An Examination of Physical Activity Participation, Sedentary Behaviour, Health, Correlates of Physical Activity and Physical Activity Enjoyment among Irish Adolescents

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Honesty Statement

I hereby certify that this material, which I now submit for assessment on the programme of study leading to the award of M.Sc. is entirely my own work, that I have exercised reasonable care to ensure that the work is original, and does not to the best of my knowledge breach any law of copyright, 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.

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Abbreviations and Acronyms

A	Perception of Neighbourhood Aesthetics
AC	Active Commuting
AF	Aerobic Fitness
AR	Area of Residence
AS	Perception of Access to Services
BMI	Body Mass Index
BP	Blood Pressure
CB	Organised sport/physical activity within a club outside school
CFLI	Canadian Fitness and Lifestyle Research Institute
CS	Perception of Safety from Crime
CSPPA	Children's Sports Participation and Physical Activity Study
CVD	Cardiovascular Disease
DAST	Department of Arts, Sport and Tourism
DCU	Dublin City University
DELGH	Department of Environment, Local Government and Heritage
DES	Department of Education and Science
DHC	Department of Health and Children
DOT	Department of Transport
EC	Extracurricular sport/physical activity at lunch time/after school
ESRI	Economic and Social Research Institute
FAI	Football Association of Ireland
FI	Fear of Injury Barrier
FSS	Family Social Support
HBSC	Health Behaviours of School Age Children
ISC	Irish Sports Council
LT	Lack of Time Barrier
LE	Lack of Energy Barrier
LW	Lack of Willpower Barrier
LR	Lack of Resources Barrier
LS	Lack of Skill Barrier
MVPA	Moderate to Vigorous Physical Activity
NCCA	National Council for Curriculum and Assessment
NHANES	National Health and Nutrition Examination Survey
NS	Non Significant
PA	Physical Activity
PAE	Physical Activity Enjoyment
PC	Passive Commuting
PE	Physical Education
PEE	Physical Education Enjoyment
PH	Physical Health
PS	Perception of Pedestrian Safety
PSS	Peer Social Support
PWC	Places for Walking/Cycling
S	Perception of Streets
SB	Sedentary Behaviour
SC	Social Class

SD	Standard Deviation
SE	Self Efficacy
SEM	Structural Equation Modelling
SES	Socioeconomic Status
SI	Social Influence Barrier
SLAN	Survey of Lifestyles, Attitudes and Nutrition
SST	Sedentary Screen Time
Take PART	Physical Activity Research for Teenagers
T2DM	Type 2 Diabetes Mellitus
TSS	Teacher Social Support
UCC	University College Cork
UL	University of Limerick
WC	Waist Circumference
WHO	World Health Organisation
YRBSS	Youth Risk Behaviour Surveillance System
20 MST	20 Metre Shuttle Run Test
≥60 mins MVPA	Average days of per week of accruing at least 60 minutes of moderate to vigorous physical activity

Abstract

Inactivity is an epidemic among adolescents; underscoring a critical need for action. The aim of this study was to investigate physical activity (PA) participation, sedentary behaviour, physical health, correlates of PA and physical activity enjoyment.

The Children's Sports Participation and Physical Activity Study (2010) used a self-report questionnaire to measure PA participation, sedentary behaviour and demographic, psychological and environmental variables. Physical health measures were aerobic fitness, BMI, waist circumference and blood pressure (BP).

Over five thousand adolescents participated in the CSPPA study (N=5397, mean age=13.85 ± 1.97, 10-18 years, 47% male). Males had a higher average of days of MVPA ≥60 per week minutes than females. Females engaged in more social/school based sedentary activities while males engaged in more technological sedentary activities. Activity decreased and sedentary behaviour increased with age. Sedentary behaviour decreased with increasing participation in all forms of physical activity. A sub-sample (N=1351) completed physical health measures (mean age=13.58 ± 2.13, range 10-18 years). Seventy five percent were aerobically fit, 77% had a normal BMI, 88% had a healthy waist circumference and 75% had a healthy BP. Those that met the ≥60 minutes of MVPA daily recommendation had the best health profile. Aerobically fit individuals engaged in less sedentary behaviour. This study supported an ecological approach to understanding PA in finding that a range of intra- and extra-individual factors predict MVPA. Males had higher PA enjoyment than females, enjoyment decreased with age and those in the upper socioeconomic status category reported higher enjoyment. Enjoyment had a significant impact on MVPA. Peer social support and club sport participation were the most salient predictors of PA enjoyment.

Future interventions should adopt an ecological approach to increasing PA among males and females. Physical activity enjoyment should be facilitated by encouraging peer social support and club sport participation.

Chapter One
1.0 Introduction

1.1 Rationale for the Study

The Benefits of Physical Activity for Adolescents

Physical activity (PA) has been found to reduce the risk of developing cardiovascular disease (Vuori, 2010), obesity (Hills & Byrne, 2006), type-2 diabetes, osteoporosis and some site specific cancers. In adolescents, PA is associated with lower blood pressure, maintenance of a healthy body weight, greater insulin sensitivity, and a healthier blood lipid profile (L. B. Andersen, Riddoch, Kriemler, & Hills, 2011). PA also has been found to impact upon numerous mental health outcomes among adolescents including anxiety, depression, quality of life and self esteem (Kantomaa, Tammelin, Ebeling, & Taanila, 2008; Motl, Birnbaum, Kubik, & Dishman, 2004). It provides opportunities for social interaction (Findlay & Coplan, 2008) and it has been shown to decrease rule breaking behaviour (Mahar et al., 2006). There is also mounting evidence for the link between activity and academic achievement (Ploughman, 2008; Sibley & Etnier, 2003). PA has therefore been associated with a range have a range of physical, psychosocial, behavioural and intellectual benefits for adolescents.

Physical Activity Recommendations

In their global strategy on PA and health the World Health Organisation (WHO) recommended that all countries prepare health enhancing PA guidelines (World Health Organization, 2010). The WHO advocates that individuals between 5-17 years old accumulate at least 60 minutes of moderate to vigorous physical activity (MVPA) daily (World Health Organization, 2010). Moderate activity is defined as an activity that is performed at 3.0 to 5.9 times the intensity of rest on an absolute scale. Vigorous activity is defined as activity that is performed at 6.0 or more times the intensity of rest on and absolute scale (World Health Organization, 2010) . The Department of Health and Children (DOHC) PA guidelines for Irish children coincide with the WHO recommendations in stating that children and youth should

participate in MVPA for at least 60 minutes everyday. This activity should be developmentally appropriate for the age of the child, it should involve a variety of activities and it should be enjoyable (Department of Health and Children, Health Service Executive, 2009).

Levels of Physical Activity, Sedentary Behaviour and Physical Health

Regular PA is essential during childhood and adolescence to protect current and future health. However, many national and international population studies have found that low proportions of children and youth are meeting PA recommendations (Canadian Fitness and Lifestyle Research Institute, 2009). The most recent International Health Behaviours of School-Aged Children (HBSC) study found that thirty-two percent of Irish 11, 13 and 15 year olds reported at least one hour of daily MVPA over the last 7 days (Currie et al., 2008). The HBSC Ireland study found that 53% of 10-17 year olds reported that they exercised moderately at least 4 times per week (Nic Gabhainn, Kelly, & Molcho, 2007). The CSPPA study represents the first Irish population study that used the current DOHC MVPA recommendations for children and youth (Woods, Moyna, Quinlan, Tannehill, & Walsh, 2010).

Opportunities for children and adolescents to engage in PA include free play and structured exercise, active commuting to and from school, PE and extracurricular sport and PA within the school environment and club sport and PA within the community. Observation of these avenues separately provides a more in depth picture of the physical activity profile of Irish children and adolescents. Active commuting presents an opportunity for habitual physical activity in the form of walking or cycling to and from school as oppose to passively commuting by car, bus or train. However research suggests that a relatively low proportion of Irish adolescents actively commute to school (Nelson, Foley, O'Gorman, Moyna, & Woods, 2008). In terms of opportunities to engage in PA within the school environment, research suggests that there are disparities between the actual and taught PE curriculum within primary and post primary schools (Connor, 2003). Traditional team games have been found to dominate the curriculum at the expense of individual or creative elements of the curriculum such as aquatics and dance (MacPhail & Halbert, 2005). This finding raises concerns in that research has found that individual activities have been found to carry over into adulthood more readily

(Fairclough, Stratton, & Baldwin, 2002). An additional challenge facing PE provision lies in the time allocation for PE within the school day. The Department of Education and Science (DES) recommend that primary children receive 60 minutes of PE per week and post primary children receive 120 minutes per week (Department of Education and Science, 1999; Department of Education and Science, 2003). However, The Economic and Social Research Institute (ESRI) study of School Children and Sport in Ireland suggests that these PE recommendations are not met, with 2nd to 6th year student's surveyed receiving and average of 69 minutes of PE per week (Fahey, Delaney, & Gannon, 2005). With regards to extracurricular sport and PA participation, research has again suggested that the range of opportunities on offer to students in Ireland focuses on team games and that as many as one in five never participate (Fahey et al., 2005). The situation has been found to differ for club sport and PA, with research indicating participation in team sport for males and a variety of activities for females, but still high levels of non-participation (Fahey et al., 2005). Overall, it is clear that examination of the different avenues and opportunities for physical activity is a necessary step towards increasing the proportion of Irish adolescents meeting physical activity recommendations.

In addition to the study of different forms of PA, research has investigated sedentary behaviour and sought to investigate its link with PA and health. Sedentary behaviours such as TV watching are generally increasing with the International HBSC study finding that 66% of 11, 13 and 15 year olds watched 2 hours or more of TV on weekdays (Currie et al., 2008). However, the relationship between PA and sedentary behaviour remains unclear with some studies reporting that they are distinct and do not displace each other (Marshall, Biddle, Sallis, McKenzie, & Conway, 2002). The WHO identified sedentary behaviour as an independent risk factor for at least 35 chronic health conditions (World Health Organization, 2006). However, cross-sectional and longitudinal data have reported inconsistent findings in terms of the relationship between sedentary behaviour and physical health variables such as BMI (R. E. Andersen, Crespo, Bartlett, Cheskin, & Pratt, 1998; Fahey et al., 2005; Robinson et al., 1993; Woods et al., 2004). The relationship between sedentary behaviour and physical health is clearly an understudied relationship that requires further study.

There have been very few population studies that have examined the physical

health of Irish children and adolescents. Most studies that have been carried out on the health of Irish adolescents have used body mass index (BMI) as a health indicator. The Report of the Irish Taskforce on Obesity estimated that were approximately 300,000 overweight and obese children in Ireland and that this number is probably rising at a rate of 10,000 per year (National Taskforce on Obesity, 2005), with the SLAN survey 2002 indicating at least a 1% increase in obesity every year (Kelleher, Friel, Nic Gabhainn, & Tay, 2003). The Take Part Study found that more than 1 in 5 adolescents aged 15-17 year old were overweight or obese (Woods, Nelson, O'Gorman, Foley, & Moyna, 2009). The International HBSC survey gathered information on height and weight among children aged 11, 13 and 15 years based on self-reports by the children rather than objective measurement. Results indicated that 17% of Irish 11 year olds, 14% of 13 year olds and 13% of 15 year olds were obese or overweight (Currie et al., 2008). The ESRI study found that the overall rate of obesity among 13-18 year olds was 19% and 4% respectively (Fahey et al., 2005). Despite previous research, objectively measured rates of overweight and obesity are still widely understudied in Ireland. The CSPPA study represents the first population study in Ireland that involved collecting data on BMI in addition to other valuable health indicators such as aerobic fitness, waist circumference and blood pressure which have often either been excluded or studied in isolation among other research. The inclusion of four health indicators is a valuable development to provide a full and clear picture of the health profile of Irish adolescents.

Research has frequently reported that PA participation, sedentary behaviour and health are influenced by demographic variables such as gender and age (Currie et al., 2008; Nielsen, Pfister, & Bo Andersen, 2011). Area of residence and socioeconomic status (SES) are less frequently investigated with inconsistent results (Currie et al., 2008; Lunn, 2006). Attention to these demographic variations is critical for identification of target groups. In order to design effective interventions there is a need for more comprehensive data on PA participation, sedentary behaviours, and physical health among Irish adolescents with respect to demographic factors.

Social-Ecological Model

The social-ecological model considers that attention to intra personal factors (individual), interpersonal factors (social), the physical environment and policy are necessary to achieve substantial changes in health behaviours, including PA behaviour (Stokols, 1996). The social ecological model can be conceptualised as a series of layers, where each layer has a resulting impact on the next level (Bronfenbrenner, 1994). For example, the social ecological model proposes that individual influences on a child's PA participation (attitudes, behaviours, beliefs, perceived barriers, motivation, enjoyment, self efficacy, skills, BMI) are rooted within their social environment of family, friends and school (peer, family and teacher social support). The model postulates that these individual and social influences are set within the physical environment (access to facilities, pedestrian safety), which is in turn embedded within the environment created by policy (planning and legislation from government). This study will use the social ecological model to examine which personal, social environmental and physical environmental variables are most important in predicting physical activity participation among Irish adolescents. The application of ecological models to improve understanding of youth PA is supported by the wide range of correlates that have been found to influence PA (Biddle, Whitehead, O Donovan, & Nevill, 2005; Sallis, Prochaska, & Taylor, 2000; Van der Horst, Paw, Twisk, & Van Mechelen, 2007). In addition, the social ecological approach has been adopted for by numerous study designs (Bengoechea, Sabiston, Ahmed, & Farnoush, 2010; Humbert et al., 2008) and has been found to be an effective framework for adolescent PA intervention design (Elder et al., 2007; Luepker et al., 1996; Woods et al., 2009).

Physical Activity Enjoyment

Physical activity enjoyment has been widely reported by children and adolescents as a motive for taking up and maintaining PA (Office of the Minister for Children and Youth Affairs, 2007). However the relationship between enjoyment and PA is inconsistent, with some studies reporting that high levels of enjoyment are associated with high levels of activity and others concluding that there is no association or that the relationship is inconclusive. A longitudinal study by DiLorenzo, Stucky-Ropp, Vander Wal and Gotham (1998) found that physical

activity enjoyment was the only consistent predictor of PA level for 5th and 6th grade children (N=54 girls, N=57 boys). Research by Dishman et al., (2005) found that physical activity enjoyment mediated the effect of a school based PA intervention. In contrast, other review articles have concluded that there is no association between PA and enjoyment among adolescents (Sallis et al., 2000; Van der Horst et al., 2007). These studies have been conducted using different measures; highlighting the importance of using a validated measure of physical activity enjoyment to examine the relationship between PA and enjoyment accurately.

There has been very little investigation of the variables that can be manipulated to increase physical activity enjoyment. Accordingly, research has called for investigation of the personal, behavioural and environmental variables that influence physical activity enjoyment (Dishman et al., 2005). With regards to the role of the social environment, several theories of physical activity enjoyment have proposed that one of the sources of enjoyment of physical activity comes from opportunities to socialise with peers and gain positive reinforcement from peers and parents (Brustad, 1988; Scanlan, Carpenter, Lobel, & Simons, 1993). In addition, parents and peers have been found to play an important role in supporting their adolescents' PA overall (Sallis et al., 2000; Wold & Hendry, 1998). Given the strong role of the social environment in influencing PA among adolescents, it is plausible that high levels of social support from parents, peers and teachers could contribute to increasing physical activity enjoyment.

1.2 Justification of the Study

This study will provide detailed and comprehensive information on the PA participation, physical health and sedentary behaviour of adolescents aged 10-18 in Ireland using the CSPPA data. The ESRI study provided valuable information on adolescents from 2nd-6th year but the CSPPA research built upon this research by including 5th and 6th class children and 1st year post primary children. The International HBSC report also covered physical activity and TV watching but did not go into detail in examining different types of PA and sedentary behaviour. The relationship between PA, sedentary behaviour and physical health has also been somewhat ignored in previous Irish research. In addition, the CSPPA study is the first population study to use the current MVPA recommendations. Research using

this dataset is therefore extremely valuable for development of government policies and interventions.

Cross sectional research of this nature will help to identify the most salient predictors of PA which can then be targeted for change in physical activity interventions. The social ecological model offers a suitable framework for examining the correlates of PA among a broad population of adolescents, as it considers that PA is a complex behaviour determined by the interplay of ones personal attributes and social and physical environment. Many studies have investigated demographic behavioural or psychological variables separately among Irish children but this is the first examination of the correlates of physical activity for children from an ecological perspective. In addition this research will examine male and female correlates separately in accordance with consistent gender differences in PA patterns.

This research will provide information on the physical activity enjoyment levels of Irish adolescents with respect to demographic factors. Irish children have reported physical activity enjoyment as an important motivator for taking part in PA, but there has been no research that has investigated if physical activity enjoyment significantly impacts Irish children's PA participation. There is a need to understand enjoyment in an Irish context for different demographic groups, and different types of activity. Identification of the most salient demographic, behavioural and social environmental predictors of physical activity enjoyment will enable effective facilitation of enjoyment. This research provides a unique opportunity to investigate physical activity enjoyment from a population perspective for Irish children using a validated and reliable measure

1.3 Study Aim and Objectives

The aim of this study is to examine PA participation, sedentary behaviour, physical health, correlates of physical activity, and physical activity enjoyment. Its specific objectives are:

1. To explore the PA participation and sedentary behaviour of Irish adolescents with respect to demographic factors and to investigate if there is a relationship between PA and sedentary activity.

2. To evaluate the physical health profile of Irish adolescents with respect to demographic factors, and to determine if physical health, PA and sedentary behaviour are related.

3. To examine the correlates of PA for Irish adolescents from a social ecological perspective, and to determine which of these correlates are significant in predicting MVPA for males and females. It is hypothesised that a range of personal psychological, social environmental and physical environmental correlates will predict MVPA among both genders.

4. To assess the relationship between physical activity enjoyment and PA participation and to examine demographic behavioural, and social environmental predictors of enjoyment. It is hypothesized that physical activity enjoyment will increase with increasing MVPA.

