a break from class work with a chance to have something to eat or drink and to go to the toilet.

While Irish primary schools appear to have policies in relation to supervision at break time written in health and safety policies and school plans, there is no explicit school policy for break time, nor are schools expected to have a formal play policy. The documentation in relation to break time is in a negative format in some cases, as in a 'yard book', where children's names are noted for misbehaviour or attempting to cause harm to other children at break time. Casey (2003) in relation to Scotland, made reference to the low value placed on break time which was evident in the space in which it takes place.

Break time provides 'an extended classroom' with a multidisciplinary role and its benefits can be taken back into the classroom (Pellegrini and Blatchford, 2002). Lucas (1994, p.81) described the school playgrounds in the UK as a mostly a "miserable, bleak and desolate landscape" which shaped children's views of place and people and did little to instil a sense of pride and aesthetic awareness. Schools should develop their school grounds to become landscapes of high quality where learning takes place

through both the formal and hidden curriculum. Lucas recognised the role of children in establishing what school grounds meant to them.

Humphries and Rowe (1994) described the ‘Coombes School’ in England as an example of using the whole school environment. The grounds were seen as a “living unit to be enjoyed for aesthetic reasons as well as for curricular gains” with the children always the focal point (Humphries and Rowe, 1994, p.116). The playground was also given unique and equal attention. Playground markings were designed and developed in the classroom, teaching mathematics skills and strategy games which children continued to use and develop at break times. Informal seating with a multiplicity of uses was developed for outdoor classroom use. Many play options were provided including logs for climbing, hiding and seating, stepping stones, groups of tyres from old cars, lorries and tractors. The playground represents a more social place of intellectual challenge and adventure.

A teacher’s competence in teaching a varied PE programme may have an influence on stimulating children to be physically active at break time. Kraft (1989 p.24) maintains “the key ingredient to a carry over effect from a PE class to recess is the enthusiasm and motivation provided by the teacher. Children will initiate activities during recess that are fun and challenging in class”. Cosgrave (2006) highlighted that junior and senior infant children (5-6 year olds) tend not to use playground markings at break time if they have not been taught the marking games at PE.

Break time contributed to the cognitive, social and emotional development of children, and breaks throughout the day improved children’s attentiveness and decreased restlessness, improved class behaviour, and provided PA (Pellegrini, Huberty and Jones, 1995; Pellegrini and Bjorklund, 1997; Blatchford and Sumpner, 1998; Jarrett et al., 1998; Patte, 2006). Boyle, Marshall and Robeson (2003) from playground observations consider enjoyment as a clear emergent theme.

2.5.2 *What do Children do in the Playground at Break Time?*

It is important to establish what children do in the playground at break time in unstructured free time and to observe if PA happens at this time in order to considered its possible contribution to daily PA guidelines. Table 2.4 summarises studies

describing children's behaviour. Key findings are now reported. Social relationships are important determinants of activities that children undertake in play at break time (Pelligrini and Smith, 1993; Sallis et al., 2000; Blatchford, Baines and Pelligrini, 2003). School topography also affects children's play activities (Humphreys and Smith, 1987; HSE, 2005a). Availability of equipment influenced children's use of space (Renold, 1997; Boyle et al., 2003; HSE, 2005). Boys engaged in activities that involved vigorous and competitive behaviour (Lever, 1978; Renold, 1997; Pellegrini, Blatchford, Kato, and Baines, 2004), aggressive play (Humphreys and Smith, 1987) and more complex activities (Lever, 1978), and boys tended to dominate yard space (Boyle et al., 2003).

Boys and girls differ in activities at break time (Lever, 1978; Humphreys and Smith, 1987; Kraft, 1989; Renold, 1997; Blatchford et al., 2003; Boyle et al., 2003; Pellegrini et al., 2004; Waring et al., 2007). Girls were found to play in a far greater array of activities (Renold, 1997; HSE, 2005) and in smaller groups (Lever, 1978). Girls displayed more emotional connection with peers through chatting (Kraft, 1989; Boyle et al., 2003; Waring et al., 2007).

Children tended to interact with children of the same sex at break time (Lever, 1978; Blatchford et al., 2003). Older children were likely to spend more time in rule-governed games (Humphreys and Smith, 1987) and activities, with more structured activities occurring at lunch break compared to shorter breaks (McKenzie et al., 2000). Kraft (1989) reported that although the finding was not significant black girls spent more time at break time in solitary behaviour and observing others (Kraft, 1989).

Boyle et al. (2003) reported conformity in the playground as an emergent theme. Children appeared to have a good idea before they went out to the yard what, where, and with whom they were going to participate at break time, with decisions being perhaps decided upon early morning when children were deciding what clothing to wear for school (Boyle et al., 2003).

2.5.3 *How Active are Children During Break Time?*

Children best accumulate PA in unstructured environments where they are free to interact with their peers (Patte et al., 1996). Table 2.4 summaries descriptions and findings from studies undertaken in the school playground at break time to assess PA

levels. Differences in schools practices in relation to the number of break times and break time durations as well as environmental differences are highlighted in keeping with the overall aims of the current study to examine whether differences exist in break time active play between schools with different policies or environments. Again attention is drawn to the various methods of PA assessment used between studies. Key findings are now summarised. A range of individual differences in children's PA occurs at break time (Stratton and Mullan, 2005). These ranges reflect the pattern and tempo of children's movement (Bailey et al., 1995). Boys and girls do not achieve the same PA levels. Children's play activity represents a choice of behaviour for children (Stratton and Mota, 2000). The unstructured playground environment at break time lends itself to the highly transitory activity patterns of children (Bailey et al., 1995). This intermittent activity behaviour is extremely difficult to match with heart rate (Stratton and Mota, 2000). Stratton and Mullan suggested that possible reasons for PA ranges in the playground were due to the type of games played, the use of space and the social dynamics of the primary school play yard.

Table 2.4 Studies Reporting Children’s Activities and PA Levels at Break Time, and Environmental Variables at Play.

Colour Code: Assessment Method: **Objective**; **Subjective**; **Observational**;

School Practice or Policy: **Environmental**; **Structural**;

Popular PA: **Most common playground activity**;

Studies varied in number of break times therefore the following code was devised for clarity: **A**=lunch break only; **B**=morning and afternoon break time; **C**=morning and lunch break; **D**= lunch break and afternoon break; **E**= morning, lunch and afternoon break; **F**= before school, morning break, lunch break and after school.

Source & Country.	Sample & Setting Particulars, No. of break times where stated.	Assessment Method	Findings
Humphreys and Smith (1987)	7 year olds n=29,	Observational	2 yards No play apparatus was provided in either yard but children brought own items of loose equipment, footballs.
Northern England	9 year olds, n=29 n=36 11 year olds	Observations	Older children spent much more time in rule-governed games-soccer and rounders . Rough and tumble (R&T) play took 10% break time at all three ages. Aggressive behaviour took 0.2% of playground time. Boys devoted more time to R&T than girls at 7 years and 11 years (P<0.05 and P<0.01 respectively) but 9 year old, possibly due to more time playing rule games than the other two age groups. 11 year olds had access to both yards. Only 3.7% of R&T play took place on the hard surface even though they spent over 27% of their break time play there, indicating play surface as an environmental factor influencing children’s activity choices. Playground topography (steep grassy banks) seemed to attract R&T play.

Source & Country.	Sample & Setting Particulars, No. of break times where stated.	Assessment Method	Findings
McKenzie, Marshall, Sallis and Conway, (2000) US	Grade 6-8 (10-15 year olds) 24 schools C 2 lunch periods per day (range 1-3) 35.5 min. (SD 6.8) min.	Objective Observation SOPLAY	Schools had on average 6.3 separate areas for PA to take place at break time. Mean size =6921(SD 1.6) m ² Total 43,545 (SD=19,211) m ² per school More boys than girls played in activity areas at lunch time (30.6 vs 8.3% of daily attendance, p=<0.001) The most prominent activity for both boys and girls was coded “no identifiable sport”. 73% for girls at lunchtime and 37% for boys. Activities with more structure (sports and games) occurred mostly at lunchtime. Basketball was the most frequently occurring sport (13% for boys and 5.7% girls). School policy and lack of supervision cited as reasons why students were not permitted in certain play areas.
Pellegrini Blatchford, Kato, Baines, (2004) Minneapolis (US) and London (UK)	7-8 years n=126 (59 boys and 67 girls) n=122 (55 boys and 67 girls)	Objective Observations autumn and summer Interviews	American children chased more. This was their first year at school. Boys chased more than girls; chasing decreased as year progressed and ball games increased. Girls preferred jumping, clapping and chanting games .
Smith, Smees and Pellegrini (2004)	5-8 year old boys n=44	Objective LT filming; Child Interviews to identify playful	Playful and real fighting usually took place with friends; 85% of occasions seen as friendly and enjoyable. Situation may change as children approach adolescence due to more sophisticated social thinking and when dominance assertion becomes important (Humphreys and Smith, 1987).

Source & Country.	Sample & Setting Particulars, No. of break times where stated.	Assessment Method	Findings
Northern England		&real fighting.	
HSE (2005a)	10-12 years n=58	Subjective	Prior to intervention 90.9% of children played tag, 80.4% ball games, 94.7% talked to friends, 64.3% walked or ran about the yard, 11.5% did nothing.
Ireland	Second and fifth class children (nos. not stated for gender) C	Children Questionnaire	Girls observed doing cartwheels and handstands in summer term when grass was available for play.
Blatchford, Baines and Pellegrini (2003)	7-8 years n=129 (61 boys and 68 girls) 4 schools.	Observational and Subjective 7906 Observation scans.	Most common activities in rank order: conversation, ball games, and traditional playground games. Girls engaged in games and play 58% of total scans and boys 85%. Ball games increased as year progressed particularly among girls.
England	School 1, 2, & 3 E (15 min morning and afternoon break, 60min lunch break). School 4 C (no afternoon break).	Child Questionnaire & Interviews	Girls' ball games did include some football but mainly ball games less physically vigorous than football. Ball games other than football involved much on looking and waiting for turns. Children interacted mainly with the same sex in 80% of scans. Where mixed age interaction occurred children played and interacted with older children which may be a learning platform for games to be passed on to younger children.
Waring, Warburton & Coy (2007)	5-11 n= 374 (177 girls and 197 boys) in 20	Observational Direct Observation Over 4 years	Football and chasing most popular games. Many girls observed not to get involved in games. Extremes of PA observed, often with gender variations.

Source & Country.	Sample & Setting Particulars, No. of break times where stated.	Assessment Method	Findings
NE, England	schools C		
Lever (1978)	10-11 years	Observational	Girls played co-operatively while boys played competitively.
Connecticut, US	n=181 Fifth grade children	Observations Semi structured interviews, questionnaire, & diaries.	Girls' games- tag, hopscotch or jump rope and preference shown for loosely structured games. Boys' games included basketball, football and baseball games with explicit rules. Football generally involved almost all boys from the class. When football was not allowed boys were seen to play in much smaller groups, playing fantasy games, chasing and racing. Whole class group display of a game or activity was rarely seen in girls. Girls operated in small groups of up to six members. Too many players were considered to detract from fun as it meant fewer turns and with longer waits between turns.
Boyle, Marshall, & Robeson, (2003) New England, US	67 schools 9-10 years C	Observational Break time observations	Boys often dominated yard space for games such as soccer. Choosing clothes may influence PA.
Renold (1997) East, England	2 Primary schools Year 2 and Year 6	Observational and Subjective Child Interviews & Observation	Common hierarchy of activities in relation to space domination were football, fighting/wrestling play, chase games, walking and talking, skipping and elastics with some gender mix and other gender segregation evident. School football team practice often took place at break time which reinforced the position of the importance of the game to the school particularly for males.

Source & Country.	Sample & Setting Particulars, No. of break times where stated.	Assessment Method	Findings
Kraft (1989) US	K=3 elementary schools n=369 C (unclear) Average daily break time= 28 min. (range 15-35 min.).	Observational Observation	Children were involved in some degree of physical play about 60% of break time. Vigorous PA amounted to 21 % of break time. Boys were more active than girls Boys MVPA=45% Girls MVPA=38%. Girls conversed and were involved in sedentary play 24% of time and boys 19%. Racial differences were not significant although black children did exhibit more solitary and independent behaviour. Black girls spent more time in solitary behaviour and more time observing others.
McKenzie, Sallis, Elder, Berry, Hoy, Nader et al. (1997) San Diego, US	4.4 years mean age n=287 A (longest break stated) Each child observed during 2 outdoor break periods at Pre school Mean=25.9 min. (SD 5.5) and 2.2 years later in a different season in elementary school break time 14.1 min. (SD 4.3). Seasonality was taken into account during the	Observational Observation BEACHES	Children more active during the first 10 min. of break time at elementary school than they were at pre school (49.1 vs 43.3% MVPA p<0.002). Reduction in activity level was within the first 3 min. MVPA elementary 47.5% preschool 41.1%. Boys more active than girls p<0.068. MVPA at pre-school 41.1% and elementary school 2 years later 47.5%. Activity prompts from peers 61.9% pre-school and 83.5% elementary school. Activity prompts from teachers 35.7% pre-school and 15.25 elementary school. Boys compared to girls received more prompts p<0.04.

Source & Country.	Sample & Setting Particulars, No. of break times where stated.	Assessment Method	Findings
McKenzie, Marshall, Sallis & Conway (2000) California, US	observational periods 6-8 Grade (10-13 years approx) 24 schools C 2 lunch periods per day (range 1-3) 35.5 min. (SD 6.8) min.	Observational Observation	Boys engaged in more MVPA than girls (adjusted= 62.4 vs 48.3% in MVPA) and had a higher average energy expenditure rate (0.083 vs 0.070 kcal/min., p=<0.004). Lunch break was found to be the most popular time for children to use school physical activity areas. 51.7% of girls and 67.7% of boys were engaged in MVPA during lunch break.
Waring, Warburton & Coy (2007) NE, England	5-11 years n=374 C Morning break and lunch break (PE lessons omitted)	Observational Observation	11.8% of children's free time at break times was spent being physically active which equates to 15 min. of the school day where there was a PE lesson. Boys more active than girls (boys 20% time in MVPA and girls 13%). (Statistical significant gender difference in levels of MPA p=0.000 but not VPA p=0.104). All children spent 11% of total lunch break in moderate to intense activity and 5% morning break. Significant differences were found for gender PA at lunch break with boys more active than girls for both moderate p=0.003 and vigorous activity levels p=0.000.
Sleap & Warburton (1992) England	5-10 years n=56 E Average observation time per child was 14.7 min. morning break; 18.7 min. lunch break. Observation of 23 break times	Observational	Morning break average time engaged in MVPA=7.15 (SD 4.23) min. =48.6% and lunch break =18.75 (SD11.48) min. =43.5% and afternoon break = 8.17 (SD 4.16) 56.4%.

Source & Country.	Sample & Setting Particulars, No. of break times where stated.	Assessment Method	Findings
Sallis, Patterson, & McKenzie, & Nader (1988) San Diego, California, US	3-5 year olds (Pre-school children) n=33 30 minute unstructured free play sessions 2 consecutive days.	Observational Observation FATS system Height/weight	60% of playtime in sedentary activities. 11% in vigorous activities.
Cardon, van Cauwenberghe, Labarque, Haerens & De Bourdeauhuj (2008), Belgium	4-5 year olds (Pre-school children) n=783; 39 schools. Average recess duration= 24.2 min. (± 11.05 , range 9-50) unstructured free play sessions 3 days.	Objective and Observational Pedometers Environmental variables measured	The average number of children per m ² was 0.15 Mean no. aiming equipment pieces on the playground was 1.79 (± 1.2 , range 0-4). Markings present on 24 of the 39 playgrounds. In 21 schools vegetation was present on the playground. The playground surface was partly soft in 20 schools. Girls lower activity levels than boys ($p \leq 0.05$). Among boys' step counts predicted by the number of children per m ² ($p \leq 0.05$) and recess duration ($p \leq 0.001$). Among girls' step counts predicted by the number of children per m ² ($p \leq 0.01$), number of supervising teachers ($p \leq 0.05$) and recess duration ($p \leq 0.001$).

Source & Country.	Sample & Setting Particulars, No. of break times where stated.	Assessment Method	Findings
Ridgers & Stratton (2005) NW, England	Mean age 8 years n=270 in 18 schools E Small Break time duration =19 min. (±4.5). Lunch break time duration =60 min. (±7.7). Afternoon break 15 min. (±2)	Objective HR Monitors 1 day	Boys' MVPA 31(±17)% = 26 min. total in school day and girls 24 (±17) % = 20 min. Gender effect p<0.01 gender but not for age p>0.05. Boys' VPA 11(±11) %=9 min. Girls VPA 8(±10) %=9 min. No effect children's MVPA and VPA across days and seasons p=>0.05. No differences between children's %MVPA p=>0.05 whether they engaged in two or three break times.
Stratton (2000) NW, England	5-7 year olds n=473 break periods E Before and after the painting of playground markings	Objective HR monitors 1 day	MVPA 35% girls and 40% boys before intervention =27 (8.9) and 29 (9.5) min. After the intervention 45% girls and 40% boys = 45 min. intervention group.
Ridgers, Stratton & Fiarclough, (2005) NW, England	5-10 year olds n=228 E (116 boys and 112 girls) 3 break periods on 1 school day	Objective Accelerometers 1 day	Boys engaged 28 min. of PA during break time compared to girls 21.5 min. (32.9% of break time for boys and 25.3% for girls). Gender effect (p=0.001) but not age (p>0.05).
Stratton & Mullan (2005)	4-11 year olds n=99	Objective	MVPA 36.7% before intervention MVPA increased to 50.3% after intervention resulting in an interaction (p<0.01).

Source & Country.	Sample & Setting Particulars, No. of break times where stated.	Assessment Method	Findings
	E 15 min. morning break 15 min. afternoon break 60 min. lunch break	HR Monitors 3 days	Increases in PA were evident in all ages. VPA 7.9% before to 12.45% (p<0.03). The increase in MVPA in late primary school more than doubled that found in early primary school children.
Pellegrini, Huberty and Jones (1995) US	5-9 year olds n=62 B 4 days observations Duration of break time =20 min. Short and long deprivation of break time twice weekly.	Observational Observation	Post hoc analyses showed that 9 yr olds more active than other children (p<0.0005); boys were more active than girls (p<0.0001) after break time deprivation confinement. Outdoor temperature positively and correlated with both PA (p<.0001) and social interaction (p<0.0001). Classroom concentrations levels will not be commented on in this table as the focus is on PA levels.
Mota, Silva, Santos, Ribeiro, & Oliveira, & Duarte, (2005) Portugal	8-10 year olds n=22 (10 boys and 12 girls) B 30 min. morning break (10.30-11h) 30 min. afternoon break (15.30-16.00h) Children allowed to bring	Objective Accelerometers, over 3 consecutive school days, all day.	38% of girls more involved in MVPA during break time compared to 31% of boys (p<0.05). Break time contributes more (p<0.05) for girls 19% (11.4 min.) than boys 15% (9 min.) to total amount PA by international guidelines. % of time engaged in MVPA during break time at school accounts for a small amount of daily MVPA (6% boys and 8% girls).

Source & Country.	Sample & Setting Particulars, No. of break times where stated.	Assessment Method	Findings
Tudor-Locke et al. (2006) Arizona, US	11 year olds n=81 (28 boys and 53 girls) D Lunch break 40 min. (25 min. to eat and 15 to play in the gym or outside). Afternoon break 15 min.	Objective Pedometers 4 school days	Contribution of break time to total school PA = 8-9%. Boys took more steps per day than girls (eta [sup2]=0.15, large; lunchtime Delta=608 steps, eta [sup2]=0.14, large (Delta=280 steps) and more steps during after school time. Boys were more active on PE days p<0.05 compared to girls p=0.92. Lunch break represented the most important source of daily PA (15-16% during school hours) obtained during school hours for both sexes and PE class 8-11%, morning break 8-9%.
Zask, van Beurden, Barnett, Brooks, Dietrich (2001) Rural Australia	5-12 year olds 18 schools (46.4% female and 53.6% male) School size range 18 to 575 enrolment mean 212 C Small break mean duration 16 min. Lunch break mean duration 30	Observational CAST (Children's Activity Scanning Tool)	Lunch break more MVPA and VPA than other breaks. Boys more active than girls. MVPA at lunch time when a 100-student school size =55.16% boys and 45.41% girls 500-student school =35.14% boys and 26.80% girls. Heat stress, equipment availability (other than balls) and teacher presence/behaviour variables were not significant. The balls-to-child (amount of equipment) ratio was a one-tailed sig. predictor of increased VPA.

Source & Country.	Sample & Setting Particulars, No. of break times where stated.	Assessment Method	Findings
Sallis, Conway, Prochaska, McKenzie, Marshall et al., (2001)	min. Grades 6-8 (10-13 year olds approx.) 24 middle schools. C 2 breaks (35.5 min. mean). 151 areas for PA possible. Summer mean temp 19°. Winter mean temp 10°. Skipping ropes and footballs available.	Observational SOPLAY	Only 2% girls and 6% boys chose to be physically active at break time. Multiple regression showed more girls were active when equipment was not present in indoor areas, but equipment $p=0.011$ increased activity levels outdoors. Supervision and fixed equipment outdoors were found to be evident when girls were most active $p=0.001$. The largest number of boys were most active when equipment was available $p=0.001$ and were most likely to be active on supervised playing courts $p=0.001$.
Burns (2004) 'Switch Off Get Active' Waterford, Ireland	10 year olds Low SES n= 312	Subjective Questionnaire	Teacher led lesson intervention to reduce screen time and increase PA. 13% participated in vigorous PA during lunch break 'often', 33% 'sometimes' and 54% 'rarely'.
Mc Greevy (2007)	4-12 year olds n=7 schools (95 -784 pupils) 5 Urban schools residential population density 50,000 2 Rural schools residential population density <50,000	Observational SOPLAY	Schools had mean 8.7 separate play areas throughout a school day (mean size play area=618.1m ²). Space per pupil range 4.9-66m ² (mean per pupil per school 12.7m ²). Space available range 3,816-8997m ² (mean per school 5,377.5m ²). No relationship between amount of space available in rural compared to urban schools ($p=0.053$). Play space available per pupil had no significant effect on MVPA levels ($p=0.052$). Number of pupils in the playground had no significant effect on MVPA levels of pupil's range
North Leinster Region of Dublin			

Source & Country.	Sample & Setting Particulars, No. of break times where stated.	Assessment Method	Findings
McGinn (2007)	<p>Before school, morning break, lunch break and after school examined</p> <p>F</p> <p>2 observation days February and March</p> <p>and inter- reliability with DVD.</p>		<p>50%-85%. No p score stated in thesis.</p> <p>Higher levels of engagement in MVPA observed in girls attending mixed schools (55.3%), in comparison to pupils attending girls' schools (53%).</p> <p>Boys found to be more active than girls in mixed schools.</p> <p>Pupils attending boys' schools were more likely to be physically active than pupils attending mixed or girls' schools.</p> <p>Boys' more engaged in MVPA than girls during morning break (63.5% vs 56.3%) and lunch break (64.9% vs 52.3%)(p<0.001).</p> <p>Boys schools more active than mixed and girls schools (p<0.001).</p> <p>Boys' schools rated highest for usability (86.8%) and accessibility (79.3%) of activity areas, while levels of supervision (48.3%), equipment (24.9%) provision and organised activities (2.8%) were highest in mixed schools.</p> <p>Lunch time most active period for all children (59.6% morning break and 68% lunch break, 46.4% after school and 39.3% before school).</p> <p>Boys more active than girls at morning break (63.2% vs 56.1% MVPA) and lunch (64.8% vs 52.1%).</p> <p>Boys and girls most prominent activity was "no identifiable sport, game"</p> <p>Provision of equipment was below 31% throughout the day.</p> <p>Organised activities unpopular 4.7% of the school day.</p>
Tuite (2007)			

Allowing for the difference in school policy in relation to the number of daily school breaks, and considering the possible inclusion of a PE lesson in a school day, break time PA represents 11-20 min. of children's daily PA guideline (60 min. MVPA daily) (Mota et al., 2005; Ridgers and Stratton, 2005; Tudor-Locke et al., 2006; Waring et al., 2007). Children engaged in 35-60% MVPA at school break time (Kraft, 1989; Stratton, 2000; Mota et al., 2004; Stratton and Mullan, 2005; Ridgers and Stratton, 2005; Ridgers et al., 2006b). Differences may be due to sample sizes as well as environmental factors (Stratton, 2000). Ridgers and Stratton (2005) reported that school playtime at break periods can contribute between 5%-40% of recommended daily PA levels when no school break time interventions were in place. Stratton and Mullan (2005) recommended a PA threshold of 40% achievable during total break time. This equates to about 34 minutes in the UK (Ridgers and Stratton, 2005; Ridgers et al., 2006b).

No significant age differences were found for PA at break time (Ridgers et al., 2005; Tudor-Locke et al., 2006) except for Pellegrini et al. (1995) who found older children more active than younger children. All studies (see Table 2.4) except for Mota et al. (2005), found that boys were more active than girls at break time. Girls were significantly more active at morning break compared to the afternoon (both of which were 30 min. duration) with no lunch break data reported ($p < 0.05$) (Mota et al., 2005). Tuite (2007) found a greater number of girls engaged in MVPA at morning break compared to lunch break (56.1% vs 52.1%).

Considering break time only (no PE lesson), lunch break PA represented the most important source of daily PA obtained during school hours for both boys and girls (McKenzie et al., 2000; Zask et al., 2001; Sutterby, Brown and Thornton, 2004; Tudor-Locke et al., 2006; Tuite, 2007; Waring et al., 2007) with the exception of Sleaf and Warbuton (1992). While vigorous activity is reported at low levels at break time for both sexes, boys scored somewhat higher in their levels of VPA at 8%-21% (Kraft, 1989; Zask et al., 2001; Burns, 2004; Ridgers et al., 2005; Stratton and Mullan, 2005; Waring et al., 2007; Cardon et al., 2008). The 4 min. of VPA and 21 min. MVPA highlighted the intermittent and spontaneous movement patterns of children proposed by Bailey et al. (1995) and supported by Ridgers et al. (2005).

Children were less active as break time elapsed (Pelligrini and Smith, 1993; McKenzie et al., 1997; Cardon et al., 2008). Children's active play at break time does not last very long (McKenzie, 1997). There are marked decreases after 6-7 minutes (Pelligrini and Davis as cited in Pelligrini and Smith, 1993). Trost et al. (2002) in a study of 9 year old children and adolescents reported very few bouts of sustained PA for 20min. in either VPA or MVPA and considered this inappropriate. There was a clear trend for greater participation in shorter 5 to 10 min. bouts of MVPA demonstrated by Sleaf and Warburton (1992). Boys were more active than girls particularly after the long confinement periods i.e. children were delayed in the classroom at tasks before break time was permitted (Pellegrini et al., 1995). Pellegrini and Davis (as cited in Pellegrini and Smith, 1993) reported that confinement prior to break time increased the intensity of children's playground activity.

The number of breaks did not appear to affect MVPA (Ridgers and Stratton., 2005), nor did the day or season (McKenzie et al., 1997; Ridgers et al., 2006a). PA was higher in smaller schools (up to approximately 200 students) and decreased linearly as school enrolment increased (Zask et al., 2001). Cardon et al. (2008) reported in pre-school children that in both genders more space per child was found to be associated with more PA during break time. However the number of pupils in the playground had no effect on MVPA levels of pupils (range 50%-85% MVPA) (Mc Greevy, 2007). The amount of break time play is influenced by fixed outdoor equipment (Sallis et al., 2001; Zask et al., 2001), equipment availability (Sallis et al., 2001), amount of equipment e.g. number of balls (Zask et al., 2001), and supervisors who prompt PA (McKenzie et al., 1997; Sallis et al., 2001).

In the course of research for this study it was apparent that some Irish primary schools allow children to eat their lunch in the classroom before the official commencement of the recreation interval. Other schools include eating time within the lunch break resulting in less time to be physically active. The practice of the scheduling of play time at lunch break before eating time would appear to be advantageous in terms of reducing food wastage and in terms of encouraging positive nourishment habits at school time (Getlinger, 1996).

In summary it is apparent from research reviewed that environmental factors, school policies and practices differ between schools that can influence children's PA levels during school break time. The causes for these different practices may also vary. One possible justification by schools for such practices will be outlined.

2.5.4 Is There an Acceptable Amount of Risk in Children's Supervised Play?

Casey (2003) highlights the dominant trend in the UK and other countries towards restrictions of children in school grounds, increased levels of supervision and decreased time for breaks. Safety is of great concern to schools and impinges on practices within the school. According to the guidelines the measure of duty placed on the teacher is to take such care of his/her pupils as a careful parent would of his/her children. This legal principle is known as 'in loco parentis' (in the place of the parent). Whitlam (2005) maintains this standard has been modified and updated in the United Kingdom as a result of a court case, *Lyes v Middlesex County Council* 1962 (61 LGR 443). The application of the careful parent should be in the context of the school rather than the home because the teacher had responsibility for more children at any one time and in a different environment from the home.