Chapter Two
2.0 Literature Review

2.1 Introduction

The aim of this review is to examine research in the area of physical activity (PA) among children and adolescents, to contextualise the present study and provide justification for research objectives. The benefits of PA and the consequences of inactivity for children will be outlined and the importance of PA participation during childhood will be highlighted. The PA levels, sedentary behaviour and physical health of children in Ireland and abroad in light of demographic discrepancies will be discussed. Key correlates and theories of PA for children and adolescents will be reviewed, with particular attention to the Social-Ecological Model. The final section will review and critically examine literature published on physical activity enjoyment, its relationship with demographic variables, its impact on PA and its association with other correlates of PA.

2.2 Physical Activity

Physical activity (PA) is defined as any bodily movement that is produced by the skeletal muscle and that increases energy expenditure (Caspersen, Powell, & Christensen, 1985). It includes activities of daily living such as gardening or housework, structured or planned exercise such as jogging or weightlifting, play, sport, physical education (PE) and active transport. For children and adolescents in Ireland specifically, avenues for PA include free play and structured exercise, active commuting to school, PE, extracurricular sport and PA within the school and club sport and PA within the community.

2.3 The Benefits of Physical Activity for Children

Although the health benefits of PA for children have not been as widely investigated as those for adults (Sallis et al., 2000), PA can have a range of direct and indirect physical, psychosocial, behavioural and intellectual benefits for children. This section will examine these benefits.

Physical Health Benefits of Physical Activity for Children

Physical inactivity is the fourth leading risk factor for death globally and is responsible for 6% of deaths worldwide and for 5–10% in the WHO European Region, depending on the country (World Health Organization, 2004). Every year in the European Region, nearly one million deaths are attributed to physical inactivity (World Health Organization, 2006). Regular PA throughout the lifespan has been found to reduce the risk of developing cardiovascular disease (Vuori, 2010), obesity (Hills & Byrne, 2006) and type-2 diabetes (Teixeira-Lemos, Nunes, Teixeira, & Reis, 2011). In adolescents, PA is associated with lower blood pressure, maintenance of a healthy body weight, greater insulin sensitivity, and a healthier blood lipid profile (Andersen et al., 2011).

Cardiovascular Disease and Physical Activity

Cardiovascular diseases are a group of disorders of the heart and blood vessels and include; coronary heart disease, disease of the blood vessels supplying the heart muscle, cerebrovascular disease, disease of the blood vessels supplying the brain, peripheral arterial disease, disease of blood vessels supplying the arms and legs, congenital heart disease, malformations of heart structure existing at birth, deep vein thrombosis and pulmonary embolism, blood clots in the leg veins, which can dislodge and move to the heart and lungs (World Health Organization, 2010)

Cardiovascular disease is the single largest cause of death in Ireland, currently accounting for one-third of all deaths and one in five premature deaths (deaths in those under 65 years). Although age-standardised death rates from cardiovascular disease have decreased by two-thirds over the past 30 years, Ireland still ranks below the European Union average for life expectancy for both men and women (McGee, 2010). Apart from the human cost of cardiovascular disease, the cost to the Irish economy, which includes the costs of healthcare, loss in productivity and informal care is a significant burden. Specific estimates for Ireland are not available, but it is estimated that cardiovascular disease cost the European economy €192 billion in 2008 (Allender, Scarborough, & Peto, 2008). Recent evidence convincingly shows physical inactivity as a key causal factor of cardiovascular disease in European adults, and highlights the importance of sufficient PA for attaining and maintaining health at all ages (Vuori, 2010). Almost two-thirds of

middle-aged and older adults in Ireland have at least 2 of 4 key risk factors for cardiovascular disease; raised blood pressure, raised cholesterol, obesity and smoking (McGee, 2010). PA can help prevent and manage the development of many of these risk factors.

Blood Pressure and Physical Activity

Blood pressure is the pressure exerted by the blood against the inside of the arterial walls. Blood pressure taken at rest can provide information about the subject's cardiovascular hemodynamics, future risk and current disease status. A recent systematic review indicates that PA interventions in youths that last from 4-25 weeks and provide 60-180 minutes of aerobic activity per week have a positive effect on systolic blood pressure, with large effect sizes (Janssen & LeBlanc, 2010). Research by Hansen, Froberg, Hyldebradnt and Nielsen (1991) tracked blood pressure changes in 68 normotensive and 64 hypertensive children aged 9-11 years during a PA intervention where children completed an extra 50 minutes of physical education, 3 times per week for eight months. There were no significant changes in blood pressure or physical fitness after 3 months of the intervention, but by 8 months, systolic and diastolic blood pressure decreased 6.5mmHg and 4.1mmHg in the normotensive group and 4.9 and 3.8mmHg respectively in the hypertensive group. Physical fitness also improved significantly over the 8 months by 3.7m02/kg/min in the normotensive group and 2.1m02/kg/min in the hypertensive group compared with that of the control group. These findings led the authors to conclude that physical training lowers blood pressure and improves fitness among children and that it may have a role in primary prevention of hypertension. A meta-analysis by Kelley, Kelley and Tran (2003), supports the necessity for prolonged PA interventions of 12-32 weeks to reduce blood pressure significantly in hypertensive children. In contrast to the findings of the study by Hansen and colleagues however, this meta-analysis indicates there is no clear association between PA and blood pressure in normotensive children. The interventions in this area predominantly use aerobic exercise prescribed in similar volumes and intensities, and so the effect of different volumes and intensities of exercise on blood pressure remain unclear (Janssen & LeBlanc, 2010)

Cholesterol/Blood Lipids and Physical Activity

Hyperlipidemia is the presence of elevated levels of lipids in the blood and is a major risk factor for the development of atherosclerosis and other cardiovascular diseases. PA appears to benefit those most at risk, though a dose response relationship has not yet been established due to limitations in the design of many studies (Janssen & LeBlanc, 2010). One study by Carnethon, Gulati and Greenland (2005), measured the cardiovascular fitness of 3110 12-19 year old American adolescents using a sub maximal treadmill test. They found that the least fit 20% of girls and boys were 1.89 and 3.68 times more likely to have hypercholesterolemia respectively and 1.03 and 1.25 times more likely to have low HDL cholesterol respectively compared to their more fit counterparts. A recent meta-analysis indicates that school based interventions that have not increased physical fitness have generally not been effective in improving lipid and lipoprotein levels in children aged 6-18 years of age (Dobbins, De Corby, Robeson, Husson, & Tirilis, 2009). However, interventions that have successfully increased aerobic fitness have generally also had a beneficial effect on blood lipid profile (Reed, Warburton, Macdonald, Naylor, & McKay, 2008; Resaland, Andersen, Mamen, & Anderssen, 2011). Resaland, Andersen, Mamen and Anderssen (2011) conducted a 2-year intervention of N=188 Norwegian school children, aged 9 ± 0.03 years. The intervention involved 55 minutes of organised PA per school day, at least 15 minutes of which was designed to be vigorous activity where the children were out of breath and sweating. The control school followed the normal school PA curriculum of 45 minutes of exercise twice per week. The intervention group increased their $VO_{2\ max}$ by 2.5–4.6ml·kg^{-1}·bw^{-1} more than the control group (8% increase), and had a 13% decrease in triglycerides and a 6% decrease in the ratio of total HDL cholesterol. This study highlights the importance of aerobic fitness in regulating cholesterol and blood lipids.

BMI, Obesity and Physical Activity

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. Excess body fat is associated with a number of health problems including cardiovascular disease and metabolic, gastrointestinal, pulmonary, orthopaedic, neurological, psychological and social disorders (Lloyd,

Langley-Evans, & McMullen, 2009). The fundamental cause of obesity and overweight is an energy imbalance between energy intake and energy expenditure through PA. When energy intake exceeds energy expenditure fat is stored as energy in the body. Overweight and obesity are most commonly identified through measurement of Body Mass Index (BMI) which is a useful tool to estimate a healthy body weight based on how tall a person is (Malina & Katzmarzyk, 1999). An adult is considered overweight if they have a BMI of ≥ 25 and obese if they have a BMI of ≥ 30. These BMI ranges are inappropriate for children and youth as height and weight continuously change from birth to adulthood. Accordingly, Cole, Bellizzi, Flegal and Dietz (2000) used six international surveys to define overweight thresholds for each age-gender group of children between 2-18 years by modelling the BMI scores children would need to have at each age if they were to pass through a BMI of 25 at age 18 years. Similarly obesity thresholds were defined by modelling the BMI scores children would need to have at each age if they were to pass through a BMI of 30 at age 18 years. To define thinness, Cole, Flegal, Nicholls, and Jackson (2007) carried out a study using international survey data to draw centile curves that passed through a BMI 17 at 18 years. Cut-offs calculated in this way are recommended as they are widely thought to be more appropriate for children. Other studies show that waist circumference may be a more appropriate measure, and is particularly effective in identifying adolescents at risk of developing the metabolic syndrome (McCarthy, 2006). Nonetheless, a higher BMI in children has been linked to subsequent development of cardiovascular disease. Baker, Olsen and Sorenson (2007), demonstrated that a higher BMI in childhood is significantly associated with coronary heart disease in adults over age 25. This study tracked the BMI of 276,835 Danish children born between 1930 and 1976 between the ages of 7 and 13 years. A linear increase in the risk for future cardiovascular events was associated with increasing BMI in both boys and girls In Ireland, the SLAN 2007 report shows the prevalence of overweight and obesity is increasing (Morgan et al., 2008). Over one-third of the population (38%) were objectively assessed as overweight (44% men and 34% women). A further 23% of the population were assessed as being obese (22% men and 24% women). Lissau et al. (2004) found that Ireland, along with Israel and Portugal, had the highest prevalence of overweight children in comparison to a number of other European and developed countries. The Take PART study of 15-17

year olds found that one child out of every five in the age cohort Ireland is either overweight or obese (Woods et al., 2004). In Europe and the United States, childhood obesity is on the increase with no sign of slowing down (Bibbins-Domingo, Coxson, Pletcher, Lightwood, & Goldman, 2007; Lissner, Sohlström, Sundblom, & Sjöberg, 2010; Pearson, Hansen, Sørensen, & Baker, 2010). In the United States, it is predicted that the prevalence of obesity will increase by another 5-16% by the year 2035 (Bibbins-Domingo et al., 2007).

PA and diet are the foundations of obesity prevention and management and can help correct the energy imbalance that causes fat gain (Hills & Byrne, 2006). The overweight and obese are less active than individuals of normal weight (Strong et al., 2005). The benefit of PA for the obese population is apparent when it is considered that those who are physically active and overweight have a lower all cause morbidity and mortality rates than their normal weight sedentary counterparts (Fogelholm, 2010). It must be noted that overweight individuals remain at greater risk for developing diabetes and other CVD risk factors, even if physically fit. A moderate weight reduction of 5-7% body weight however has been found to reduce the risk of progression from impaired glucose tolerance to Type 2 diabetes by 58% (Knowler et al., 2002).

Type 2 Diabetes Mellitus and Physical Activity

Type 2 diabetes mellitus (T2DM) is a metabolic disorder characterised by high blood glucose in the context of insulin resistance and relative insulin deficiency. Long term high blood glucose can increase the risk of a cardiovascular event and can damage small blood vessels, effecting sight and kidney function and in extreme cases, may lead to amputation of a limb, due to poor circulation and ulceration. The International Diabetes Federation estimate that the disease currently affects 246 million people worldwide, and is expected to increase to ~380 million by 2025. The prevalence of diabetes in Ireland is increasing and is expected to increase by 37% over the 10-year period 2005-2015 due to an ageing of the population and increased rates of obesity (Balanda & Wilde, 2001). The incidence of T2DM is increasing in adolescents and children too, and this increase has been attributed to unfavourable lifestyle factors that lead to weight gain and obesity. It has been reported that obesity is a contributing factor in around 55% of T2DM cases and a moderate weight

reduction of 5-7% body weight can reduce the risk of progression from impaired glucose tolerance to T2DM by 58% (Koro, Bowlin, Bourgeois, & Fedder, 2004). PA is useful in weight management but also has an insulin-like effect on glucose metabolism in that it stimulates glucose transport to the muscle, increases insulin sensitivity on organs involved in exercise and positively regulates the signalling pathway stimulated by insulin (Teixeira-Lemos et al., 2011). These glycaemic responses can occur independently of weight loss (De Feyter et al., 2007), making PA an important preventative and secondary management behaviour in dealing with T2DM among children and adolescents.

Psychosocial, Behavioural and Intellectual Benefits

The benefits of PA for adolescents are becoming increasingly well known, yet several important psychosocial, behavioural and intellectual benefits of regular PA for adolescents have received less attention.

Physical activity and Regulation of Emotion/ Behaviour

A study in Finland evaluated the association between the level of PA and the prevalence of emotional and behavioural problems in adolescents (Kantomaa et al., 2008). The study population consisted of 7002 adolescents who responded to a postal inquiry in 2001-2002 at the age of 15-16 years. Among males, physical inactivity (1 hour or less of MVPA per week) was associated with anxious/depressed symptoms, withdrawn/depressed symptoms, social problems, thought problems and attention problems when compared to being physically active (4 hours or more of MVPA per week). In girls, physical inactivity was associated with withdrawn/depressed symptoms, somatic complaints, social problems, attention problems, and rule-breaking behaviour compared to being physically active. The author concluded that physical inactivity was associated with several emotional and behavioural problems in adolescents. The cross sectional design does not imply cause and effect the large sample size adds weight to the findings of this study.

Physical Activity and Behavioural/Psychosocial Skills

A study by Findlay and Coplan (2008) aimed to examine the role of organised sport participation as a moderator of the links between shyness and

psychosocial maladjustment in childhood. Participants at Time 1 were 355 school children (Mean age= 10.1 years, SD = 0.6); at Time 2, 1 year later, 201 children (56%) were retained. At both time points, children completed self-report assessments of their shyness and aggression, sport participation, and psychosocial adjustment (social skills, self-esteem). Parents also rated children's social skills. Results indicated that sport participation was positively related to indices of positive adjustment, social skills and self-esteem. In contrast, shyness was associated with social skill deficiencies and internalizing problems. However, shy children who participated in sport over time reported a significant decrease in anxiety. This study suggests that sport participation may play a unique protective role for shy children, with the longitudinal design of this research strengthening the finding.

Physical Activity and Depression

A study by Motl, Birnbaum, Kubik, and Dishman (2004) examined the relationship between naturally occurring changes in PA and depressive symptoms across a 2-year period among 4594 adolescent boys and girls between the autumn of 1998 (baseline), spring of 1999 (interim) and the spring of 2000 (follow up). Latent growth modelling indicated that a 1 SD unit change in the frequency of leisure-time PA was inversely related to a 0.25 SD unit change in depressive symptoms. This relationship remained significant when controlling for gender, SES, smoking, alcohol consumption, and the value participants placed on their health, appearance, and achievement. The authors concluded that naturally occurring changes in PA were negatively related with changes in depressive symptoms. The longitudinal design, large sample size, use of validated measures and control of confounding variable reinforce the results of this study.

Physical Activity and Suicidal Behaviour

Apart from the effect of PA on depression, research has also indicated that exercise and sports participation can reduce suicidal behaviour. Suicide is the principal main cause of death among men aged 15-34 (Central Statistics Office, September 2011). Research by Unger (1997) reported that adolescent boys who did not exercise or participate in sports had higher rates of suicidal behaviour than their peers that did participate. Similarly, Brown and Blanton (2002) conducted a study of

4728 college students and found that men who did not participate in sports were 2.5 times more likely to report suicidal behaviour than men who were sports participants. This research provides evidence that regular PA and sports participation can provide a protective effect against depression and suicidal behaviour, both during adolescence and into adulthood, although the exact mechanism is unknown.

Physical Activity and Academic Achievement

There is growing evidence for the intellectual benefit of PA. It has been found to enhance memory and learning, cause new brain cell growth and release chemicals involved in learning (Ploughman, 2008). An intervention study of 243 3rd and 4th grade students found that participants that received a classroom based PA programme of "energizers" between subjects improved classroom behaviour by 8% overall and took significantly more in school steps than a control group who did not receive intervention (Mahar et al., 2006). One study found that 89 adolescents who reported higher levels of daily PA reported having higher grades. However this research was based on self report and therefore does not imply cause and effect (Field, Diego, & Sanders, 2001). It also used an unvalidated measure of PA and the sample size was small. A meta-analysis of 44 studies conducted by Sibley and Etnier (2003), found a positive relationship between PA and cognitive performance (e.g., perceptual skills, intelligence quotient, achievement, verbal tests, mathematics, developmental level, academic readiness) in school-aged children. Effect sizes were calculated for each study and an overall effect size of 0.32 (*SD* = 0.27) was found, implying a medium sized effect for PA on cognitive performance. This effect size provides strong support for the link between PA and cognitive performance. However the authors note that more research using statistically powerful intervention designs and valid and reliable measures is needed in the area of cognition and childhood exercise before a causal relationship can be established (Sibley & Etnier, 2003). Although the benefits of PA in terms of academic achievement are not conclusive, studies such as this are crucial to assess the current research situation and advance the research.

Tracking of Physical Activity

Tracking studies measure the stability of PA participation over time. Existing

tracking studies provide conflicting results, however the paucity of longitudinal studies and the use different measures make comparison difficult. A review by Malina (2001) suggested that physical fitness tracks better than PA into adulthood and is supported by several studies (Janz, Dawson, & Mahoney, 2000; Telama et al., 2005). Malina comments that this is possibly due to the objective measurement of aerobic fitness and the fact that PA is widely measured by unvalidated self report or interviews, often retrospectively requiring the individual to recall the amount of PA they engaged in during youth (Malina, 2001). Although there is a need for more tracking studies using objective measures of PA, Twisk (2001) comments that children that engage in regular PA experiences are more likely to develop long term habits and experience associated health benefits into adulthood (2001).

Summary of Section 2.3

In summary, section 2.3 has discussed and reviewed the literature surrounding the physical, mental, social and intellectual benefits of physical activity for adolescents. Section 2.4 and 2.5 will discuss physical activity recommendations and the proportion of adolescents that are engaged in adequate levels of physical activity to accrue these positive health benefits with attention to the various avenues for physical activity. It will also involve discussion of the sedentary behaviour and physical health profile of Irish adolescents.