Recreation is part of the school day and it has a particular function (Allianz, 2001). Inherent in PA at break time is a certain amount of risk that should be acceptable. Whitlam (2005) refers to the risk continuum in relation to PE and school sport. A Guide to Insurance, Safety and Security in the School is available online from Allianz insurance company. The guide has been updated since it was first published in 1991. The guide quotes a judicial comment that reads as follows, "If every teacher is to take precautions to see that there is never ragging horseplay among his pupils, his school would be too awful a place to contemplate". Glendenning (1999, p.285) maintained, "It was necessary to strike a balance between too rigid supervision and the commendable aim of promoting sturdy independence in the pupils as they grow towards maturity".

Minister of Education and Science, Mary Hanafin in a national RTE 1 radio interview in May 2005 described the growing trend for schools introducing 'no running' policies at lunch time for fear of litigation as "ludicrous" (RTE, 2005).

This comment was in reaction to a Health Service Executive Report (Millar and Millar, 2005) which showed that 40% of schools in the Cork and Kerry region had implemented 'no running' policies during lunch break time. The sample consisted of 50 randomly selected schools. Seventy-five per cent of 300 or more pupil schools had such a policy compared to 29% of schools with an enrolment of less than 300 pupils. Over half of the city schools had such a policy compared to one third of rural schools but this figure was not found to be statistically significant (Murray and Millar, 2005). No indication was apparent whether this policy was a clear written statement or an informed practice understood by children at playtime communicated by supervisors. The Irish Primary Principals Network reporting on the RTE radio programme maintained the reason for the introduction of such a policy was the fact that many schools simply did not have enough space to allow the children to run freely.

The Board of Management of each school must decide on the number of supervisors appropriate for the topography of the yard and the age and number of children playing there and the activities being undertaken. Risk assessment is essential and would include regular checks of all play areas, surfaces and equipment used at break time. Children should be warned of any potential hazard-for example 'out of bound' areas. Equipment should only be used for the purpose it was intended and children should be instructed of this practice. Appropriate medical care should be available on site if needed.

Cox (2005) recommends that schools should have a policy that specifies school practices in relation to PA, games, sport and extra curricular activities. This would imply that break time should be included. This is part of the school day when PA occurs naturally. The policy should be displayed prominently in the school and should be conveyed to parents. Current practices should be reviewed often in keeping with reasonable forethought (Whitlam, 2005). Formalising policies and practices could result in schools exploring possibilities to increase the PA levels of children at break time and children's enjoyment of break time.

2.5.5 What Interventions are Reported to Increase Children's Physical Activity at Break Time?

Many interventions have been designed to influence children's PA levels. For the purpose of this study, particular attention will be paid to those interventions that specifically target school break time which involve simple environmental changes. However, it is useful to also consider the efficacy of interventions in other settings. As before, key findings are reported in tabular form (see Table 2.5) and the main findings summarised in the text.

Table 2.1 Break Time Interventions to Increase Children's PA.

Colour Code: Assessment Method: **Objective**; **Subjective**; **Observational**;
 School Practice or Policy: **Environmental**; **Structural**;

Studies varied in no. of break times studied and are therefore coded: **A**=lunch time only; **B**=morning and afternoon break time; **C**=morning and lunch break; **D**= lunch time and afternoon break; **E**= morning, lunch and afternoon break; **F**= before school, morning break, lunch break and after school.

Source, Country.	Sample and Setting Particulars, (No. of break times where stated)	Intervention	Method and Time frame where stated.	Findings
Connolly & McKenzie (1995) US	n=56 Elementary school	'Easy-to-implement games at break times' No examples stated	Subjective , Observational & Objective Self report Accelerometer Direct observation	Children "sweated" and "breathed hard" higher proportion of the game intervention than the standard break time (p<0.01). No changes in enjoyment or gender differences (p>0.01).
Stratton & Mullian (2005) England	4-11 year olds n=120 (4 intervention school and 4 control school Data used from 51 boys and 48 girls) E . 3 Break periods 60min lunch break	Playground Markings Bright fluorescent coloured markings varied between schools e.g. castles, dragons, clock faces, snakes and ladders and hopscotch. Small loose equipment e.g.	Objective Heart Rate Monitors Baseline data collected 4 weeks prior to summer holidays. During holidays playground had playground	MVPA intervention group increased from 36.7% (±23.9) to 50.3% (±28.9) compared to a decrease from 39.9(±21.1) to 33.4 (±18.4) in control group (p<0.01). Children exceeding PA guideline of 50%MVPA at break time which was 10% lower at baseline. Younger children increased MVPA by 2.4% and older children by 6.9%. Boys increased MVPA by 4.2% and girls 4.6%. Intervention group increased VPA by 4.5%; Younger children showing increase of 1.6%; older children 4.1%.

Source, Country.	Sample and Setting Particulars, (No. of break times where stated)	Intervention	Method and Time frame where stated.	Findings
	(30 min. to eat and 30 min to play) and 15 min. morning break and afternoon break)	skipping ropes and footballs were already available in playgrounds.	markings painted. Post intervention data collected for 4 continuous weeks September - October	Boys VPA increased by 2.8% and girls by 2%. Range of individual differences in PA levels before and after intervention.
Stratton & Leonard (2002) England	5-7 year olds n=47 2 schools Control school had limited loose equipment for break time use. Intervention school one football. C 3 Break Periods (15, 60(30 play), 15 min. morning, lunch, afternoon)	Playground Markings themes linked to curricular areas, 10 markings, e.g. castle, pirate ship, dragon, clock face, maze, hopscotch; 2 schools similar playground space Control school =40x20 metres; Intervention school =30x30 metres With the exception of a soccer ball, no other play equipment was allowed into the playground area. Control school had no ground markings, but allowed limited equipment in the before and after phases of the intervention. Mean duration break time 84 min. control school and intervention school 85.8 min.	Objective Heart Rate Monitor Before intervention and within 4 weeks post intervention.	Mean energy expenditure increased by 6.1%, boys showing higher increase than girls. Intervention group showed an energy expenditure increase of 7.8% (p<0.02). Girls energy expenditure increased at similar level to boys during intervention. Total energy expenditure during play in intervention school increased by 35% (800kj). Total energy expenditure during play 23% higher in boys compared to girls. Mean HR increased by over 6 beats/min. in experimental group to an average 132 beats/min. Intervention caused increase in break time duration (p<0.01). Playground markings accounted for 1/3 of increase in PA but remainder was a result of increase in break time duration. Stratton (2000) reported post intervention increases reaching 45-50% guidelines.

Source, Country.	Sample and Setting Particulars, (No. of break times where stated)	Intervention	Method and Time frame where stated.	Findings
Ridgers, Stratton, Fairclough & Twisk (2007) England	5-10 year olds n=297 26 elementary schools C mean daily break time = 81.1 min. (±17.3)	Playground Redesign new multicolour playground markings; playground designed into 3 coloured zones-sports area, fitness and skills area and a 'chill out' area. Small loose equipment e.g. skipping ropes, soccer balls available in all school playgrounds.	Objective Accelerometers Once before intervention and once 6 weeks after the intervention.	Effective in increasing children's MVPA and VPA in the short-term. Crude increases in PA post intervention (increase 5.95% MVPA and 1.7% VPA) but following adjusted analysis non-significant. The results indicated boys engaged in 7.2% more PA than girls during recess. Age by intervention inverse interaction (p=0.09) stronger on younger children. Recess time x intervention MVPA (p=0.07) indicating the more time available the stronger the intervention effect on recess MVPA.
Verstraete, Cardon, De Clercq, & De Bourdeaudhuij (2006) Belgium	10 year olds Intervention Group n=122 (75 boys and 47 girls) Control Group n=113 (46 boys and 67 girls)	Copious Games Equipment Intervention school received game equipment and activity cards. Teachers asked to stimulate the children to play with equipment, divide equipment into sets where bags could be alternated regularly. Teachers were advised to explain rules about the use and care of equipment. Equipment included jump ropes x2, scoop sets x 2, flying discs x 2, poco ball x 1, plastic hoops x 2, juggling scarves x3, juggling rings x 6, spinning plates x 4, badminton	Objective Accelerometers Before and 3 months after the intervention.	During lunch break MVPA increased from 38% to 50% overall and VPA from 10 to 11% (p<0.01). Morning break showed an increase in MVPA from 41% to 45%. In girls' time spent on MVPA significantly increased L.T pre test score from 31% to post intervention effect 40% and VPA 3% to 6% respectively (p<0.01). No intervention effect change in boys at morning break. Lunch break effect (p<0.01) on both boys and girls. Low intensity activities in girls decreased in the intervention group by 14% (p<0.01). Post intervention scores morning break 56% and lunch break 51% (above break time guideline).

Source, Country.	Sample and Setting Particulars, (No. of break times where stated)	Intervention	Method and Time frame where stated.	Findings
	C (16±1 min, 86±6, 13±2 min. morning, lunch, afternoon)	racquets x 2, two sets of oversized beach paddles. All schoolyards were of similar size and comparable with equipment provided.		
Afonso & Botelho (2003) Portugal	8-10 year olds n=32 (16 boys and 16 girls) 2 nd and 4 th grade children C 3 break times	Rearrangement of how space was organised. Distribution of equipment for free play. Ropes, hula-hoops, tennis balls, balls of different dimensions, sets for field hockey, junior and senior stilt, elastic bands, hoops, blocks for balance and construction.	Observational PA observed not intensity. Moment 1: Monitored pre intervention Moment 2: Categories (activity/inactivity) were created based on baseline data observations.	Grade 4 boys the most active at baseline but became even more active post intervention (p≤0.05). Inactivity time in Grade 2 boys decreased from 4 hrs 26 min. to 1 hr 14 min. post intervention. While 4 th grade girls less active than 2 nd grade, all girls groups showed less post intervention inactivity (p≤0.05). Grade 2 girls inactivity decreased by 34% (3 hrs) post intervention, with 4 th grade girls showing a doubling of time spent in activity.
'Schools on the Move' (2004) Project in Turku Finland.	7-12 year olds n=18 primary schools	Distribution of equipment e. g. brooms, rakes, snow shovels and ploughs, planting trowels, and bulbs, soil; Change in structure of school day to include longer breaks.		Evaluation is pending.

Source, Country.	Sample and Setting Particulars, (No. of break times where stated)	Intervention	Method and Time frame where stated.	Findings
www.koulutitikkelle.fi		Reviving play culture, traditional games, new games invented by children; Play leaders.		
HSE (2005) Midlands, Ireland	n=448 observed 3 schools Questionnaires to n= 58 8 year olds and 11 year olds (second and fifth class) and n=57 principals/contact person F 2 break periods (15,30 min. morning, lunch)	Playground Markings School Study 1 Enrolment = 166 School supplied one ball per class; Basket of skipping ropes was supplied to 2-6 classes. Children allowed bring own equipment. Playground markings School Study 2 Enrolment = 68 Children not permitted to bring own equipment. Ample supply of balls, beanbags, mini scooters, hula hoops in a storage shed to which all children had access. Playground markings. School Study 3 Enrolment = 214 No school equipment supplied. Children permitted to bring own	Observational SOPLAY prior to and 7 weeks after playground markings put in place. Subjective Questionnaires to Principal and Children	78.2% children playing more games during break time post intervention. 59% stated the markings used at PE. 51.9% thought markings were 'great'. Limitation: neglected to factor use of green open spaces in spring/summer season post intervention period. Preferred use of grass areas by children in summer term. School Case 1 indicted increases across both stationary and walking activity types in both girls and boys; However the increases were not as great for boys. School case 2. A small increase in 'walking' activity levels in all areas was noted and a decrease in stationary levels. School case 3. Markings were only available to junior classes modest increases reported; soccer still dominated space and implementation of zoning was recommended.

Source, Country.	Sample and Setting Particulars, (No. of break times where stated)	Intervention	Method and Time frame where stated.	Findings
Sutterby, Brown & Thornton (2004) US	Grades 1-5 n=120 2 schools economically disadvantaged and Hispanic Equipment Comparison PA levels at PE classes, Free time in school with no fixed equipment but with loose equipment, and one school with fixed climbing/hanging equipment.	equipment/ toys. Basketball markings in school pre-intervention, without hoops. Playground markings. PE v's Free Play Fixed equipment and loose (items not available)	Objective Heart Rate Monitors BMI	Children in free play with fixed playground equipment had a mean HR 152.7 bpm. Children in free play with no fixed playground equipment HR 145.8 bpm. Children in PE lessons had a mean HR 132.2 (SD=13.7) bpm. Free play average 149(SD +17.7) p<0.0001.
Scruggs, Beverage & Watson (2003)	Mean age 11 years n=27	School Fitness Breaks (FB) 15 min. duration = afternoon break time	Objective	Boys liked FB more than girls (p=0.014). Girls liking for normal BT higher than for FB (p=0.006).

Source, Country.	Sample and Setting Particulars, (No. of break times where stated)	Intervention	Method and Time frame where stated.	Findings
US	<p>(10 boys and 17 girls)</p> <p>Shared yard space with 50 other children.</p> <p>Loose play equipment available, 2 basketball posts, and 2 hopscotch markings.</p> <p>C 3 break periods (15, 20, 15 min. morning, lunch afternoon).</p>	<p>period of a continuous obstacle course including skipping, crawling, dancing exercise equipment and scooter travel.</p>	<p>Heart Rate Monitors</p>	<p>Students had significantly higher % MVHR ($p=0.0001$) and %VHR ($p=0.0001$) with FB intervention.</p>

In general, most playground marking interventions showed positive results in terms of increasing PA levels in children (Stratton and Leonard, 2002; Stratton and Mullan, 2005; Ridgers et al., 2007). Positive PA enhancing interventions included providing loose equipment (Afonso and Botelho, 2003; Verstraete et al., 2006), fixed equipment (Sutterby et al., 2004) and playground redesign (Afonso and Botelho, 2003; Ridgers et al., 2007).

Playground interventions at break time accounted for 15-20% of estimated total daily energy expenditure (Connolly and McKenzie, 1995; Stratton and Leonard, 2002). Ridgers and Stratton (2005) recommended a reasonable break time MVPA% level guideline of 40%. This equated to 34 min. in the UK. Children met the proposed break time guidelines MVPA following interventions (Stratton and Mullan, 2005; Verstraete et al., 2006).

The variety and spacing of playground markings to equally distribute children across the whole playground area is noteworthy, and playground markings were attractive to both boys and girls (Stratton and Leonard, 2002; HSE, 2005). Boys' and girls' involvement in the design of the playground markings, and the design of the playground itself, proved positive in encouraging PA (HSE, 2005). Verstraete et al. (2006) recommends the children's choice of equipment to stimulate both girls' and boys' play and PA. One of the recommendations of the HSE study is the creation of zones for different activities.

Irrespective of the type of intervention, all studies (see Table 2.5) showed both boys' and girls' PA levels increased for MVPA and VPA post intervention. Caution was noted in relation to the 'novelty effect' of playground environmental interventions in relation to post intervention data collection (Ridgers et al., 2007). Girls' PA levels showed an even greater increase than boys' (Stratton and Leonard, 2002; Afonso and Botelho, 2003; Verstraete et al., 2006) but boys at baseline were already starting at a higher baseline point compared to girls (Afonso and Botelho, 2003; Scruggs, Beveridge and Watson, 2003; Stratton and Mullan, 2005; Verstraete et al., 2006; Ridgers et al., 2007).

There was a range of individual differences in children's PA levels both before and after the interventions (Stratton, 2000; Stratton and Leonard, 2002; Stratton

and Mullan, 2005). It was suggested that this might be due to the nature of children's movement patterns when at play. The observations from the HSE (2005a) indicated that the nature of playground marking games and activities rarely lead to vigorous levels of activity but did promote stationary and walking activity levels which may be attributed to children lining up to take turns.

Both morning and lunch breaks showed positive intervention effects (Verstraete et al., 2006). Girls benefited greatly at morning break from the intervention. Boys' PA levels however appeared to be already high at this break period and showed no change as a result of the new equipment. It is possible that the new equipment appealed to girls more than to boys. The equipment choice may be responsible for stimulating the increase in children's moderate levels of activity but may not be suitable for increasing children's vigorous levels of activity. During lunch break, the intervention was effective for both girls and boys despite the lack of observation of teacher prompts for children to be active. It is important to note that children were already habituated to a minimum level of equipment in the playground before the intervention.

Afonso and Botelho (2003, p.143) reported significant increases in both boys' and particularly girls' PA participation at break time following an intervention where "cheap and simple" equipment was offered to children at break time. The pre-intervention findings of high inactivity in relation to boys was suggested to be due to the routine of break time with little stimulation and an empty playground space resulting in poor motivation of boys to play and actively enjoy free play. The effective equipment intervention resulted in a "revolution in girls' PA at recess" (Afonso and Botelho, 2003, p. 144). Sallis et al. (2001) found the provision of play equipment appeared to enhance the children's enjoyment of break time at school.

All studies (see Table 2.5) showed strong intervention effects in children, in general, studies showed no differences with age post-intervention. Ridgers et al. (2007) reported a stronger effect on younger children and Stratton and Mullan (2005) commented on the stronger intervention increase in older children. Ridgers et al. referred to the change that occurs socially in the playground, as children get older. Children's social groups enlarge, game choices develop and space may be

sex segregated unintentionally (Renold, 1997; Blatchford et al., 2003; Boyle et al., 2003).

Although unplanned, the duration of break time increased during some interventions (Stratton and Leonard, 2002). The more time available, the more positive was the intervention effect (Ridgers et al., 2007). The longer duration of lunch break allowed for children to organise and to play complete games with the equipment (Zask et al., 2001; Verstraete et al., 2006).

Girls and boys engaged in significantly more PA during fitness breaks than break time (Scruggs, Beveridge & Watson, 2003) and during free play with equipment compared to PE class (Sutterby et al., 2004). The findings of this study suggest that manipulating the traditional break time environment to allow an opportunity for structured activity can increase children's school time PA levels. Fitness breaks should not replace all traditional unstructured breaks which have developmental and educational merit also (Scruggs et al., 2003). Structured activities may be inappropriate for children who quickly become bored if they are unable to modify the activities or to free play (Tomporowski, 2003). Boys had a higher preference for fitness breaks unlike girls whose preference was for free play break time (Scruggs et al., 2003). Enjoyment is an important variable in promoting PA at break time (Connolly and McKenzie, 1995; Sallis et al., 2001; Scruggs et al., 2003; HSE, 2005a).

The study by Sutterby et al. (2004) reported that organised games did not significantly increase children's HR (particularly older children's) to an extent greater than that of children in the school with playground fixed equipment. The increased HR of children in the school with fixed equipment was found in all age groups. This is particularly relevant in relation to older children and girls whose activity levels are reported to decrease with age. Obese children (BMI range 18.9, 6 year olds - 23.3, 10 year olds, Centre for Disease Control and Prevention guideline) reached the same levels of activity during both the PE lesson and free play class with equipment as the children in the normal range.

Confounding variables that could possibly affect the outcome on PA levels at break time in a school, with or without interventions, are school practices related to whether equipment is offered to children and the amount of that equipment, and what supervisors do at break time in relation to organising children into games or prompting (Ridgers et al., 2007), and whether playground marking games are taught at PE lessons (HSE, 2005). Ridgers et al. suggested the benefit of observational data to examine the social influences on children's PA levels in order to support accelerometer data. Long term PA assessment would be valuable beyond the point of the intervention periods (Ridgers et al., 2007; Salmon et al., 2007).

What is clear is that through both implicit and or explicit policies schools unintentionally or intentionally promote certain practices at break time that influence children's PA behaviour. While the school is not solely responsible for children's PA levels, simple, well thought out changes in practices may encourage and stimulate more children to be active.

2.5.6 What Irish Initiatives are Supporting Physical Activity in the School Setting?

Since the implementation of the revised curriculum, schools are expected to have a PE plan related to their whole school plan. Break time play and its contribution to the school's PE programme and PA are not mentioned specifically in the planning template. The role of outside agencies, particularly if implemented during allocated PE time, should be interpreted as a support role in implementing the PE programme and confirmed in the school PE plan. Integrated thinking was called for in relation to PE, sports programmes, extra curricular sport, and out of school sport, showing respect for the differences in character and function of each (Fahey et al., 2005). While PE is the remit of the DES, many other agencies in Ireland are involved in schools. Deenihan (2005) reported participation rates in programmes such as Action for Life (Irish Heart Foundation) 27.9%, and the Buntús Programme by Local Sports Partnerships 38.8%.

Initiatives at national and local level in Irish primary schools which aim to promote children's PA at school include supporting PE programmes, promoting extra curricular activities and community links, providing equipment and resource

packs and teacher courses, as well as initiatives that are relevant to the children's play at break time. The Campaign for Commercial Free Education is critical of the supermarket chains' links to schools through advertising used on the equipment supplied to schools and the actual real cost of the equipment to the supermarket compared to the cost to the customer in terms of points which equate to cost.

National Governing Bodies, e.g. Football Association of Ireland (FAI), Irish Rugby Football Union (IRFU) and the Gaelic Athletic Association (GAA), have made concerted efforts to improve the delivery and the number of programmes that they are implementing in schools through coaches that are employed in local clubs. Until the introduction of these programmes, many schools with poor facilities negotiated access to the facilities of clubs for PE and sport with little contact with the organisations themselves (McGuinness and Shelly, 1995). Now the clubs have programmes to offer the schools as well. A draw back associated with these programmes is that parents sometimes believe it constitutes PE. A broad and balanced programme for PE may not result. McArdle (2007) highlighted the marginalisation of other sports which have not got the same financial resources. The ERSI report (Fahey et al., 2005) explains that as well as providing an additional resource to the PE programme, sports clubs can acquire structured access to children which can enhance the clubs ability to recruit and develop new players and possibly club members. National and local PA and health promotion programmes invited by some Irish primary schools are summarised in Appendix 8.

2.6 Summary

Children aged 5-18 years should accumulate 60 minutes of PA of moderate intensity daily (National Heart Alliance, 2006; WHO, 2006). Studies in the review of literature consistently showed many children 5-12 years, the age group which is the focus of this study, not meeting guidelines for PA, with boys more active than girls. The literature showed that key environmental barriers inhibiting PA were:

- Limited opportunities for outdoor play,
- A decrease in active transport to school
- Increased competition in the home with sedentary pursuits.

Findings from studies showed schools as an ideal setting to implement PA promotional strategies (Biddle et al., 1998, Tudor-Locke et al., 2006). While it is recommended that children are physically active for 50% of a PE lesson, a PE lesson is not a daily occurrence, and even if it was a PE lesson by itself cannot provide the recommended 60 min. per day of activity engagement (McKenzie and Kahan, 2008). The literature review confirmed that other strategies are needed. Time spent weekly at break time easily exceeds PE class time (Kraft 1989). The review of literature highlighted Ridgers and Stratton (2005) and Ridgers et al. (2006b) findings which indicated that break time in the UK accounted for about a half of daily PA recommendations for children (34min.). Tudor-Locke et al. (2007) reported that lunch break PA represented the most important source of daily PA 15%-16% and break time 8%-9% obtained during school hours for both boys and girls. A threshold of 40%-50% MVPA was recommended for break time (Stratton & Mullan, 2005; Ridgers and Stratton, 2005; Ridgers et al., 2005). Based on this literature the current study will proceed to establish the potential contribution of break time duration to Irish primary schools children's daily PA guidelines.

In two meta-analysis studies it was concluded that inexpensive approaches for increasing PA in children at break time can be effective. Small environmental changes in the playground at break time were proposed as positive practices to increase children's PA (Jago and Baranowski, 2004; Ridgers et al., 2006b; Salmon, Booth, Phongsavan, Murphy and Timperio, 2007) despite the limitations of PA assessment methods in children. The playground environment influences how children play at school. What is clear is that schools through implicit or explicit policies, unintentionally or intentionally promote certain practices at break time that influence children's PA levels. Salmon et al. (2007) suggested that while not always reported in PA intervention studies, simple environmental strategies and changes in school practices to promote more active unstructured play are likely to be sustainable in the school setting with a teaching staff already in place and with little training required. More ambitious programmes could involve consultation and partnership with outside agencies. In the meantime, simple, safe stimulation and enjoyment of break time should be a starting point in a pedagogical approach to break time which would be communicated to parents

and guardians in order to seek their support and partnership in the creation of a positive health promoting school environment.

Following the review of international PA studies related to schools physically active play at break time there is limited research on how active Irish primary school children are during break times and what influences their PA. This study will investigate Irish primary school practices and policies and playground environmental influences on children's active play and PA accrual. Two methods were chosen to investigate the study. Firstly a questionnaire survey to Irish primary schools principals to examine break time policies and practices that currently exist in Irish primary schools in the light of findings from the review of literature. The second method chosen was an observation method, using the SOPLAY system of observation to assess a large number of children's PA levels in an open environment, at three Irish primary schools. An observation study was considered useful to establish the PA environment and habits of children in three Irish school playgrounds in the light of findings from the questionnaires.

3 METHODOLOGY

This chapter describes the methodology used in conducting the study. Two research instruments were employed: a survey in the form of a questionnaire and an observation method for physical activity assessment in three schools. A description of the research instruments used and the subjects included in the study are presented in this chapter. Issues pertaining to research methodology and data analysis are also highlighted.

3.1 Ethical Approval

The project gained approval from the Waterford Institute of Technology Ethics Committee in October 2006. The researcher undertook not to take any video footage or photographs of children, as requested by the Committee.

3.2 School Selection/Sample

The target population were primary school principals, or a person nominated by the principal who was familiar with the schools facilities, equipment, and policies around physical education and physical activity. All primary schools in the former South Eastern Health Board Region were surveyed, i.e. schools in counties Wexford, Kilkenny, Waterford, South Tipperary and Carlow (n= 391). This study sample represents 11.9 % of Irish primary schools (n=3,290 in total). Mixed and single sex schools were included. Irish primary schools cater for children aged 5-12 years of age.

3.3 Pilot Work and Questionnaire Development

No previous investigation of this topic has been undertaken previously in Ireland. Hence, no standardised or previously validated instruments exist. The researcher considered a questionnaire worthwhile to establish frequencies of school practices and policies that may influence and stimulate children's physical activity patterns at break time. The project began in September 2006 with seven phone calls to

primary school teachers and principals known to the researcher. Practices at break time in relation to children's play, and play policies were discussed to establish themes to prepare questions for a questionnaire.

The ecological model guided the development of questions designed to assess a range of influences on children's active free-play at school break time (Sallis et al., 1998). Questions investigated the following issues:

- Times of the day that unstructured play and physical activity occur
- The duration of this time
- Whether eating time is part of break time
- Potential physical activity facilities, locations and space
- Supervision practices at break time
- Loose equipment availability and yard organisation at break time
- Weather implications
- Play policy
- Children's activities at break time
- Children's freedom to run
- Practices during PE classes and the impact of these practices on break time PA.
- Respondents were also given an opportunity to freely comment on PA at break time in respect of their school.

The questionnaire consisted of 42 questions (see Appendix 20). The researcher was conscious of the busy schedules of principals and teachers and the need to consider speed of questionnaire completion. Thus, the questionnaire consisted of mainly closed questions (Wilson and Mc Lean, 1994) with an open category to allow respondents to write a free response as related to their circumstances, to explain and qualify their responses and avoid the limitations of answers supplied in closed questions (Cohen, Manion and Morrison, 2000).

Closed question types incorporated dichotomous questions (16, 19, 20, 24, 26, 32, 37, 40, 42) and multiple-choice questions (14, 15, 21, 22, 25, 27, 29, 31, 35, 38, 39). For some questions, a rating scale was used for useful information rather than a yes/no response. Such scales allow degrees of sensitivity and differentiation of response among respondents (Cohen et al., 2000), although limitations do exist. Cohen et al. (2000) warned of the different interpretations of answer choices in 'Likert' scale questions. One respondent's 'agree' may be another's 'strongly agree'. There is no assumption of equal intervals between the categories.

Respondents may also avoid the two extreme choices of answers especially in relation to sensitive questions.

3.4 Online Questionnaire

The questionnaire was available initially on-line followed by traditional hard copy format. It was clear from the DES website that only 4.3% of Irish primary schools had an email address indicated. The researcher therefore enlisted the help of a known contact to potential respondents. Users will delete ‘junk’ mail unless they come from a trusted source (Yu and Mikat, 2006). A contact, in the Kilkenny Education Centre Information Technology Department, was known to these schools from the Information Technology schools support service and schools were familiar with receiving communication from this address and emails. While web-based surveying is becoming more popular in social science and educational research internationally, online surveys would not be a common occurrence in the primary education sector in Ireland to date.

Advantages of web-based surveys include a short time frame for the collection of responses, and time and cost savings (Medin et al., as cited in Solomon 2001; Mertler, 2003). There are however significant disadvantages. These include unavailability of population lists, computer access to the survey and technology-related issues (Solomon, 2001; Gunn, 2002). After consideration, the researcher decided to initially prepare and send the survey online.

The online Internet survey site SurveyMonkey was used to create the questionnaire and a URL link. A small monthly fee was paid for this service. The formatting capabilities of the SurveyMonkey site allowed the creation of an easy-to-read and attractive form. Combining an email cover letter as a means of contacting sampled people with the use of the URL link provides an especially effective and efficient approach to Internet surveying.

A plain draft questionnaire was developed on the SurveyMonkey website. Dillman, Tortora and Bowker (2001, p.4) found that relatively plain Web surveys that load quickly resulted in higher response rates than “fancier” surveys that take

longer to load. The researcher's telephone number was noted on the email cover letter for respondents to phone if there was a problem with completion.

3.5 Pilot Study and Questionnaire Validation

A pilot questionnaire was sent online by the researcher to six known subjects for critical comment (n=6). The respondents were telephoned in advance to seek their permission. The respondents were therefore expecting the email with the online questionnaire. None of the pilot respondents were part of the main study. A number of small modifications and changes were made based on this consultative process. Fifteen minutes was the established time to complete the questionnaire online. A comment box was suggested to explain individual school circumstances if desired by the respondents. No subjects had difficulties opening the link or completing the questionnaire online. The modifications were completed to the questionnaire in December 2006.

The survey was sent online in January 2007, to avoid the Christmas period (Cohen et al., 2000). An advertisement was published in the InTouch magazine, a widely circulated educational magazine in Ireland, to promote the pending online survey. Respondents were given two weeks to complete the online survey, a recommended time for completion (Bell, 1993). An option was offered to send the researcher an email with a postal address for a hard copy and a stamped addressed envelope.

There was only a 1% (n=4) response rate online. A follow-up email was sent with an embedded live URL link. It was also suggested on the email cover letter, that the URL link could be pasted or typed into the browser address bar if the respondent had difficulty clicking the live URL. Respondents were then given one week to complete the survey. Ten further responses were received. The final response rate to the online survey as a result of the follow up email was 3.6% (n=14). Hence, the researcher reverted to the traditional hard copy method.

The poor online response rate was not surprising to the person enlisted to help with the sending of the online survey. The nature of the work of a teaching Principal, or teacher may not involve regularly checking emails daily or weekly.

Emails would not be a formal means of communication for primary schools in Ireland. Computer settings may not be conducive to completing the questionnaire online. Respondents Internet connection may be slow (Solomon, 2001). Dillman et al. (2001) suggest that experience and comfort with Internet-based tools such as Web browsers may affect the response rates and the way people respond to the survey. Respondents may even be hesitant clicking on an unknown link to supply school information.

3.6 Postal Questionnaire

The study progressed with a postal questionnaire. It was important to replicate the online design of the questionnaire in hard copy format as the questionnaire had been previously validated. The document was copied and reformatted using Microsoft Word. The online survey link was included in the cover letter as an option. Replicated copies of the questionnaire which appeared online were posted to the same sample of schools (n=377), excluding the online respondents (n=14), on 13 February 2007. To ensure a high rate of return a stamped addressed envelope was included. A draw for a book token was offered as an incentive to complete and return the questionnaire. Four schools responded online on receiving the hard copy (total n=18 online returns). The URL link was closed on 17 March 2007 after a 4- month period.

3.7 Non-Respondents

The researcher was interested in exploring the reasons for non-response to the survey, and in establishing whether policy differences existed between schools who responded and those who did not. Twenty schools (n=20) were randomly selected using 'Graph Pad' free online software from the non-respondents of the survey. Telephone details of these primary schools were obtained from the DES Website primary school listings (Department of Education and Science, 2006). Short response questions were prepared for telephone interview. Five minutes was requested of respondent's time. Telephone calls were conducted in April and May 2007.

3.8 School Yard Observation

Qualitative research, namely structured observation, was used in this study in order to interpret some of the statistical data generated by the questionnaire. The researcher was curious to observe practices that take place in selected primary school yards at break time and practices that may be in place by specific schools as indicated on questionnaire responses. The researcher wanted to observe if children were physically active at break time and what physical activities attract children's attention. Cohen et al. (2000, p.305) refer to "freshness" to this form of live data collection. The physical setting for break time, including the physical environment and its organisation, could be observed and given a perspective.

The researcher chose an observation method called SOPLAY (System for Observing Play and Leisure Activity in Youth) (McKenzie, 2002). This method allows observation of large numbers of children in the yard at break time. It is an unobtrusive method and relatively inexpensive. This method was felt to be appropriate to describe children's physical activity behaviours and habits in the yards at break time.

3.9 School Selection

The researcher's familiarisation with SOPLAY as a method of observing children's PA levels began in August 2006. A study was commencing in a school known to the researcher using SOPLAY and the researcher was invited to participate in introductory training sessions. This observation method had been used in Ireland in a recent study (HSE, 2005a). Dr. Thom McKenzie, who developed the observation method, visited Ireland in February 2007. Further clarifications of the method of observing children's PA and contextual characteristics were discussed at a workshop.

Three schools were chosen in which to observe children's PA behaviour at break time in February and March 2007. It was a non-probability purposive sample. Initial selection was based on responses to the questionnaires returned. A key factor was to select schools that provided equipment at break time and schools that did not provide equipment (Question 28, Appendix 20). Other important

factors had to be considered in the selection process. Firstly, the researcher alone could not carry out observations for reliability purposes. Secondly, due to the nature of playtime organisation in schoolyards in Ireland and the relatively short length of school break time, other observers were necessary in the process. Three third year undergraduate Health Promotion students from Waterford Institute of Technology volunteered to act as observers following an explanation of the project by the researcher. One school (School A) in close proximity to Waterford Institute of Technology agreed to host SOPLAY observation training followed by PA data collection. A further two schools were approached and both schools accepted observation of play at break time to measure PA. These schools will be referred to as 'school B' and 'school C' respectively. School A and school B were located in Waterford city and school 'C' in Kilkenny city. Maps were prepared for all three schools (see Appendices 15, 16 & 17). Ordnance Survey maps were required for schools A and C with a copyright permit granted (Ordnance Survey Ireland, 2007). The observers finalised target areas (see Appendix 1) with the researcher on their first visits to each school. Protocols were prepared for the observation days at the three schools.

3.10 Observer Training

SOPLAY training with the researcher and the three students took place over four days in February 2007. It involved two theory-based sessions which included familiarisation with SOPLAY materials and coding. This was followed by practise and assessment using the SOPLAY PA pre-coded behavioural vignettes on DVD supplied by Dr. McKenzie (2002). Observers were given a copy of the SOPLAY pre-coded behavioural vignettes on DVD and a counter (see Appendix 9), and were requested to practice in their own time. Two 'live' training sessions followed at school A. This school had a staggered break time system in operation, which allowed extra 'live' practice opportunities for the observers. Four potential target areas were established at school A for observing PA at break time outdoors (see Appendix 15).

3.11 Reliability

Pre-coded behavioural vignettes on a DVD were used as an assessment of intra-reliability. These served as gold standard observations. All trainees were required to meet acceptable criteria for reliable assessment >80% (McKenzie, 2002). This was completed on two occasions during training. The first occasion fell short of required 80% agreement. However, the second occasion had 93.3% agreement. Segment 3 followed this from the DVD to establish inter-reliability. All scores for each trainee and the researcher were recorded. All observations were in the same yard for reliability purposes.

SOPLAY is designed to observe children's activity levels in open spaces, for example a schoolyard. The method provides observational data on the number of participants and their PA behaviour during play. The system is based on group time sampling techniques following a systematic series of scans. All target areas for outdoor play are established. Following an agreed protocol, each target area is scanned from left to right in waves during which time the PA of each individual in the target area is recorded on a counter at an approximate rate of one child per second. The counter is hand held with three buttons. The buttons represent sedentary, walking and very active behaviour respectively (see Appendix 9).

The categories of activity were similar to those used in SOFIT which have been validated in both laboratory and field studies using heart rate monitoring and CALTRAC and tri-trac accelerometers (Rowe et al., as cited in McKenzie 2000, p.72) The most prominent PA in which the children were participating was also recorded (see Appendix 14). Details of contextual characteristics in schools were completed directly before and after observations (see Appendix 1). During all observations at the three schools, information was gathered in relation to the duration of break time, the number of children in attendance in school on the day, the evidence of equipment available to children and practices in the yards as well as interesting descriptive information (see Table 4.2). The observations were carried out in each of the three schools once at 'morning break' (R1) and twice at 'lunch break' (L1 and L2) where possible (Appendix 14 copy of SOPLAY recording aventura form).

3.12 Statistical Analysis

3.12.1 SOPLAY System of Analysis

PA behaviours in relation to gender and break time were the variables of concern to the author. Raw counts in each activity level (sedentary, walking and very active, see Appendix 1) in each target area were aggregated (mean) according to the variable of interest (gender, or morning or lunch break). A mean activity count was taken from the double scan at lunch break where the sample schools had sufficient time to allow this double scan. This resulted in a single count again for each activity level and gender at lunch break. The outcome were scores representing boys and girls PA levels at morning break and lunch break which could also be aggregated to give a sum across a school day for each activity level. Across three measurement days at each of the three observation schools, an average was calculated (McKenzie, 2000). Where there was more than one observer in a given target area an average score was calculated. Average scores were also used for the three observed days.

To estimate kilocalories/kg expended, the number of children counted in each activity level category are multiplied by the constants 0.051kcal/kg/min, 0.096 kcal/kg/min, and 0.144 kcal/kg/min, respectively (McKenzie et al., 2000). Using mean PA counts for break period and gender, a measure of total kilocalories/kg expended by children can be calculated. These values represent the number of kilocalories per kilogramme of body weight per minute expended in each area during the school day.

The sum of boys and girls measured across target areas on any given measurement day did not always tally with the official school attendance roll for that day (see Appendix 22). This is in spite of the fact that, in all schools, all children visited the schoolyard at break time. Perhaps the shortfall in numbers, when they occurred, may be due to several factors: children who were not in the yard due to feeling ill, or running an errand, or visiting the toilet, or temporarily absent with a parent on, e.g. a dentist visit. In school C, on each day of observation a considerable number of children were gone to matches in other schools. In 4% of cases, the measured number of children exceeded the official number on the school roll, and this is probably due to measurement error. To

account for this fact, the denominator was taken as the number of children actually counted by the research team on a given day, and not the number of children on the official school roll.

3.12.2 Questionnaire Analysis

Following the return of completed questionnaires, responses were coded and cleaned using an Excel programme. Data was then analysed using SPSS (V 14) statistical software. The open-ended questions were typed up separately and examined for common criteria or recurrent themes. Likewise, comments that were written by respondents beside questions were also noted.

Throughout the questionnaire, analysis frequencies were calculated where appropriate, to describe common practices. In some cases, data was condensed for clarity. An important aspect to this study was the comparison of two independent groups or variables, namely gender and school size. Six school sizes based on school enrolments were used in the statistical analysis process 0-50, 51-100 pupils, referred to as small schools, 101-200, 201-300 pupils referred to as medium size schools, and 301-500, and 501-800 pupils considered large schools.

The Kruskal-Wallis test is a nonparametric test to compare three or more unpaired groups using the mean rank (or median) between groups. Like ANOVA, post hoc tests are required to determine which groups differ on the dependent variable but no quick and easy procedure for running non-parametric post hocs in SPSS. Rather, the researcher must run a Mann-Whitney *U* test on all pairs in order to determine if there are differences between them. These tests were performed in relation to gender and school sizes in order to establish the source of statistical significance.

4 RESULTS

4.1 Introduction

Results will be described under the following headings:

- Findings from SOPLAY system of observation reliability method
- Descriptions of the three observed schools
- SOPLAY physical activity findings
- Questionnaire analysis

4.2 SOPLAY Results

4.2.1 *Reliability*

Intra-reliability of observers was tested using pre-coded behavioural vignettes on a DVD supplied by Prof. Thom McKenzie. There were three DVD segments. Section 1 introduced the SOPLAY observation system and provided information on the key concepts used with the system. Section 2 had sample clips of people being physically active in various settings. This provided an opportunity for observers to practice recording. Answers were provided at the end of each clip. Section 3 was designed for observers to assess their ability to code quickly and accurately.

There was agreement with the scoring on the Section 2 DVD vignettes in 93.3% of cases. The required level of agreement for acceptable intra-tester reliability is >80% (McKenzie et al., 2000). Section 3 pre-coded answers were not available despite requests to Prof. Thom McKenzie, the author of the SOPLAY method. However, no significant differences between independent observers were found for coding on Section 3 ($p=0.901$), and inter-observer/intra-class correlations were high ($R=0.957$) indicating close agreement between observers.

Two outdoor 'live' break time observation practice days were held at school A. Children were observed and PA levels recorded at break times. Inter-tester reliability in 'live' observations in school A was established at $\text{Alpha}=0.9732$ on day one and $\text{Alpha}=0.84$ on day two. Alpha is an unbiased estimator of reliability.

Alpha will increase when correlations between items increase. For most purposes alpha should be above 0.8 to support reasonable consistency.

Reliability data was collected on three of the nine observation days (66.6%) over the eight-week period March–May 2007 by observers making simultaneous and independent observations across three schools (see Appendix 10). Data from observations in 19 (35%) of 54 target areas where children were present at break times was used in reliability analysis. There were 66 potential target areas for observation including green areas which in some cases were locked and inaccessible (see Appendix 13). Due to the unpredictability of the weather and the availability of trained observers, the principal observer was present on six of the nine measurement days (66.6%) and on 11 of the 19 observations (57.8%).

To examine the reliability of activity counts made by different assessors a series of paired t-tests and intra-class correlations were computed, in accordance with the method described by McKenzie et al. (2002). Alpha was >0.8 in 11 out of 19 cases (57.8%). There was a total inter-observer agreement for the five contextual variables.

4.2.2 Do Children have Adequate Yard Space to Play?

In the three schools in which PA was observed at break time, the schools had policies that children had to stay at school for break time, unlike the study undertaken by McKenzie et al. (2000) in which swimming pools, gymnasiums, multipurpose rooms, and an auditorium were observed as target areas. The three Irish primary schools had twelve ‘area types’ (McKenzie, 2002), or play areas at school break time, all of which were outdoors. This included nine ‘court areas’ (75% of area types in the three observed schools), referred to as yards in an Irish context, and three ‘open fields’ or grass/green areas (25%). Values throughout the text are expressed as mean (SD). The mean (SD) numbers of areas in schools for PA to take place at each break time were 3(1). The size of each area was 595(210.2) m², excluding grass areas. For the purpose of following the SOPLAY protocol (McKenzie et al., 2000), target areas for measuring PA were established to include all yard and grass areas as shown in Appendix 13. In the three schools

observed in this study, class groups were banded and assigned to specific areas for play at break time.

The size of the grass field areas was much greater than the yard areas in each of the three sample schools (see Appendix 12). Appendix 12 illustrates the percentage of actual space, in which the children had to be active when grass areas were not in use. The percentage of available ‘hard play area’ or yard space to children at break time was mean 1,385(577.7) m² which is 11.8% of the amount of space potential of the schools, mean 11, 682 (5209.6) m². While school A had a staggered break time policy (i.e. class groups had break times at different times) for morning break, this was for school organisation reasons and did not enhance play space for children unlike in school C. School C also allowed the use of green areas at lunch break throughout the year.

Table 4.1 Observations of Space for PA at Break Time.

Space	Average m ² per child per school hard area space only (yard)	Potential playing space per child if grass used more frequently m ²
Department of Education and Science Planning Guidelines (2007) and class size information 2005/2006 4.1 m ² per child illustrated in Appendix 11		
School A	5.96	44.67
School B	4.3	67.25
School C*	4.9 morning break junior/5.8 seniors BT/12.75 lunch break	12.75 **

* Staggered breaks in operation at small break to maximise space available to children for play

** Grass area is used all year round at lunch break with change of footwear

Table 4.1 compares space available per child to play at break time when grass is not in use as opposed to when grass areas are available. The Planning Guidelines (Department of Education and Science, 2007) use as an example, a 16 classroom new school as guidance for potential outside yard space. This translates to an average of 4.1m² of hard outdoor space per child not including grass (see Appendix 11). All schools observed appear to be within these guidelines for hard space surface.

4.2.3 What are the Practices Affecting Break Time in the Observed Schools?

Descriptive information relevant to PA promotion in the three schools observed is summarised in Table 4.2. This includes a brief outline of observed activities at break time, dress code, equipment availability, yard surface, and the green space availability as well as reported information related to school practices and policies influencing break time.

Table 4.2 PA Related Characteristics of the Three Observation Schools.

Characteristics	School A	School B	School C
Number of Students	339	200	432
Number of Boys %	169	108	231
Number of Girls %	172	92	201
Play Policy	No	Yes, informal	No
Yard description from observations (Courts/ Hard Play Areas))	Purpose built bitumen yards (basketball courts without posts).	Irregular shaped bitumen yards constructed around old convent building.	Purpose built bitumen yards (basketball courts with posts).
Small break duration	15 minutes	15 minutes	15 minutes
Lunch break duration	30 minutes	30 minutes	30 minutes
Eating part of small break?	Yes, 5 min. indoors,	Yes, 5 min. indoors	Yes, 5 min. indoors
Eating time part of lunch break time?	Yes 15 minutes	No	No
Staggered breaks	Yes, at small break only for timetable curriculum reasons	No	Yes, at small break-to allow more playing space for children.
Equipment permitted at break time.	Skipping ropes, footballs, marbles and elastics.	Skipping ropes, footballs, marbles and elastics to school.	Skipping ropes
Equipment offered by school at lunch break.	No school equipment	Moveable basketball posts, soft and hard footballs and basketballs, skipping ropes, hula hoops and lightweight foam discus	Skipping ropes, hula hoops, beanbags and soft tennis balls.
Equipment observed	None	1 basketball, 5 short tennis bats with soft tennis balls,	5 soccer balls, cricket bat and ball with stumps, skipping ropes, school jumpers

Characteristics	School A	School B	School C
Green space	Very large playing field used in June if dry otherwise locked.	4 colourful elastics, two soft footballs, 2 low target baskets, 1 skipping rope; Shared use of field adjoining the school if dry in summer - under lock.	used as goal posts. Large playing field used any time if dry. Change of footwear necessary.
Dress code	School track suit or uniform acceptable but tracksuit on PE days	Uniform (choice of skirt or trousers for girls) except on PE day -school tracksuit uniform is worn.	Uniform (choice of skirt or trousers for girls) except on PE day -school tracksuit uniform is worn.
Games observed	Chasing games. Infrequent, if any use of playground markings.	Hopscotch infrequently. Line of 5-6 year old pupils taking turns with one ball to shoot at a high hoop with a supervisor. Target practice with low basket. 4 games of elastics with girls waiting for turns	'Red rover, running games. Structured camogie training. 5 games of soccer at each lunch break with at least 15 per team, a couple of girls played in predominantly boys soccer games. A cricket game at lunch breaks on two occasions, boys only with children observing. A couple of girls doing cartwheels and handstands infrequently on grass.

4.2.4 *What are the Contextual Characteristics of the Observed Schools?*

Table 4.3 shows the percentage of activity areas that were useable, accessible to children, and had supervision, school equipment, and organised activities available during break time. The average daily temperature during data collection was 10 degrees Celsius.

Table 4.3 Contextual Characteristics by Percentage of TA

School	Total No. Of target areas observed in 3 days	% Accessible	% Useable	% Supervised	% Organised	% Equipped
A	24	81.8	81.8	81.8	0	0
B	30	84.2	84.2	84.2	2.6	15.8
C	12	100	84.2	84.2	15.8	15.8
Total	66	86.7	83.3	83.3	4.4	10.0

4.2.5 *Supervision*

Teachers supervised break times in the three schools. Special-Needs Assistants were present to assist specific children in their care. School A had higher presence of staff supervising than school B and C. The supervisors were in and adjacent to relevant yard areas to direct and respond to emergencies. Apart from school B, none were seen to instruct, officiate, organise activities or prompt. In school B, on two brief occasions supervisors were observed prompting children into simple target practice drills.

4.2.6 *What Type of Physical Activity Takes Place in Playgrounds at Break Time?*

‘No identifiable activity’ (McKenzie et al., 2000) was the predominant type of activity for children at all breaks. In all schools, chasing was observed to be popular with the occasional use of playground markings. More variety of activities were observed in schools B and C at lunch break as opposed to morning break (see Table 4.2).

4.2.7 *What is the Duration of Break Time?*

Table 4.2 shows duration of break time and duration of eating time in the observed schools. The three schools had a 15-minute break in the morning. A snack was eaten indoors in the first five minutes allowing ten minutes play outdoors. These schools had 30 minutes for lunch break. Schools B and C had eating time included in curricular work before going out to play. The principal from school C, in a conversation, highlighted the importance of children having enough time to eat and justified this practice in the Social Personal and Health Education Programme. This allowed 30 minutes to play outdoors which was considered by this school to be important. School A had eating time as part of the 30 minutes lunch time and ate in their classrooms at the start of lunch break for 15 minutes or more. As a result, the maximum time available to play outdoors was approximately 15 minutes. On most occasions of observation, eight minutes play outdoors appeared to be the average duration. It is note worthy that there was not sufficient time to carry out two scans at lunch break in this school as suggested in the protocol (McKenzie, 2002). Thus the observers commenced scans as soon as it appeared that most children were present in the yards.

4.2.8 *How is the Total Daily School Break Time Physical Activity Calculated?*

In order to establish total daily PA of the children at break time the number of children observed (mean SD) in MVPA was calculated. The non-parametric Mann-Whitney U test for two independent samples was used to determine differences between the sexes and school sizes. Statistical significance was set at $p \leq 0.05$. All statistical analysis was performed using SPSS (V14) for Windows. Gender (girls and boys) and observation period (morning break and lunch break) were the primary independent variables for analysis. Following the SOPLAY protocol (McKenzie, 2002), each school was visited on three occasions for observation to gather PA data (9 days) (see Appendix 10).

The observation schools enrolment, attendance and the number of children observed are reported in Table 4.4. 'Enrolment' in this study is the number of children registered in the particular school with the DES for the school year. 'Attendance' is the number of children who reported for school on a given day with the mean calculated for three days. The school principal supplied the

enrolment and attendance figures. 'Observed' is the mean number of children that were counted by the observers at break time with the mean (SD) calculated for three days. If more than one observer was present in a yard, a mean figure was calculated. Appendix 22 displays the number of children enrolled at each of the observed schools and the mean (SD) attendance for three days. It should be stated that the three schools had policies for all children to stay in school for break periods.

The sum of boys and girls measured/observed across target areas on any given measurement day did not always tally with the official school attendance roll for that day as explained in Chapter 3 (see Appendix 22). The denominator was taken as the number of children actually counted/observed and not the number of children on the official school roll (% enrolment). Since attendance figures consistently represented a very high percentage of the actual schools enrolment (i.e. school 'A' 88.4%, school 'B' 97.4% and school 'C' 95.6%) this was deemed as acceptable approximate of student enrolment.

Using summary scores for sedentary, walking and very active behaviour activity counts, an estimate of energy expenditure rate (kcal/kg/min.) was calculated separately for girls and boys as explained in Chapter 3. The estimate energy expenditure rates (EER) are reported in Tables 9 and 10. By summing the walking and very active categories a summary score, moderate to vigorous physical activity (MVPA) was created.

4.2.9 Which School was the Most Active at Break Time?

School A was found to be the most active school with 67.3% of children involved in MVPA compared to 58.1% in school C and 53.4% in school B (see Table 4.4). In the three schools boys were found to display more active behaviour than girls with the greatest differences in schools B and C. Both girls and boys were found to be the most active in School A with 63.6% and 70.2% in MVPA.

Table 4.4 School Enrolment, School Attendance (mean, SD), Children Observed (mean, SD), Energy Expenditure Rate Estimates (EER), Percentage in Moderate to Vigorous Physical Activity (MVPA), by Gender and Overall by School (n=3).

All Students	School A	School B	School C
School Enrolment 2006-2007	341	210	432
Mean School Attendance (SD)	301 (8.7)	204.6 (7.6)	413 (2.8)
Mean No. Observed (SD)	321 (39.7)	225. (4.2)	286 (82.6)*
EER (kcal/kg/min.)	60.6	38.72	58.4
% MVPA	67.3	53.4	58.1

Girls

School Attendance (SD)	152 (8.5)	82 (5.7)	194 (2)
Mean No. Observed (SD)	167 (29)	92 (9.6)	123 (39.6)
EER (kcal/kg/min.)	30.26	14.60	26.79
% MVPA	63.6	47.0	51.3

Boys

School Attendance (SD)	149 (10.4)	123 (2)	208 (16.7)
Mean No. Observed (SD)	153 (12.3)	133 (5.4)	144 (34)
EER (kcal/kg/m)	30.41	24.12	31.97
% MVPA	70.2	59.7	63.9

* Children gone to matches

4.2.10 During Which Break Time are Children Most Physically Active?

Table 4.5 shows that morning break was more active compared to lunch break in the three schools. Girls were shown to be a little more active at morning break. Overall, boys were slightly more active at lunch break. Boys in school C displayed more active behaviour at lunch break compared to the boys in schools A and B.

Table 4.5 Children Observed (mean, SD), Energy Expenditure Rate Estimates (EER), Percentage in Moderate to Vigorous Physical Activity (MVPA), by Gender and Overall at Morning Break and Lunch Break (n=3).

All Students	School A Morning Break	School B Morning Break	School C Morning Break	Total for 3 schools	School A Lunch Break	School B Lunch Break	School C Lunch Break	Total for 3 schools
Mean No. Observed (SD)	321 (39.7)	225. (4.2)	286 (82.6)*	277 (48.5)	321 (39.7)	225. (4.2)	286 (82.6)*	277 (48.5)
EER kcal/kg/min.	33.12	18.65	28.37	26.7	27.55	20.07	30.09	26.1
% MVPA	67.8	53.5	58.6	60	66.0	53.2	56.7	58.6
Girls								
Mean No. Observed (SD)	167 (29)	92 (9.6)	123 (39.6)	127 (37.6)	167 (29)	92 (9.6)	123 (39.6)	127 (37.6)
EER kcal/kg/min.	17.04	6.93	13.61	12.5	13.22	7.66	13.17	11.3
% MVPA	64.7	47.4	54.9	55.6	62.5	46.7	47.7	52.3
Boys								
Mean No. Observed (SD)	153 (12.3)	133 (5.4)	144 (34)	143 (10)	153 (12.3)	133 (5.4)	144 (34)	143 (10)
EER kcal/kg/min.	16.08	11.71	15.88	14.5	14.32	12.41	16.08	14.2
% MVPA	70.9	59.7	62.2	64.3	69.5	59.7	65.6	64.9

School C: Third class boys and sixth class boys and some supporters were missing at lunch break due to a football match.

The highest proportion of children was sedentary, with the lowest proportion of children in the vigorous category (see Table 4.6).

Table 4.6 Free-Play Activity Behaviour of All Children and by Gender

	All Pupils	Girls	Boys
Total number of children measured in 3 schools combined	985	461	524
% Sedentary	39.34	43.86	34.81
% Moderate	32.90	30.81	34.99
% Vigorous	26.43	23.20	29.66

For each measure, counts were tallied for those engaged in sedentary, walking and very active behaviour to obtain a summary score. Girls displayed more sedentary behaviour compared to boys. Boys were found to be more active than girls in both moderate and vigorous physical activity behaviour scores.

4.3 Questionnaire Analysis

Throughout the questionnaire analysis the following approach was taken. The Kruskal-Wallis test was used to establish statistical significance between school type and gender ($p < 0.05$) and if so, a Mann-Whitney U test on pairs was conducted in order to locate the differences. For clarity, statistical significant differences will be reported and highlighted where they exist ($p < 0.05$).

4.3.1 *What was the Response Rate?*

A total of 391 questionnaires were distributed. The response rate for the mixed-mode survey was 54.5% (see Table 4.7).

Table 4.7 Response Rate to Survey Methods

Online returns	Postal returns	Postal returns unusable	Postal returns usable	Total response rate (mixed mode methods)
n=18	n=202	n=7	n=195	n=213
4.6%	53.6%	1.9%	52.3%	54.5%

Reasons cited for the returned uncompleted questionnaires (n=7) were the closure of three schools, three schools were ‘special schools’ and one a pre-school who considered the questionnaire inappropriate to their circumstances. Co. Kilkenny reported the highest response rate by schools (67.7%) with South Tipperary the lowest rate (49.5%) (see Table 4.8).

Table 4.8 Total Number of Primary Schools Surveyed by Mixed-Mode

Counties	School Sample Posted Questionnaires	No. Responses	% Responses
Waterford	90	45	50
Kilkenny	65	44	67.7
Carlow	38	23	60.5
Wexford	101	54	53.5
South Tipperary	97	48	49.5

4.3.2 School Types

The majority (89%) of primary schools in the sample were mixed schools, 8% were single sex boys’ and 3% were single sex girls’ schools (see Appendix 19).