2.4 Physical Activity Recommendations

In their *Global strategy on Physical Activity and Health*, the WHO recommends that all countries should prepare health enhancing PA guidelines (World Health Organization, 2010). The WHO (2010) advocates that children between 5-17 years should accumulate at least 60 minutes of moderate to vigorous activity daily. Most of the activity should be aerobic in nature with muscle and bone strengthening activities 3 times per week. These guidelines are already in existence in a number of countries including Ireland, (Department of Health and Children, Health Service Executive, 2009), USA(US Department of Health and Human Services, 2008), Australia (Department of Health and Ageing, 2004) and the UK (Department of Health, 2004), with all recommending at least 60 minutes of MVPA per day. Only Canada's guidelines differ from other countries in that they

recommend that young people should aim to increase their PA to 90 minutes a day (Public Health Agency of Canada, 2002). Irrespective of duration and frequency, all countries advocate that activity should be developmentally appropriate for the age of the child, it should involve a variety of activities and it should be enjoyable.

2.5 Physical Activity, Sedentary Behaviour and Physical Health

This section will review PA levels with attention to the demographic factors of gender, age, area of residence and SES. It will discuss activity levels within the different types of PA including active commuting, PE, extracurricular sport and PA and club sport and PA. The prevalence of sedentary behaviour will be discussed with attention to the influence of demographic factors. Finally, research surrounding the physical health of Irish adolescents will be discussed and the link between PA and health and sedentary behaviour and health will be reviewed.

Meeting Physical Activity Recommendations

Despite the research supporting the many benefits of PA for children and the existence of recommendations, many national and international population studies have found that low proportions of children and youth are meeting MVPA recommendations. Internationally, the Canadian Fitness and Lifestyle Research Institutes CANPLAY study (2009) found that 13% of 5-19 year olds were meeting their recommendation of 90 minutes of activity per day in 2009. In Australia, the National Children's Nutrition and Physical Activity Survey (2007) reported that 32% of 9-16 year olds met the national recommendation of at least 60 minutes of MVPA per day on all of the four days sampled. The objective data from the 2003-2004 National Health and Nutrition Examination Survey (NHANES) showed that 8% of those aged 12-18 met the 60 minutes per day of MVPA recommendation (Troiano et al., 2008). The International HBSC study across 41 countries found that 21% of 11, 13 and 15 year olds reported that they engaged in at least 60 minutes of MVPA over the last 7 days (Currie et al., 2008). On average, thirty-two percent of Irish 11, 13 and 15 year olds reported at least one hour of daily MVPA over the last 7 days. The recommendation that Irish children and youth aged 2-18 years accumulate at least 60 minutes of moderately per day was only released in 2009 (Department of Health and

Children, Health Service Executive, 2009). Prior to the publication of these guidelines, Irish population studies followed the old World Health Organisation recommendations, which stated that children and youth should participate in at least moderate activity for an average of one hour per day for all if not most days of the week. This definition was rather vague and the use of the word "most" left the guideline open to interpretation, meaning that publications were not consistent in their definition of regular PA. This inconsistency makes comparisons across the literature difficult. The HBSC Ireland study found that 53% of 10-17 year olds reported that they exercised to the point or getting out of breath and sweating at least 4 times per week (Nic Gabhainn et al., 2007). The Take Part Study of 15-17 year olds found that 35% were moderately active for at least 60 minutes a day on 4 or more days per week (Woods et al., 2004). The CSPPA study represents the first Irish population study that uses the current 2009 DOHC MVPA recommendations for children and youth (Woods et al., 2010). In addition to low proportions meeting the recommendations, population studies frequently report that PA is influenced by gender, age, area of residence (region) and SES. Attention to these demographic variations in PA is critical for identification of target groups.

Meeting of MVPA Recommendations and Demographic Factors

Males are widely found to be more active than females. The previously mentioned CANPLAY (2009) study reported that between both objectively measured and self report data, males were more active than females, with 16% of males meeting recommendations vs. 8% of females (Canadian Fitness and Lifestyle Research Institute, 2009). In Australia, 38% of 9-16 year olds met the MVPA recommendation on all of the four days sampled versus 25% females (Department of Health and Ageing, 2007). The International HBSC survey demonstrated that Irish boys are more likely to report being active for at least 60 minutes a day as compared to girls, with this finding proving consistent across the three age groups studied: 11 years (boys = 51% active, girls = 38% active), 13 years (boys = 39% active, girls = 23% active), and 15 years (boys = 27% active, girls = 13% active) (Currie et al., 2008). The HBSC Ireland study found that of 10-17 year olds, 63% of males exercised 4 or more days per week while only 43% of females exercised to the same extent (Nic Gabhainn et al., 2007). This gender gap was also evident in the Take

PART Study in which 42% of males reported being active on 4 or more days per week compared to 30% of females (Woods et al., 2004).

Activity is generally found to decrease with age throughout adolescence. This trend has been found internationally (Canadian Fitness and Lifestyle Research Institute, 2009; Currie et al., 2008; Department of Health and Ageing, 2007; Troiano et al., 2008) and nationally (Nic Gabhainn et al., 2007). The Take PART Study found that fewer 17 year olds than 15 or 16 year olds were regularly active but there was no significant age effect, perhaps suggesting that the decrease in activity with age plateaus or slows down in later adolescence (Woods et al., 2004).

An effect of area of residence or region on PA has been observed in many studies. The CANPLAY study found that Ontario, West Canada and North Canada had significantly higher proportions of children meeting recommendations from 2005-2008 than Atlantic Canada and Quebec (Canadian Fitness and Lifestyle Research Institute, 2009). The Health Survey for England Survey had similar findings with a significantly higher proportion of children in South West England meeting the recommendations (81% of boys and 75% girls) than in London (63% of boys and 50% of girls) (Craig et al., 2008). In Ireland, area of residence is an understudied variable in terms of children's PA. Among adults, the Irish Sports Monitor reported that Dún Laoghaire-Rathdown and Mayo had high PA and sport participation (engaged in 30 minutes or more of MVPA ≥5 days per week) while Dublin City, Limerick, Kildare, Offaly, Leitrim and Westmeath recorded low participation (Lunn, Layte, & Watson, 2007). There is a need for further research on the effect of area of residence on PA among children and adolescents specifically.

The relationship between SES and activity is somewhat inconsistent. Several studies have found that those in higher social classes are more active than those in lower social classes or that children whose parents have a higher income or are more educated are more active (Canadian Fitness and Lifestyle Research Institute, 2009; Craig et al., 2008). Other research, particularly Irish studies, reports no effect for SES variables on PA (Nic Gabhainn et al., 2007; Woods et al., 2004). The International HBSC data indicated that Ireland was one of 23 countries out of a total of 41 in which no association was found between family affluence and daily MVPA (Currie et al., 2008). Higher levels of PA were associated with higher family affluence in the other 18 other countries included. The ESRI report on Sport and

Social Disadvantage in Ireland found a strong relationship between social disadvantage and PA as measured by level of education and income among adults. However, the relationship among children was less robust, with children from disadvantaged primary schools having less opportunity for PA and less choice than their non-disadvantaged counterparts, but with no such effect observed for post primary students (Lunn, 2006). Further population research is required to clarify the relationship between PA and SES in Ireland.

Active Commuting

Active school commuting is defined by walking or cycling to school whereas passive school commuting refers to use of automated transport modes such as cars, buses or trains (Woods et al., 2009). Walking and cycling to school provide a convenient opportunity to incorporate PA into an adolescent's daily routine (Nelson et al., 2008). However, research has indicated that active commuting is relatively low among school children in Ireland (Fahey et al., 2005; Nelson et al., 2008) and abroad (British Heart Foundation, 2009). Research from England suggests that active commuting has decreased over the last 3 decades, with 40% of 10-11 year olds born between 1932/41 actively commuting to school compared to 9% of children of a similar age born in 1990/91. However there are initial signs that this downward trend may be starting to change (British Heart Foundation, 2009). The 2004 National Transportation Survey found that just over a third of Canadian students reported actively commuting to school (Cragg, Cameron, & Craig, 2006). This finding is comparable to commuting levels in Ireland. A study by Nelson, Foley, O'Gorman, Moyna and Woods (2008) on the Take PART data found that 38% of the 4013 15-17 year olds surveyed (48% male, mean age 16.02 SD±.07) actively commuted to school. These findings are slightly more favourable than the ESRI report which found that 30% of post primary students actively commuted to school (Fahey et al., 2005). In relation to distance travelled to school, Nelson et al. (2008) found that the majority of walkers lived within 1.5 miles and cyclists within 2.5 miles of their school. Over 90% of adolescents who perceived distance as a barrier to active commuting lived further than 2.5 miles from school. This study highlights that distance is an important barrier to active commuting and a predictor of transport choice among adolescents. It concluded that distances within 2.5 miles are

achievable for adolescent walkers and cyclists, but alternative strategies for increasing PA are required for individuals living further away from their school (Nelson et al., 2008). A study by Davison, Werder and Lawson (2008) provided a meta-analysis of active commuting studies published before June 2007. Eight studies found that children and adolescents who walked or cycled to school had higher daily levels of PA and were more likely to meet PA recommendations than youth who travelled to school by car or bus. These effects were found when both self-report and objective measures of PA were used and were evident among elementary middle- and high-school–aged children. Two studies did not find a significant association. Objective accelerometer data from 4 studies indicated that children who actively commute to school accumulate approximately 20 additional minutes of MVPA per day on weekdays. These findings suggest that active commuting contributes to daily MVPA but that the findings between active commuting and health are inconclusive.

Active Commuting and Demographic Factors

In terms of the effect of demographic factors on commuting, Nelson et al. (2008) found that more males than females walked or cycled to school (41% vs. 34%). The previously discussed meta-analysis by Davison et al. (2008) reported that 5 studies found that boys were more likely to actively commute than girls. The authors suggested that gender differences may reflect sex differences in general levels of PA and that higher rates of walking to school among boys may reflect social tendencies of parents to be more protective of girls and to place greater restrictions on girls' independent mobility (Davison et al., 2008). The effect of age was also examined with 3 studies indicating that older children are more likely than younger children to actively commute to school and 3 studies finding the opposite pattern. Davison et al. (2008) suggest that this inconsistent pattern may reflect the possibility that children's age-related gains in independent mobility may be linked with higher rates of active commuting until they are old enough to begin driving themselves to school. Furthermore, differences across studies may reflect regional differences given that age-related gains in mobility may be overridden in areas where schools are not served by safe walking or cycling routes (Davison et al., 2008). The findings of Nelson et al. (2008) would support this hypothesis in finding that adolescents living

in more densely populated areas had greater odds of active commuting than those in the most sparsely populated areas, reflecting an area of residence effect and an urban rural divide. In relation to the effect of SES, the meta-analysis by Davison et al. (2008) suggests that children from low SES backgrounds are more likely to actively commute to school than children from high SES backgrounds. This effect was noted in four studies using school-level SES measures (e.g., percentage of students on welfare), neighbourhood-level socioeconomic measures, and measures of household income and home ownership (Davison et al., 2008). Irish population research on active commuting among adolescents will help identify target groups and guide implementation of current policies and strategies concerned with active commuting such as the *Green Schools Module,* a scheme funded under Ireland's transport policy for 2009-2020, *Smarter Travel – A Sustainable Transport Future* (Department of Transport, 2009b) and the National Cycling Policy Framework (Department of Transport, 2009a).

The School Environment: PE and Extracurricular Sport and Physical Activity

The school environment is an important setting for children and adolescents to take part in PA through both PE and extracurricular sport and PA participation during lunch time or after school (World Health Organization, 2003). These forms of activity allow youth opportunities to engage in positive, competence-building PA experiences in a safe environment with the support of teachers, peers and parents. However, decreasing PE programmes in schools, curriculum inequalities, lack of teacher training and the absence of conducive PA environments in schools is an alarming trend worldwide that threatens PE and extracurricular sport in schools (Hardman, 2004; Hardman, 2007). There are a number of challenges relating to PE that this study will address, including deviations from curricula and time allocation for PE.

Deviations from PE Curricula

The primary and post primary PE curricula are developed by the National Council for Curriculum and Assessment (NCCA), with the responsibility of implementation falling on the DES. The primary PE curriculum was revised in 1999 and a new post primary junior cycle curriculum was implemented in 2003

(Department of Education and Science, 1999; Department of Education and Science, 2003). There are currently two post primary senior cycle curricula in development: a non examination curriculum and a PE syllabus for examination (Physical Education Association of Ireland, 2009). The DES now has the task of concluding and implementing these senior cycle curricula in light of additional policy challenges. One such challenge is the identified discrepancy between curricula currently in place and what is actually taught and implemented in PE classes throughout Ireland. The current post primary PE curriculum consists of seven strands; athletics, outdoor and adventure activities, games, aquatics, dance, gymnastics, and health related fitness. The implementation and teaching of this curriculum is not regulated or monitored and there is a shortage of research on the content of PE classes in Ireland. However, the research that has been conducted suggests a disparity between the actual and taught curriculum both within and between schools (Connor, 2003; Fahey et al., 2005). Research seems to suggest that traditional team games dominate the curriculum at the expense of individual or creative elements of the curriculum such as aquatics and dance (MacPhail & Halbert, 2005). This finding raises concerns as research has found that individual activities have been found to carry over into adulthood more readily because they generally only need one or two people, they require little structure, few time constraints and minimal equipment and cost (Fairclough et al., 2002). Research has suggested that if children are attracted to these individual "lifetime" activities and have opportunities to participate in them during childhood, they may be more likely to follow physically active lifestyles during adulthood (Fairclough et al., 2002). Sallis and McKenzie (1991) reported that children who participated in team games tended to take part in more individual "lifetime" activities as adults, as opposed to continuing with team pursuits. Children who were most active in team sports programmes were more likely to watch sport on television as adults rather than actually participate in PA (Sallis & McKenzie, 1991). The findings of the Irish Sports Monitor support the popularity of individual activities in adulthood (Lunn et al., 2007). Personal exercise was found to be the most popular sport and exercise activity, with a collective 27% of people surveyed indicating active participation in personal activities or individual sports such as swimming, golf, running, cycling and dancing. Only 11% indicated participation in team sports such as soccer, gaelic football hurling, camogie or rugby (Lunn et al.,

2007). These findings would seem to suggest that adherence to the recommended PE curriculum that aims to develop motor skills and cater for all interests and preferences would serve students best throughout their childhood and into adulthood rather than allowing one type of activity to dominate (Department of Education and Science, 2003).

Allocation of time for PE within the School Curriculum

An additional challenge lies in the time allocation for PE with in the school day. The DES recommends that primary children receive 60 minutes of PE per week and post primary children receive 120 minutes per week (Department of Education and Science, 1999; Department of Education and Science, 2003). Again, these recommendations are not compulsory and adherence within schools is not monitored. The ESRI study suggests that these recommended criteria are not met, with 2nd to 6th year student's surveyed receiving and average of 69 minutes of PE per week (Fahey et al., 2005).

PE and Demographic Factors

As with activity overall, demographic inequalities have been observed within PE. The ESRI study found that males received more minutes of PE than females (males=81 minutes, females=64 minutes) and PE decreased with age throughout the school cycle. The exception was the 4th year or transition year group in which lack of exam pressure seemed to result in additional time being allocated to PE (Fahey et al., 2005). A qualitative study by Mac Phail, Halbert, Mc Evilly, Hutchinson and Mac Donnacha (2005) had similar findings with a trend of diminishing time allocation for PE from 1st year (76 minutes/week) to 6th year (58 minutes/week), with the exception of transition year (101 minutes/week). The authors concluded that this rise in PE in Transition year may be evidence of the recognition that PE can contribute to the holistic aims of the Transition year, while in other years the curriculum time for PE is decreased due to timetable competition from exam subjects (MacPhail et al., 2005). There is no empirical evidence that academic performance is hindered in any way by PE (Active Healthy Kids Canada, 2009). Internationally, an Australian study found that when 1.25 hours of PE per day was added to the daily curriculum, maths and reading scores were not adversely affected with a follow up study 2 years later,

showing that the effects persisted (Maynard, Coonan, Worsley, Dwyer, & Baghurst, 1987). Similarly, an American study found that a group of 6th grade children who received 55 minutes of daily PE performed equally well in Mathematics, Science and English when compared to a group that spent those 55 minutes in academic classes (Coe, Pivarnik, Womack, Reeves, & Malina, 2006). In an Irish context, these results would seem to suggest that PE should be encouraged rather than diminished in importance as students' progress through the school cycle towards their leaving certificate. In terms of SES and PE provision, there is a shortage of studies. Lunn (2006) found that those from fee paying post primary schools had significantly higher weekly minutes of PE than those in disadvantaged schools (80 minutes vs. 75 minutes). Additional research is needed on the current situation with regards to PE in Irish primary and post primary schools to build upon the reviewed literature. The current research will provide information in terms of activities, time allocation and demographic variations which will help to address and direct policy challenges.

Range of Extracurricular Activities

Although extracurricular sport is undertaken within the school setting, it differs from PE in that it is not an element of the formal curriculum and thus it is governed by the school rather than education policy. Nonetheless, it is often considered an essential part of a child's PA experience in school. The delivery of extracurricular sport and PA in school relies on the willingness of teachers or parent volunteers to contribute their time during lunch breaks or after school. It is therefore subject to many challenges.

Research has suggested that the range of extracurricular sport opportunities on offer to students in Ireland focuses on team games rather than individual activities, although the divide does not seem to be as strong as for PE (Fahey et al., 2005). Research has shown that it is these individual activities that track better into adulthood (Fairclough et al., 2002). In their 2006-2008 strategy '*Building Sport for Life*' the ISC (2006) commented that a combination of activities is more likely to cater for differing interests, develop motor skills, and foster motivations necessary for lifelong participation in sport and PA. This statement highlights that there is a need for schools to diversify and broaden the extracurricular programmes on offer.

Frequency of Participation in Extracurricular Sport and Physical Activity

The frequency of participation in extracurricular sport has been another research focus. The ESRI report found that three quarters of primary school participants engaged in extracurricular sport (38% participated twice or more per week, 23% participated once a week, 13% participated less often) (Fahey et al., 2005). An alarming one quarter of primary children surveyed reported that they never participate in extracurricular sport or PA. Similar trends were found for post primary students with 78% participating overall (22% 4 or more days a week, 30% 2-3 days a week, 18% 1 day a week, 8% less often) (Fahey et al., 2005). Twenty-two percent of post primary students report that they never participate in extracurricular sport and PA (Fahey et al., 2005).