4.3.3 School Sizes

Over 52% of the sample schools had enrolments of 0-100 pupils. Only 21.1% of the schools had enrolments of more than 200 pupils (see Appendix 18).

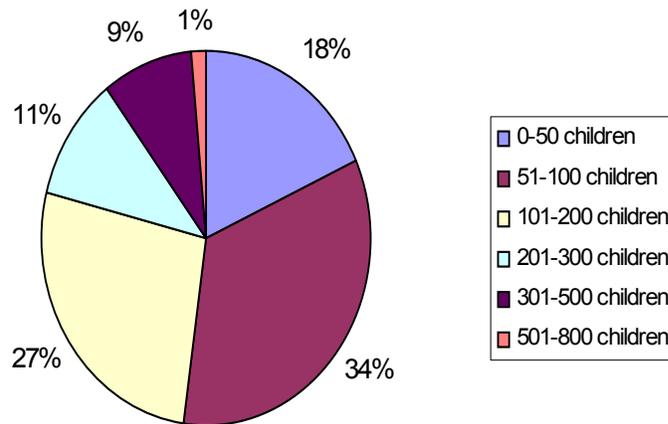


Figure 4.1 Breakdown of Schools by Enrolment Size

4.3.4 How Many Breaks are in the School Day?

The majority of schools (89%) had two break periods. The duration of morning break in 56.7% of cases was 6-10 minutes. In the majority of cases (81.9%), lunch break was 26-30 minutes in duration. There was no afternoon break in 90% of schools. In 50.2% of schools teachers supervised children at break periods, with the assistance of special-needs assistants who cared for specific children.

4.3.5 Is Eating Time Part of Break Time and what is its Duration?

Eating time was part of morning break in 73.8% of schools and of these 57.7% had 0-5 min, and 4.8% 6-10 min. The remainder of time was for play. Eating time was included in the lunch break in 73.3% of schools. Five minutes eating time was reported by 13.9% of schools and 40.9% reported eating time of 6-10 min. The remainder of time was for play. Over 6.6% of schools had an afternoon break of 0-5 min, and 1.9% of schools 6-10 min. The remainder, 1.5%, indicated that the duration was at the discretion of the teacher.

4.3.6 *How are Children Grouped at Break Time?*

The most popular practice for grouping children at break time for play was banding groups together in yards. This was reported by 56.2% of respondents. Over 33.8% reported the practice of having all year groups playing together in the same yard with no segregation. Play in class groups was reported by 10% of schools. Very small schools (<50 pupils) were more likely to have all the children playing together in the yard ($p=0.024$).

4.3.7 *What Times During the School Day is Outdoor Play Allowed?*

Outdoor play was permitted before school in 54% of schools while 86.2% of respondents reported that outdoor play was prohibited after school. Supervision of play was reported by 35.2% of schools before and after school.

4.3.8 *What School Venues are Available at Break Time and When Raining?*

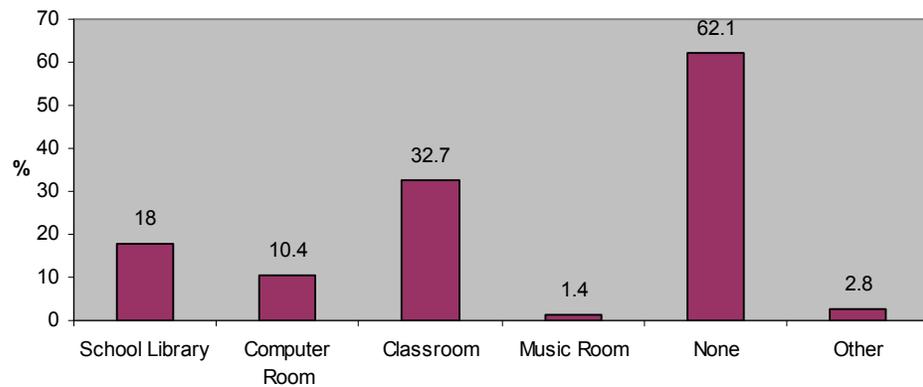


Figure 4.1 Where do Children Play at Break Time?

Over 62% of schools reported not allowing any other school facilities apart from the school yard to be used for play at break time. The most common practice in most schools (95.3%) when it rained at break time was for children to remain in their classrooms. Children were not considered to be active in 88.3% of respondent schools when it was raining.

4.3.9 Do Schools have Play Policies?

A formal and written play policy was reported in 17% of schools. Two questionnaire respondents noted in the comment box the existence of ‘yard books’ to record negative behaviour at break time.

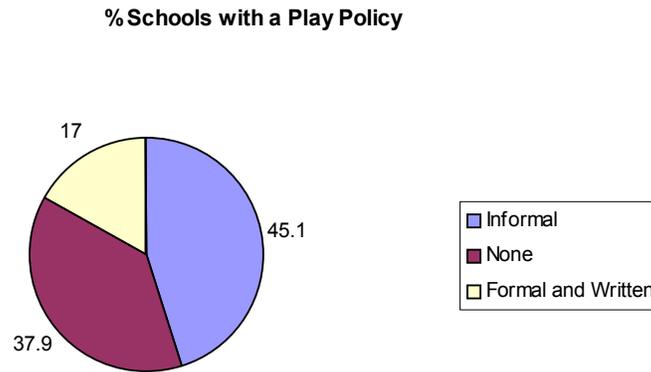


Figure 4.2 Do Schools have a Play Policy?

4.3.10 Is Yard Space Adequate for Children to be Physically Active at Break Time?

School yard space for children to be physically active at break time was considered to be inadequate by 38.5% of schools in the current study. Yard space had been encroached for building use in 48.4% of responding schools. School yard space was considered adequate for PA by 61.5% of respondents but there was a significant difference ($p=0.045$) with the source of the difference lying between mid-size schools (101-500 pupils) versus smaller schools. Small schools (<101 pupils) and very large schools (501-800) were more likely to have adequate playground space.

4.3.11 What Practices Exist in Relation to Schools Usage of Green Areas at Break Time?

Many practices were apparent in relation to whether children were allowed to play on green areas at break times.

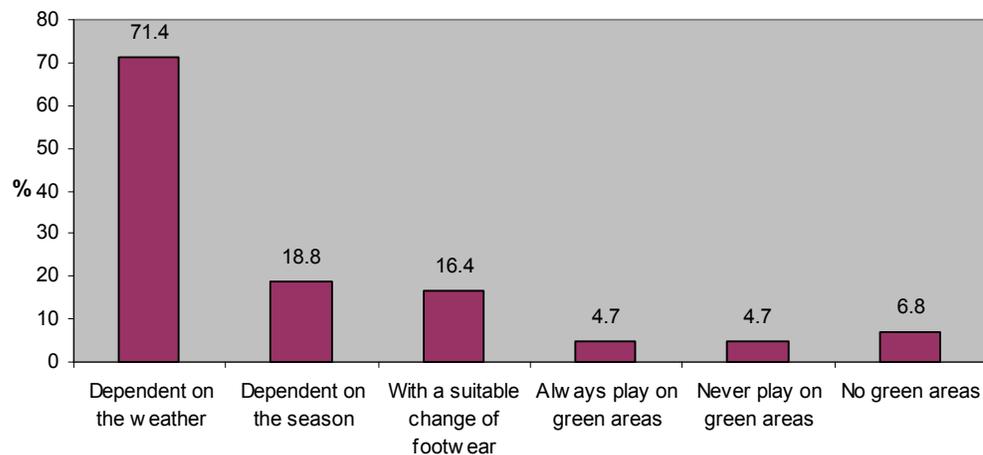


Figure 4.3 Do Schools Allow Play on the Grass?

Mid to large schools (>200 pupils) were significantly less likely to allow children play on grass areas than smaller schools (<201) ($p=0.044$) or it was dependent on the weather.

4.3.12 What School Facilities are Available in Schools?

In this study, a variety of facilities were available to children for PA depending on the practices and policies within individual schools.

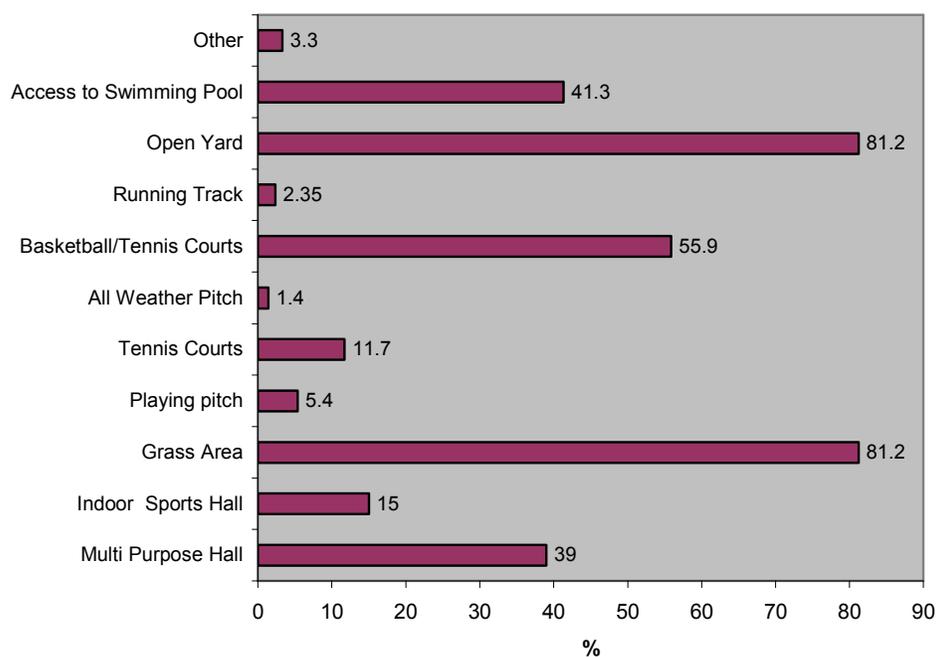


Figure 4.4 What Facilities are Available in Schools at Break Time?

There was a significant difference between the indoor facilities of schools of different sizes ($p=0.000$) but not the outdoor facilities ($p=0.171$). Indoor facilities were generally better in larger schools with the exception of very large schools (501-800 pupils). As schools increased in size, they were more likely to have a school multi-purpose hall except schools with 501-800 pupils. A higher percentage of large schools (>300 pupils) reported an indoor purpose-built hall compared to medium to small size schools (<301 pupils).

The questionnaire sought to establish what facilities in relation to fixed equipment were available to children to play with at break time (see Figure 4.6). While various fixed facilities were reported to exist for children's' play at break time, certain school practices were reported regarding these facilities and their potential for play purposes at break time.

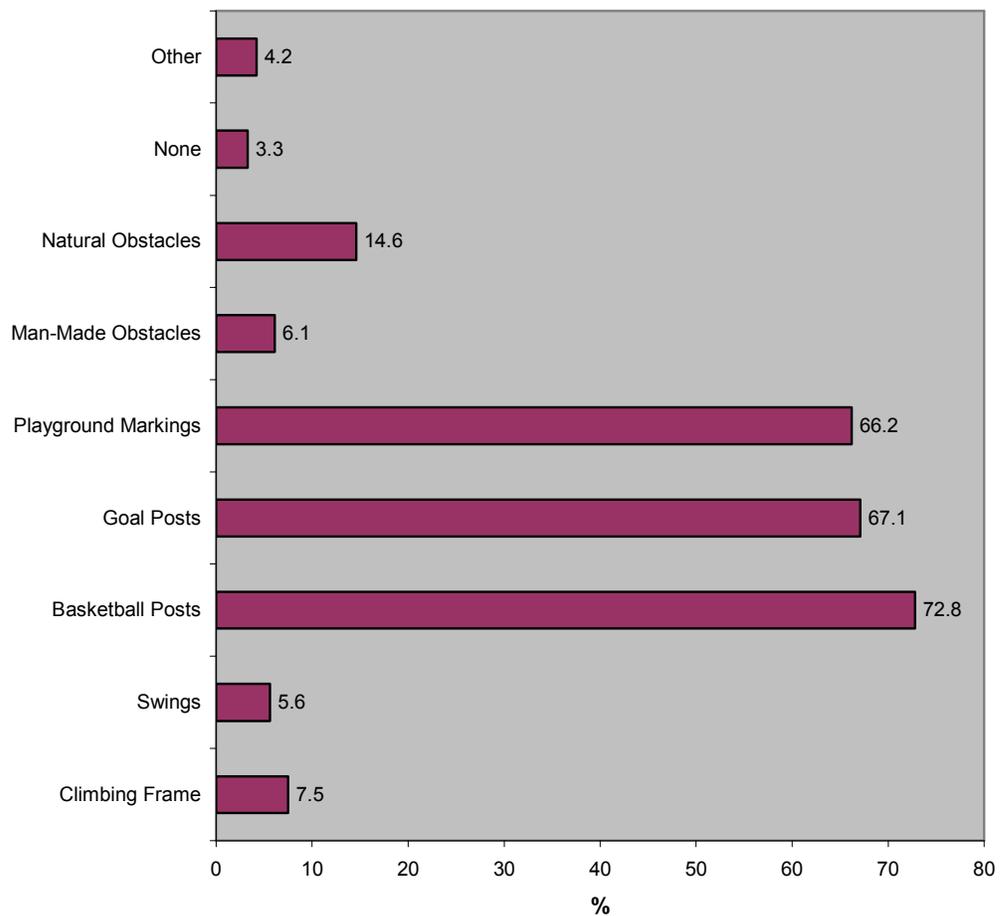


Figure 4.5 What Fixed Equipment is Available to Children for Play at Break Time?

Differences between schools were found for the availability of basketball posts, goal posts and playground markings ($p < 0.05$). While schools differed in availability of fixed equipment, in general smaller and mid-size schools (101–300 pupils) were more likely than larger schools to have basketball posts ($p = 0.012$), goal posts ($p = 0.001$) and playground markings ($p = 0.001$). While 66.2% of all schools reported having playground markings available for children to use at break time, 30.7% responded that children must compete with other children to use these markings. The markings were not zoned and hence other children could play other games or walk over these markings while children were trying to use them. Mixed schools were more likely to have goal posts and basketball posts compared to single sex schools ($p = < 0.05$).

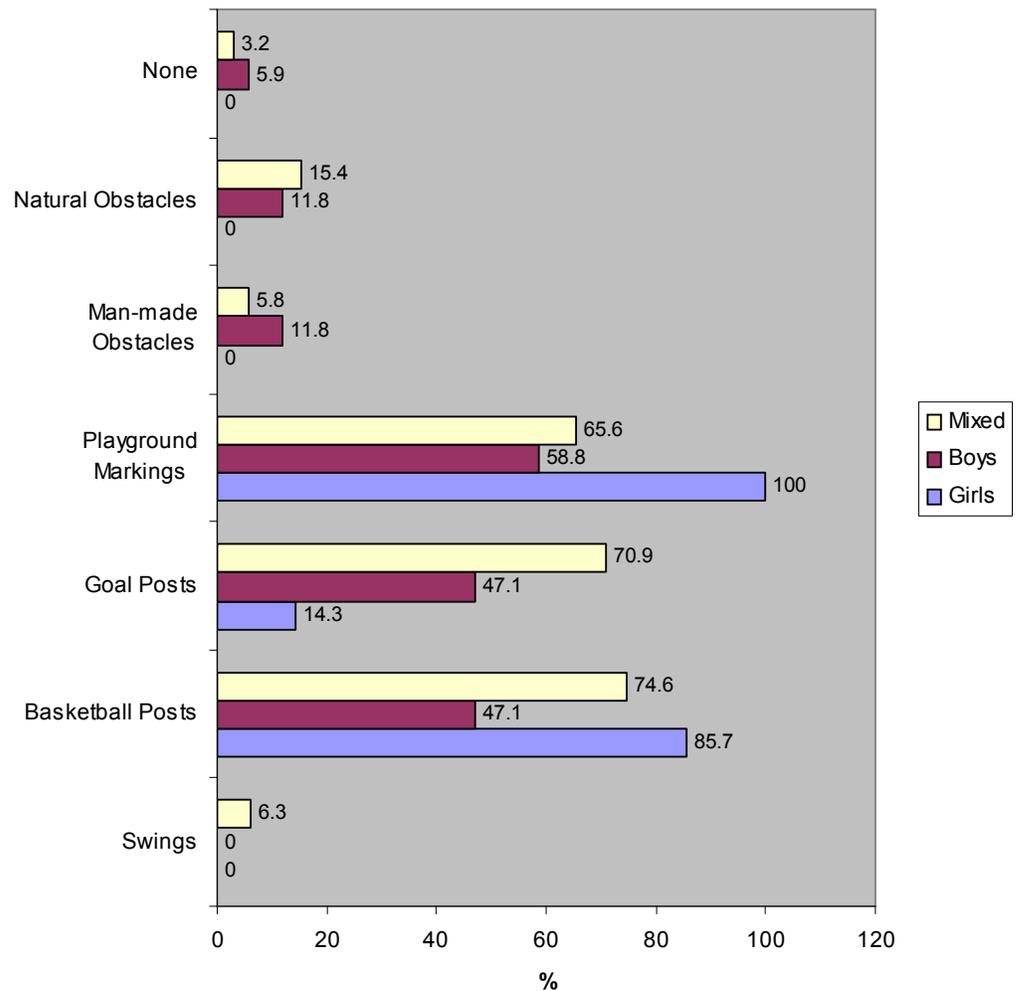


Figure 4.6 School Type and Fixed Facilities Available to Children at Break Time?

The questionnaire sought to establish the practices of the supervisor at break time.

Table 4.9 School Practices in Relation to Children’s Use of Fixed Equipment at Break Time.

School Practice	Always %	Sometimes %	Rarely %	Never %	Not applicable %
Children are shown how to use the facilities and then left to explore them.	38.8	41.8	6.7	4.2	8.5
Children freely explore the facilities.	60.4	26.8	3.0	2.4	7.3
Supervisors monitor the children when they use the facilities.	74.1	13.8	5.7	2.3	4.0
Prompted play by supervisors takes place at break time.	13.9	51.9	17.7	11.4	5.1

It would appear that supervisors generally monitor the children at unstructured play at break time with some indication of prompted play and help when using facilities.

4.3.13 Do Schools Allow/Encourage Children to Play Using Equipment at Break Time?

Schools were asked whether they allowed children to bring their own equipment to school. Just over 20% of schools reported they did not allow children to bring their own loose equipment for break time play.

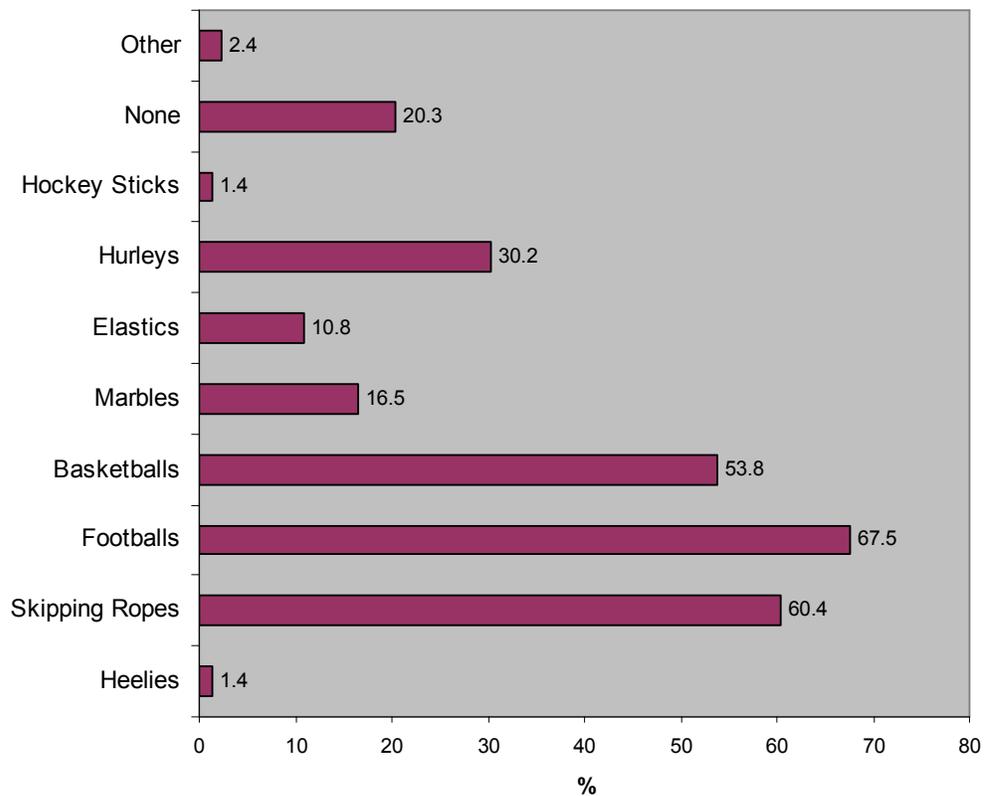


Figure 4.7 Schools Permitting Children to Bring Their Own Equipment to School

Differences existed between girls, boys and mixed schools in the case of skipping ropes, footballs and elastics only ($p < 0.05$). Girls schools were more likely to bring their own skipping ropes and elastics to school compared to boys schools with boys schools more likely to bring more footballs, basketballs and marbles, hurleys and hockey sticks. Mixed schools reported a higher percentage of footballs, elastics, basketballs and marbles compared to single sexed schools. Small to mid size schools (<301 pupils) permit the practice of children bringing their own equipment to school more than larger schools, especially elastics ($p = 0.001$) and footballs ($p = 0.019$).

Schools were asked whether they provided loose equipment to children at break time.

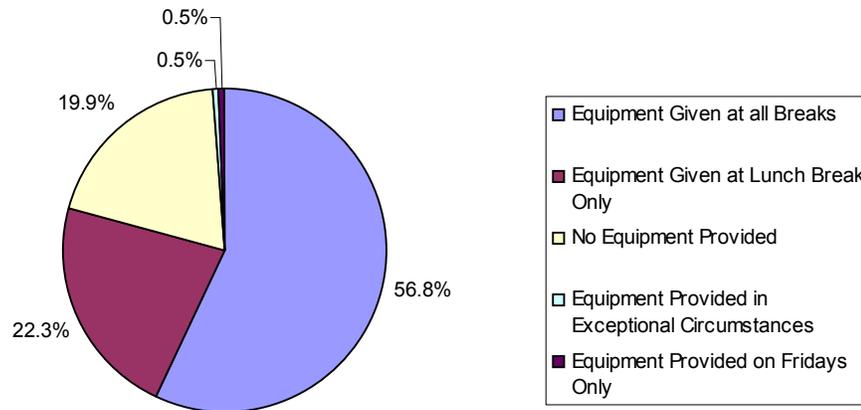


Figure 4.8 Do Schools Provide Loose Equipment at Break Time?

It is evident that while 19.9% of schools never provide school equipment, 57% provide loose equipment at all break times for play. Many differences existed between schools. Sometimes, equipment was allowed when grass areas were in use, different equipment was available on different days or equipment was permitted at lunch break only. Boys schools were more likely than girls schools to provide loose equipment at all break times with little differences at lunch break only. Girls schools were more likely than mixed schools to provide equipment at break time ($p=0.008$). Analysis would indicate that schools with an enrolment size of greater than 100 pupils were less likely to provide school equipment to children to play with at all break times ($p<0.05$) (see Appendix 21).

4.3.14 What School Loose Equipment is Provided to Children at Break Time?

A variety of equipment is provided to children in Irish primary schools in this sample.

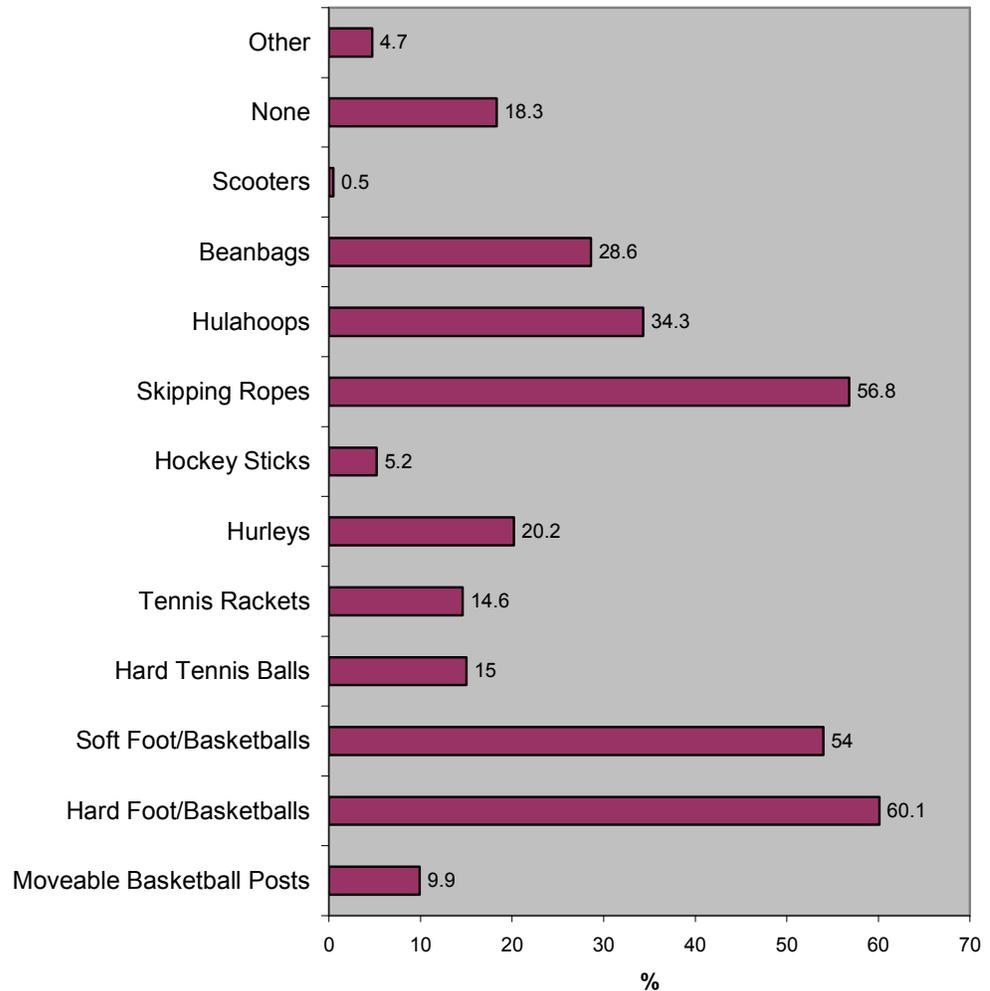


Figure 4.9 What Loose Equipment do Schools Provide to Children to Play with at Break Time?

Two categories of equipment were created (a) soft footballs and basketballs, skipping ropes, hula-hoops and beanbags, considered by the author to be items that are safe, flexible, fun and relatively easy to store and (b) hard footballs and basketballs, hard tennis balls, tennis rackets, hurleys, hockey sticks, scooters, and moveable basketball posts. This equipment may be considered somewhat unsafe or requires considerable space for its use and storage. For both types of equipment, statistically significant differences were found between schools of different sizes ($p < 0.05$), with larger schools offering less equipment. From the analysis of soft and hard equipment variables it would appear that schools with an enrolment of < 101 pupils appear to distribute a greater variety of equipment (hard and soft). Mixed schools were more likely to provide a variety of equipment than

girls schools ($p < 0.05$). Boys schools provided more hard equipment than girls schools ($p < 0.05$).

4.3.15 *What Barriers Hinder Schools Providing Loose Equipment to Children at Break Time?*

Respondents were asked to indicate reasons why school equipment may not be offered to children to play with at break time.

Table 4.10 Barriers to Schools Providing Equipment to Children at Break Time

Reason for not providing school equipment at break time	Not important %	Undecided %	Important %	Not applicable %
Time limitations	15.8	3.2	26.3	54.7
Organisational issues	9.4	2.6	33.5	54.5
Safety	3.0	2.0	44.3	50.8
Supervision difficulties	9.6	1.1	34.6	54.8
Cost of equipment	18.0	2.2	23.4	56.5
Storage space for equipment	14.0	2.2	27.6	56.2
Equipment lost/damage	14.6	4.7	27.1	53.6

It would appear that small schools (<101 pupils) experience fewer barriers than larger schools specifically with respect to storage space, equipment cost or risk of equipment loss/damage ($p < 0.05$; Kruskal-Wallis and Mann-Whitney U tests).

Schools showed little difference in the variety of activities performed by children in the playground at break time.

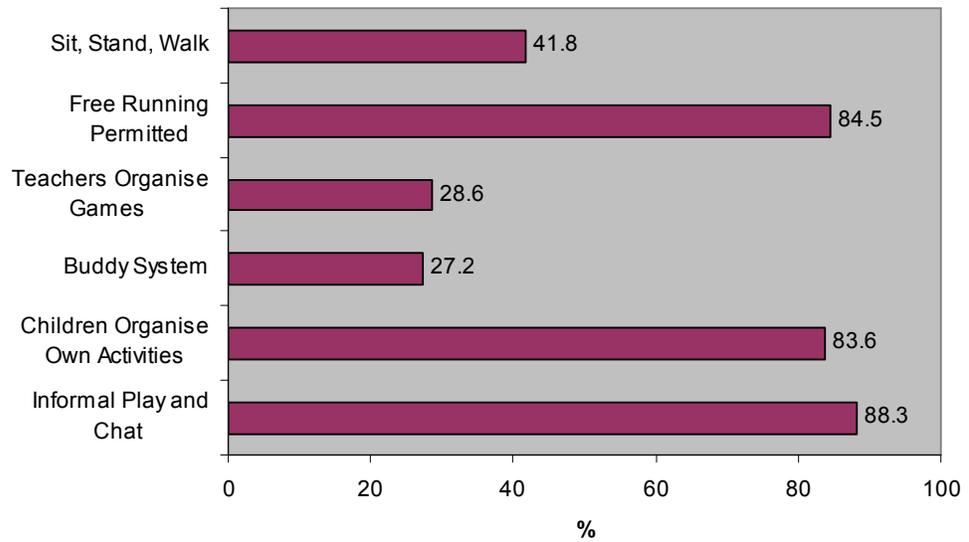


Figure 4.10 What Do Children Do at Break Time?

It would appear that in larger schools (>300 pupils) children organise themselves less often into group activities e.g. soccer, basketball games ($p < 0.05$). No significant differences existed between schools for other variables including children running freely in the yard at break time.

4.3.16 What Barriers Hinder Break Time Physical Activity?

In a scaled response, respondents were asked to indicate what might hinder children's PA levels at break time.

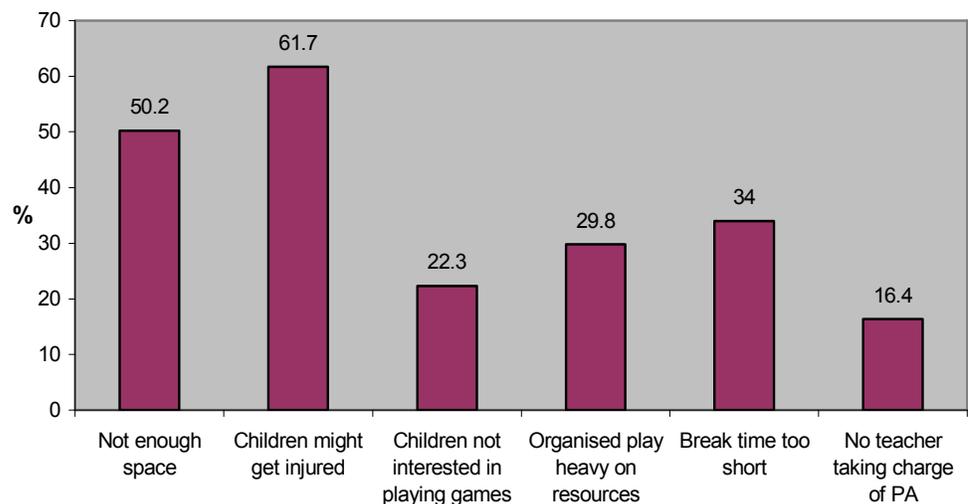


Figure 4.11 What Barriers Hinder Break Time PA?

It would appear that girls' schools differ from boys' and mixed schools in that they consider break time too short ($p=0.008$).

4.3.17 What PA Practices are Promoted by the School?

Schools were asked what PA promotional practices took place in the playground at break time.

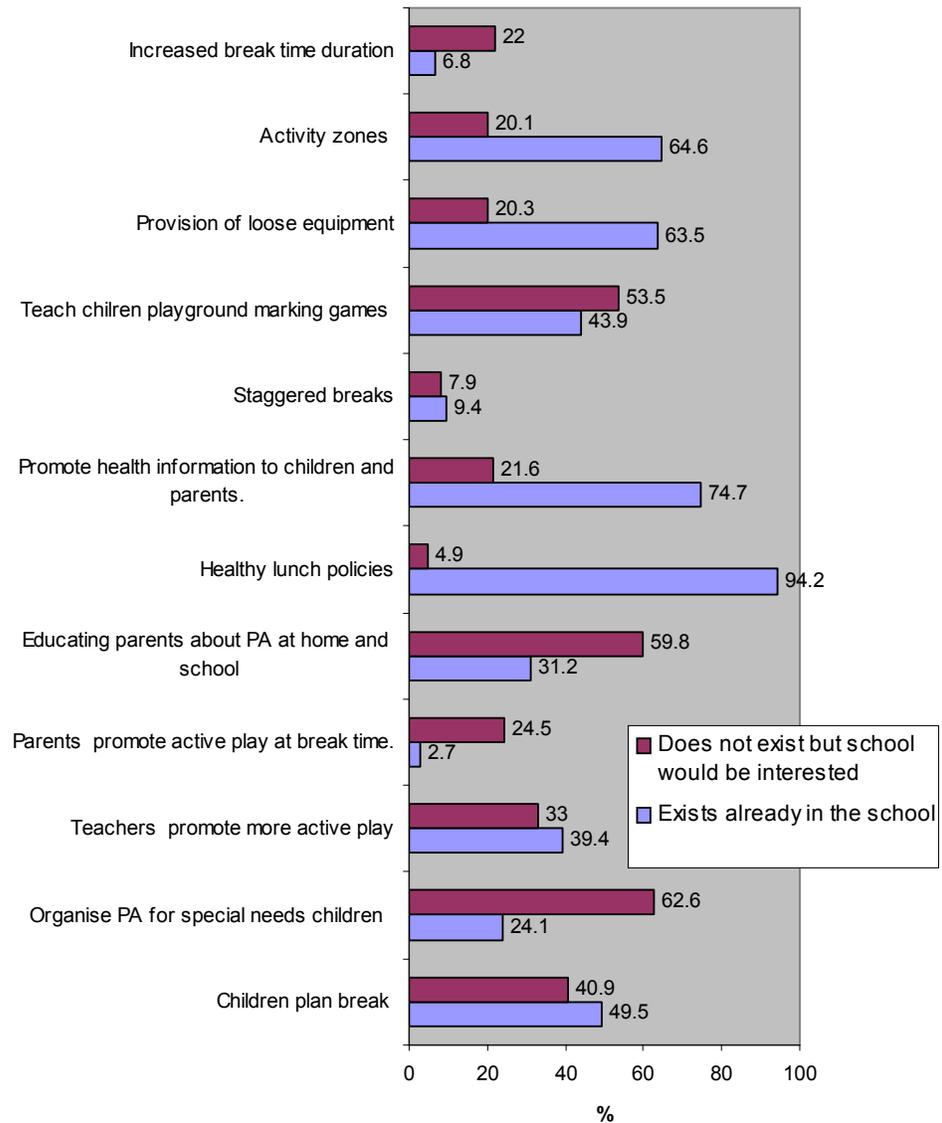


Figure 4.12 PA Promotion Practices at Schools

In larger schools (>300 pupils), children were involved in planning their own break time activities ($p=0.000$) compared to smaller schools. Moderate to large schools (301-500 pupils) were more likely than other schools to have staggered breaks ($p=0.029$) and small schools were less likely to use zoning for activities ($p<0.05$). With increasing school size (>100 pupils) loose equipment was less likely to be provided ($p<0.000$).

Girls schools were more likely to plan their own break time activities ($p=0.035$) compared to boys and mixed schools and to have zones in the playground for specific activities compared to mixed schools ($p=0.026$). Mixed schools were more likely to have staggered breaks ($p=0.019$) compared to boys schools.

Categories were combined into policy-related (i.e. children planning break, special needs PA activities, teachers promoting active play, staggered breaks, teach playground marking games, increase duration of breaks), environmental-related (i.e. provision of loose equipment, provision of activity zones) and parental-related variables (i.e. parental promotion of active play at breaks, parental education on benefits of PA at home and school, healthy lunches, provision of health promotion information). Differences in these variables were not statistically significant between schools with the exception of a difference between girls and mixed schools where mixed schools provided loose equipment and zoning of activities more often at break time. Medium to large size schools (>100 pupils) were less likely to allow children to plan their own break time. Schools were negative towards three practices. Staggered breaks were opposed by 82.2% of schools, 70.7% were opposed to increasing the length of break time, and 72.3% against using parents to promote more active play in the yard at break time.

4.3.18 How Visually Attractive are Schoolyards?

Schools of different sizes rated the attractiveness of the yard differently with schools with more than 100 pupils indicating greater negativity ($p=0.002$). The school play area was visually attractive for play in 65.4% of schools. Boys schools rated themselves less visually attractive than girls schools and mixed schools but differences were not statistically significant ($p=0.450$).

4.3.19 What is the Weekly PE Provision?

In accordance with PE curriculum guidelines, 69.2% of schools reported 60 min. of PE weekly with 25% reporting only 30-60mins. This practice could change depending on the time of the year as reported by 30.8% of schools. No significant differences existed between schools of different sizes or school types.

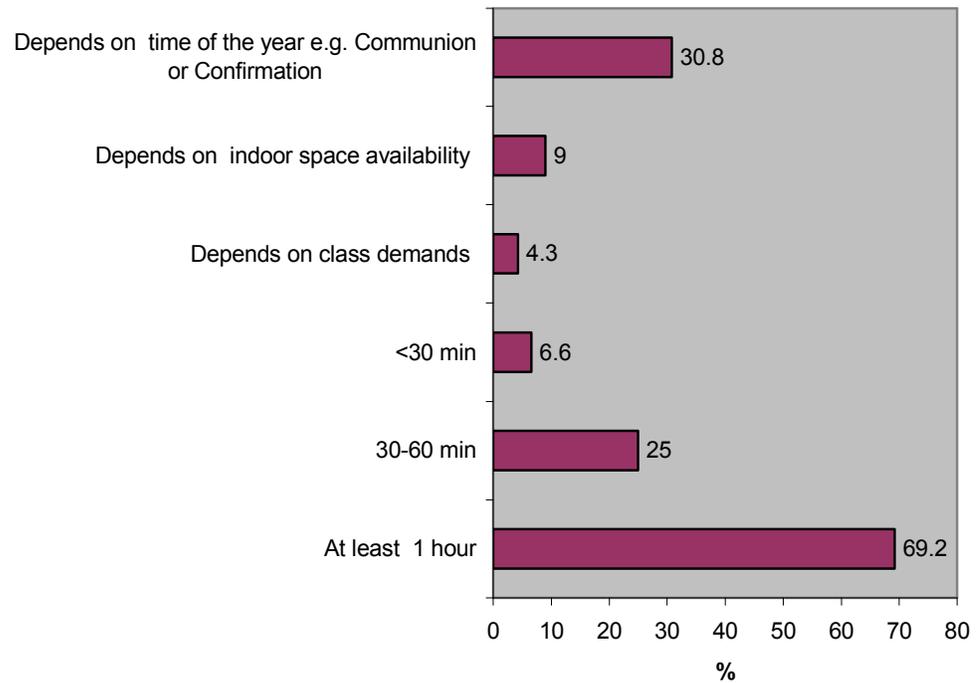


Figure 4.13 Weekly PE Provision

4.3.20 What are Teachers Perceptions Towards PE Provision?

Teachers were considered to be confident to teach PE in 78.6% of schools. This represents the reported perception of the respondents to the questionnaire.

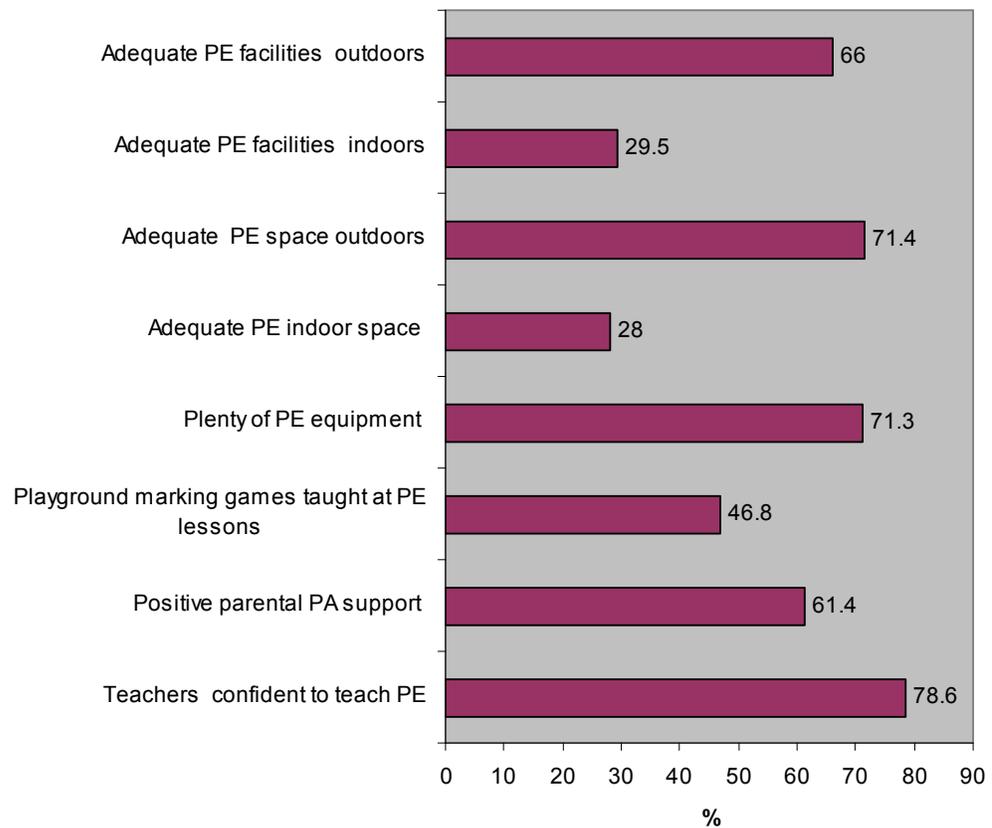


Figure 4.14 What are Teacher’s Perceptions of PE?

When PE was referred to specifically, mixed schools reported having plenty of equipment for teaching PE compared to boys schools ($p=0.041$). Smaller schools (<201 pupils) perceived that they had plenty of equipment ($p=0.001$), indoor facilities ($p=0.001$), and adequate space both indoors ($p=0.001$) and outdoors ($p=0.030$) compared to larger schools (>201 pupils) for the teaching of PE.

4.3.21 What Agencies Contacted Schools in Relation to PA Promotion?

Outside agencies had written to or visited 96.7% of schools in relation to PA promotion.

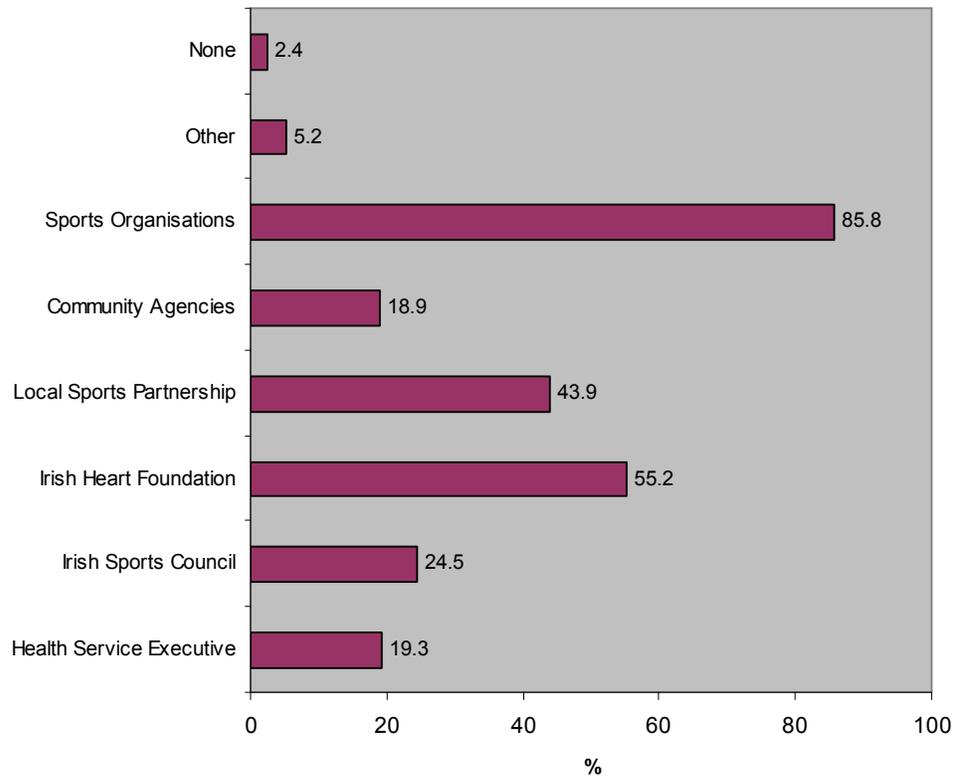


Figure 4.15 What Percentage of Schools had Received Communication from Outside Agencies?

National Governing Bodies (NGB's) had made contact with many schools. The GAA was the most frequently reported sporting organisation to contact schools.

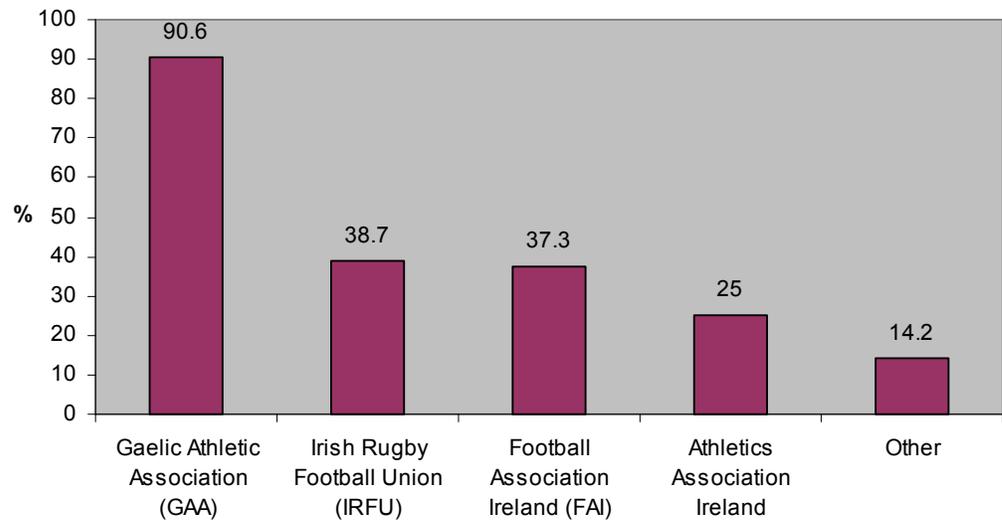


Figure 4.16 What Sporting Organisations Communicated with the School?

A teacher with a post of responsibility which included PE, was reported by 44.6% of schools. As schools increased in enrolment size, schools were more likely to have this type of post, i.e. 23.7% of schools with 0-50 pupils reported such a post, with 43.9% of 101-200 pupil schools and 77.8% of 301-500 pupil schools.

4.4 Non- Respondents

Brief telephone calls to randomly selected schools (n=20) that did not respond to the postal questionnaire revealed that 65% were 'too busy' to respond (see Figure 4.17). Eighty five percent of the schools contacted reported not viewing the questionnaire online. Seventy five percent reported not recalling seeing the postal questionnaire hardcopy. Ninety five percent of the personal communications reported to permit 'free running' in the school yard at break time. Restrictions to this 'free running' however were indicated in conversations. Comments forthcoming included "within limits", "within reason", "if children are in danger of hurting others", "chasing banned". Two schools (10%) reported no formal written documentation related to physical activity at break times (see Table 4.11). From the personal communications, it was apparent that the written documentation did not include a formal play policy. The following is a list of formal documents that were referred to as having some written documentation related to break time organisation in 90% of the schools:

- Code of behaviour
- School policy
- School plan
- Health and safety policy
- Yard incident book
- Supervision policy
- In house document

Table 4.11 Comparisons of Reported Practices Between Questionnaire Respondents and Personal Communication Responses with Non-Respondents to Online and Postal Questionnaire.

Break Time Practices Reported	Mixed Methods Responses (online and postal questionnaire) (n=213)	Telephone Communication of Non-Respondents to Online and Postal Questionnaire (n=20)
Permitting loose equipment at break time.	58% all break times 22% lunch break only	85%
Schools allow children to bring their own equipment.	20%	10%
Running freely permitted at break time.	84.5%	95% but in 35% of these schools conditions were qualified for free running.
Written documentation for break time.	17% reported a formal written play policy.	90% reported some written reference to break time in school documentation related to perhaps supervision arrangements, banned activities, discipline, safety, organisation of year groups; A formal play policy was not indicated



Figure 4.17 Reasons for non-response to the postal questionnaire

While written reference was apparent in relation to certain aspects of break time organisation in a range of school documents, a formal play policy was not clearly reported in personal communication with the non-respondent schools. Less than 20% of the postal questionnaire respondents reported a formal written play policy.

Children appeared to be permitted to run freely at break time in most schools. However, personal communication with schools revealed that conditions or restrictions to this practice might apply.

It does not seem to be a popular practice with schools to allow children to bring their own loose equipment to school at break time. However, telephone conversations confirmed that a very large number of schools provided loose equipment to children at break time.

5 DISCUSSION

5.1 Introduction

The current study investigated the physical activity (PA) levels of 5-12 year old children in the school playground at break time where the effects of school environmental and policy practices influence PA. School policies and practices at break time were examined using a questionnaire to quantify break time practices in Irish primary schools. Children's PA behaviour was also examined in a sub sample of schools using the SOPLAY system of observation (System for Observing Play and Leisure Activity in Youth) (McKenzie, 2002).

This chapter will state the contribution of Irish schools break time PA to the school day and to children's daily PA recommendations in respect of international guidelines. Enablers and barriers in relation to time, space and the provision of facilities for PE and of PA at break time in Irish primary schools will be discussed and gender differences highlighted.

Differences in break time timetabled practices are evident between Ireland, the UK and other countries (McKenzie and Kahan, 2008). In the UK, Sleaf and Warburton (1992) and Ridgers and Stratton (2005) reported three break periods with potentially 45 min. play at lunch break following eating time. A morning break of 19 min. and an afternoon break of 15 min. duration respectively were reported. The total playtime potential was 79 min. It is interesting to note that no differences were found in children's MVPA whether they engaged in two or three breaks (Ridgers and Stratton, 2005).

In the UK a threshold of 40% of available break time was recommended for the spontaneous movement pattern of children allowing for the influence of the social contexts of children's play as well as environmental variables influencing playtime (Ridgers and Stratton 2005; Stratton and Mullan, 2005; Ridgers, Stratton and Fairclough, 2006b). In the Irish school context, on the basis of the current study's findings on break time duration, this 40% PA threshold recommendation would equate to 16 min of break time (see Appendix 23). This 16 min. equates to 26% of children's daily-recommended PA guideline i.e. 60 min. MVPA daily

(WHO, 2006). However, current Irish primary school break time practices may challenge this threshold.

In the current study, boys were found to be more active than girls at break time. Data suggest that a variety of break time practices were evident in schools of different sizes and types which can influence PA promotion and accrual. The most noteworthy findings from this study are critically analysed and discussed below, and recommendations for future work proposed in Chapter 6. For the purpose of clarity in the following discussion school size will be categorised as follows: small schools (schools with 0-50 pupils and 51-100 pupils), medium size schools (101-200 and 201-300 pupils) and large schools (301-500 and 501-800 pupils).

5.2 Time, Space and Facility Provision for PE in Irish Primary Schools

In 'State of the Nations' Children', Fahey et al. (2005) concluded that there are three main avenues around which structured PA for children in Ireland can take place. These are the PE curriculum in schools, extra curricular sports played in schools and sports played outside school. All avenues play a role to ensure each child reaches his/her PA guideline. As outlined in Chapter 2, given the decline in active transport, the competition with passive activities like television viewing and computer games with outdoor play all opportunities for daily PA should be targeted in 5-12 year old children. These opportunities suggested by the National Heart Alliance (2006) and McKenzie and Kahan (2008) include:

- Before and after school
- Break time
- PE lessons
- Structured sport
- Discretionary time (what children do in their free time as well as incidental opportunities for accumulating PA during the day i.e. active transport).

PE makes a contribution to the education of the child as well as promoting skill development, positive attitudes to, and enjoyment of activities, in addition to lifelong benefits in relation to PA (NASPE, 2006; McKenzie and Kahan, 2008).

While this study did not attempt to seek the PA contribution of PE lessons to children's daily PA levels, the literature in Chapter 2 suggests that PE lessons can contribute up to 40% MVPA per lesson which equates to about 6-10 min. in the Irish primary school context (Sleap and Warburton, 1992; McKenzie et al., 1995; Waring et al., 2007).

In the current study, almost 70% schools reported weekly PE provision of one hour while 25% reported 30-60 min. These figures for PE provision are not unlike those previously reported in Irish schools (McGuinness and Shelly, 1995; Broderick and Shiel, 2000; Deenihan, 2005; Murray and Millar, 2005; Cosgrave, 2006; Hardman, 2007; Murphy, 2007; Waring et al., 2007). Myers et al. (1996) found that children had more minutes of PA daily when they also had a PE lesson on the same day compared to children who had no PE lesson during school. On the contrary Mallam et al. (2003) found that the total amount of PA accumulated did not depend on children's participation in PE class at school, as they appeared to compensate out of school.

Weekly PE provision, in the current study, varied according to the time of the year in 31% of schools. It is apparent that the PE lesson may be forfeited in the week in favour of more immediate demands on curricular time (e.g. preparation for Communion and Confirmation). Schools must use outdoor space for PE lessons if there are indoor space restrictions. Almost one tenth of schools indicated that PE provision depended on indoor space availability as the hall may be used for other purposes. Adequate outdoor space for the teaching of PE was reflected by over 70% of schools while only 28% of schools indicated that they had adequate indoor space. These findings were in keeping with previous reported Irish studies (McGuinness and Shelly, 1995; Deenihan, 2005; Fahey et al., 2005; Murray and Millar, 2005; Murphy, 2007). In the current study, an indoor sport-specific hall was reported in only 15% of schools and 39% reported a multi-purpose hall. It should be pointed out that McKenzie et al. (1995) reported outdoor PE was more active than indoor lessons. It is clear from the current study that adequate indoor space is perceived as a barrier to teaching PE indoors.

Although over 70% of schools reported having adequate PE equipment, boys' schools reported not having sufficient of equipment for teaching PE compared to mixed schools and small to medium size schools. It is possible that boys' schools used PE equipment at break time and the equipment may not be replaced after damage or loss. In small to medium size schools there appeared to be plenty of equipment and adequate space for PE teaching both indoors and outdoors when compared to large schools. Recently a once off grant of €2,000 was provided to primary schools by the DES (Government of Ireland, 2006) to replace possible dangerous goalposts and to the meet PE equipment renewal requirements.

In the current study, teacher confidence to teach PE was reported by 79% of respondents to the questionnaire. However this was the reported perception of the respondents to the questionnaire (who may possibly have been the school principal or a person with a post of responsibility for PE or sport) and may not represent the class teachers' perceptions. The provision of recent in-service education by the Primary Curriculum Support Programme (PCSP) may be reflected in this figure and their continued support of teachers in their teaching of PE is welcomed.

5.3 Time, Space and Provision of Facilities for Break Time PA in Irish Primary Schools.

All children potentially receive more opportunities to be physically active daily at break time in school rather than within PE lessons (Kraft, 1989). In the current study 89% of schools surveyed had two break periods daily. Over half the schools surveyed reported (56%) 6-10min for morning break and over 80% reported 26-30 min for lunch break.

Adequate yard space would appear to be an issue for many schools at break time, particularly amongst medium sized schools (201-300 pupils). The three observed schools met the hard area spatial guidelines (4.1m² hard outdoor space per child not including grass) proposed by the DES (2007a) (see Appendix 12). These observed schools were in the medium to large size, with enrolments of school A 339, school B 200 and school C 432 pupils. The largest of the three schools, school C, while irrespective of meeting planning guidelines proposed by the DES,

this school had break time policies in place in an attempt to overcome population pressure on space for play at break time and to promote break time enjoyment i.e. a change of footwear at lunch break in order to play on grass areas was observed as well as staggered breaks at morning break. Increased space would appear to allow a further positive practice of loose equipment provision to children.