Extracurricular Sport/Physical Activity and Demographic Factors

In relation to the influence of demographic factors, The ESRI study found that 16% of males never participate in comparison to 29% of females (Fahey et al., 2005). In contrast to PE, no age by participation effect was established for extracurricular sport and PA (Fahey et al., 2005). Lunn (2006) found an effect of SES, with children from disadvantaged primary schools participating in less extracurricular sport and PA. The ESRI study also reported a similar SES trend for post primary students although their findings were not significant (Fahey et al., 2005).

Club Sport and Physical Activity

Club Sport and PA differs from PE and extracurricular sport and PA in that it is concerned with participation within community clubs rather than within the school environment. It is under the remit of sports policy and is considered an important element of the institutional structure of sports participation in Ireland (Lunn et al., 2007). Research from Canada has indicated that children who are club sport participants are more likely to meet physical activity recommendations (Canadian Fitness and Lifestyle Research Institute, 2008). Club sport and PA also has the advantage of providing opportunities for children to feel a strong sense of belonging and social support within their community and among their peers. The ISC (2006) have stated that they have a responsibility to ensure that all young people,

irrespective of personal attributes, see sport as an integral and enjoyable part of their lives and have the opportunity to increase their participation. This statment highlights that club sport and PA is faced with similar challenges to that of PE and extracurricular sport and PA in terms of attracting the interest and increasing participation of all youth in light of demographic inequalities.

Range of Club Sports

The ESRI study found that traditional team games were dominant club activities for males with females reporting that they participated in a range of individual and team sports in clubs (Fahey et al., 2005). Swimming and dance were found to be the most common activities for female primary participants, with dance hardly featuring at all for males. The situation was similar for post primary participants with team sport, namely Gaelic football, coming in first place for males and females. It could be argued that the first place ranking of gaelic football reflects the existence of designated development officers and strong club support and infrastructure for recruitment with the Gaelic Athletic Association. The ISC has also provided €32.5 million funding to the three main field sports; gaelic football (GAA), soccer (FAI) and rugby (IRFU) from 2001-2005 to assist in increasing youth participation and to improve standards in the area of underage sports (Office of the Minister for Children and Youth Affairs, 2007). In contrast to males, the ESRI study found that dance and swimming came in 2nd and 3rd place for females. The author noted that non-school clubs sports may be more effective in delivering opportunities to participate in dance and swimming to girls than PE or extra-curricular sport even though they are two of the recommended disciplines in the PE curriculum (Fahey et al., 2005). As mentioned previously, it is these individual activities that have been found to track better into adulthood. Research has found a large drop off in the number of youth participating in club sport, in the transition period after leaving school. This finding suggests that increasing the focus and community sport funding for individual sports to the level of dominant team sports, may help alleviate or decrease this drop off. The ESRI report found evidence of the "staying power" of such individual activities in finding that while both gaelic football and hurling dropped off during junior certificate and leaving certificate years, weight training and aerobics had their highest participation rates in 6th year (Fahey et al., 2005). This

finding suggests that education and sport policy, together with local partnerships, should increase opportunities to engage in these personal individual activities within PE, extracurricular sport and club sport to tackle this drop off in participation and facilitate lifelong activity participation.

Frequency of Participation in Club Sport/PA

The ESRI study found that 88% of primary participants were involved in club sports (Fahey et al., 2005). The proportion that reported never participating was 12%, which was considerably lower than the 25% of primary pupils who indicated that they never participate in extracurricular sport and PA (Fahey et al., 2005). This study also found that 21% of post primary participants reported that they never participate in sport played in clubs (similar to the 22% who reported never participating in extra-curricular sport in the school). These patterns suggest that club and extra-curricular sport and PA are both important. Research has indicated that the vast majority of adults (68%) do not participate in club sport, further highlighting the importance of promoting involvement throughout childhood and adolescence to increase chances of continuing participation into adulthood (Lunn et al., 2007).

Club Sport/Physical Activity and Demographic Factors

The frequency of participation in club sport has been largely found to be higher among males than females (Connor, 2003; De Roiste & Dineen, 2005). In the ESRI study, gender differences were also evident with males being found to be more frequently involved in club sport than females (Fahey et al., 2005). Another finding was that gender differences were also somewhat larger than in the case of extra-curricular school sport, suggesting that club sport in particular needs to be promoted among females. The influence of area of residence or region on club sport participation is understudied in Ireland and requires further research. With regards to the effect of SES, there is evidence that children from higher SES backgrounds are more likely to be involved in club sport than their lower SES counterparts (Connor, 2003). Connor (2003) comments that due to financial constraints, community based sport may even exaggerate disparities among social class. Research for the *Teenspace* report would support this finding that those in the lower SES groups were more likely to experience financial barriers to participation in recreation (De Roiste

& Dineen, 2005). These findings are not exclusive to Ireland; in Canada the CANPLAY study found that children and youth from the highest-income families report higher sport participation rates than children from lower-income households (92% vs. 72%) (Canadian Fitness and Lifestyle Research Institute, 2008). The current study will detail the types of club activities Irish adolescents engaged in and demographic variations which may help to identify the groups that are most in need of intervention and direct the efforts of sports policy and local sports partnerships.

Sedentary Behaviour

Sedentary behaviour refers to activities that do not involve participation in physical activity (Varo et al., 2003). Among youth, these include TV and video viewing, playing computer games, using the internet, talking on the phone, sitting and talking with friends and listening to music (Marshall et al., 2002). Technological sedentary activities that involve screen viewing such as watching TV, playing video games and using the computer have been given the majority of research attention. Current American Academy of Paediatrics (2001) recommendations advise that children and youth should not exceed 2 hours per day of sedentary screen time (SST; TV viewing, sitting playing video games, using computer). The International HBSC study found that 66% of 11, 13 and 15 year olds watched 2 hours or more of TV on weekdays (Currie et al., 2008). Irish 11, 13 and 15 year olds were slightly below this average (62%). The ESRI study noted that a similar percentage of post primary participants engaged in ≥2 hours of TV on weekdays (59%) (Fahey et al., 2005). The Take PART Study reported that 65% of 15-17 year olds viewed two or more hours of TV daily (Woods et al., 2004). It must be noted that all of these studies used different measures of sedentary behaviour. In the case of the HBSC study, participants were asked to indicate the amount of TV they watched each weekday. The ESRI study differed in asking participants to place their average TV watching behaviour during the week and on weekdays into one of 5 categories ranging from none to more than 6 hours per day. The Take PART study differed again, requiring participants to classify their usual weekday and weekend TV watching into one of nine categories from none to ≥7 hours per day. The use of different measures makes comparison across the research difficult and highlights the need to employ validated, reliable measures or objective measures to assess sedentary behaviours as accurately as possible.

Sedentary Behaviour and Demographic Factors

The effect of gender and age on sedentary behaviour has been reported within the literature. The Take PART study found that males viewed significantly more TV than females (2.4 hrs Vs 2.1 hrs) and more males exceeded the SST recommendation than females (70% vs. 60%) (Woods et al., 2004). The HBSC study observed significant gender differences for ≥2 hours of TV watching on weekdays in just over a third of countries with 11 year olds being the only age group to show a significant gender gap among Irish children (63% males, 56% females) (Currie et al., 2008). The ESRI study did not find any significant gender differences (Fahey et al., 2005). Research by Marshall, Biddle, Sallis, McKenzie and Conway (2002) argues that complete examination of youth sedentariness by gender requires examination of multiple sedentary behaviours as opposed to using TV watching as a sole indicator of sedentary behaviour. This study found that males were more likely to engage in technological sedentary behaviours while females tend towards social sedentary activities (Marshall et al., 2002). This finding suggests that the SST recommendation, which only considers TV viewing, video game playing and computer usage, has major limitations in terms of identifying those that are most sedentary. In terms of age differences, The HBSC study found that there was a general increase in TV viewing with age in just over half of countries (including Ireland). Higher levels of TV watching were also significantly associated with lower family affluence in Ireland and just over half of other countries (Currie et al., 2008).

Physical Activity and Sedentary Behaviour

The link between sedentary behaviour and PA, especially among children is somewhat unclear. One theory is that involvement in sedentary behaviour limits the time available for participation in PA. As stated previously, the majority of existing studies focus on single behaviours, mainly TV viewing, or define inactivity or sedentariness as failing to meet PA recommendations (Marshall et al., 2002). Marshall et al. (2002) maintains that PA and sedentary behaviour are distinct behaviours. This study found three clusters among each gender (Marshall et al., 2002). Within one cluster of boys, deemed the "techno actives", 26% played more than 1 hour of video games per day and 27% watched ≥4 hours of TV per day, yet 94% of boys in this cluster met PA recommendations. Cluster 2, the "non socialising

actives", was comprised of boys that engaged in infrequent levels of social sedentary behaviour (sitting and talking with friends/listening to music, yet the majority (92%) engaged in PA that exceeded twice the recommended guidelines. A third cluster of boys "the uninvolved inactives" was characterised by relatively low sedentary activity and low proportions meeting recommendations (10%). Clusters emerging among girls were the "sociable actives" (high social sedentary behaviour and high percentage meeting PA recommendations), "non socializing actives" (low sedentary behaviour, high activity) and "uninvolved actives" (low sedentary behaviour, low activity) (Marshall et al., 2002). The high levels of activity alongside high levels of sedentary behaviour found in this study suggest that PA and sedentary behaviour are distinct behaviours that don't displace each other (Marshall et al., 2002). In addition, Marshall et al. (2002) found only small positive correlations between sedentary behaviours and PA (r=.22). The findings of this study are strengthened by the use of a validated measure of sedentary behaviour, the SAPAC. In contrast to the findings of Marshall, the Take PART study found that non regularly active males were more likely to have a high TV viewing behaviour than their regularly active counterparts (59 vs. 46%) (Woods et al., 2004). However, the use of different measures of sedentary behaviour makes comparison difficult. The relationship between PA and sedentary behaviours requires additional research using validated measures.

Physical Health

With regards to aerobic fitness as a measure of physical health, there is a paucity of research examining fitness levels among Irish adolescents. Although the Take PART study used validated and standardized protocols in administering the 20 metre shuttle run test to measure aerobic fitness, this study did not apply criterion related fitness standards (Woods et al., 2009). Criterion related fitness standards, known as FITNESSGRAM standards, have been developed by the Cooper Institute (2004). These standards allow for classification of healthy and unhealthy levels of fitness based on gender and age specific cut off points. The use of these criterion referenced standards for aerobic fitness has been shown to be a valid method to identify those with those with a high cardiovascular risk profile (Lobelo, Pate, Dowda, Liese, & Ruiz, 2009). In addition longitudinal studies have shown that criterion referenced fitness tracks moderately from youth to adulthood (Malina,

2001) and that fitness levels during adolescence predict adult total and central body fatness (Eisenmann, Wickel, Welk, & Blair, 2005), blood pressure (Boreham et al., 2001), blood lipids (Carnethon et al., 2005) and prevalence of metabolic syndrome (Ferreira et al., 2005). Research by Lobelo, Pate, Dowda, Liese, and Ruiz (2009) found that 70% of 1247 adolescents (46% male, age range 12-18 years) in the United States were classified as fit using FITNESSGRAM standards. Given the importance of cardiovascular fitness to adolescent and adult health, there is a need for meaningful aerobic fitness data on Irish adolescents using validated standards.

Most studies that have been carried out on the health of Irish adolescents have used BMI as a sole indicator of health. The Report of the Irish Taskforce on Obesity estimated that were approximately 300,000 overweight and obese children in Ireland and that this number is probably rising at a rate of 10,000 per year (National Taskforce on Obesity, 2005) with the SLAN survey 2002 indicating at least a 1% increase in obesity every year (Kelleher et al., 2003). The Take PART Study found that 17% percent of participants were overweight and 5% were obese. A further 9% were underweight and 69% were normal weight (Woods et al., 2004). BMI was measured objectively in this study using standardised procedures providing strength to this finding. The International HBSC survey gathered information on height and weight among children aged 11, 13 and 15 years (Currie et al., 2008). This information was based on self-reports by the children rather than objective measurement and, in Ireland, was subject to high rates of item non-response. The findings should therefore be interpreted with caution. Results indicated that 15% of 11, 13 and 15 year olds were obese or overweight (Currie et al., 2008). The ESRI study found that the overall rate of obesity among 13-18 year olds was 19% and 4% respectively (Fahey et al., 2005). However a limitation of the measurement of BMI in this study was that children were not asked to remove footwear when measuring height and weight. Findings are therefore subject to overestimation and an increased margin of measurement error overall. All of these studies used the validated BMI cut off points by Cole et al. (2000) described previously, but it is clear that objectively measured rates of overweight and obesity using standardized testing procedures are still widely understudied in Ireland.

Research has indicated that waist circumference is a good measure of central adiposity and obesity, perhaps better than BMI as it gives an indication of

distribution (McCarthy, 2006). A central distribution of body fat, rather than a more peripheral distribution, carries a higher risk for obesity-related ill health. In a review of waist circumference McCarthy (2006) comments that attention to abdominal fatness in children is important as excess abdominal fatness in childhood results in metabolic alterations associated with features of the metabolic syndrome and hence risk for CVD in later life such as increased insulin sensitivity, increased LDL cholesterol, increased blood lipids and increased blood pressure. A study by Flores-Huerta, Klünder-Klünder, Reyes de la Cruz and Santos (2009) found that high blood pressure was found to have a direct correlation with increases in waist circumference. Another study Lee Bacha, Gungor and Arslanian (2006) found a good correlation between waist circumference and lipid profile further strengthening the evidence for measuring waist circumference to detect features of the metabolic syndrome and CVD risk factors. Despite the fact that waist circumference has been established as a reliable indictor of central adiposity among children that is easy and cost effective to measure, there have been no population studies which have measured waist circumference among Irish children using validated cut off points relative to age and gender.

In terms of blood pressure as an indictor of health among children and adolescents, research has found that high blood pressure among children often clusters with other cardiovascular disease and metabolic syndrome risk factors such as central adiposity, high triglycerides, low high density lipoprotein cholesterol and hyperinsulinemia (Cook, Weitzman, Auinger, Nguyen, & Dietz, 2003; Williams et al., 2002). In children and adolescents the normal range of BP is determined by body size and age. BP standards developed by the National High Blood Pressure Education Program Working Group on High BP in Children and Adolescents (2004) that are based on gender, age and height provide a more precise classification of BP according to body size. This approach avoids misclassifying children or adolescents who are very tall or short. Despite the existence of these validated standards and documented research relating high blood pressure in children to metabolic and CVD risk factors, there have been no studies which have collected blood pressure data on Irish adolescents with application of height, gender and age standardised cut of points. This data would be useful in giving an indication of those that are at risk of hypertension and possible cardiovascular complications in future.

Physical Health and Demographic Factors

In relation to the effect of demographic factors on physical health, inequalities are not as conclusive as they are among PA. With regards to BMI, The Take PART study found that a similar proportion of males and females were obese or overweight. The ESRI report found no statistically significant gender differences in their measurement of BMI (Fahey et al., 2005). The International HBSC study also showed little evidence of a gender gap in that 15 year olds were the only age group in which significantly more males than females reported overweight or obesity (Currie et al., 2008). In terms of an the influence of age, the International HBSC study indicated that 17% of 11 year olds, 14% of 13 year olds and 13% of 15 year olds were obese or overweight with no significant age effect (Currie et al., 2008). The ESRI report also reported that no clear age pattern was observed for obesity or overweight (Fahey et al., 2005).With reference to obesity and SES, the International HBSC study indicated that obesity was associated with overweight and obesity in about half of the countries surveyed, with those from lower affluence families being more likely to be overweight or obese (Currie et al., 2008). There is some evidence for an effect of area of residence with this pattern showing to be most prevalent in western European countries {{239 Currie, C. 2008}}. However as stated previously, the use of self reported height and weight in this study was a major methodological flaw.

With reference to fitness and gender, Lobelo et al. found that more males than females were classified as aerobically fit (71% vs. 68%) but this finding was not statistically significant (Lobelo et al., 2009). In the Take PART study, males completed significantly more laps than females (Woods et al., 2004). With reference to age and fitness the Take PART study found no significant difference on total number of laps completed across age groups (15, 16 or 17 years) (Woods et al., 2004). Given that criterion referenced standards were not utilised in this study, it is difficult to evaluate the true effect of demographic factors relative to developmental differences between genders at different ages.

Physical Health and Physical Activity

As discussed in section 2.3, the relationship between physical health and PA in children is not as well established as it is among adults however links between

physical health and activity have been observed among many studies.

With regards to the relationship between cardiovascular fitness and physical health research by Gutin Yin, Humphries and Barbeau (2005) found that a higher cardiovascular fitness was associated with higher amounts of oobjectively measured PA and meeting of criterion referenced fitness standards among N=421 16 year old adolescents. There is also evidence that the influence of PA on blood pressure acts through a path of increasing cardiovascular fitness with longer PA interventions showing more significant decreases in blood pressure than short term interventions although this relationship is thought to be somewhat inconclusive (Hansen et al., 1991). A review by Malina (2001) also suggested that physical fitness tracks better than PA into adulthood and this finding has been supported by several studies (Janz et al., 2000; Telama et al., 2005). This researcg highlights the importance of obtaining accurately measured fitness levels among Irish youth.

The fundamental cause of obesity and overweight has been identified as an energy imbalance between energy intake and energy expenditure and a subsequent storing of body fat. However the relationship between obesity/overweight and PA has been found to be somewhat inconclusive among adolescents. Molnár and Livingstone (2000) reviewed the evidence on this issue in relation to children and adolescents. Of the 7 studies they examined, 4 found an association between PA and weight gain. Wareham van Sluijs and Ekelund (2005) found similar results with many studies finding no effect of PA on weight gain, while in those that did, the measures of association tended to be small. The ESRI report found that 16% of normal weight post primary participants vs. 11% of overweight and obese participants met the MVPA recommendation of 60 minutes of daily MVPA. However it was not stated if this finding was statistically significant, and it was concluded that the relationship between obesity and PA found no strong associations (Fahey et al., 2005). The authors reasoned that this lack of relationship may be due to the fact that measures of PA used in population research do not adequately capture real variations in energy expenditure or because variations in energy expenditure are too small to counteract the effects of other factors such as diet (Fahey et al., 2005). It would seem that more sophisticated and objective measurements than self report are required to clarify the relationship between PA and risk of obesity and overweight.