The current study indicates that sufficient available yard space and surface area affects play at break time. Cardon et al. (2008) found that more space per child was found to be associated with more PA during break time. Humphreys and Smith (1987) recognised the importance of the topography of the playground, particularly its surface, to encourage 'rough and tumble' play and its PA benefits. Cardon et al. (2008) reported a harder ground surface was a borderline significant predictor for higher step counts in boys only and suggested that this may be related to the games and activities boys play at break time. In the current study girls in school C were observed using green areas for gymnastic movements, a finding also reported by HSE (2005a). The green area was observed to allow boys play more formal rule governed games, i.e. football and cricket, a need reported by Lever, (1978); Renold, (1997); Blatchford, Baines and Pellegrini, (2003); Boyle, Marshall and Robeson, (2003). All three schools in the current study had vast green areas but only school C was observed to use this space during break time (see Appendix 12). In relation to green areas for play it is interesting to point out that the DES recommends where a school site area has surplus space an area should be reserved 'suitable for use as a practice playing field' but the levelling and preparation of this area for use as a pitch is not included in the cost of the new school building project (DES, 2007a, p.30). Despite the spatial restrictions and limited equipment for children at break time what do children in Irish schools do at break time?

5.4 Children's PA Behaviour in the School Playground at Break Time

The need for schoolchildren to be physically active, to talk with their peers and to play freely has been recognised in the scheduling of break time (Evans, 1996; Blatchford and Stumpner, 1998). In this study schools reported a combination of children's behaviours at break time. Over 80% of schools reported the following behaviour at break time: informal play and chat; children organising their own

activities; sitting, standing and walking; and children running freely. This mix of behaviour, incorporating active periods, is similar to that described by Evans (1996) and Pate et al. (1996).

The findings from the questionnaire in relation to break time play were also evident in the three schools in which SOPLAY observation took place i.e. the highest proportion of children were sedentary (39%) with the lowest proportion in the vigorous category (26%). The mix in children's behaviour reflects children's unstructured movement patterns and the social complex natures of children's unstructured free time (Lever, 1978; Kraft, 1989; Bailey et al., 1995; Blatchford et al., 2003; Boyle et al., 2003; Waring et al., 2007). It could be argued that more sedentary children could be stimulated to be more active, more moderately active children could be more vigorously active and all children stimulated to be more physically active. It should be pointed out that it is possible that the presence of observers in the playground at break time had an influence on children's PA behaviours. One child asked the observers "Are you aliens?" (Field notes: 26/3/07). The novelty effect cannot be overlooked.

School A was found to be the most active of the three schools observed in spite of the initial finding from the questionnaire that this school had no break time PA promoting strategies in place. The observers spent five days in total in this school including two days for SOPLAY training (i.e. familiarisation with activity discrimination, notation and establishing reliability) and three days in the remaining schools so the novelty effect should have diminished. The children in school A spent the least amount of break time at play (e.g. 8 min. on most lunch breaks). Explanations suggested for the higher PA levels are possibly due to confinement as explained in Chapter 2 by Pelligrini et al. (1995).

In the case of this current study, children's confinement in the classroom before break time may be related to the practice of holding the children in the classroom for unnecessarily longer periods eating. Schools, for the fear of an accident in the yard, may justify this practice. This confinement may be responsible for the higher activity scores as children knew they had little time to play following eating. However, it was also suggested that after the first 6-10 min. of break time PA levels decline and this could be a further possibility in the case in school A

(Pelligrini and Davis as cited in Pelligrini and Smith, 1993; McKenzie et al., 1997). There was a clear trend for greater participation in shorter 5 and 10-min. bouts of MVPA demonstrated by Sleaf and Warburton (1992). Whatever the reason for school A being the most active of the three observed schools it should be emphasised that this finding may not be generalised to all schools, as the observation schools selected were not a truly representative sample. Safety as a factor influencing PA promotion in the yard cannot be overlooked in the duration of actual playtime at break time.

The SOPLAY system for observing children in an open environment is effective for observing a large number of children in an unobtrusive manner. All methods of assessing PA appear to have strengths and limitations (Baranowski et al., 1992) as pointed out in Chapter 2 and SOPLAY would appear to be no different. A school playground is a complicated setting to measure activity due to the intermittent movement patterns of children in unstructured play at break time as well as the variety of environmental variables that may occur in different schools. SOPLAY involved recording five contextual characteristics for description purposes. The SOPLAY activity codes were validated by heart rate monitoring and can permit energy expenditure rates to be estimated.

The SOPLAY training DVD provided was appropriate in the early stages of training for observers but was not considered representative of a school playground situation for advanced practices. Practice in the school playground at break time was considered necessary. However firstly, the live training which would be required to reach reliability requirements, could prove difficult in the Irish context given the Irish climate and the short duration of primary school break times. Secondly, the amount of training could be costly in terms of money and attrition of observers due to other commitments.

The SOPLAY system was developed in California which has a more favourable climate to Ireland for outdoor observation. The current study had only one day cancelled due to inclement weather conditions. The researcher considered this situation to be very fortunate given the time constraints of observers as well as distance to be travelled from Dublin, Kilkenny and Waterford.

As this study was not funded, training days and data collection observation days depended on the availability of the five observers. If long-term studies and follow-up observations were required, the availability of the original observers would be questionable and costs could accumulate.

5.5 Gender Differences in Children's Physical Activity Behaviour in the School Playground at Break Time

The observation study found that 54% girls and 65% boys were engaged in MVPA at break time which is consistent with a finding reported in break time studies in Chapter 2 (Stratton, 2000; Sallis et al., 2001; Zask et al., 2001; Tudor-Locke et al., 2006; Cardon et al., 2008). The finding that boys were more active than girls has been consistently reported in other settings (Myers et al., 1996; Sallis et al., 2000; Carrier and Herbert, 2003; Klasson-Heggebø and Anderssen, 2003; Cardon and De Bourdeauhuij, 2004; Ridloch et al., 2004; Mota et al., 2005; Murray and Millar, 2005; Woods, et al., 2005; CFLRI, 2006; Tudor-Locke et al., 2006).

Mota et al. (2003) found that girls and boys differ in the time of the day that they are most active and recommended schools should take cognisance of the influence the time of the day may have on the PA levels of boys and girls. As explained in Chapter 2 Mota et al. found that girls were significantly more active at morning break compared to afternoon break with no lunch break data reported. In the current observation study while there were no afternoon breaks, this finding supported that girls were more active at morning break compared to lunch break.

Boys were more active at lunch break. In school B and C the longer duration of lunch break with the availability of a large green area in school C to allow boys to play rule-governed games i.e. football and cricket resulted in higher PA levels of boys. Although caution is advised with the generalisation of findings from the observation study schools should be aware of PA promotional practices among girls and the optimal time of day that these opportunities are offered. Particular focus should be given to space distribution to encourage more balanced opportunities for girls to play in larger spaces if they so wish (Renold, 1997; Boyle et al., 2003). Boys were found to be more active than girls where three

school conditions existed: PE lessons were offered, where free play was allowed at school with playground equipment and when a school offered only loose equipment at break time (Sutterby et al., 2004).

In relation to discretionary activities it is worth noting the gender differences in relation to screen time and active transport (Troost et al., 1996; Marshall et al., 2002; Biddle et al., 2003; WHO, 2004; Spinks et al., 2007). Perhaps, girls' higher sedentary behaviour at school break time could be related to other sedentary behaviours at home. Myers et al. (1996) commented that more girls than boys reported indoor chores and more time spent on indoor chores. Time spent outdoors is one of the most consistent physical environmental variables that predict children's PA (Sallis et al., 2000).

5.6 Policies and Practices in Irish Primary Schools Effecting the Break Time Environment and Physical Activity

In this current study it is clear that policies and practices vary between schools for break time organisation which effects the promotion of PA at break time.

(a) Timing of eating

Where eating time was included in morning and lunch breaks, children can potentially play for 6 min. in the morning and 20 min. at lunch break, a total of 26 min. per day. Where eating time was not included in break time and children ate during curricular time children could play for 10 min. at morning break and 30 min. at lunch break, a total of 40 min.

At lunch break at schools B and C, it was evident that the children ate in the classroom before going outside with pupils listening to music, or listening to a story or poetry while eating. The value of integrating PE with other curricular areas is highlighted by McKenzie and Kahan (2008) and in the PE Teacher Guidelines (Government of Ireland, 1999b). Whatever the educational reasons behind eating practices in Irish primary schools, the children who ate outside the reported lunch time period potentially gained more playtime and perhaps more time to be physically active daily than children who ate during the reported break.

In school A, where children ate lunch as part of lunch break, the children were observed to play for eight minutes and a maximum of 15 min. at lunch break.

(b) School uniform policy

A variation in school practice which could have implications for PA promotion, is a school's policy in relation to a school uniform. In the three observed schools, children wore school tracksuits on PE lesson days. Girls were given a choice of uniform to wear on other school days i.e. trousers or a skirt. Consequently, what girls wear to school may be restrictive on girls PA levels at break time as skirts could hinder their PA movements and activities (Boyle et al., 2003). Some schools may not permit a choice in uniform for girls. This possible restrictive practice was not investigated in this current study.

(c) Documentation of a play policy

The dominant trend in the UK and other countries towards restrictions to children in school grounds, increased levels of supervision and decreased time for breaks and restrictive practices encouraged was reported by Casey (2003). In the current study, two questionnaire respondents noted documentation in relation to a 'yard book' to record negative break time behaviour. In the personal communication made with the non-respondent schools to the postal questionnaire a range of documents referring to some break time practices were reported as having some evidence of formalisation of practices. Written documentation referred to supervision arrangements, discipline, year group yard organisation and banned activities. Cox (2005) recommends that schools should have a policy that specifies school practices in relation to PA, games, sport and extra curricular activities. If school break time was included, it might help maximise the potential to promote PA at break time. Practices at break time should be explicit and agreed amongst teachers, children and parents/guardians. In the current study, only 17% of schools reported having a formal written play policy, 45% an informal policy and 37.9% had none. However the problem of imposing more paperwork on schools is a concern. Positive break time PA promotional practices should be encouraged in the light of support from Cox (2005), Glendenning (1999), National Play Policy (Government of Ireland, 2004a).

(d) Staggered breaks

Whilst staggered breaks (i.e. having break times at different times for classes in order to allow children more yard space at break time to play) existed in almost 10% of schools in the current study, only 8% of schools reported that their school would be interested in this PA promotion practice. Although reasons were not explored for this, a possible suggestion for the lack of interest may be due to supervision difficulties, or noise levels. Staggered breaks were in operation in observation school C in order to maximise spatial distribution and to promote break time enjoyment for children at morning break.

(e) The teaching of games using playground marking at physical education lessons

Playground markings were reported in 66.2% of schools in the current study. The HSE (2005a) PA initiative offering a grant for markings and a training day to organise these markings is likely to be represented in this finding. The HSE study reported that 59% of teachers (n=455) taught playground marking games at PE lessons. The figure reported in this current study was 47%. Positive PA promotional initiatives like the HSE playground marking scheme example is welcomed. Humphries and Rowe (1994) and Lucas (1994) recognised the cross-curricular links of playground markings. One of the HSE (2005a) recommendations from the evaluation report requested sustainability of playground interventions and follow-up in terms of the supervisors prompting that is needed to maintain attitudinal and behaviour change (HSE, 2005a). In the three schools observed in this current study, children were found to use the playground markings at break time rarely and had to compete with other children playing alternative activities in the marked spaces. The need for children to be taught playground marking games was an emergent theme in the study conducted by Cosgrave (2006).

(f) Organisation and segregation of classes

In the current study, 56% of schools reported year groups banding together in playground areas. It would appear that in very small schools (schools with <50 pupils), children play as one group at break time while larger schools (>50 pupils) need to divide groups perhaps for reasons of safety and supervision. This organisation of groups for break time play creates settings for various social group mixes. From the literature in Chapter 2, the social context of the school playground was reported as a variable affecting behaviour in the playground (Lever, 1978; Kraft, 1989; Blatchford et al., 2003; Boyle et al., 2003; Waring et al., 2007). As children increased in age, the size and gender mix of their groups changes and the nature of games and activities undertaken at break time can change which may have implications for PA levels at break time (Evans, 1996; Renold, 1997). Banding of groups could have positive or negative effects on PA levels.

(g) Supervision

Supervision arrangements can affect PA promotion at break time (Sallis et al., 2001; McKenzie et al., 1997). In the current study, all target areas or yard areas used for play at break time were supervised. However should the role of the supervisor include encouraging or prompting play? Positive 'vibes' to children about PA by the way staff, parents and children talk and act was considered effective in PA promotion (Broderick and Shiel, 2000; Sleaf et al., 2000 p.38). It is interesting to note here that in the current study only three per cent of schools had parents involved in break time play, and over 70% of schools were not in favour of using parents to promote more active play in the playground at break time.

The practice of prompted play by supervisors at break time was reported in this current study to occur 'sometimes' by over 50% of schools. McKenzie et al. (1997) reported that boys were found to receive significantly more prompts to be physically active from playground supervisors than girls which could be a possible reason for the gender differences in PA levels in the current study. Cardon et al. (2008) found that pre-school children were less active when more

teachers were supervising although this was only significant in girls. It was reported that girls in particular stayed closer to teachers at break time than boys and, as a consequence, girls may need more prompts to be active. The amount and type of prompts from supervisors and peers were not measured in the current study.

(h) The topography of the playground

The actual topography of the playground presented to children to play in at break time can be influential in promoting PA. The current study found an open yard and green areas were the most common play spaces available at break time. Restricted use of green areas inhibited PA. The current study reported 71% of schools permitting play on green areas 'dependent on the weather' while 16% permitted grass for play with a change of footwear. It is interesting to note that fixed equipment was rare in school playgrounds i.e. climbing frames were reported by 7% of schools in this study, natural obstacles 15%, man-made obstacles 6%, and swings 6%. Reasons for this were not pursued but expense and safety are suggested. The personal communications referred to non-respondent schools resulted in the researcher visiting a primary school in Cashel, Co. Tipperary to view positive PA promotional practices at break time. Fixed play equipment as well as stepping logs and tyres had been installed in the schools green areas. Equipment had been agreed on, and purchased from fund raising, by the parents association. Previous items purchased included games equipment for outdoor use at break time and wooden play houses (sheds), considered appropriate for storage of some break time equipment. A rota for use of equipment was in place.

(i) Provision of loose equipment

It does not seem to be a popular practice with schools to allow children to bring their own loose equipment (see Appendix 1) to school at break time. However, telephone conversations confirmed that a very large number of schools provided loose equipment to children at break time.

The degree to which children were encouraged to bring equipment to school is unknown. Loose equipment belonging to schools was provided by 57% of schools at all break times who responded to the questionnaire and by 85% of non-respondent schools contacted by telephone. This is an encouraging practice in an effort to promote enjoyment and PA. The quantity of equipment provided to children is unknown, as is the extent of involvement of children in the choice of stimulating play equipment for playtime purposes, the possible rotation practices of equipment and the variety of equipment to stimulate various levels of PA (Verstraete et al., 2006). Few target areas in the current observation study were equipped, and the equipment that was evident was scarce and basic.

(j) Both break periods should be addressed if PA is to be promoted.

In this observation study which may not be representative of other schools, morning break was more active compared to lunch break (60% vs 58.6% MVPA) in the three observation schools. Morning break was of longer duration for play in school A than lunch break after eating time. Perhaps it is the case that children's PA levels decrease after the first 6-10 min of break time (McKenzie et al., 1997) regardless of the duration of breaks.

Much of the research showed that considering break time only (i.e. no PE lesson takes place on that day), lunch break PA represented the most important source of daily PA during school hours for both boys and girls (McKenzie et al., 2000; Zask et al., 2001; Sutterby et al., 2004; Tudor-Locke et al., 2007; Waring et al., 2007). However, Sleaf and Warburton (1992) contradicted this finding. Intervention studies showed that both break times were effective generally at increasing PA levels but lunch break was demonstrated to be more effective compared to morning break due to its longer duration (Verstraete et al., 2006; Ridgers et al., 2007). Ideally both break periods should be addressed if PA is to be promoted.

(k) Role of outside agencies in physical activity promotion

The current study reported outside agencies becoming a feature of schools in relation to the promotion of PA. Cavill (2001) encouraged the exploration of the role of National Governing Bodies in providing opportunities for children's PA

participation in both school and after-school settings to be considered, and the exploration of the role and support of parents.

5.7 School Type and Physical Activity at Break Time

The majority of schools in the questionnaire study were mixed (87%), 17% were single sex boys schools and 7% girls only schools. A break down of Irish primary schools nationally shows 89% mixed schools, 7% single sex boys and 4% single sex girls (DES, 2006) (see Appendix 19). The three observation schools in this study were mixed schools hence a comparison of school types could not be made.

In boys' schools, children were significantly more likely to bring their own footballs to school than girls or mixed schools. Perhaps this practice was encouraged in boys' schools and not in girls' schools. Girls may not find the game of football stimulating or have not been socialised into football. Boys engage in activities that involve vigorous and competitive behaviour (Pellegrini et al., 2004; Lever, 1978; Renold, 1997), aggressive play (Humphreys and Smith, 1987) and more complex activities (Lever, 1978). Football would appear to have these features. However, Boyle et al. (2003) and Renold (1997) highlighted the gender imbalance created when footballs were introduced into mixed sex schools. Boys dominated the space but also created gender imbalance in that those who played the game were generally boys who seem to have their own code of practice at play. This dominance of the game of football also signified to girls in the yard the importance being attached to the game by the school even though this may be unintentional.

In relation to the choice of activities, research shows that boys and girls differ in activities at break time (Lever, 1978; Humphreys and Smith, 1987; Kraft, 1989; Renold, 1997; Blatchford et al., 2003; Boyle et al., 2003; Pellegrini et al., 2004; Waring et al., 2007). Girls were found to play in a far greater array of activities (Renold, 1997; HSE, 2005) and in smaller groups (Lever, 1978). Older children have a desire to play more rule-governed games (Humphreys and Smith, 1987).

In the current study, children in girls schools were more likely to bring skipping ropes and elastics to school compared to boys schools. Girls' schools were more

likely to provide loose equipment and activity zones compared to mixed schools at break time. In girls' schools, girls were more likely to plan their own break time activities. The quantity of equipment as well as the more detailed information in relation to zones was not examined in this current study. Mixed schools reported the greatest variety of equipment available to children perhaps due to the gender mix. Respondents on behalf of girls schools differed from boys and mixed schools in that they considered break time too short. However this may not be the perception of the girls themselves.

5.8 School Size and Physical Activity at Break Time

In the current study, almost 79% of schools had enrolments of less than 200 pupils (see Appendix 18). These schools are considered for the purpose of this study in the small to medium size bracket. The current study questionnaire sample would appear to be nationally representative in terms of school size. From the current study, it would appear that the practices of schools at break time differ depending on the size of the school. Environmental conditions can be enablers or barriers to PA with the potential to influence or stimulate what children do at break time.

Data in the present study indicate that small schools reported more positive PA promoting practices at break time than larger schools not alone at PE but also in relation to break time PA promotional practices. Small schools (schools with < 101 pupils) experienced fewer barriers than larger schools specifically with respect to storage space, equipment cost, or risk of equipment loss/damage. Small schools were more likely to have adequate playground space, more likely to distribute a variety of equipment at all break times and perceived their yards more attractive. Children in small schools all played together in the playground at break time. While small schools were found to be less involved in planning their own break time activities, neither the interpretation of this was not defined on the questionnaire nor the degree to which the child's voice is heard in a meaningful way (a recommendation by the National Play Policy, Government of Ireland, 2004a) is unclear. Small to medium size schools were more likely to permit children to play on the grass areas but this was 'dependent on the weather'. These schools also permitted the practice of children bringing their own play equipment to school. Meanwhile in larger schools (> 300 pupils) children were more likely to

organise themselves more often in to group activities at break time e.g. playing soccer, basketball games.

While schools differed in availability of fixed equipment particularly basketball posts, goal posts and playground markings, in general medium size schools (101-300 pupils) had these facilities available to children. However, from the observation study their use is questionable and maybe even inappropriate in size for children aged 5-12 years. Moderate to large schools (301-500 pupils) reported practices that could promote PA at break time e.g. activity zones and staggered breaks but the questionnaire did not explore the reasons behind the reported practices. Safety could possibly be a reason.

While it is encouraging to report that 85% of all schools in the questionnaire survey allowed children to run freely in the yard at break time, barriers reported hindering play included inadequate space particularly in mid-size schools (101-500 pupils) and yard space was encroached upon for building purposes in almost half the schools. Nearly 40% of respondents to the survey considered their schools playground space inadequate to promote PA at break time. Murray and Millar (2005) reported 75% of >301 pupil schools had 'no running' policy compared to 29% of schools with an enrolment of < 300 pupils. Observations in the three observed schools showed children running freely in the playground environment presented to them and with respect of the particular schools practices and space. No school policy restrictive practices were observed. Telephone conversations with the non-respondent schools revealed that 95% of these schools allowed children to run freely in the yard at break time but 35% of these respondents clarified that conditions applied i.e. no 'bull dog' chasing games, and children were requested to stop playing a game if the game could cause injury.

In the current study, 'no teacher taking charge of PA' was reported as a barrier to break time PA promotion by 16% of schools responding to the questionnaire. As schools increased in enrolment size, they were more likely to offer teachers a post of responsibility that included PE. Larger schools were found to be more restrictive with PA promotional practices despite the possible existence of the above post. The post may be for extra curricular sport organisation and PE

planning but the lack of priority for PA at break time and the lack of time may restrict PA promotional practices at break time.

Zask et al. (2001) found that as schools got larger children became less active. However McGreevy (2007) reported the number of pupils in the playground had no effect on MVPA levels of pupils (range 50%-85% MVPA) unlike Cardon et al. (2008) who found that more space per child for children aged 4-5 years was found to be associated with more PA during break time. The present study would indicate that small and large size schools have different challenges in relation to space for play, capacity, supervision arrangements, and yard organisation which may hinder or promote PA at break time. Perhaps methods to overcome these challenges need to be explored. Cardon et al. (2008) reported that 27% to 35% of variance in steps counts of children aged 4-5 years at break time may be attributed to differences in practices between schools.

5.9 Non-Respondent Schools

It would appear that non-respondent schools did not differ greatly from the schools that did take part in the questionnaire survey in relation to practices at break time. Similar numbers had a formal playground policy and children bringing their own equipment to school were not encouraged.

5.10 Opportunities to Promote Physical Activity at Break Time

To achieve PA break time recommended threshold, opportunities exist for increasing the PA levels of all children at break time. Cavill (2001) suggests that girls should be singled out for particular attention. While no intervention was carried out in this study, in general most playground interventions reported in Chapter 2 were found to be effective for increasing the PA levels of both sexes. While equipment enhanced PA levels of children at break time, Sallis et al. (2001) found the provision of play equipment appeared to enhance the children's enjoyment of break time at school. Enjoyment is an important variable in promoting PA at break time (Connolly and McKenzie, 1995; Sallis et al., 2001; Boyle et al., 2003; Scruggs et al., 2003; HSE, 2005;). Stucky Ropp and DiLorenzo

(1993) highlighted children's enjoyment of PA as the most important predictor of exercise for both boys and girls. With reference to the literature reviewed in Chapter 2, schools wishing to promote enjoyable PA at break time should consider the following practices:

- The provision of a variety of equipment and a plentiful supply to stimulate different types of physical activity levels including perhaps activity cards (Afonso and Botelho, 2003; 'Schools on the Move' 2004; Sutterby et al., 2004; Verstraete, Cardon, De Clercq, & De Bourdeaudhuij, 2006).
- The rotation of equipment between groups of children (Verstraete et al., 2006).
- The provision of a variety of playground markings to equally distribute children across the whole playground with playground markings attractive both to boys and girls (Stratton and Leonard, 2002; HSE, 2005a; Ridgers et al., 2007).
- The teaching of playground marking games and other games at PE and yard time with perhaps older children teaching younger children (HSE, 2005a; Cosgrave, 2006).
- The redesign of the playground into zones of activity levels (Ridgers, Stratton, Fairclough & Twisk, 2007).
- The encouragement of prompted play by supervisors (McKenzie, 1997, 2000).
- The provision of a fitness circuit from time to time (Scruggs, Beveridge & Watson, 2003).
- The organisation of easy to implement games (Connolly & McKenzie, 1995)
- The provision of fixed equipment (Sutterby et al., 2004).
- Engaging children in planning their own play space (Lucas, 1994; Government of Ireland, 2004a).

It is encouraging to report that the current survey found that 58% of schools provided loose equipment at all breaks and 22% at lunch break only. However, 20% never provided loose equipment. Considering the limitations of self-report questionnaires as a research assessment method this figure may even be higher. Research has shown that providing equipment to children at break time is an

effective strategy to increase both boys and girls PA levels (Afonso and Botelho, 2003; 'Schools on the Move' 2004; Verstraete et al., 2006). From this study, little is known about the amount of equipment that was provided to children. If this was found to be scarce, as was the case in the observation schools, reasons would need to be identified as to why this was the case. The type of equipment did not show great variety. School C was chosen for observation due to the variety of equipment that it provided from the returned questionnaire, however, this was not found to be the case in reality.

Actual barriers to the provision of loose equipment at break time reported in the current study as 'important' are commented on here. Schools reported 'safety' (44%) as a barrier followed by 'supervision difficulties' (35%) and thirdly 'organisational' reasons (34%). Safety was a concern that emerged as a theme from telephone conversations with the non-respondents to the online/postal questionnaire schools contacted. While 'safety' was not found to be a statistically significant barrier, it nonetheless appears to be a barrier. When responses in respect of barriers hindering break time PA were sought in the questionnaire survey, schools reported the 'fear of injury' to children as the principal barrier (62%). Again this was not found to be statistically significant but nonetheless is an issue of concern to schools.

5.11 Summary

It is clear that differences in the PA opportunities at break time exist between Irish primary schools and within schools which result from various different policies and environmental practices in schools and from differing expectations from peers and teachers/supervisors at break times. Data in the present study indicate that smaller schools (<100 pupils) would appear to promote more positive PA promoting practices at break time. The study illustrates that small and large size schools have different challenges in relation to space, numbers, capacity, supervision arrangements, and yard organisation which may hinder or promote PA at break time. Perhaps methods to overcome these challenges need to be explored. However, opportunities exist for both large and small schools to increase the PA levels of all children.

6 RECOMMENDATIONS

The recommendations from the outcomes of this current study are based principally on the findings of the study reported but also on the literature reviewed in relation to enablers and barriers to the accrual of children's daily PA both at home and at school. The current studies' limitations, as outlined in Chapter 1, are taken into consideration.

With regard to the SOPLAY system of observation as a PA assessment method, the availability of official SOPLAY 'Section Three' DVD scores for reliability purposes is recommended. The development of pre-coded vignettes of school playgrounds on a DVD for SOPLAY training and reliability purposes as well as for reducing observer drift over time would be welcomed.

These study findings suggest that school playground size, space and lack of equipment may be barriers to children achieving adequate PA levels at break time. Safety may also be a barrier. Arising from this, the following recommendations are made for future practice.

The Department of Education and Science (DES) should encourage schools to become supportive environments with a healthy public policy related to PA and should ensure the barriers mentioned are minimised. This includes the provision of safe routes to school to encourage active transport. While one-off initiatives such as walk to school days can have positive effects (Jago and Baranowski, 2004), strategies are most likely to be successful when they operate at multiple levels i.e. policy, environmental, community and individual levels (Sallis et al., 1998; Cavill, 2001). The DES should include guidelines on the promotion of PA during break time in its policies.

School playgrounds should be given equal attention to other school facilities. Despite recently revised primary school design guidelines for new schools, no increase in outdoor hard surface areas is evident since the 2000 planning guidelines (Department of Education and Science, 2007a). DES should consider the following:

- Revision of the amount of hard surface space provided to schools.
- The inclusion of the development of green areas with an all-weather soft surface.
- Providing grants to schools to encourage the purchase of age-appropriate fixed equipment and loose easily storable equipment for break time play.

Schools should be encouraged to re-think and re-structure some practices at break time in light of gender imbalances and practices that may be occurring in the nature of play and particularly the promotion of PA, without intention, due to playground organisation. The development of a play policy for break time is recommended to schools including simple, safe, stimulation and enjoyment of active play. The policy should be devised in partnership with parents and guardians to seek their support and partnership for a positive health promoting school environment. Children spend a large proportion of the day at school. Therefore, schools should be advocating the importance of break time in relation to children's daily accumulation of 60 min. of PA.

Break time takes up a sizeable, enjoyable and memorable part of school life for most primary school children. Schools should consider playground design as part of the outdoor educational environment (Lucas, 1994; Humphries and Rowe, 1994; Stratton and Leonard, 2002; HSE, 2005a; Cosgrave, 2006; Ridgers et al., 2007). Schools need to explore children's preferences for activities, playground design and motivational equipment to promote active play. Children need to be involved in the process. Based on visits to participating schools in the current study, staggered breaks as a school policy to maximise space distribution of children at break time worked effectively and should be encouraged as a PA promotion practice by schools to promote enjoyable play. Exploration of school practices in relation to the scheduling of children's eating time with a view to maximising physically active play for children should be considered. However further evaluation of whether children are more physically active with longer playtime at lunch break would also need to be undertaken.