Physical Health and Sedentary Behaviour

In terms of the relationship between health and sedentary behaviour, the WHO (2002) study on risk factors identified sedentary behaviour as an independent risk factor for at least 35 chronic health conditions (World Health Organization, 2002). However cross-sectional and longitudinal data between adiposity and TV viewing has found somewhat weak associations. A study of 4063 children aged 8 through 16 years involved in the NHANES study found that those that watched more than 4 hours of TV per day had a higher BMI and higher body fat than those that watched less than 2 hours a day (Andersen et al., 1998). Although BMI and body fat were measured objectively by a researcher, sedentary behaviour was measured by asking the participants to indicate the number of hours of TV watched the day before they completed the questionnaire. Use of this unvalidated measure of sedentary behaviour confounds the results of this study somewhat. In an Irish context, the Take PART study found that more obese respondents had a high sedentary leisure habit (i.e. ≥2 hours per day), in comparison to normal weight, overweight or underweight adolescents (Woods et al., 2004). As noted previously the measurement BMI was measured objectively but the sedentary behaviour measure was not validated. In contrast to the Take PART study, the ESRI report found no clear association between obesity or overweight hours and hours spent watching TV or playing video games (Fahey et al., 2005). However as noted previously standardized protocols for measurement of height and weight were not used and an unvalidated measure of sedentary behaviour was used. The use of objective measures of health, standardized protocols and validated measures is essential to investigate the relationship between physical health and sedentary behaviour.

Summary of Section 2.5

Despite the documented current and future benefits of a physically active lifestyle, PA levels, sedentary behaviour habits and physical health levels among children and adolescents are cause for concern. To address this issue we need to accurately assess the Irish situation with respect to demographic factors, different types of PA and sedentary behaviours and a range of health indictors using validated self report measures, objective health measures and standardized protocols. We need to investigate the relationship between PA, sedentary behaviour and physical health

further. We also need to understand what factors motivate or prevent children from adhering to regular health enhancing PA. This investigation requires detailed investigation and careful consideration of the correlates of PA for children and adolescents.

2.6 Correlates of Physical Activity for Children and Adolescents

A wide variety of theories, models and research has focused on analysing the factors that influence PA behaviours in both adults and children. Identified determinants are classified into demographic, personal and biological factors (age, sex, SES, ethnicity, genetic influences, overweight/obesity), behavioural factors (activity history, dietary habits, processes of change, coping skills, smoking), psychological factors (attitudes, perceived barriers, enjoyment, intention to be active, mood disturbance, self efficacy, perceived competence, self motivation), social environment factors (support from family friends, parent PA) and physical environment factors (access to facilities, availability of conducive environments) (Berger, Pargman, & Weinberg, 2007). These correlates have been investigated separately by an extensive number of researchers and there is of course wide variation among findings. It is therefore advisable to look to review papers to gain a clearer picture. This section will compare and critique 3 reviews of correlates of PA in youth; Sallis Prochaska, and Taylor's (2000) *Review of Correlates of Physical Activity for Children and Adolescents*; Biddle, Whitehead, O Donovan, and Nevill's (2005) *Correlates of Participation in Physical Activity for Adolescent Girls: A Systematic Review* and Van der Horst, Paw, Twisk, and Van Mechelen's (2007) *A Brief Review on Correlates of Physical Activity and Sedentariness in Youth*. The reviews by Sallis et al. and Van Der Horst et al. included children (4-12) and adolescents (13-18). Considering the cohort of this study (10-18 year olds) Table 1 and Table 2 depict the adolescent studies only.

Table 1: **Summary of Correlates of Physical Activity Review Papers**

Review Paper	Number of Studies Included	Number of Variables Studied	Study Characteristics	Mean and Range of Sample Sizes
Sallis et al.,2000	54	1-28	83% cross sectional, 69% unvaildated self report, 28% empirically supported self report, 4% objective measures	Mean sample size 1286 (SD= 1645 Range=51-7302)
Biddle et al., 2005	50	1-21	80% cross sectional 20% longitudinal or perspective 18% unvalidated self report, 61% validated self report,8% objective measures, 8% unvalidated self report and objective measures, 6% validated self report and objective measures	Mean sample size =2448 Female only=22-9309 mean=1280 Range 48-17,776
Van der Horst, et al., 2007	43	1-23	7% prospective study, 9% objective measures	Not specified

Sallis et al.'s review of the correlates of PA was viewed as one of the most comprehensive reviews in the field up until Van der Horst et al. updated and extended the review to include correlates of sedentary behaviour in addition to PA. In between the publishing of these two reviews, Biddle et al.'s review provided further correlational research on adolescent girls specifically. Each review included studies that looked at one or more variables and in total up to 28 variables were investigated for association with PA or with sedentariness in the case of Van der Horst and colleagues' paper. Table 2 summarises and compares the associations found by each review paper for each variable. They are broken down into demographic, behavioural psychological, social environment and physical environment correlates. The legend shows the criteria for association categorisation.

Table 2: Comparison of Findings of Correlates of Physical Activity Reviews

Category of Variable	Correlates	Association Sallis et al., 2000	Association Biddle et al., 2005	Association Van der Horst et al., 2007
Demographic and Biological	• Gender (Female)	-	-	-
	• Age	-	-	-
	• Ethnicity (Caucasian)	+	+	0
	• BMI/skinfolds	0	-	0
	• Family Income/SES	0	+	0
	• Higher Parental Education	NI	+	+
Behavioural	• Smoking	?	-	0
	• TV/Sedentary Time	-	?	0
	• Participation in organised sport(school)	0	NI	+
	• Participation in organised sport (community)	+	+	NI
	• Active Commuting	NI	NI	NI
Psychological	• Perceived Competence	+	+	0
	• Self Efficacy	?	+	+
	• PA Enjoyment	00	+	0
	• Perceived Barriers	0	-	?
Social Environment	• Peer Involvement and Support	+	?	+
	• Family Support	+	+	+
	• Teacher Support	NI	NI	NI
Physical Environment	• Access to Facilities	00	NI	0

Note: When more than 75% of association were in a similar direction this was coded as += positive association, - = negative association, 00= no association. When 50-75% of associations were in a similar direction this was coded as +, - or 0. When exactly 50% of the findings were in a positive or negative direction, or there was a lack of consistency in the findings it was coded ? = inconclusive, NI= not included in review.

Comparison and Critique of Correlate Studies

The wide range of factors that were found to be associated with PA across the 3 reviews reflects that youth PA is a complex behaviour determined by many factors. Comparing the reviews across demographic personal and biological variables there is consensus that female gender and increasing age are negatively associated with activity during adolescence. This gender gap has been widely supported by population studies (Canadian Fitness and Lifestyle Research Institute, 2008; Currie et al., 2008; Fahey et al., 2005; Woods et al., 2004) Although there was a positive association observed for SES/family income among studies involving females in the review by Biddle et al., the other two reviews concluded that there was no association. However both Sallis et al. and colleagues and Van der Horst et al. reported an association for parental education which is an alternative indication of SES. These inconsistent findings for SES have been reported in large scale studies such as the International HBSC study (Currie et al., 2008). Biddle et al. also found a negative association for BMI among females but Sallis et al. and Van der Horst et al. concluded that there was no association, consistent with the inconclusive literature surrounding BMI and PA among adolescents (Molnár & Livingstone, 2000; Wareham et al., 2005).

The behavioural associations with PA contrasted between reviews. Participation in community sport was the only behavioural variable that was positive across two reviews with Van der Horst et al. not including this variable in the review. Participation in school sport was not studied in Biddle et al. paper but Sallis et al. found no association while Van der Horst et al. reported a positive association. None of the reviews included a review of the relationship between PA and active commuting to school, highlighting that this variable is an understudied form of PA. The relationship between smoking and PA was deemed inconclusive by Sallis et al., negative by Biddle et al., and unassociated by Van der Horst et al. Similarly, TV viewing and sedentary behaviour showed differing results across the reviews with Sallis et al. being the only review to conclude that the relationship was negative, reflecting previous discussion of the unclear link between sedentary behaviour and PA.

There is little consistency in the psychological results reported across the reviews. Two of out of three found that higher levels of perceived competence and self-efficacy were associated with greater PA. Perceived competence refers to a

perception of control over the outcome and is associated with mastery of a desired behaviour (Biddle & Mutrie, 2007). Self Efficacy refers to ones belief in their ability to perform a desired behaviour. It is surprising that Sallis et al. found inconsistent results given that self efficacy has received the most support of any variable in predicting adherence to PA (Berger et al., 2007). Physical activity enjoyment was found to have a positive association only by Biddle et al and among females. Similarly, Biddle et al. reported that higher levels of perceived barriers are associated with lower PA among girls (negative relationship). In contrast, Sallis et al. concluded that there was no association and Van der Horst and et al. reported inconclusive findings. Barriers to PA for youth can typically include a lack of time, willpower, resources, skills and social influences or fear of injury (Center for Disease Control and Prevention, 2001).

The social environment showed more similarities across reviews. Family social support was the only variable (apart from age and gender) that showed consensus across all three reviews, indicating that the positive relationship between family support and PA is very strong across the research and that parents still play an important role in their teenagers lifestyle. Social support can from family can be direct (providing transportation, paying fees or participating with the child) or indirect support that is non tangible (positive reinforcement and encouragement) (Berger et al., 2007). Peer involvement and social support were positively associated with PA in the reviews by Sallis et al. and Van der Horst et al. but Biddle et al. concluded that there were inconclusive findings among females.

Access to services/facilities was the only physical environment variable that was included by Sallis et al. and Van der Horst et al .Both studies reported no association with PA. Biddle et al. did not include any physical environment variables. This exclusion highlights that these variables have been somewhat neglected in the research and have not been given as much attention as demographic, psychological and social environment variables. Environmental variables have however been subject to other reviews specific to the environment.

In conclusion, there are many inconsistencies across these reviews, perhaps due to measurement error, varying sample sizes, differing patient characteristics and use of different analysis techniques. It could be argued that given the gender differences in PA, correlates should be analysed separately concurrent with the review by Biddle et al. Regardless of inconsistencies, the findings of these reviews

emphasise that PA can be influenced by a range of personal, behavioural, psychological and environmental factors. Collectively, these finding imply that interventions should target variables from all categories to illicit substantial behaviour change. Due to the complexity of context influencing PA correlates, there is need for specific information on the correlates of PA for Irish children and youth.

Theoretical Models of Physical Activity

Theoretical models of PA offer rationale as to the specific workings and interactions of variables and give an overall rationale as to how the exercise process works. They provide a framework under which we can better understand the reasons why individuals adopt and maintain, or avoid a physically active lifestyle (Berger et al., 2007). Many models of PA have been developed. These include the Health Belief Model, The Theory of Reasoned Action, The Theory of Planned Behaviour, Self-Efficacy Theory, The Transtheoretical Model and Social Ecological Theory (Berger et al., 2007). The Self Efficacy Theory reasons that behavioural changes are mediated not by health outcomes or the decision making process, but by self efficacy (Bandura, 1977). Self efficacy refers to an individual's belief in their ability to execute behaviour. Bandura states that self efficacy influences the choice of tasks, the effort exerted and the degree of persistence. It is a social cognitive approach in which exercise behaviour is determined by an interaction of cognitive, physiological, behavioural and environmental factors (Bandura, 1977).

The Social-Ecological Model

The Social-Ecological model recognises the influences of individual, social environmental, physical environmental and policy components on behaviour. The inclusion of the policy influence is a development on the Social Cognitive Theory. Ecological and Social-ecological models of human behaviour have evolved over a number of decades in the fields of sociology, psychology, education and health and focus on the nature of people's interactions with their environments (Berger et al., 2007). The social-ecological model considers that attention to intra personal factors (individual), interpersonal factors (social), the physical environment and policy are necessary to achieve substantial changes in health behaviours, including PA behaviour (Stokols, 1996). In developing the social ecological model, the work of Bronfenbrenner (1994) saw the influences on behaviour as a series of layers, where

each layer had a resulting impact on the next level as seen in Figure 1. For example, individual influences on a child's PA participation (attitudes, behaviours, beliefs, perceived barriers, motivation, enjoyment, self efficacy, skills) are rooted within their social environment of family, friends and school (peer, family and teacher social support). These individual and social influences are set within the physical environment (access to facilities, pedestrian safety), which is in turn embedded within the different levels of policy environment (planning and legislation from government, county councils, school policies).

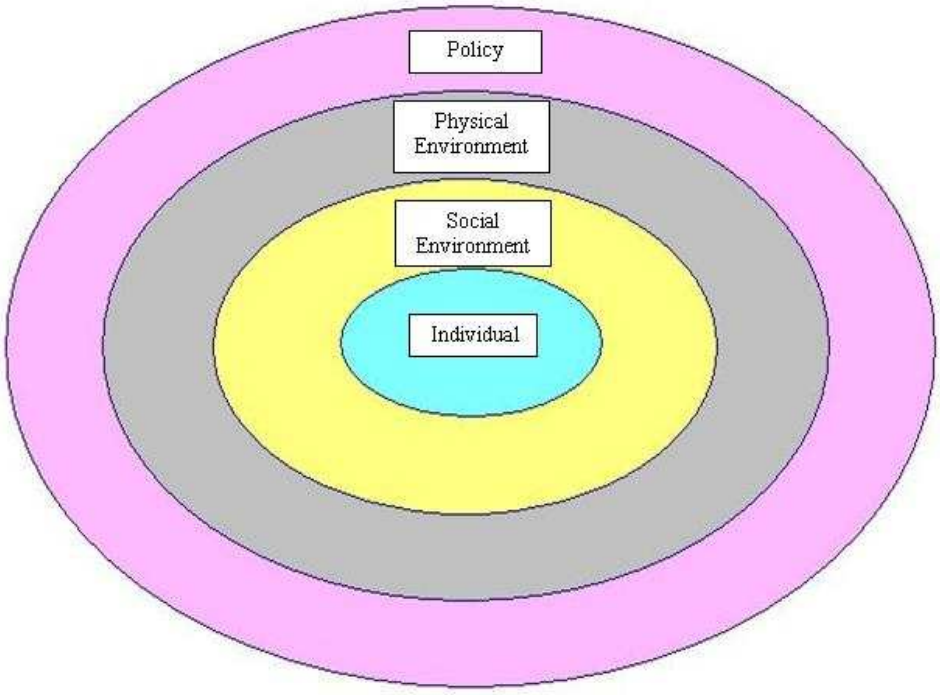

Figure 1: Graphic Representation of the Social-Ecological Model

Social Ecological Model and Physical Activity

The application of ecological models to improve understanding of influences on youth PA is supported by the wide range of correlates that have been found to influence PA in previously discussed reviews by Sallis et al. (2000), Biddle et al. (2005) and Van Der Horst et al. (2007). In addition, the social ecological approach has been adopted for numerous review articles (Biddle, Gorely, & Stensel, 2004; S.

Biddle & Fuchs, 2009; Sallis, Taylor, Dowda, Freedson, & Pate, 2002) and study designs (Bengoechea et al., 2010; Humbert et al., 2008), and has been found to be an effective framework for adolescent PA intervention design (Elder et al., 2007; Luepker et al., 1996; Woods et al., 2009). The study of PA in this research will be based on an ecological approach to understanding PA. Consequently, it will involve an investigation of intra-personal (demographic, biological and psychological) inter-personal (social environment) and extra-personal (physical environmental) variables as potential correlates of youth PA.

2.7 Physical Activity Enjoyment

We have seen that attention to the broader picture through investigation of the combined efficacy of correlates of PA is important in order to understand the nature of PA as behaviour. However, in terms of intervention design it is also very important to investigate single variables to determine their importance for specific cohorts.

The current PA recommendations reference enjoyment directly, in saying that children should receive at least 60 minutes of daily PA that is developmentally appropriate, involves a variety of activities and is enjoyable (Department of Health and Children, Health Service Executive, 2009). Given that enjoyment is an element of the recommendations, and the goal of youth health promotion is to increase uptake and adherence of recommended levels of PA, it is logical that enjoyment is studied and carefully considered in an Irish context. This section will focus on discussion of the various measures that have been developed to assess physical activity enjoyment, definitions and concepts of physical activity enjoyment, the link between enjoyment and PA participation and its relationship with other correlates of PA.

Measurement of Physical Activity Enjoyment

The measurement of physical activity enjoyment has been studied over the last 20-30 years, culminating in the development of a number of measures.

The Physical Activity Enjoyment Scale (PACES)

Perhaps the most widely used measure, and the one that has received most attention in terms of validity research is the Physical activity enjoyment scale.

Research by Kiendzerski and DeCarlo, (1991) led to the generation of a set of 39 bipolar items. These items were primarily based on; i) an examination of the exercise adherence and exercise enjoyment literature ii) examination of dictionary and thesaurus entries, iii) discussions between the authors undergraduate subjects and acquaintances about affective responses to PA. Several items were generated from interviews with 16 individuals (age 23-65). They were asked to describe what they liked and disliked about PA and to describe how they felt while doing PA (Kendzierski & DeCarlo, 1991). Every item that authors could generate based on this information was included at this stage. The resulting list of 39 items was them submitted to 3 experts in the field of exercise adherence. They rated the extent to which they thought each item should or should not be included. Of the 39 items 19 were deemed suitable for further study, and a further item was dropped due to a total item correlation below the .30 criterion. The 18-item, 7-point bipolar PACES scale was then tested for reliability and validity by carrying out 2 studies (Kendzierski & DeCarlo, 1991). In study 1, each subject rode an exercise bicycle under control (no external stimuli in the room) and external focus conditions (choice of music provided to subject) before being asked to fill out the PACES and a measure of boredom proneness. The PACES had high internal consistency in both conditions (Cronbach alpha=.96). As predicted, subjects reported enjoying the exercise more as measured by the PACES in the externally focused condition. There was also a significant negative correlation in the control condition between subjects PACES scores and their scores on a measure of boredom proneness. This finding implied that those that were particularly prone to boredom enjoyed the control condition least due to lack of external stimuli. In the second study, each subject rode an exercise bicycle and jogged on a mini trampoline in separate sessions each then chose one of these activities for their 3rd session. Once again as predicted there was a significant relationship between subjects PACES ratings and their choices of activity. Cronbach alpha (0.96) and test retest reliability was high for jogging and moderate for bicycling. It is important to note that these studies were carried out with college aged males and on specific activities so the findings applicability to other populations and other activities is limited. There was also very small sample sizes used. However, these studies were important in terms of development of this instrument and they provided preliminary evidence for the reliability and validity of PACES.