In order to promote PA at break time, further research is recommended comparing age groups, gender, rural and urban schools and break time activities. It is necessary to establish whether or not effective teaching of games using playground markings and activities at PE lessons is actually happening. Teachers need adequate time allocation for PE to ensure maximum PA is incorporated into PE lessons and opportunities must be maximised to integrate PE with other curricular subjects and other PA opportunities in the school day. There is a need for the provision of time to teachers with a post of responsibility to allow PA promotion planning and implementation at break time and other times of the school day as well as time to establish linkage with outside agencies promoting PA e.g. Green schools, National Governing Bodies and Local Sports Partnerships.

Based on the review of literature, there is a need for the provision of more time in the colleges of education to allow pre-service primary teachers form a deeper understanding of PE and PA. Qualified teachers need continued curricular support in implementing the curriculum and understanding the wider implications of PE to lifelong PA participation. In-service education for teachers in relation to giving children the opportunity to participate in decisions that affect their everyday lives at school would be valuable.

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APPENDICES

Appendix 1 Definitions Relevant to the Study

Physical activity (PA) is any bodily movement that is produced by the skeletal muscles that results in energy expenditure (Caspersen, Powell and Christenson, 1985).

Break time is the combination of morning break and lunch break (Recess in the USA).

Free play is unstructured play where children play in the playground at break time supervised but without formal instruction or teaching.

Sedentary behaviour expends energy greater than an ordinary walk. Lying down, sitting, and standing are examples (McKenzie, 2002, McKenzie et al, 1991). Sedentary behaviour involves no participation in PA (Varo, Martinez-González, Irala-Estévez, Gibney and Martinez, 2003)

Walking is locomotion and transfer of weight with an ordinary to moderate pace (McKenzie et al. 1991). Waring et al. (2007) referred to this as moderate activity which is the equivalent to brisk walking leaving the participant feeling warm and slightly out of breath, 4-7 METS (Sallis, 1999).

Very active behaviour is expending energy at a higher rate than an ordinary walk. Examples include fast walking, getting up from sitting down, chasing, running and kicking a moving ball, wrestling lying down, pedalling even though sitting down (McKenzie et al., 1991). Waring et al. (2007) referred to vigorous activity as equivalent to slow jogging leaving one out of breath and sweaty. Sallis (1999) defined this in terms of energy expenditure as 7+ METS.

MVPA moderate to vigorous physical activity.

VPA vigorous physical activity -a subset of MVPA

PA levels have been quantified in many studies as the proportion of time that subjects engage in MVPA or VPA.

Enrolment in this study is the number of children registered in the particular school with the DES for the school year.

Attendance is the number of children who reported for school on a given day with the mean calculated for 3 days.

Loose Equipment in this study refers to small items used for play e.g. footballs, basketballs, soft balls, elastics, skipping ropes, hockey sticks, and tennis rackets.

Fixed Equipment or facilities at break time in this study refers to equipment that is not easily movable or fixed to the surface or wall e.g. basketball posts and hoops, football goal posts, wall bars, climbing frames, playground markings, and natural obstacles.

Facilities at the school refers to locations for physical activity e.g. sports hall, tennis courts, a track, swimming pool, open yard, grass areas and all weather pitch.

McKenzie (2002) defined the terms below:

Accessible area is accessible (e.g., not locked or rented to others).

Usable area is usable for physical activity (e.g., is not excessively wet or windy).

Supervised area is a playground supervised by designated school personnel (e.g., teachers). The supervisor must be adjacent to that specific area (i.e., available to direct children and respond to emergencies), but does not have to be instructing or organising activities).

Equipped refers to loose equipment provided by the school and not students own equipment. Fixed/permanent equipment (e.g., basketball posts) is not included.

Organised PA is planned activity, with a leader, teacher or coach present in an area for instruction, a training session, or perhaps a fitness station.

Kcal/kg/min. represents the number of kilocalories per kilogramme of body weight per minute expended.

Target Area (TA) is a predetermined observation area in which children may be potentially physically active.

Scan space (SS) is a subdivision of a target area in which the observer makes scans. These are devised if the number of students is large or obstacles in the yard prevent full view of all children at play. All scores from scan spaces in a target area are aggregated to give a total score for a specific target area.

Scan is a single observation movement from left to right across a target area or scan space in which each child in the sweep is counted and coded as being sedentary (S), walking (W) or very active (V).

Appendix 2 Guidelines for PA in Children

Agency	Guideline
World Health Organisation (WHO) 2006	A total of at least 60 min. of moderate intensity PA each day and at least twice a week activities should include muscle strength and flexibility.
US Department of Health and Human Sciences [CDC] 1996 Surgeon General Report	60 min. of PA on most, preferably all, days of the week
Department of Health 2004 UK Chief Medical Officer	60 min. of moderate intensity PA each day. At least twice a week this should include activities to improve bone health.
Public Health Agency of Canada 2002	Children add 90min of total MVPA (60min) and VPA (3 min.) to the incidental activities required by daily living, an amount equivalent to 16,500 steps daily (CANPLAY study 2006 PA guideline))
Australian Department of Health and Aging 2005	60 min. of moderate to vigorous PA everyday
Health Education Authority 1998 Young and Active? Policy framework for young people and health-enhancing PA (Biddle et al., 1998) London, England: HEA Publishing	60 min. MVPA daily 5-8 METS 120-150 min./day/40% -60% VO2max HRR cited in Epstein et al. (2001)
National Heart Alliance 2006	At least 60 min. MVPA daily. Twice a week is suggested for children to experience some activities that help to enhance and maintain muscular strength and flexibility and bone health (Biddle et al., 1998)

Appendix 3 Guidelines on Children's PA Levels

Legend: **Objective:** Type of PA assessment method used in the study. **Subjective:** Type of PA assessment method used in the study. **Guideline:** PA guideline used in the study

Study Reference and Country	PA Method <i>Objective /Subjective</i>	Age And sample size	Results <i>PA Guideline</i>	Relevant information on PA	Study limitations
Tudor-Locke, Lee, Morgan, Beighe & Pangrazi, (2006) Arizona	Objective Pedometer	11 year olds n=81 (28 boys and 53 girls)	Guideline: 13,000steps/day boys 11,000 steps/day girls 71.4% of boys and 53.6% of girls achieved.		Small, self- selected sample
Loucaides, Chedzoy & Bennett, (2004) Cyprus	Objective Pedometer Parental Questionnaire assessing environmental variables	11-12 year olds n=256	Guidelines: 60 min. daily MVPA 46% of urban and 33% of rural school children attained the recommendation for winter. For summer, 42% of urban school children and 69% of rural school children reach the value of 14,000 guideline steps per day average.	Number of children attaining this value is low. The increase in summer may be due to more favourable weather and more outdoor space for rural children 4 days summer and 4 day winter reliability 0.74 and 0.69.	Other variables could influence findings like social and psychological which were not looked at in this study. 4 days of assessment in winter and 4 days in summer. More days would provide more in-depth data. Limitations of pedometers for PA assessment.

Study Reference and Country	PA Method Objective /Subjective	Age And sample size	Results	Relevant information on PA	Study limitations
Mota, Silva, Santos, Ribeiro, Olivera & Duarte(2005) Portugal	Objective CSA Accelerometer 14 h of PA measurements 3 consecutive school days May-June	8-10 year olds n=22	PA Guideline Guideline: 60 min. MVPA each day Boys spent 142 min. and girls 137 min. per day in MVPA.		22 children- Small sample from only one school.
Riddoch Andersen, Wedderkopp, Harro, Klasson-Heggebo, Sardinha, Cooper & Ekelund, (2004) Denmark Portugal Estonia Norway	Objective CSA Accelerometer 3 and 4 days including at least 1 weekend day. All waking hours.	9 and 15 year olds n=2906	Guideline: 60 min. daily MVPA 36%. 9-yr-olds are more active than 15 yr-olds. Nearly all 9 yr-old children achieve guidelines but fewer 15-yr-olds achieve them particularly in girls.	Boys are more active than girls at both 9 yr (21% more active) and 15 yr (26%) with gender differences at 20%	Reactivity Mal-functioning accelerometers Removal for swimming. Contact sports, showering
CFLRI (CANPLAY)(2006) Canada	Objective Pedometer waking hours 7 days	5-17 year olds n=6,000	Guideline: 16,500 steps /day Canadian children and youth (between the ages of 5 to 19) take an average of 11,356	Boys are more active than girls, taking roughly 1,200 more steps per day on average. Younger children are more active than older children. The gap between the youngest and oldest	

Study Reference and Country	PA Method Objective /Subjective	Age And sample size	Results	Relevant information on PA	Study limitations
Klasson-Heggebo & Anderssen (2003) Norway	Objective CSA accelerometers 4 consecutive days	9 and 15 year olds n=760	<p>steps per day well below Canada's PA Guideline of 16,500 steps</p> <p>PA Guideline</p> <p>Guideline: 60 min. MVPA daily 13.8% of the 9-year-old children and 44.6% of the 15-year-old youth did not fulfil the Norwegian PA recommendations</p>	<p>age group is particularly evident among boys (2,800 for boys and 2,300 for girls).</p> <p>PA levels also were found to decline with age</p> <p>9 year old were more active than 15 year olds p<0.001</p>	
Cardon & De Bourdeauhij (2004) Belgium	Objective Pedometers Diaries	9,6 year olds n=92	<p>Guideline: The Presidential Active Lifestyle Award 11,000 steps / day ≥ 5 days a week.</p> <p>Average daily step count 15,038 and the average daily MVPA was 106 (SD 39) min. Mean boys 16,628 steps and girls 13,002 steps (p<0.001) 72 children met recommended guideline steps unlike 6 children.</p>	<p>Boys accumulated more steps daily than did girls 16,248.</p> <p>Minutes of MVPA engagement did not differ between genders</p> <p>Significant difference with age- 6-7 year olds 15,878 steps; 8-9 year olds 16,352 steps; 10-12 year olds 13,842 steps; p=0.03</p>	<p>Explanation by authors was proposed, boys at this age are developmentally less mature than girls. This may result in girls stride length been greater and thus recording less strides on the pedometer. Again the pedometer cannot measure intensity but boys may accumulate more steps than girls due to higher levels of VPA</p>

Study Reference and Country	PA Method <i>Objective /Subjective</i>	Age And sample size	Results <i>PA Guideline</i>	Relevant information on PA	Study limitations
Dencker, Thorsson, Karlsson, Linden, Svensson, Wollmer et al., Andersen (2006) Malmö Sweeden	<i>Objective</i> Single plane (vertical) Accelerometer	9 year olds n=249	Guideline: Moderate PA for 60 min. or more per day. All children met the recommended PA guideline stated.	The mean daily activity was higher in boys than in girls 751±243vs 618±154 counts/min. (P<0.001).	All schools were situated in middle-class areas with inhabitants of non-immigrant origin.
Myers, Strikmiller, Webber & Berenson (1996) Los Angelus	<i>Subjective</i> Self-report questionnaire 24-h recall	9-15 year olds n=955	Guideline: ≥ 3 sessions weekly of PA ≥ 20 min. bouts MVPA 168 min. PA reported daily by children with a decrease shown in age	Boys more physically active than girls. 153 vs 110 min, P<0.0001 Boys reported higher levels of heavy PA (21 vs 8%, p<0.0001 Decrease in PA with grade increase. Blacks more sedentary than Whites (15 vs 10 min, p< 0.0001)	Overestimation Seasonal and geographical differences
Spinks, Macpherson, Bain & McClure, (2007) Brisbane Australia	<i>Subjective</i> 7 day parental recall of children's PA out of school and sedentary leisure activities including weekday and week ends	5-12 year olds n=518	Guideline: Children and young people at least 60 min. (and up to several hours) of MVPA every day. 15% children did not meet	31% spent longer than 120 min. per day cumulatively watching screen time which was significantly higher with increased age, and with boys compared to girls.	Accuracy of parents knowledge questionable PA at school was not included

Study Reference and Country	PA Method <i>Objective /Subjective</i>	Age And sample size	Results	Relevant information on PA	Study limitations
Hussey, Gormley & Bell (2001) Dublin Ireland	<i>Objective /Subjective</i> and seasonal variation. Interview Diaries	7-9 year olds n=786	PA Guideline guidelines for PA 2 h daily screen use max Guideline: VPA of 20 min. ≥3 per week 39% of children met VPA standard (boys 53% and girls 28%) 57% reported involvement in moderate exercise with 14 METS/hour/week	Of concern is large number of children not involved even in moderate PA. Significant sex differences in hard exercise (heavy breathing/fast heart rate 20 min. ≥ 3 times/week) with boys scores greater than girls unlike light exercise where there were no sex differences.	Contribution of shorter bouts of exercise to children's PA daily levels was not examined.
Carrier & Herbert (2003) Ireland	<i>Subjective</i> Self-Report Questionnaire	10-12 and 15-17 year olds n=289	Guideline: The American Heart Children 5 years +30 min. of enjoyable, daily moderate-intensity activities also at least 30 min. of vigorous PA 3-4 days weekly. 81% of boys and 75% of girls met the PA criteria	Boys more active than girls. Younger boys more active than older boys p=<0.05; Similarly with age and girls p<0.0001 Older girls less active than older boys p<0.0005 PA was more prevalent in urban than rural areas. Maybe rural children do not consider discretionary activity related to rural living as exercise or PA.	Maybe boys overestimate the number of hours spent in PA and girls give modest reports.
N.Murphy, Riddoch, Cran and	<i>Subjective</i> Self-Report Questionnaire, Anthropometric Data and	11-18 year olds	Guideline: US FITNESSGRAM an accumulation of >60 min.	The majority of children had acceptable levels of cardio-respiratory fitness. 52% Girls had lower baseline data than boys may	

Study Reference and Country	PA Method <i>Objective /Subjective</i>	Age And sample size	Results <i>PA Guideline</i>	Relevant information on PA	Study limitations
Boreham, (1994) Northern Ireland	Endurance Ability Test 20m shuttle run	n=3,211	<i>daily.</i> Found that with the exception of a small group of very active children, baseline PA levels for the majority of children was low 30-60 min. MVPA daily	account for differences	
Murray and Millar (2005). Cork Ireland	<i>Subjective</i> School Principal and Parental Telephone Questionnaire Interviews.	10-13 year olds 50 principals and 50 parents	<i>Guideline:</i> 60 min. active play daily 66% of children participated in at least 20 minutes of VPA \geq 3 times per week. 70% of children participating in MVPA \geq 3 times per week	Boys were found to be more likely than girls to have taken any form of exercise \geq 3 days a week.	
Telama, Laakso and Yang (1994) Finland	<i>Subjective</i> Questionnaire Longitudinal study 1980-1986	9 year olds n=3,596	<i>Guideline:</i> Frequency of PA >30 min. outside school hours Frequency was at its highest in late childhood. 85% girls and 90% boys PA at least once/week	PA decreased after late childhood but intensity increased.	4 schools in the study one school and daily PE classes and the other 3 had PE classes twice weekly.
Burns	<i>Subjective</i>	10 year olds	<i>Guideline:</i>	73% boys and 56% girls achieved an average of	

Study Reference and Country	PA Method <i>Objective /Subjective</i>	Age And sample size	Results	Relevant information on PA	Study limitations
(2004) 'Switch Off Get Active' Waterford, Ireland	Teacher led lesson intervention Aim: reduce screen time and increase PA 'Switch Off Get Active' Questionnaire based, BMI and 20m shuttle run test	Low SES n= 312	PA Guideline Moderate PA for 60 min. or more per day.	60min daily MVPA	
Belton (2006) Ireland	Objective Heart rate monitors 4 weekdays and one week end day	7-9 year olds n=87	Guideline: Moderate PA for 60 min. or more per day.	55% accumulated 60 ≥ light to vigorous PA ≥120 bpm on all days monitored; 35% accumulated ≥30min moderate to vigorous PA on all days. No significant difference was found between weekday and weekend mean accumulated min. of LVPA, MVPA and VPA.	
* Woods, Foley, O' Gorman, Kearney and Moyna, (2005) Ireland	Subjective and Objective Self-report questionnaire, anthropometric data and an endurance ability test	15-17 year olds n=1,508	Guideline: IOTF guidelines established (Cole et al 2000) 56% (n=813) reported not regularly active 62% females and 52% males not active ≥ 4 days/week for at least 60 min. daily	A large number of adolescents reported high levels of sedentary behaviour. 61% 17 yr olds not active 54.2% 15 yr olds 54.1% 16 yr olds Therefore decline with age noted. 1:5 adolescents were overweight or obese	

*Although this study is not concerned with a relevant age category it is one of the few Irish studies that have been conducted and thus is included

Appendix 4 Environmental Variables Influencing PA in 5-12 Year Old Children

Legend: **Objective**: Type of PA assessment method used in the study. **Subjective**: Type of PA assessment method used in the study. **Observational**: Observational used as a method for assessing PA. **Variable**: Green colour represents an environmental variable possibly influencing PA.

Source and Country	Assessment Method	Age and Sample Size	Variable	Finding
Johns and Ha (1999) Hong Kong	Observational (BEACHES McKenzie 1991)	6 and 8 year olds n=40	Physical and Social	Although school facilities for play were greater than that offered at home little difference was found in PA levels for both locations. ($p < 0.001$) and no gender differences
Rowland and Hughes (2006) UK	Objective Pedometer Height and mass 2 weeks summer and 2 weeks winter Waking hours	8 and 10 year olds n= 36 (boys only)	Weekend v weekday Season	Weekday activity levels were lower than weekend level ($p < 0.006$). Physical activity levels higher in summer than in winter ($p < 0.001$). Data for summer equated to 14,000-16,000 steps/day and winter 12,000-13,000 steps/day s
Cardon and De Bourdeaudhui (2004) Flanders, Belgium	Objective Pedometers and diaries 4 weekdays and 2 weekend days Waking hours	6-12 year olds n=92	Weekend v weekday	No significant differences in steps counts during weekdays and weekend days ($p=0.26$). Children's individual activity patterns varied greatly. A moderate correlation was found between pedometer step counts and reported minutes of MVPA in diaries ($r=0.39$).
Klasson-Heggebo and Anderssen (2003)	Objective CSA accelerometers 4 consecutive days	9 and 15 year olds n=760	Weekend v weekday	PA levels were significantly higher in both genders during the weekdays than during the weekend ($p < 0.05$). Similarly for age ($p=0.019$). Girls lower PA levels than boys during both times ($p=0.008$)

Source and Country	Assessment Method	Age and Sample Size	Variable	Finding
Norway				A peak in activity pattern during the day was found at lunch break (11.30) for both age groups and for 9 year olds in the after-school programme (13.30).
Trost, Pate, Sallis, Freedson, Wendell, Taylor, Dowda & Sirard (2002) Massachusetts US	Objective CSA Accelerometer 7 consecutive days Waking hours	6-18 year olds Grades 1-12 (Children grades 1-6 Adolescents grades 7-12) n=381	Weekend v weekday Time of day	Younger children grades 1-6 exhibited significantly higher ($p<0.05$) levels of MVPA on weekends unlike adolescents who exhibited significantly lower levels on weekends relative to weekdays. Children exhibited less day-day variability in MVPA compared to adolescents. Children were MVPA early morning as well as during the rest of the day. Boys were more active than girls with age decline also noted.
Mota et al., (2003) Portugal	Objective CSA Accelerometer Waking hours 3 consecutive weekdays.	8-12 year olds n=84	Time of day	Gender differences showed no clear pattern however when relative values (%MVPA) were considered girls participated in MVPA longer during the morning and early afternoon (51.0%), while boys percent of time engaged in MVPA was higher in the late afternoon and evening periods (53.8%). Data supported studies that times spent outdoors significantly increased the time in MVPA.
Loucaides et al., (2004) Cyprus	Objective Pedometer 4 weekdays days in winter and 4 weekdays in summer Waking hours Parental questionnaires	11-12 year olds n=256 (2 urban schools and 3 rural schools)	Geographical differences (Urban v rural) Season Exercise equipment	Urban children were more active in winter than rural children ($p<0.001$). Rural children were more active in the summer ($p<0.001$). Rural children's parents reported more space in their gardens ($p<0.00$) and in their neighbourhoods $p<0.01$ which were reported safer than the urban sample ($p<0.0$). Children in urban schools had more exercise equipment available at home ($p<0.0$). Children in rural schools spent significantly more time outdoors than children in urban schools in both seasons. Winter means=1.5 versus 1.1 and summer means=2.2 versus 1.4 Both groups spent more time outdoors in summer playing. Parents of urban children reported spending more time transporting their children to places of PA

Source and Country	Assessment Method	Age and Sample Size	Variable	Finding
Veitch, Bagley, Ball & Salmon (2006)	Subjective Semi-structured Parent Interviews	Mean age 8.3 years n=78 parents of children within grades 1-6 only Low n=23, middle n=35 and high n=20 socio economic backgrounds	Garden space Outdoors Transport	than parents of children in village schools for both seasons ($p<0.001$).
Melbourne, Australia	Subjective Parent Interviews	Mean age 8.3 years n=78 parents of children within grades 1-6 only Low n=23, middle n=35 and high n=20 socio economic backgrounds	Garden Safety Parent Availability Children to play with Garden V Open Spaces Dog Ownership	74% reported the home 'yard' as the most frequently reported location for children's active free-play. This was followed by the street particularly by families living in cul-de-sacs, and then public open spaces like a park. 94% of parents were concerned with safety. Older children aged 9-10 were given more independence to cycle and walk to safe places. Younger children were dependent on parent availability. In all 3 groups 40% of parents reported that absence of nearby friends and neighbours influenced child's outdoor play. An appropriate garden appeared to influence children's outdoor play and lack of dependence on open public spaces or parks. 59% of the families owned a dog.
Myers, Strickmiller, Webber & Berenson (1996)	Subjective 24-h recall questionnaire	9-15 year olds n=995	Indoor and outdoor chores	More girls reported indoor chores (56 vs 42%) and more time spent indoors on chores while boys reported outdoor chores (32 vs 15%).
Bogalusa, LA Fahey, Delaney and	Subjective	10-12 year olds.	Factors affecting	19% take part in club sport ≥ 4 times/week (21% boys and 16% girls)

Source and Country	Assessment Method	Age and Sample Size	Variable	Finding
Gannon, (2005) Ireland	4 questionnaires Height and weight measurements	Nationally represented sample 137 primary schools n= 3,833 pupils from 5 th and 6 th classes	participation in structured sports at home (club level) and school (extra curricular).	37% 2-3 times /week 12% never take part in club sport. (39% boys and 34% girls) 16% never participate in club sport. 23% take part in extra curricular sport \geq 4 days a week (18% boys and 13% girls). 25% 2-3 days a week (21% boys and 25% girls). 25% never participate in extra curricular sport. The principal reason for non-participation was not enough time by 58% boys and 43% girls. Little gender differences in reasons, and other reasons were on a much lesser scale. Which included schools did not offer sports and not enough spare time. Factors that had a significant positive correlation with children's participation in club and extra curricular sport included being a boy 0.14 sig. at 1% level sport and 0.61 club sport. Mother playing a sport extra curricular 0.19 sig. at 5% level and club 0.60 sig. at 5% level. Father playing a sport extra curricular 0.25 sig. at 5% level and club 0.58 sig. at 5% level. Home activities: active activities 29.85% and inactive activities 53.6%.
Sleap & Warburton (1992) England	Observational Observation (O' Hara et al, 1989, Activity points to predict heart rate (HR). Observations break times, n=23 observed during free time outside school; including 4 hours weekend.	5-10 year olds n=56 observed at school PE lessons and break times with 23 children observed also out of school time (one	Home vs School	School break activities: Active activities 58.5% and inactive activities 28.8% MVPA as % of total time: Morning break: 48.6 Afternoon break: 56.4 Lunch break: 43.5 PE lesson 35.4 Weekend 29.9 Weekday evening 23.0

Source and Country	Assessment Method	Age and Sample Size	Variable	Finding
	MVPA= HR to 140bpm	weekday evening and one 4- hour weekend period).		
Stucky Ropp and DiLorenzo (1993) Columbas, MO	Subjective Interview with both child and mother Child PA Questionnaire Parent PA Questionnaire	Mean age 11.2 years 5-6 grade n=242	Family and Social environment	Child enjoyment of PA was the most important predictor of exercise for both boys and girls (p<0.01). Mother's perception of barriers to exercise as well as rewards and punishments for exercise were important predictors in both sexes boys (p<0.01) girls (p<0.01). Equipment in the home for PA girls' (p<0.01). Modelling and support for exercise from friends and family seemed to be important for boys only (p<0.01). Child self-efficacy was not found to be an important predictor.

Appendix 5 Extent of Club and Extra Curricular Sport (ECA) in Ireland

Author	Sample	Club Sport	Extra Curricular Activities (ECA)	Weekend
Broderick and Shiel (2000)	11 years n=1,762	71% boys and 65% girls participate at least once a week. Popular Boys Activities: 49% soccer 45% gaelic football, 32% swimming, Popular Girls Activities: 42%swimming 21% basketball, 20% gaelic football.	85% of children attend schools in which ECA activities are offered. Children in large schools, and medium sized boys and medium sized schools are more likely than children in medium-sized girls schools and small schools to be offered ECA activities.	26% of boys participate 3-5 hours and 14% girls. 35% of boys participate 1-2 hours and 32% girls.
Fahey et al., 2005	10-12 years n=3,833	83% boys and 78% girls involved in club sport. 19% of children ≥4 time per week. 37% participating 2-3 days per week, 25% once a week. Popular Boys Activities: 40% soccer, 37% gaelic football 24% hurling Popular Girls Activities: 29% dance	39% of children took part in ECA at least once per week. 25% never took part in ECA. Popular activities included soccer, gaelic football, basketball and athletics. Popular Boys Activities: 39% gaelic football 23% hurling 23% soccer Popular Girls Activities: 32% gaelic Football	-

Author	Sample	Club Sport	Extra Curricular Activities (ECA)	Weekend
Murray & Millar (2005)	n=50 (schools) 50 Principals and 250 parents (5 from each sixth class in each school)	29% swimming 22% gaelic football.	27% basketball 26% camogie Other ECA activities reported by both sexes included swimming, athletics, tennis, karate, rugby, and Olympic handball	
	78% of children involved club sport. No significant sex differences (79% boys and 76% girls)	70% of schools team training sessions, 46% had other ECA activities including dance, badminton, table tennis, karate, taekwando.		-
Deemihan (2005)	Primary School principals n=3,200	25.9% of schools had ECA	19% of respondents stated that they had focused initiatives for girls participation in PE or recreational programmes.	

Appendix 6 Barriers to the Provision of PE Quality Programmes in Schools

Legend: Green colour represents barrier to PA.

Source	Sample Primary school principals/teachers	Barriers	Findings
Deenihan (2005)	n=3,200	Facilities	59.2% inadequate facilities 70.4% hard surfaces 54.1% outdoor grass area 25.3% indoor multipurpose room 51.4% sports hall
Fahey et al., (2005)	n=137	2/3 of principals needed major investment in sports facilities	23% multipurpose indoor floor; when combined with schools with off site access such floors were available to 60% of schools.
Murray and Millar (2005)	n=50		66% playing field 66% paved outdoor area 56% basketball hoops 8% running track 48% playground area 28.5% access to a swimming pool. 90% access to some indoor facility with 9 schools having access to a gymnasium; 12% schools considered hall inadequate
INTO 2004		Regional variations apply	80% schools Donegal no PE hall; 63% Clare; 86% with halls in Dublin; over 60% of schools reported that these were inadequate or

Source	Sample	Barriers	Findings
Murphy (2007)	Primary school principals/teachers n=26 tutors (primary schools teachers specialising in PE in-service provision)	Facilities	unsatisfactory 69% of tutors indicated outdoor hard surface facilities were satisfactory. 36% responded positively to indoor facilities.
McGuinness and Shelly (1995)	n=135 Response rate 69%	Distance to off site facilities Cost of transport and facilities. Dept. of Education funding for equipment.	78% hard surfaces 59% outdoor grass area 50% indoor multipurpose hall 50% schools dissatisfied with equipment available for PE classes.

Appendix 7 How Active are Children During PE Lessons

Legend: **Objective:** Type of PA assessment method used in the study. **Subjective:** Type of PA assessment method used in the study. **Observational:** Observation used as a method for assessing

Source	Sample	Assessment Method	Findings
Myers, Strikmiller, Webber and Berenson (1996) Bogalusa, LA (US)	9-15 years n=995	Subjective Recall daily PA	Children who had PE class had more minutes of PA daily compared to children who had no PE class during school ($p<0.0001$).
Waring, Warburton & Coy, (2007) NE England	5-11 year olds n=374	Observational Observation of 374 PE lessons (omitting break times)	44% lessons 30 min. duration. Children moderate active 14% of time observed (6.6 min.). The range of MPA was 0-21 min. and for VPA 0-20.2 min. Boys more active than girls VPA $p=0.043$ and MPA $p=0.02$.
Tudor-Locke, Lee, Morgan, Beighle & Pangrazi (2006) Arizona, US	n=34 boys and 54 girls	Objective Pedometers	8 and 11% total steps per day, on days on which children participated in PE, boys and girls respectively.
McKenzie, Feldman, Woods, Romero, Dahlstrom, Stone, Strikmiller, Williston & Harsha (1995) US (San Diego CA, New Orleans LA, Minneapolis,	Third grade students elementary n=95 schools 293 PE lessons observed.	Observational SOFIT	Average lesson lasted 29.5 min. Overall children engaged in VPA 5.2 min. (17% of lesson time) and MVPA 10.6 min. per lesson (36.2%) of the lesson time. Indoor and outdoor lessons were similar in length but outdoor lessons were more active ($p<0.00$). Boys were more active than girls, due to greater activity levels during free play section of the lessons. Boys ($p<0.005$) very active and MVPA ($p<0.0001$).