PACES was then developed for use with adolescents by Motl et al. (2001). This research made several modifications to the PACES based on an evaluation of the instrument by focus groups of eighth-grade girls. Two of the original 18 items (Item 5, "I am very absorbed in the activity," and Item 11, "It's very invigorating") were removed because the content was not relevant to enjoyment in eighth-grade girls (Item 5) or the content was redundant with other items (Item 11). Some of the remaining 16 items were rewritten to improve comprehension. The rating scale was changed to a 5-point likert scale that ranged from 1 ("Disagree a lot") to 5 ("Agree a lot"). The questionnaire was administered to N=1797 adolescent eighth grade girls (mean age=13.6 years, SD 0.6). Results showed evidence of factorial validity and construct validity indicating that the PACES was a valid measure of physical activity enjoyment among adolescent girls.

Further research sought to test fit of uni-dimensional model to data obtained from summer youth sport camp participants (N=279, mean age=14.4 years) using confirmatory factor analysis (Crocker, Bouffard, & Gessaroli, 1995). Participants completed a 30 minute session of track and field, basketball soccer or tennis before completing PACES. It was found that there was a lack of support for the uni-dimensional structure of PACES. The authors concluded that there is a need to resolve research questions relating to measurement of enjoyment. They reasoned that some items are related to excitement sensation while others are linked to competence motives or general affective states. Thus they concluded that the scale may be measuring both antecedents of enjoyment and perceptions of enjoyment, and hypothesised that using exploratory factor analysis may produce single factor solutions. They suggested that the nature of enjoyment, as a concept or construct needs to be explored more to further clarify these measurement issues (Crocker et al., 1995).

More recently a study by Moore et al. (2009), sought to determine the reliability and validity of the revised PACES in elementary school children. The sample consisted of 564 3rd grade (268 male, 296 female, mean age= 8.72, SD= .54) African American and European American children. In order to make the model comprehensible to children of this age group, one further modification was made in changing the word depressed to sad in one item of the questionnaire. Results indicated that the PACES displayed good internal consistency (0.87) and item-total correlations. Confirmatory factor analyses supported uni-dimensional factor structure

in contrast to the previous study by Crocker et al (1995). Scores correlated significantly with task goal orientation and self reported PA (r=.16) however, results of intervariance suggest the factor structure is variant across gender. This finding may suggest boys and girls respond differently to questions based upon activity preference. This study provided strong support for the validity of PACES in younger age groups.

Additional Measures of Physical Activity Enjoyment

Additional measures have been used, particularly in terms of assessing sport enjoyment. Wankel and Kreisel (1985) developed a 10-item Minor Sport Inventory to investigate participant enjoyment of sport. The items were developed based upon review of literature and open ended interviewing of 50 youth sport participants. The list was then reviewed to create a concise list of items. A test retest over 1 week obtained a 73% reliability level with a younger sample and 86% reliability with an older sample over 2 days. Scanlan, Carpenter, Lobel and Simons (1993) also developed a 4-item scale to measure enjoyment of sport. This measure adds "happy" and "enjoy" items to an earlier, 2-item scale consisting of "liking" and "fun". Factor analysis demonstrates that these items form a single, reliable scale. Moreover, this finding indirectly strengthens past research by suggesting that the enjoyment, liking and fun items used throughout the literature are likely similar terms, hence their validity as measures of enjoyment is enhanced. There is therefore evidence for the use of these measures to determine sport enjoyment in youth, however given that this study is concerned with investigating physical activity enjoyment, it is permissible and logical to use the modified physical activity enjoyment scale (PACES) in the present study considering its validity has been shown in the previously discussed studies among children and adolescents of different ages and backgrounds.

Defining Physical Activity Enjoyment

The defining of physical activity enjoyment and the nature of physical activity enjoyment has been acknowledged as important, but are poorly understood concepts in research. Exercise psychology is ‘the application of psychology to antecedents and consequences of health-related PA’ (Biddle & Fuchs, 2009). Antecedents refer to factors influencing uptake of PA whereas mediators refer to intervening psychological constructs that may influence PA behaviours or outcomes

of an intervention. Psychological consequences are outcomes of PA such as health benefits or changes in depression or cognitive functioning as a result of PA (Biddle & Fuchs, 2009). In terms of physical activity enjoyment, the nature of this concept and whether it is an antecedent (i.e. a factor that motivates one to take up PA) a mediator (a construct that influences the outcomes) or a consequence of PA is unclear. There are a number of physical activity enjoyment concepts that have been developed and adopted by numerous researchers in the area in an attempt to clarify the concept of physical activity enjoyment.

The Flow Model of Physical Activity Enjoyment

Research by Csikzentimihalyi and Csikzentimihalyi (1975) studied why people invest time and energy in tasks appearing to yield limiting external rewards. The conclusion was that motivation is highest when the difficulty of the task is matched to the person's abilities and skills. This matching led to a state of flow or supreme enjoyment and engagement in the task. A mismatch can lead to either boredom (low challenge/high skills) or anxiety (high challenge/low skills). Kimiecik and Stein (1992) developed upon this Flow Model of enjoyment to propose 6 dimensions of flow in sport specifically matching of action and awareness, clear goals and unambiguous feedback, concentration, paradox of control, loss of self consciousness and loss of awareness of time. Kimiecik and Harris also (1996) defined enjoyment in terms of flow. They suggest that enjoyment is not positive affect but an optimal psychological state. In other words enjoyment is a psychological state that leads to positive feeling states. This theory would suggest that enjoyment is a psychological consequence of PA.

Intrinsic Motivation

Intrinsic motivation is a further area which has been associated with physical activity enjoyment. High intrinsic motivation includes high effort, feelings of enjoyment, competence, autonomy and self determination and low levels of pressure and anxiety (Deci & Ryan, 1985). Deci and Ryan (1985; 1987; 2000) have directed a great deal of attention towards the self determination of behaviour through intrinsic motivation. They pose that enjoyment is derived from achievement behaviour, which is intrinsically motivating and provides perceptions of competence and self determination or autonomy. While some researchers use the constructs of enjoyment

and intrinsic motivation somewhat interchangeably, Scanlan et al. (1993) contend that these two constructs need to be clearly distinguished. These authors view enjoyment as a broader, more inclusive construct with many diverse sources possible including intrinsic (e.g., sensory/movement experiences, feeling fit), extrinsic (e.g., receiving tangible rewards or social recognition), achievement related (e.g., demonstrating autonomous or social achievement), or non-achievement related (e.g., affiliation, travel opportunities). In contrast, intrinsic motivation is typically thought to derive from a limited set of achievement related factors. The Flow Model highlights accomplishment, skill development and mastery as important aspects of enjoyment as outlined by Deci and Ryan (2000) and similarly does not maintain that enjoyment has and extrinsic component as Scanlan et al. (1993) propose. In contrast to the Flow Model, self-determination theory suggests that physical activity enjoyment is a mediator of achievement and self determination.

Theory of Motivation

Harter's (1978, 1981) theory of motivation also parallels some of the concepts within self-determination theory (Brustad, 1988). Central to Harter's theory is the desire to show competence. The basic concepts of this theory are that successful independent attempts in mastery experiences foster perceived competence, which leads to intrinsic motivation, and hence an innate desire to remain involved. However, Harter's theory contends that socialisation experiences may contribute extensively. In terms of factors that have been found to be important, research by Wankel and Kreisel (1985) found that intrinsic factors were most important to enjoyment whereas social factors were of secondary importance and extrinsic factors such as winning were even less important. The theory of motivation thus would pose enjoyment as a mediator of perceived competence and intrinsic motivation.

Scanlan's Sport Commitment Model

Sport enjoyment has also been given some specific attention, particularly by Scanlan, et al (1993). Scanlan et al.'s (1993) study of sport in children led to the development of the Sport Commitment Model. Sport commitment was defined as a "psychological construct representing the desire and resolve to continue sport participation" (Scanlan et al., 1993). Sport enjoyment was proposed as central to this model with enjoyment defined as " an individuals positive affect response to his her

competitive sport experience which reflects feelings and or perceptions such as pleasure, liking and experiencing fun" (Scanlan et al., 1993). They proposed that sport enjoyment was concerned with intrinsic achievement in reference to personal perceptions of mastery and competence, intrinsic non achievement (physical movement sensations and excitement) extrinsic achievement (competence derived from social approval) and extrinsic non achievement (non performance related such as affiliation). This model again highlights the importance of intrinsic motivation in sport and PA but also emphasises that external social factors can play a role in enjoyment, and suggests that enjoyment is a psychological consequence of PA.

Enjoyment as a Motive or Antecedent for Physical Activity

Motives that children report for taking part in PA and sport are considered important areas for investigation. Many population based studies and government surveys have reported that children and youth report enjoying PA or fun as top priorities for taking part in PA and sport. A study in Italy with over 2500 participants found that enjoyment was the most frequently reported reason for participation in youth sports given in response to open ended questions (49.2%), ahead of physical health/fitness reasons (32%) social reasons (8.9%) competition (4.2%) skill motives (2.9%) and social status (2.8%) (Buonamano, Cei, & Mussino, 1995). Similarly, in an international study, children aged 11, 13 and 15 rated the degree to which they thought certain reasons were important for liking sport or PA (King & Coles, 1992). Comparable data was obtained between Canada and Poland, with Canadian 11 year olds much more likely to report fun than children of the same age from Poland, with the trend reversed for winning.

In Ireland, there have been no cross-sectional studies of physical activity enjoyment, however public consultation data from the *Teenspace National Recreation Policy for Young People* reported that enjoyment was a key motivator to participation in recreation (Office of the Minister for Children and Youth Affairs, 2007). A review by Biddle (1999) concluded children are motivated by diverse reasons including fun and enjoyment, learning and improving skills, being with friends, success and winning, physical fitness and health. This study concluded that more research was needed to understand the differences in motives across activities, levels of participation, and developmental stages (Biddle, 1999). Given that physical activity enjoyment has been found to be an important motivator by international

studies and reviews, there is a need to understand physical activity enjoyment more fully and explore it in an Irish context.

Physical Activity Enjoyment and Compliance

Aside from evidence that physical activity enjoyment is a motivator or antecedent for PA, there has also been research to suggest that enjoyment is important for PA compliance and that is acts as a mediator to prevent drop out. In the previously mentioned *Teenspace* report, lack of interest was one of the main reasons for dropping out of sport (Office of the Minister for Children and Youth Affairs, 2007). Gould (1987) summarised reasons for children dropping out of sport as conflicts of interest, lack of playing time, lack of fun, limited improvement in skills or no success, boredom and injury. Similarly, qualitative and quantitative reviews on children and PA stress the importance of enjoyment and development of perceptions of competence as a means of encouraging and maintaining PA behaviours (Allender, Cowburn, & Foster, 2006; De Bourdeaudhuij, 1998).

Physical Activity Enjoyment and Physical Activity

Research has suggested that physical activity enjoyment is associated with taking part and maintaining PA, but it is also necessary to explore studies which have looked at the relationship between enjoyment of physical activity and PA participation. This study is interested in exploring the relationship between levels of physical activity enjoyment and corresponding participation levels in sport and PA. If an adolescent exhibits high levels of PA is this high PA associated with high levels of physical activity enjoyment? Studies in this area often differ largely in terms of findings and conclusions.

Di Lorenzo, Stucky-Ropp, Vander-Wal and Gotham (1998) found that physical activity enjoyment was the only consistent predictor of PA level for 5th and 6th grade (5th and 6th class) children. This research involved a longitudinal study of the determinants of PA among 5th and 6th grade children at phase 1 and 8th and 9th grade at phase 2 (n=54 girls and n=57 boys). Phase 1 involved a physical activity interview (PAI) and completion of a PA questionnaire. The PAI collected information through probing questions on time, type and intensity of PA by separating the day into functional segments (before, during and after school). In scoring the PAI, a pre-coded activities list was used. Activities were assigned a MET

value that characterised the amount of energy being used. Only minutes spent in vigorous activity were used in the analyses. The children's PA questionnaire collected additional information on social learning variables with potential to effect exercise participation (self efficacy, parent modelling, friend family support, physical activity enjoyment, home equipment, exercise knowledge, number of hours spent watching TV). Participants' mothers completed a parental questionnaire. The parental questionnaire was used to obtain information on PA of and assess child referent variables relevant to social learning theory (Mother's PA, mother self efficacy, friend modelling support , family modelling support, mother enjoyment's enjoyment of PA, PA barriers). The same protocol was followed in Phase 2 of the study when participants were 8th and ninth grade adolescents (n=54 girls, 57 boys, mean age=14 years SD .7). Participant's mothers' and 80 of the father's completed the parental questionnaire at Phase 2. The results of simultaneous stepwise regression analyses showed that physical activity enjoyment was the only consistent predictor of PA for boys and girls during phase 1. At phase 2, different predictors emerged for boys and girls, peer and family social support became more important for girls and personal interest in PA and interest in sport media became more important for boys. There was a 17.8 % and 11% drop in mean vigorous minutes of PA for boys and girls over the 3 year period. This study provided interesting findings in terms of enjoyment research. The fact that enjoyment was a predictor for 5th and 6th grade children but not for 8th and 9th grade adolescents may suggest that enjoyment is particularly important in younger age groups. This study highlights the need for attention to differences between developmental levels. However, it must be said that a correlation does not imply a cause and effect relationship and it is not possible to report that high physical activity enjoyment leads to more PA based on this research, particularly given that there are limitations to this study including delimiting moderate activities. It could also be argued that the presence of mothers during interviews may have influenced children's responses. Nevertheless, this study provides support for exploring the nature of this relationship further.

In another study of 1504 children in grades 4–12, PE enjoyment as opposed to physical activity enjoyment consistently predicted participation in PA among boys in grades 4–12 (equivalent to 4th class- 6th year in Ireland) and girls in grades 7–12 (equivalent to 1st year- 6th year in Ireland) (Sallis, Prochaska, Taylor, Hill, & Geraci, 1999). The methodology for this study involved interviewing participants by phone

to collect information via a structured interview format. An index of PA was used to gain information about PA behaviours. Use of this Index of PA is a major limitation of this study as it is an unvalidated measure. This study did not include an investigation of physical activity enjoyment; however the finding that PE enjoyment predicted participation has connotations for the importance of PA enjoyment. PA enjoyment and PE enjoyment are not interchangeable, but research has found that there are correlations between the two concepts (Motl et al., 2001) .

A study designed to analyse children's enjoyment and perceived competence in PE and PA found that although participants reporting high enjoyment did not participate in more PE than those of low enjoyment, those who received recommended amount of PA for health enjoyed PE significantly more than those who did not (Carroll & Loumidis, 2001). Although PE and PA are not synonymous given that participation in PE is often not a voluntary behaviour due to school timetabling, this study does have important implications for PA enjoyment. It suggests that there may be some relationship between achievement of recommendations for PA and enjoyment. Additional research in this area will make the relationship between general PA enjoyment and participation more clear.

A study of psychosocial correlates of structured PA in middle school girls participating in the Trail of Activity for Adolescent Girls (N=2791, 6th grade) found that although those with higher exercise self-efficacy and higher enjoyment of PE were more likely to participate in PE, PA enjoyment was not associated with participation in structured PA (Barr-Anderson et al., 2007). This research was correlational and used an unvalidated version of PACES, which was shortened to 7 statements. Similarly, the review paper by Sallis et al. (2000), did not find that enjoyment was significantly related to PA participation among the 13-18 year cohort of studies included. However 69% of the measures used in the studies were invalidated self reports. This high percentage highlights the need for additional research using validated measures of PA enjoyment.

In contrast, the review by Biddle et al. (2005) reported a positive relationship physical activity enjoyment and PA for adolescent girls. Additionally, Dishman et al. (2005) found that enjoyment mediated the effect of a school based PA intervention on 2087 adolescent girls. The study evaluated whether targeted changes in factors influencing enjoyment of PE, PA enjoyment, and self efficacy beliefs about participating in PA, mediated the effect of the Lifestyle Education for Activity

Program (LEAP) intervention on participation in PA. Structural equation modelling indicated that the intervention had direct positive effects on factors influencing enjoyment of PE which subsequently explained the effects of increased PA enjoyment and self efficacy on increased PA. Results also found an indirect effect of PA enjoyment on PA operated by influence on self efficacy. This study is very significant in terms of PA enjoyment research as it provides experimental evidence from a randomised controlled trial linking increased enjoyment with increased PA among adolescent girls. The use of the validated measure of physical activity enjoyment (PACES) and the longitudinal design of the study are further strengths of the research design. This research provides support for the use of enjoyment as a mediator variable in interventions designed to increase PA among girls. This research also highlights that the mechanism by which PA enjoyment effects PA may not be straightforward or direct, it is plausible that it is mediated by other variables.

In conclusion, inconsistencies in the research exploring the relationship between enjoyment of PA and participation in PA exist. Additional research is needed to identify personal, behavioural and environmental factors that that can be manipulated to optimally increase enjoyment of PA among children and youth.

Physical Activity Enjoyment and Other Correlates

Research has also found that physical activity enjoyment is positively associated with a number of PA correlates such as self efficacy (Dishman et al., 2005) self-determination, motivation, effort, (Ntoumanis, 2002) perceived competence and task orientation (Boyd & Yin, 1996). Again, the mechanism by which these associations occur is unclear, but it can be said that associations between these positive variables and physical activity enjoyment do exist and merit further research.

Social support is one previously examined correlate of PA for which there has been a great deal of support (Biddle et al., 2005; Sallis et al., 2000; Van der Horst et al., 2007). Parents play an important role in supporting their child's PA (Sallis et al., 2000). Peer influence is also thought to be important, although less supported in the literature (Wold, Hendry, Biddle, Sallis, & Cavill, 1998). Many theories of physical activity enjoyment have proposed that one of the sources of enjoyment of PA comes from opportunities to socialise, meet people and gain positive reinforcement from peers and parents. Scanlan et al.'s Sport Commitment Model

(1993) proposes that sport enjoyment is partly attributable to extrinsic achievement, which refers to competence derived from the social approval of peers and parents and extrinsic non-achievement, which refers to non-performance related gains such as affiliation with peers and team members. In line with this notion, Scanlan and Lewthwaite (1986) also examined levels of season-long enjoyment as reported by male age-group wrestlers, ages 9 to 14 years. Their findings revealed that high levels of enjoyment were predicted by high parental satisfaction with performance, positive adult involvement and interactions, a low frequency of negative maternal interactions, and perceived ability. Furthermore, they found a strong correlation (r= .70) between enjoyment and the desire to continue competing in the sport the following year. Similarly, Brustad (1988) conducted research grounded in Harter's Theory of Motivation, and found that high enjoyment was predicted by low parental pressure among a group of 207 adolescent basketball players. Given the strong role of social support in PA and sport among adolescents, it is plausible that high social support from parents, peers and teachers, could contribute significantly to increasing physical activity enjoyment.

2.8 Current Research

This review has highlighted that PA levels, sedentary behaviour habits and physical health levels among adolescents in Ireland underscoring a critical need for action. This study will provide data on the PA participation, sedentary behaviour and physical health of Irish children and adolescents with respect to types of activity and demographic factors. The relationships between PA, sedentary behaviour, and physical health will also be examined.

This review has emphasised that there is a crucial need to help insufficiently active children reach the minimum recommended amount of daily PA. It is clear that in order to effectively increase PA, the interplay of the correlates of PA need to be understood. Accordingly, this research will use a social ecological approach to investigate the personal psychological, social environmental and physical environmental correlates of PA that most significantly predict MVPA among Irish males and females. The analysis of males and females separately is a valuable development on most reviews which analyse all adolescents together despite consistent existence of gender differences in PA patterns. It is hypothesised that a

range of personal psychological, social environmental and physical environmental correlates will influence MVPA for males and females, consistent with Social Ecological Theory.

This review has found that the research in terms of physical activity enjoyment as a correlate of PA in children and adolescents is inconsistent, with use of different measures of enjoyment making comparison and consensus difficult. Irish children have reported physical activity enjoyment as an important motivator for taking part in PA and maintaining the behaviour; however there has been no research that has investigated if physical activity enjoyment significantly impacts Irish adolescents' PA participation. This study hypothesizes that physical activity enjoyment will increase with increasing MVPA This research provides a unique opportunity to quantify the importance of enjoyment from a population perspective for Irish adolescents using a validated measure of physical activity enjoyment. There is a need to investigate enjoyment for different demographic groups, and different PA behaviours. Furthermore there is a need to understand the most significant personal, behavioural and social environmental predictors of physical activity enjoyment so that it can be manipulated effectively.

Chapter Three
3.0 Methodology

3.1 Research Design

The Children's Sport Participation and Physical Activity (CSPPA) study was a cross-sectional study of 10-18 year old children and youth in Ireland. It was carried out in 2009 by Dublin City University, University of Limerick and University College Cork. Data was collected and inputted by teams of undergraduate students under the training, supervision and coordination of postgraduate research assistants. I am one of two research assistants that were involved in research design, data collection and data inputting at Dublin City University. I am the sole data analyst with regards to the results of the current research.

The CSPPA study involved collection of self-report questionnaire data on PA levels, active commuting, physical education, extra-curricular sport participation, club sport participation, and sedentary behaviour among participants from 5th class in primary school to 6th year in post primary school (10-18 years). It also involved collection of demographic, psychological, social, and environmental data. In addition, physical health measurements were taken from a subset of the sample. This chapter will summarise the methods used for sampling and recruitment and will detail the measures and data analysis procedures utilised for this study.

3.2 Sampling and Recruitment

School and Year Group Sampling

All primary (N=3292) and post-primary (N=732) schools in the Republic of Ireland were eligible for sampling provided they were not special schools, junior only primary schools or colleges of further education to target the 10-18 age cohort and facilitate comprehension and reliable completion of the questionnaire. Sampling was stratified by gender (male, female, mixed), SES (designated disadvantage vs. non-designated school), area of residence (population density), type (primary, secondary, and community, comprehensive, vocational) and fee paying status (post primary only: fee paying or non fee paying). Table 3 shows the Department of Education distribution of schools and the number of potential schools and children

within each of the six strata. Table 4 shows the study sample. A total of 324 schools (162 primary schools, 162 post primary schools) were sampled and targeted for participation.

Table 3: Distribution of Potential Schools and Participants for Sampling by the Six Strata

Type	Item	B.R	G.R	M.R	B.U	G.U	M.U	Total
Primary Schools	Schools	135	113	2295	74	73	248	2938
	Children	22852	27644	236607	21884	21994	60048	178029
Post Primary Schools	Schools	59	71	350	51	72	106	709
	Children	26014	37344	146843	25531	35053	49995	320780

Table 4: Sample of Schools

Type	Item	B.R	G.R	M.R	B.U	G.U	M.U	Total
Primary Schools	Schools	11	15	89	11	13	26	162
	Children	2075	4238	10167	1770	4423	5288	27961
Post Primary Schools	Schools	14	19	74	13	18	26	162
	Children	6259	10,197	32117	6880	9315	12727	77495

Note *B= Boys, G=Girls, M=mixed, U=Urban, R=rural

School Recruitment

Sampled schools (n=324) were sent a recruitment letter by post (Appendix A). The letter gave a brief summary of the research project, the purpose of the study and outlined what would be involved for the school. Researchers followed up with a phone call to school principals or PE teachers within 7 days (Appendix B). Schools

interested in participating were asked to give details of class or year group numbers and school facilities

In total over the two samples, 70 post primary schools and 53 primary schools committed to taking part (N=123). The year group that would be tested in each school was selected based on availability of the year group. Attempts were made to have an equal representation from each year group however due to exam constraints some principals were not willing to allow 3rd or 6th years to participate. Contact was then made with each school to finalise a day and time for testing. A pack containing consent letters was then sent out to each school, with a covering letter confirming the date, time and protocol for testing day. Once a school was recruited, every child within the selected class group (i.e. 5th or 6th class in primary schools) or the selected year group (1st year through to 6th year in post primary schools) was targeted for participation. Twenty-five percent of participants were selected to complete the physical measures element of the testing; the remaining 75% were selected to do questionnaires only. DCU took responsibility for the physical measures schools whilst the remaining, 'questionnaire only' schools were divided amongst the University of Limerick and University College Cork.

Participants

The questionnaire sample consisted of N= 5397 participants (mean age = 13.95 years ±1.97 years, 47% male, 24% primary) all of whom completed a self report questionnaire. A 25% sub-sample of the 5397 participants (n=1351, 51% male, average age of 13.58 ± 2.13 years, range 10-18 years) also had their height, weight , waist circumference and blood pressure measured and completed a 20 metre shuttle run test.

Inclusion Criteria

Participants were deemed eligible to participate in the project provided they met the following criteria:

- Participants were required to be aged between 10-18 years of age on the day of testing

- All physical measures participants under 16 were required to receive and return parental consent, or opt out consent forms in the case of those completing questionnaire only.
- Completion of informed consent was required by all participants prior to testing.
- Completion of a PAR-Q (physical activity readiness questionnaire) was required before participants were medically cleared to participate in the 20m shuttle run test.

Ethical Approval and Informed Consent

In accordance with University Regulations, a research proposal detailing the envisaged methodology was submitted to the Research Ethics Committee at Dublin City University, University of Limerick and University College Cork. The submission was reviewed and a report was returned with changes and clarifications requested, mainly with regards to the procedures for obtaining consent to participate. A revised submission was devised and approval was then granted. Permission to participate in the 'questionnaire only' part of the study was obtained by an 'opt out' consent form sent home to the parents of the study participants (Appendix C). Students participating in physical measures assessments that were under 16 were required to bring a consent and information sheet home and have it signed by their parents/guardians and returned by the testing day (Appendix D). Those aged 16 years or over were eligible to give their own written informed consent on the day (Appendix E).

3.4 Procedure

Pilot Testing

Standardized testing procedures were used throughout the study (Woods et al., 2009). Extensive training was undertaken before data collection to minimize potential sources of error in the physical measures and questionnaire administration. Piloting of the questionnaires took place in both primary and post-primary schools outside the sample prior to commencement of testing. The CSPPA primary questionnaire was piloted on the 16th January with a boys 5th class (n=19). A subsequent draft was piloted on the 30th of January with a girls 5th class (n=14). The

CSPPA post primary questionnaire was piloted on the 9th December 2008 with mixed 2nd years (n=43). A subsequent draft was piloted on the 8th January with mixed 3rd year students (n=48). No problems were reported regarding the comprehension or layout of the questionnaire. All piloting data was inputted into SPSS by members of the research team. Reliability analysis for both primary and post-primary data sets yielded acceptable levels (alpha coefficients > 0.6).

Questionnaire Data Collection

The collection of the questionnaire data in primary and post-primary schools was conducted with a researcher to participant ratio of 1:20, and a range of 3-86 participants per class/year group. Completion time was approximately 45 minutes. The procedure was as follows:

1. Students were divided into groups to facilitate ease of completion and appropriate pupil to researcher ratio.
2. Consent forms were collected to ensure that all students under 16 had permission to participate. Students without consent were not allowed to take part and students 16 and over that wished to take part were given a 16+ consent form to complete.
3. The questionnaires were handed out to each participant. There were separate questionnaires for primary and post primary (see Appendix F, Appendix G). Each participant was given an ID sticker to display on their clothing that corresponded to the ID number on their questionnaire.
4. Students were given a brief outline of the aims of the research and a detailed instruction on how to complete the questionnaire. Participants' attention was drawn to specific requirements of different questions and definitions were explained.
    - Physical activity was defined as participation in sport, structured exercise, and/or general physical activities. Moderate and vigorous intensity levels were explained and examples were given.
    - Physical education was defined as their timetabled exercise class during school hours.
    - Extra curricular sport/activity was defined as the activities they did at lunch time or after the school with the help of a teacher.

- Club sport/activity was defined as activities they did in an organised club in the community but not with the school.

5. Participants were given the chance to ask questions. They were informed that their responses would be treated in strictest confidence and that their names would not be associated with the data.
6. Participants completed the fist page of the questionnaire containing the assent and personal data. This page was detached from the questionnaire and stored separately so that participants were only identifiable by their ID number (printed on the ID sticker, the questionnaire and physical measures data collection forms).
7. Participants were encouraged to take time, reflect on their answers, ask questions if they were uncertain, and to be as honest as possible.
8. To minimise the occurrence of missing data, questionnaires were checked by a researcher when each participant was finished. Participants were asked to complete any questions they may have missed and then the questionnaire was rechecked and collected.
9. Where applicable, participants then left the room to complete physical measurements including height, weight, blood pressure waist circumference and 20 metre shuttle run test.
10. Participants were given a short talk about the importance of PA for a healthy lifestyle.

Physical Measures Data Collection

In schools selected to partake in physical measures, the ratio of researchers to pupils was approximately 1: 10. Following questionnaire completion:

1. The participants' height, weight, waist circumference and blood pressure were measured. Boys and girls were measured in separate rooms by a same gender researcher and attention was given to ensure the privacy of each participant.
2. Participants that were determined as eligible, via completion of a Physical Activity Readiness Questionnaire (PAR-Q) (Appendix H), then completed a continuous incremental shuttle run test (the 20 metre shuttle run test, or bleep test) to estimate their aerobic fitness.
3. The full protocols adhered to for each physical health measure can be obtained from the appendices (Appendix I-L).

3.5 Self Report Measures

CSPPA Questionnaire

The CSPPA primary questionnaire was used for 5th and 6th class pupils (see Appendix F). The CSPPA post primary questionnaire was administered to students from 1st to 6th year (see Appendix G). The questionnaires replicated questions from The ESRI study of *School Children and Sport in Ireland* and the Take PART Study (Fahey et al., 2005; Woods et al., 2009).

Primary school test-retest reliability of questionnaire measures took place with 5th class students (n= 43) from on Tuesday 10th February at 9:30am, and a re-test of quantitative measures occurred on Friday 13th February 1:00pm. The Post primary test took place on Wednesday 11th of February at 11:00am with 3rd year students (n=31) and the re-test occurred on Wednesday 25th of February at 11:00am. The test-retest reliability and the internal reliability for each measure are presented within the data treatment section in Table 5.

Demographics

A detachable page at the front of the questionnaire allowed for collection of demographic information from each participant. Participants were requested to provide their gender, age, name, nationality (post primary only), home address, school name, year or class in school and disability status. In the case of post primary students only, participants were asked to indicate their area of residence from one of the following:

- Big city with >70,000 inhabitants
- Suburbs/large towns/outskirts of the city with 20,000-69,999 inhabitants,
- Town with 3000-19,999 inhabitants
- Village or rural area with <2999 inhabitants

Participants living in a big city or a suburb were classified as urban participants and participants living in either a town or a village were classified as rural participants.

In a different section of the questionnaire socioeconomic status (SES) was assessed by asking each participant if there mother and father had a job and if so to list their profession and where they work. This question was used previously by the ESRI study, The Irish HBSC study and the Take PART study (Fahey et al., 2005;

Nic Gabhainn et al., 2007; Woods et al., 2009). It allows for classification of the SES of each participant into one of the following social classes:

1 Professional
2 Managerial or Technical
3 Non-manual
4 Skilled- manual
5 Semi- skilled
6 Unskilled
7 Gainfully occupied or unknown
8 Unemployed

For this research social class 1 and 2, 3 and 4 and 5, 6 and 8 were grouped together to form respective upper, middle and lower SES categories. It was decided that SC 7, gainfully occupied or unknown would be treated as missing data, as it was not possible to assign an appropriate SES given the uncertainty within the statement "gainfully occupied or unknown". Classifying SES into three groups allowed for more equal distributions of participants. This method has been used previously in the Health Behaviours of School Age Children Study (Nic Gabhainn et al., 2007).

Physical Activity

Physical activity (PA) was assessed by measuring the number of days during the past 7, and for a typical week, that participants had accumulated 60 minutes of moderate-to-vigorous physical activity (MVPA). A composite average of the 2 items provided a score of days per week that the children had accumulated 60 minutes of MVPA. This measure was originally developed for use with adolescents in primary care (Prochaska, Sallis, & Long, 2001). It was found to be reliable (intraclass correlation (ICC), 0.77) and correlated significantly (r = 0.40, p<.001) with accelerometer data (Prochaska et al., 2001). It has since been used in similar cross sectional research by the Take PART study (Woods et al., 2009).

Active Commuting

The usual mode of transport to school was selected from foot, bicycle, car or bus. Only one response was selected, representing the longest distance of the journey. The return journey was also reported. Travelling by foot or bicycle was defined as active commuting (AC). Travelling by car, bus or train was defined as

passive commuting (PC) (Woods et al., 2009). Primary and post primary students were asked to give an estimate the time (minutes) taken to travel to school and post primary students were also asked the distance travelled (km). This question was taken from the 1996 Irish census form (Central Statistics Office, 2006). It was modified slightly for the young population of the study.

Physical Education

Physical education (PE) was assessed by a question previously used in the ESRI study (Fahey et al., 2005). The type of activity, number and length of PE class was assessed.

Extracurricular Sport and Physical Activity

Extracurricular sport and PA participation was assessed by a question previously used in the ESRI study (Fahey et al., 2005). The respondent was required to indicate the type of extracurricular sport or PA participated in within the last 12 months and the frequency of participation.

Club Sport and Physical Activity

Club sport and PA participation outside of the school environment within the community was measured by a question used in the ESRI School Children and Sport in Ireland study (Fahey et al., 2005). The respondent was required to indicate the type of club sport or PA participated in within the last 12 months and the frequency of participation.

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Sedentary Behaviour

The Self-Administered Physical Activity Checklist (SAPAC) was used to assess minutes spent in sedentary behaviour (Sallis et al., 1996). The 7-day SAPAC assesses habitual behaviour patterns to reduce the likelihood of recording out of the ordinary behaviour. Respondents are asked to indicate the frequency (in days and minutes) that they engage in sedentary leisure behaviours such as TV and video/DVD viewing, playing computer games, using the internet, reading, sitting during school breaks, talking on the phone, sitting and talking with friends and listening to music. This measure has been shown to have acceptable levels of test

retest reliability and validity in other cross sectional research among children using heart rate telemetry and accelerometer measures (Sallis et al., 1996).

Physical Activity Enjoyment

Physical activity enjoyment was measured using an adaptation of the Physical Activity Enjoyment Scale (PACES) (Kendzierski & DeCarlo, 1991) developed by Motl et al. (2001). Two of the 18 items from the original measure were removed and the rating scale was changed from a 7-point bipolar scale to an easy-to-understand, 5-point likert scale that ranged from 1 ("Disagree a lot") to 5 ("Agree a lot"). Motl et al. (2001) administered the questionnaire to adolescent girls (N=1797; mean age=13.6 years, SD 0.6). Results showed evidence of factorial validity and construct validity indicating that PACES was a valid measure of physical activity enjoyment among adolescent girls. More recently a study by Moore et al. (2009) sought to determine the reliability and validity of the revised PACES in elementary school children. The sample consisted of 564 3rd grade (3rd class) (268 male, 296 female, mean age= 8.72, SD= .54) African American and European American children. Results indicated that the PACES displayed good internal consistency (.87) and item-total correlations providing support for the validity of PACES in younger age groups.