Source	Sample	Assessment Method	Findings
MN and Austin, TX)			
Sleap & Warburton (1992) England	5-10 years n=56 55 PE lessons	Observational Observation MVPA= HR to 140bpm	Average time engaged in MVPA 10:94 min. (SD 8:93) MVPA 35.4%.
Mallam, Metcalf, Kirkby, Voss & Wilkin, (2003) England	Mean 9 years n=120 boys and 95 girls	Objective Accelerometers	Total amount PA accumulated did not depend on how much PE was participated in by children at school. Children appeared to compensate out of school.

Appendix 8 National and Local Programmes Promoting PA in Irish Primary Schools

Organisation	Information	Aim	Type of Initiative
The Primary School Curriculum Programme http://www.pesp.ie/html/index.php	Spring 2006	Teacher support	PE lessons plans and resources based on the PE Curriculum Primary Schools Sports Initiative (IPSSI) DVD (http://www.pesp.ie/html/pe_pssi.php)
Buntús http://www.irishsportscouncil.ie/developing-lsp-yp-buntus.aspx	Developed and implemented by the Irish Sports Council 2004.	Support to PE programme in schools	Buntús means 'basic start'. The multi sport programme is delivered to schools locally by Local Sports Partnerships. Key components are training, resource cards, equipment and a DVD. Sports specific Buntús programmes now available. Three partners of the programme: the Irish Sports Council, Superval, the Irish supermarket chain, and the Irish Universities Nutrition Alliance. One phase: involves research on 5-12 year old children's PA patterns. Second initiative: Supervalue Kids in Action in-store collector scheme for sports equipment for primary schools as well as an in-store nutrition education programme. Final strand: Buntús
Happy Heart Schools Programme http://www.irishheart.ie	Irish Heart Foundation	Daily PA, PE curricular links and development of skills for lifelong PA	4 programmes under Happy Heart at schools programme. Bizzy Break: 10 min. PA within a very confined space. Action for Life: PE and SPHE resource pack received after a training workshop for teachers. Action for Everybody: resource pack used in conjunction with the

Organisation	Information	Aim	Type of Initiative
Active School Week http://www.activeschoolawards.ie/home.html	Launched 2004; Funded by the Teacher Education section of DES. Managed by the Mayo Education Centre.	Promotion PE, PA and sport.	Action for Life programme Get Kids on the Go is a parent and teacher programme designed to get children physically active in lifelong participation PA promotion within the school and community. Project based, to record evidence.
Special Olympics http://www.activeschoolawards.ie/home.html	Sponsored by SPAR and supported by The Primary Curriculum Support Programme	Cross-sport bod, which organises sports training for children with learning disabilities (Fahey et al., 2005).	Resource Pack cross-curricular emphasis. ‘SO Get Into It’ 4, DVD to help children understand and respect need of all children
Cuman na mBunscol Náisiánta http://cnmb.gaa.ie/	Founded in 1977 Voluntary	Promotion and organisation of Gaelic games, athletics, handball and rounders.	PA based After School and Lunch Time
Gaelic Athletic Association ‘Step Through Education Programme’ http://www.gaa.ie		PA promotion specialising in GAA skills	Implemented more frequently as part of the PE programme. GAA have qualified National Governing Body (NGB) coaches that are employed in local clubs who visit schools.
GAA Fun Do http://www.gaa.ie/files/flash/fundo_web.swf		Promotion of fun and fair play to assist in creating a positive play environment for football and hurling.	Resource pack and DVD for parents, teachers and coaches.

Organisation	Information	Aim	Type of Initiative
Football Association of Ireland (FAI) http://www.fai.ie	Implemented in 90 primary schools.	To teach and coach football related sessions during PE and after schools programmes.	The programme is currently being promoted through 16 LSP's. Soccer resource bag and drill cards.
Irish Rugby and Football Union (IRFU) http://www.irishrugby.ie	Buntús Rugby	To provide opportunities for children to play rugby and to develop club links	Buntús Rugby builds on skills developed in the ISC generic Buntús programme. Tag Rugby programmes in schools DVD Tag Rugby
Community Games http://www.communitygames.ie/fla_shpage.jsp	National voluntary organisation	Founded 1967 Competitions	Organises local-level competitions for children aged 6-16 years in a range of sports (Fahey et al., 2005). It has the support of the HSE and the ISC. Contact is made on occasions to schools as a resource for children's sport.
Irish Society of Chartered Physiotherapists http://www.iscp.ie	Launched their annual MOVE 4 Health campaign in March 2007	Highlight the need for young children to be active, to take plenty of weight-bearing exercise for healthy bone development and long-term bone health.	'Healthy Bones- A Hop, Skip and Jump Away' Nationwide campaign- School Seminar- physiotherapists contacting schools offering to speak with children about bone health.
Health Promotion Unit and the Department of Health and Children http://www.schb.ie	2003 North Eastern Health Board and the Irish Heart Foundation	Playground markings offer children opportunity to be PA during school day in games that help them develop physically. Aim to increase PA of a child and increase number of children who are active.	Get a Life Get Active: Playground Markings & other Playground Games' Resource Booklet HSE midland section offered grants to schools for actual markings (2005)
Co. Wicklow VEC Sports Promotion Unit in conjunction with the Volleyball Association of	J4 Teacher Training Seminar in 2006	To equip teachers with skills to teach J4 Volleyball a modified game of volleyball.	Ultimately this initiative should increase the PA levels of some children through enjoyable participation in the game.

Organisation	Information	Aim	Type of Initiative
Ireland http://www.wicklowvec.ie/sportsprmotionunit.htm			DVD available
Athletics Association of Ireland http://www.athleticsireland.ie/content/?p=2071#more-2071	Teacher Summer Courses	Fun and participation. To introduce and develop physical literacy in the areas of agility, co-ordination and balance with an emphasis on the correct posture and movement skills based on strand units running, jumping and throwing.	Teacher Courses
Co-Dex Kids http://www.codexkids.com/	Private Enterprise Venues in the Dublin area.	To develop motor skills through ball work, sports skills, gymnastics and play	PA based After School Hours Workshops can be arranged
Playball http://www.playball-coaching.com/main/Data/Home_1244.asp	Private Enterprise Venues in the Dublin area, Kildare, Galway, Belfast and Cork	Ball skills and activities programmes progressing to more complex teamwork to play 6 popular sports and matches	For aged 2 years to 8 years olds (6 programmes) Within school time and after school.
County Wicklow Vocational Education Committee Sports Promotion Unit Sports Programme http://www.wicklowvec.ie/spubooklet.pdf	3 Primary schools in the Bray area	To encourage and develop young people's participation in sporting activities.	After school sports and 6 week in school physical activity programme for 5 th and 6 th class Certificates
Waterford Sports Partnership WASP Programme	In partnership with Primary schools in Waterford and	Child completes PA tasks at home 30-60 min./ 5 days/week stickers are awarded by teachers.	Project is teacher dependant. Pack containing record cards and stickers, posters, school. League tables.

Organisation	Information	Aim	Type of Initiative
http://www.waterfordspartnership.ie/wizzy.shtml	parents		
Fingal Sports Partnership Sports Conditioning Programme 2007 http://www.fingalsportpartnership.ie/section8_1.htm	Fingal County Council in conjunction with Niall Quinn & Harm Jager	Motor Skills programme aimed at primary school children aged 6-9 years.	Programme based on agility, balance, co-ordination, throwing, catching, and running in a non-competitive environment.
Fingal Sports Partnership Primary School Swim http://www.fingalsportpartnership.ie/section8_1.htm	Fingal sports partnership in conjunction with the National Aquatic Centre.	Swimming lessons are in accordance with the aquatics strand of the Primary School PE Curriculum.	Primary schools in Dublin 15 receive swimming lessons in the NAC.
Donegal Sports Partnership http://www.irishsportscouncil.ie/developing-lsp	20 Primary Schools km Challenge	To get more children active	
Donegal Sports Partnership http://www.activedonegal.com/	Ag Súgradh Le Chéile	A programme to promote active play in young school children (junior to second class)	90 min. workshop where trainers teach young school children and their parents the value of play within the family through participation in ball games, music, rhyme and traditional games. Promotional material also provided.
Supermarket Tesco http://www.tesco.ie/sport/howitworks.html	Launched 2005	Equipment for schools and clubs- to encourage children to try out a variety of sports.	Shoppers by purchasing set amounts can collect special vouchers to obtain sports equipment for schools. Schools who purchase equipment are entered into a draw for a school coaching session with Irish rugby sports star.
Supermarket Supersave with the	Launched 2006	To promote PA	Similar purchase voucher scheme to above for sports equipment.

Organisation	Information	Aim	Type of Initiative
support of the Irish Sports Council 'Kids in Action' http://www.supervalukidsinaction.com/			

Appendix 9 An Example of SOPLAY Counter Used by Observers in the Study.



Counter used in SOPLAY data collection

http://www.countersales.co.uk/products_detail.asp?Id=100

Countersales UK Ltd.

Appendix 10 Calendar of Official Observation Data Collection Days Following Three Training Days

Observation School	Day 1	Day 2	Day 3
A	26 March 2007	28 March 2007	24 April 2007
B	18 April 2007	24 April 2007	25 April 2007
C	1 May 2007	15 May 2007	21 May 2007

Appendix 11 Example of DES Guidelines for Hard Area Play Space for Children.

Number of Class Rooms	Number of children per classroom (24 children per class)	Space Allocated	Average space per child / no. of class rooms m ²
16	24x16=384	2 Ball court area (585 m ²) 1170 m ² play + junior play area 430m ² =1600 m sq	1600 m ² /384 pupils =4.1 m ² per child

Adaptation from DES Planning Guidelines (Department of Education and Science, 2007) for primary schools and DES website in relation to average class sizes 2005/2006.

Appendix 12 School Outdoor Space

Schools Observed	M² per yard area	No. of children using each yard area	M² per child to play per yard
School A			
Junior yard	722	95	7.60
Middle yard	646	130	4.90
Senior yard	665	116	5.70
Total Yard Space	2033	341 children	
No. Of yards	3		
Grass	13,200		
Max space available	15,233		
Space used	13.34%		
School B			
Junior and Senior Infants	315	60	5.25
1st & 2 nd	182	60	3.03
3rd & 4th Class	160	50	3.20
5th & 6th Class	266	40	6.65
Total Yard Space	923	210 children	
No. Of Yards	4		
Grass	13200 m ² (Shared pitch with secondary school)		
Max space available	14,123		
Space Used	6.5%		
School C			
Staggered breaks at morning break, and grass in use at lunch break throughout the year.			
Junior and Senior Infants	600	124	4.8
1st & 2 nd	600	117	5.10
3rd & 4th Class	600	110	5.40
5th & 6 th Class	600	96	6.25

Schools Observed	M² per yard area	No. of children using each yard area	M² per child to play per yard
Space used at morning break	1200		4.9bt junior/5.8m ² seniors BT
Space used at lunch time	5700		12.75
Grass (used by 3 rd - 6 th classes 206 children at lunch break)	4500		21.84 **
Max space available	Max space available 5700	447 children	
No. Yards	2		
% Space usable break time	21%		
% Space usable lunch time	100%		

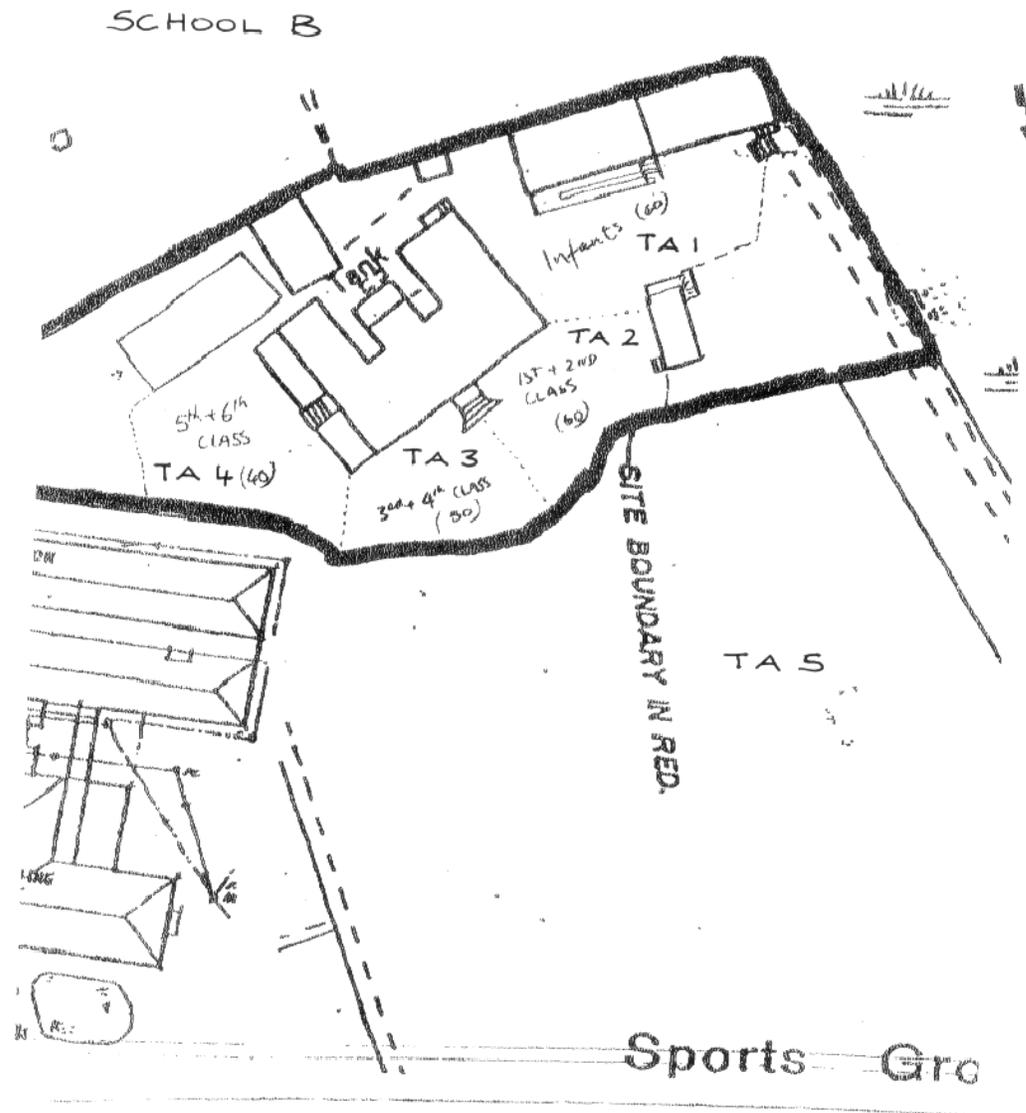
*Staggered break system in operation in this school to try to overcome problem of restricted space.

** 3rd – 6th class children allowed play on grass at lunch break all year round with a change of footwear to allow maximum use of space for play and PA.

Appendix 13 Number of Target Areas (TA) Possible for PA at Break Time.

School	TA per break	TA per day	Total TA for 3 days Observations	Accessible	Useable	Supervised	Organised	Equipped
A	4	8	24	18	18	18	0	0
B	5	10	30	24	24	24	2	4
C	3	6	18	18	15	15	3	5
Total			72	60	57	57	5	9

Appendix 16 School B Map of All Target Areas Used at Break Time



Appendix 18 Primary School Sample: Comparison of Size of School (number of students) in the Sample with the Population

Size	Schools nationally		Schools in current study	
	No. Primary	%	No. Primary	Sample %
<50	682	21.50	39	18.30
50-99	954	30.10	72	33.8
100-199	779	24.60	57	26.8
200-299	432	13.60	23	10.8
300-499	247	7.80	19	8.9
500+	66	2.00	3	1.4
Total	3160		213	391

Department of Education and Science 2005/2006

Appendix 19 School Type

School Type	Mixed	Boys	Girls
Current Study	89%	8%	3%
Irish Primary Schools	88.4%	7.1%	4.3%

Department of Education and Science, website

Appendix 20 Questionnaire Sent to Schools

Break Time Play Time, A study of children's physical activity levels at break times in Primary Schools.

Dear Colleague,

Thank you most sincerely for taking time to complete this survey. It takes about 15 minutes to complete.

Should you feel that the circumstances particular to your school are not covered by the questionnaire there is a comment space at the end.

Yours sincerely,

Susan Marron

1 Name and Address of School

2 How many children are enrolled at your school?

(Please tick one of the following)

<input type="checkbox"/>	0-50
<input type="checkbox"/>	51-100
<input type="checkbox"/>	101-200
<input type="checkbox"/>	201-300
<input type="checkbox"/>	301-500
<input type="checkbox"/>	501-800
<input type="checkbox"/>	801+

3 What is the number of boys and/or girls in your school?

<input type="checkbox"/>	Boys
<input type="checkbox"/>	Girls

4 How many formal break times are there times are there at your school during the school day? (Please tick one of the following)

<input type="checkbox"/>	2
<input type="checkbox"/>	3

4

5 What is the duration of small break in the morning?

- 0-5 minutes
- 6-10 minutes
- 11-15 minutes
- 16 minutes plus

6 What is the duration of lunch break time?

- 0-20 minutes
- 21-25 minutes
- 26-30 minutes
- 31-35 minutes
- 36 minutes plus

7 What is the duration of afternoon break time?

- No Break
- 0-5 minutes
- 6-10 minutes
- 11-15 minutes

8 Is eating time part of break time?

- Yes
- No

9 If yes, approximately how long is eating time at small break time?

- 0-5 minutes
- 6-10 minutes
- It varies

10 If yes, approximately how long is eating time at lunch break time?

- 0-5 minutes
- 6-10 minutes
- 11-15 minutes
- It varies

11 If yes, approximately how long is eating time at afternoon break time?

- 0-5 minutes
- 6-10 minutes
- It varies

12 Is outdoor play allowed at the following times? (Tick relevant boxes)

- Before School
- After School
- Neither

13 Is play before and after school supervised?

- Yes
- No

14 Can children use any of the facilities below during break time? (Tick relevant boxes)

- School Library
- Computer Room
- Classroom with Board Games
- Music Room
- None
- Other (Please state)

15 If it is raining, where do children have break time in your school? (Tick relevant boxes)

- Sheltered Area Outdoors
- Gym Hall
- Classroom
- Library
- Computer Room

16 On wet days, can the children be physically active during break time in your school?

- Yes
- No

17 How are children organised at break time in the school?(Please tick one of the following)

- Play in class groups (e.g. only First class together) in a marked yard area.
- Class groups are banded together (e.g. First, Second and Third Class) in a marked yard area.
- All class groups play together in the same yard with no segregation.

18 Who supervises break time? (Tick relevant boxes)

- Teachers
- Parents
- Special Needs Assistants
- Other (Please specify)

19 With regard to physical activity for children in your school at break time, would you describe your school yard space for children as adequate?

- Yes
- No

20 Have yard spaces/green areas been encroached upon for building expansion at your school in the past?

- Yes
- No

21 What facilities are there in your school? (Tick relevant boxes)

- School Multi Purpose Room
- Indoor Purpose Built Sports Hall
- Grass Area
- Playing Pitch(es)
- Tennis Court(s)
- All Weather Pitch
- Basketball/Tennis Court(s)
- Running Track
- Open Yard

- Access to Local Swimming Pool
- Other (Please specify)

22 What equipment/facilities are available at your school at break time?(Tick relevant boxes)

- Climbing Frames
- Swings
- Basketball Posts
- Goal Posts
- Playground Markings e.g. hopscotch
- Man-Made Obstacles e.g. stepping stones
- Natural Obstacles e.g. tree stumps, hilly areas
- None
- Other (Please specify)

23 Where any of the facilities exist, please indicate your response to the following in respect of break time. (Please tick one box for each statement)

	Always	Sometimes	Rarely	Never
Children are shown how to use the facilities and then let to explore them.				
Children freely explore the facilities.				
Supervisors monitor the children when they use the facilities.				
Prompted play by supervisors takes place at break time.				

24 If your school has playground marking games e.g. hopscotch, do children compete for use of these markings with children who are playing other games e.g. chasing, soccer?

- Yes
- No

25 Are children permitted to play in green areas (e.g. grass/playing fields) at break time?

- Dependent on the weather
- Dependent on the season

- With suitable change of footwear
- Always
- Never

26 In your opinion, is your school play area visually attractive for play?

- Yes
- No

27 What type of sports equipment are children permitted to bring to school for use at break time?

- Heelies or Roller Skates
- Skipping Ropes
- Footballs
- Basketballs
- Marbles
- Elastics
- Hurley's
- Hockey Sticks
- None
- Other (Please specify)

28 Is equipment given to children at break time? (Tick appropriate circle)

- No equipment given at break times
- Equipment is given at lunch break time only
- Equipment given at small break time only
- Equipment given at afternoon break time only
- Equipment given at all our break times

29 What school sports equipment is given to the children at break time in the school? (Tick relevant boxes)

- Moveable Basketball Posts
- Hard Footballs and Basketballs
- Soft Footballs and Basketballs
- Hard Tennis Balls
- Tennis Rackets
- Hurley's

- Hockey Sticks
- Skipping Ropes
- Hula Hoops
- Beanbags, Soft Tennis Balls
- Scooters
- None
- Other (Please specify)

30 If equipment is not available, please tick the box that is closest to the reason for this for each variable.

	Least Important	Not important	Undecided	Important	Very Important	Not Applicable
Time Limitations						
Organisational Issues						
Safety						
Supervision Difficulties						
Cost of Equipment						
Storage Space for Equipment						
Equipment gets Lost/Damaged						
Other						

31 At break time what do children do in your school? (Tick relevant boxes)

- Children play informally and chat
- Children organise themselves into group activities e.g. soccer, basketball
- Older children help organise younger children into groups to play formal games e.g. soccer
- Teachers organise the children into groups to play formal games e.g. soccer
- Children are allowed to run freely in the school yard at break time
- Children sit, stand and walk in the school yard at break time.

32 Does the school have a play policy for break time?

- Yes, formal and written
- Yes, informal
- No

33 What might hinder children's physical activity levels at break time in your school? Please tick a box for each statement, reflecting its relevance in your schools break time organisation.

	Not at all relevant	Not relevant	Undecided	Relevant	Very relevant
There is not enough space					
Children might get injured					
Children not interested in playing games					
Organised play is too heavy on resources					
Break time is too short					
There is no teacher who takes charge of sport/physical activity at school					

34 Does your school engage in, or would you consider engaging in the following. (Tick relevant box for each statement)

	Exists already in our school	Does not exist in our school but school would be interested	No, our school would not be interested	Not relevant
Involving children in planning their own break time physical activity.				
Organising physical activities for children with special needs.				
Using teachers to promote more active play in the school yard at break time.				
Using parents to promote more active play in the school at break time.				
Educating parents about the benefits of physical activity at home and at school.				

Healthy lunch policies.				
Giving other health information to the children and their parents.				
Staggered break times (i.e. different break times for different class groups).				
Teaching playground marking games to children.				
Provide loose sports equipment to children at break time.				
There are specific areas/zones in your yard at break time for activities e.g. skipping, football, hurling, dance and formalised physical activity?				
Increase the length of break time.				

35 How much timetabled physical education classes have children per week? (Tick relevant boxes)

- 1 hour per week
- 30-60 minutes per week
- Less than 30 minutes per week
- Depends on the demands of the teacher of the particular class.
- Depends on indoor space being available for use.
- Depends on the demands of the teacher at a particular time of the year e.g. Communion or Confirmation.

36 How do you feel about physical education provision in your school? (Please tick relevant box for each statement).

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Teachers feel confident to teach physical education.					
There is good parental involvement in after school					

extracurricular sport (e.g. watching matches and giving positive encouragement, providing parental supervision when required, helping teachers).					
Playground marking games are taught at physical education lessons.					
There is plenty of equipment for teaching physical education.					
There is adequate space for teaching physical education indoors.					
There is adequate space for teaching physical education outdoors.					
There are adequate facilities for teaching physical education indoors.					
There are adequate facilities for teaching physical education outdoors.					

37 Have outside agencies made contact with your school in relation to physical activity?

- Yes
 No

38 If yes, tick the agencies from the list below.

- Health Service Executive
 Sports Council
 Irish Heart Foundation
 National Children's Office
 Local Sports Partnership
 Community Agencies
 Sport Organisations
 Other (please specify)

39 If a sporting organisation has made contact with your school please tick which one(s).

- Gaelic Athletic Association
- Irish Rugby Football Union
- Football Association Ireland
- Athletics Association Ireland
- Other (please specify)

40 Is there a teacher on the staff with a post of responsibility which includes responsibility for Physical Education?

- Yes
- No

41 Please feel free to add any further general observations you may have in relation to physical activity at break time pertaining to your school.

42 Would your school be prepared to take part in Stage Two of this study which involves observing children's physical activity levels at break time? Observers will be measuring physical activity movements using a hand held instrument and will be located discretely in play areas during break time.

- Yes
- No

43 If yes, please provide contact details for your school below -

Appendix 21 Source of Significant Differences of the School Practice of Providing School Equipment to Children at Break Time to Play Compared to School Enrolment Size.

School equipment offered to children at break time (no. of pupils)	0-50	51-100	101-200	201-300	301-500	501-800
0-50			*	*	*	*
51-100					*	*
101-200					*	*
201-300						*
301-500						*
501-800						

Mann-Whitney test $p < 0.05^*$

Appendix 22 Number of Children Observed with Official Number in Daily Attendance

School	Girls OB D1	Day 2	Day 3	SD	BoysObd1	Day 2	Day 3	SD	MixobD1	Day 2	Day 3	SD
A	136.83	169.62	194.75	29.044298	146.58	146.25	167.75	12.318873	283.41	315.87	362.5	39.755999
B	83.35	102.5	90.25	9.6987542	137.62	127	134.75	5.4936903	220.97	229.5	225	4.2671575
C	84.62	119.75	163.75	39.64777	105.5	157.5	169.5	34.019602	190.12	333.25	333.25	82.636144

mean no. observed

This data is from Attendance observation sheets hand written

	Nos. observed mixed mean	School A	320.59333
	Nos. observed mixed mean	School B	225.15667
	Nos. observed mixed mean	School C	285.54
	mean no. attended		

Sch A	Observed G	Attend G	%	Observed B	Observed B	%	Observed M	Attend M	%
day 1 aver	136.83	156	87.71	146.58	144	101.79	316.08	300	105.36
day 2 aver	169.6	143	118.60	146.35	142.00	103.06	315.87	285	110.83
day 3 aver	194.75	159	122.48	167.75	161	104.19	332.5	320	103.91

Sch B	observedG	Attend G	Observed B	Observed B	Attend M				
day 1 aver	83.35	88	94.72	137.62	125	110.10	221	213	103.76
day 2 aver	102.5	77	133.12	127	121	104.96	228.5	198	115.40
day 3 aver	90.25	80	112.81	134.75	123	109.55	225	203	110.84

Sch C	observedG	Attend G	Observed B	Observed B	Attend M				
day 1 aver	84.62	196	43.17	105.5	219	48.17	190.12	415	45.81
day 2 aver	119.75	192	62.37	157.5	223	70.63	282.25	415	68.01
day 3 aver	163.75	193	84.84	169.5	217	78.11	333.25	410	81.28

mean **0.04**

In school C on each day children were gone to school matches

Appendix 23 Irish Break Time Calculations Using the 40% Break Time PA Threshold Guideline Proposed by Stratton and Mullan (2005) and Ridgers and Stratton (2005).

PA Potential of Break Times at Schools	UK Playtime	Ireland Playtime (Eating time as part of curricular time just before breaks).	Ireland Playtime (4 min. eating at morning break; 10 min. eating time included in lunch break)
Morning Break Duration	19 min.	6-10 min.	6 min.
Lunch Play Duration	45 min.	26-30 min.	16-20 play
Afternoon Duration	15 min.	None	None
Total Duration of Play	79 min.	32-40 min.	22-26min.
40% Break Time Threshold Guideline (Stratton and Mullan, 2005; Ridgers and Stratton, 2005)	31.6 min.	12.8-16 min.	8.8-10.4 min.
PA Guideline 60 min. moderate intensity PA daily (WHO, 2006)		Contribution of break time PA is 13-16min = 21-26% of daily guideline	Contribution of break time PA is 8-10min = 13-16% of daily guideline