Physical Education Enjoyment

Physical education enjoyment was measured using the Factors Influencing Enjoyment of Physical Education Enjoyment (FIPE) scale (Motl et al., 2001). This scale was developed by Motl et al. (2001) through generation of 32 items based on previous research on the factors influencing PE enjoyment. The items were then evaluated by groups of 8th grade girls with some items revised and others deleted. The final measure consisted of 12 items on a 5 point likert scale ranging from 1 (dislike a lot) to 5 (enjoy a lot). Support for the model was obtained using calibration and cross-validation samples. It has been used and validated for youth PA research (Dishman et al., 2005).

Self Efficacy

Self efficacy was assessed using the 10 item Self Efficacy for Physical Activity measure. It is an extended version of the 5 item self efficacy measure developed by Marcus, Selby, Niaura and Rossi (1992). Test retest was 0.90 for

original measure. The measure by was redeveloped by Nigg and Courneya (1998) for use with adolescents with alpha coefficients of 0.85. The extra 5 items were added based on factors that were believed to be important barriers to activity for adolescents such as having homework to do, good TV shows being on, and having household chores to do. Participants are asked to indicate how confident they are in their ability to do PA when presented with a number of situations such as those above on a scale of 0-10, 0 being not at all confident, 5 being somewhat confident and 10 being very confident.

Barriers to Physical Activity

Barriers to PA were assessed using the Barriers to Physical Activity Quiz (Center for Disease Control and Prevention, 2001). This is a 21 item scale with a 4 point likert scale requiring respondents to indicate if they are very likely, somewhat likely, somewhat unlikely or very unlikely to say a number of statements relating to common barriers to PA. The questionnaire has 7 subscales (lack of time social influence lack of energy, lack of willpower fear of injury lack of skill lack of resources). Each subscale is a composite measure of three questions, with a higher score indicating a higher barrier. Certain items of the questionnaire were adapted to suit the Irish school population of the current study.

Social Support

The social environment was assessed through frequency of peer, family and teacher support for involvement in PA. The scales were developed by Sallis, Taylor, Dowda, Freedson and Pate (2002) for the Amherst Health and Activity Study. This was a cross-sectional observational study that examined determinants of PA in school-age children and youth. The 5 item family social support scale requires the participant to indicate how often a member of their family encouraged them to do PA, did PA with them, provided transportation to a place to do PA, watched them do PA or told them that that were doing well in PA or sport on a 6 point liker scale ranging from never (0) to everyday (5). Scores on each item are then added for a minimum score of 0 and a maximum score of 25. Research with children has found that this measure has a cronbach alpha of 0.78 and an ICC of 0.81 (Sallis et al., 2002). The peer measure is similar, asking the respondent to indicate frequency of encouraging friends to do PA, encouragement from friends to do PA, doing PA with

friends, being teased by friends for not being good at PA (reversed scoring) and being told that you are doing well in PA or sport. The same likert scale and scoring system is used as above. Previous research has shown that this scale exhibits an alpha coefficient of 0.74 and an ICC of 0.70 with strong correlations between the peer and parent scales (r=.06) (Sallis et al., 2002). The teacher social support scale was developed for the Take Part Study. It replicates the design of the family social support scale in asking the respondent to indicate frequency of encouragement for PA. It allows for the examination of social support from within the school environment.

Physical Environment

Perceptions of the environment were measured using the Neighbourhood Environment Walkability Scale (NEWS), which was developed by the authors along with transportation, environmental protection, and urban planning professionals to assess environmental factors influencing PA (Saelens, Sallis, Black, & Chen, 2003). It required respondents to rate where they live on a scale ranging from 1 (strongly disagree) to 4 (strongly agree) in relation to 5 subscales (aesthetics, pedestrian safety, crime safety, walkability of neighbourhood, walking/cycling facilities and access to services). Higher scores indicated that the participant had a favourable perception of that environmental characteristic. The initial study found acceptable test/retest intraclass correlation coefficients for each of these subscales. Reliability of this measure has been shown in several other European and American studies (Brownson et al., 2004; De Bourdeaudhuij, Sallis, & Saelens, 2003; Leslie et al., 2005).

3.5 Physical Health Measures

Aerobic Fitness

Aerobic fitness was estimated using a validated 20-Meter Shuttle Run Test (20 MST) (Ramsbottom, Brewer, & Williams, 1988). Standardised testing procedures from the Take PART study were adhered to (Woods et al., 2009). The test requires subjects to run back and forth between 2 lines 20 metres apart, keeping in time with a series of audio signals. The initial speed is 8.0 km/h, and this speed increases to 9.0 km/h after 1 minute. Every minute thereafter the running speed

increases by 0.5 km/h. The test is terminated if a subject withdraws voluntarily or if they are unable to maintain the set pace. The final level and shuttle completed were used to estimate VO_2 max. The testing protocol of the 20MST has been widely used internationally (full protocol, Appendix I). Scores were classified into age and gender specific criteria for fitness using Cooper Institute (2004) FITNESSGRAM standards. These criterion related fitness standards, known as "healthy fitness zones", establish the minimum scores linked to health related outcomes in youth for each gender at different ages. These standards were produced by regressing data linking cardiovascular fitness with all-cause and cardiovascular disease mortality among adults to a paediatric population and they have been validated by Lobelo et al. (2009)

Body Mass Index

Height (cm) and weight (kg) were measured to the nearest 0.1 cm and 0.1 kg, respectively, using a SECA stadiometer and scale (full protocol, Appendix J). Body Mass Index (BMI) was then calculated with the following formula, (weight, kg)/(height, m)^2. Age and gender specific thresholds defined by Cole et al. (2000) were then applied to define overweight, obesity and thinness. These cut off points were developed by modelling the BMI scores children would need to have at each age if they were to pass through a BMI of 25, 30 or 16 respectively at age 18 years. These cut offs are used by the International Obesity Task Force, the International HBSC study (Currie et al., 2008) and in Ireland specifically they were used for the Report of the National Taskforce on Obesity (National Taskforce on Obesity, 2005) and the Take PART study (Woods et al., 2009).

Waist Circumference

Waist circumference was measured to the nearest 0.1 cm using an anatomical measuring tape. Measurements were taken at the narrowest point from the anterior view (or halfway between the rib cage and the superior iliac crest) at the end of a gentle expiration, with participants in a standing position (full protocol, Appendix K). Age and gender-specific criteria were used to define levels of healthy and unhealthy abdominal fat (Taylor et al., 2000)

Blood Pressure

Blood pressure was measured using an automatic blood pressure cuff. The auscultation method of manually detecting kortokoff sounds is a more reliable measure however given the nature of this data collection it was not possible to obtain a manual blood pressure reading due to noise in the data collection area and time constraints. Participants were instructed to sit quietly on a chair and relax for 5 minutes prior to measurement. They were seated and the appropriate sized cuff was fitted to their right arm, which was then rested on a table at heart height. The right arm is preferred in repeated measures of BP for consistency and comparison with standard tables and because of the possibility of coarctation of the aorta, which might lead to false low readings in the left arm. They were instructed to keep both feet flat on the floor and breathe normally as the cuff tightened (Full protocol see Appendix L). Blood pressure was classified into healthy and unhealthy categories using the age gender and height standards developed by the National High Blood Pressure Education Program Working Group on High BP in Children and Adolescents (2004). If both systolic and diastolic blood pressure were greater than the 90th percentile for age, gender and percentile of height the participant was classified as having an prehypertensive or unhealthy blood pressure, consistent with the cut off used in previous research (Cole et al., 2000; Saelens et al., 2003)

3.6 Data Treatment

Data Storage

Prior to data entry hard copy questionnaires and physical measures data collection sheets were stored securely with first page personal data stored separately, and a labelling system detailing school, time of testing and number of questionnaires to ensure all data was easily identifiable for data entry.

Data Entry

All data were entered directly into Statistical Package for Social Sciences (SPSS 17.0). Researchers were trained on the appropriate protocol for data entry of questionnaire and physical measures data, and quality checking was carried out by research group leaders to decrease occurrences of human error. Each file was named

by the group name and school roll number and these files were then subsequently merged when data entry was complete. Separate ID files were created containing sensitive personal data were created and stored separately from questionnaire and physical measures data.

Data Cleaning

Data cleaning was undertaken using the Statistical Package for Social Sciences (SPSS 17.0). Descriptive statistics and frequency analysis were used to detect missing data, extreme outliers or data that was likely to be incorrect. Referral was made to the original questionnaire where necessary to check for possible errors during data entry. Deliberately missed data was coded 999 or left blank in cases where it was non applicable to participants. For any question with a scaled response where two items have been selected, the higher of the two responses was retained.

Data Preparation

In the results chapter, section 1 reports on PA participation and sedentary activity and Section 2 reports on physical health. The full data set was used for these analyses in order to avoid removing participants who missed sections in error or opted not to complete the full questionnaire. These occurrences were few and it was deemed acceptable. In analysing the correlates of PA (Section 4.3 of Results) and the data on physical activity enjoyment (Section 4.4 of Results) only cases with full data sets on all variables of interest were used in the analysis. This method facilitated the use of regression analysis. Where relevant, those with missing data were compared to those that had full data sets on key demographic variables and this information is detailed at the start of the respective sections.

Data Analysis

The data were explored for homogeneity of variance, covariance, normality and outliers. Table 5 shows that some variables were slightly positively or negatively skewed. These were, Body Mass Index (1.04), Physical Activity Enjoyment Scale (-1.13), the Safety from Crime subscale on the NEWS questionnaire (-1.21) and Sedentary hours per day (1.23). These variables were transformed into standardized residuals and p-plots and q-plots were examined. Due to the acceptability of these plots, the large sample size, and the fact that they were only marginally greater than

1, these variables were deemed normal and suitable for analysis using parametric statistics (A. P. Field, 2009). All other data met the assumptions of parametric tests with skewness levels of less than 1 and satisfactory distributions of box plots and histograms.

Test re-test reliability of the measures was assessed through calculation of interclass correlation coefficients (ICC). Self report measures and physical health measurements in the main sample were tested for internal consistency reliability using Cronbach Alpha (α) where applicable. Table 5 shows that some measures had alpha scores below the 0.7 criterion for good reliability, however given the sample size and the diversity among psychological constructs, these measures can still be deemed acceptably reliable (Kline, 2000).

Descriptive statistics and frequency analyses were conducted to assess means, standard deviations, minimums, maximums and percentages with figures and tables representing this data visually where appropriate. Independent Sample t-tests (t) and One-way ANOVAS (F) with Tukey's post-hoc tests were used to compare the means of interval parametric data and reveal where significant differences lay. Categorical data was analysed using Pearson's Chi Square test (χ^2). Effect size was calculated for Independent Sample t-tests (r) and wilson's omega (ω^2) squared was calculated to obtain population effect size for One-way ANOVAS. An r value of ±0.1 represents a small effect size, ±0.3 is a medium effect size and ±0.5 is large effect size (A. P. Field, 2009). A ω^2 value of 0.01 represents a small effect size, 0.03 is a medium effect size and 0.06 is a large effect size (A. P. Field, 2009). In the case of Chi Square tests, effect size was calculated through odds ratios and observation of the Cramer's V statistic (ν). Pearson's correlation coefficients (r) were used to examine correlations between interval data with partial correlations (r) being employed to control for demographic factors such as age and gender. Hierarchical linear regression analyses (R^2) were used to examine multivariate relationships between variables found to be significant through initial univariate analyses and to predict variance in physical activity and physical activity enjoyment. These regression analyses were conducted by entering unmodifiable demographic variables into block 1 and modifiable variables into subsequent blocks to control for the effect of demographic variables on other variables of interest. Tables 6-9 present the

dependant and independent variables used in each of the statistical tests in sections 4.1-4.4 of the results chapter.

Table 5: Internal Consistency Reliability, Alpha Scores and Skewness for Measures

Variable Name	Test-Retest ICC	Crobach Alpha α	Skewness (Raw Score)
Physical Activity			
Days of MVPA	.71	.89	-0.16
School Commuting (mode)	.70	N/A	0.50
Physical Education (minutes)	.75	N/A	-0.82
Extracurricular Sport/PA	.68	N/A	-0.40
Club Sport/PA	.72	N/A	-0.40
Sedentary Activity (Hours per day)	N/A	N/A	1.23
Physical Health			
Aerobic Fitness (Total Runs)	N/A	N/A	0.75
Body Mass Index	N/A	N/A	1.04
Waist Circumference	N/A	N/A	0.91
Blood Pressure (Systolic)	N/A	N/A	0.35
Blood Pressure (Diastolic)	N/A	N/A	0.61
Psychological			
Physical Activity Enjoyment	.71	.90	-1.12
Physical Education Enjoyment	.67	.81	-0.74
Self Efficacy	.78	.84	0.02
Lack of Time Barrier	.77	.73	0.31
Social Influence Barrier	.55	.64	0.48
Lack of Energy Barrier	.72	.76	0.34
Lack of Willpower Barrier	.75	.76	0.26
Fear of Injury Barrier	.78	.74	0.93
Lack of Skill Barrier	.62	.75	0.76
Lack of Resources Barrier	.55	.52	0.48
Social Environment			
Peer Social Support	.82	.82	-0.27
Family Social Support	.87	.70	-0.17
Teacher Social Support	.66	.83	0.54
Physical Environment			
Aesthetics	.49	.70	-0.24
Safety - Pedestrian	.58	.58	-0.11
Safety - Crime	.64	.80	-1.21
Places for Walking/Cycling	.69	.79	-0.28
Neighbourhood Streets	.16	.34	-0.18
Access to Services	.40	.62	-0.30

Table 6: Section 4.1 Physical Activity and Sedentary Behaviour Analyses

Dependent Variable	Independent Variables	Statistical Test	Measure of Effect Size
MVPA	Gender	Independent t-test (*t*)	Effect size (*r*)
	Age Category	One way ANOVA (F)	Wilson's Omega Squared (ω^2)
	Area of Residence	Independent t-test (*t*)	Effect size (*r*)
	SES	One way ANOVA (F)	Wilson's Omega Squared (ω^2)
MVPA Rec	Gender	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	Age Category	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	Area of Residence	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	SES	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
Active Commuting	Gender	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	Age Category	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	Area of Residence	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	SES	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
PE minutes	Gender	Independent t-test (*t*)	Effect size (*r*)
	Age Category	One way ANOVA (F)	Wilson's Omega Squared (ω^2)
	Area of Residence	Independent t-test (*t*)	Effect size (*r*)
	SES	One way ANOVA (F)	Wilson's Omega Squared (ω^2)
PE Rec	Gender	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	Age Category	Chi Square Test (χ^2)	Odds ratio/ Cramer's V (ν)
	Area of Residence	Chi Square Test (χ^2)	Odds ratio /Cramer's V (ν)
	SES	Chi Square Test (χ^2)	Odds ratio/ Cramer's V (ν)
EC participation	Gender	Chi Square Test (χ^2)	Odds ratio/ Cramer's V (ν)
	Age Category	Chi Square Test (χ^2)	Odds ratio /Cramer's V (ν)
	Area of Residence	Chi Square Test (χ^2)	Odds ratio /Cramer's V (ν)
	SES	Chi Square Test (χ^2)	Odds ratio /Cramer's V (ν)
Club participation	Gender	Chi Square Test (χ^2)	Odds ratio/ Cramer's V (ν)
	Age Category	Chi Square Test (χ^2)	Odds ratio/ Cramer's V (ν)
	Area of Residence	Chi Square Test (χ^2)	Odds ratio/ Cramer's V (ν)
	SES	Chi Square Test (χ^2)	Odds ratio /Cramer's V (ν)
Sedentary Behaviour	Gender	Independent t-tests (*t*)	Effect size (*r*)
Sedentary Hours	Gender	Independent t-test (*t*)	Effect size (*r*)
	Age Category	One way ANOVA (F)	Wilson's Omega Squared (ω^2)
	Area of Residence	Independent t-test (*t*)	Effect size (*r*)
	SES	One way ANOVA (F)	Wilson's Omega Squared (ω^2)
SST Rec	Gender	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	Age Category	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	Area of Residence	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	SES	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
Sedentary Hours	MVPA Rec	Independent t test (*t*)	Effect size (*r*)
	Active Commuting	Independent t-test (*t*)	Effect size (*r*)
	PE REC	Independent t-test (*t*)	Effect size (*r*)
	EC participation	One way ANOVA (F)	Wilson's Omega Squared (ω^2)
	CB participation	One way ANOVA (F)	Wilson's Omega Squared (ω^2)

Table 7: Section 4.2 Physical Health Measures Analyses

Dependent Variable	Independent Variables	Statistical Test	Measure of Effect Size
Aerobic Fitness	Gender	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	Age Category	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	Area of Residence	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	SES	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
BMI	Gender	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	Age Category	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	Area of Residence	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	SES	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
Waist Circumference	Gender	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	Age Category	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	Area of Residence	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	SES	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
Blood Pressure	Gender	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	Age Category	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	Area of Residence	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
	SES	Chi Square Test (χ^2)	Odds ratio/Cramer's V (ν)
MVPA	Aerobic Fitness	Independent t test (t)	Effect size (r)
	BMI	Independent t test (t)	Effect size (r)
	Waist Circumference	Independent t test (t)	Effect size (r)
	Blood Pressure	Independent t test (t)	Effect size (r)
Health Index	MVPA	One way ANOVA(F)	Wilson'sOmegaSquared (ω^2)
	EC Participation	One way ANOVA(F)	Wilson'sOmegaSquared (ω^2)
	CB Participation	One way ANOVA(F)	Wilson'sOmegaSquared (ω^2)
Sedentary Hours	Aerobic Fitness	Independent t test (t)	Effect size (r)
	BMI	Independent t test (t)	Effect size (r)
	Waist Circumference	Independent t test (t)	Effect size (r)
	Blood Pressure	Independent t test (t)	Effect size (r)
Health Index	Sedentary Hours	One way ANOVA(F)	Wilson'sOmegaSquared (ω^2)

Table 8 Section 4.3 Correlates of Physical Activity Analyses

Dependent Variable	**Independent Variables**	**Statistical Test**	**Measure of Effect Size**
Psychological (10 Variables)	Gender	Independent t test (*t*)	Effect size (*r*)
Social Environment (3 Variables	Gender	Independent t test (*t*)	Effect size (*r*)
Physical Environment (6 Variables)	Gender	Independent t test (*t*)	Effect size (*r*)
MVPA (Males)	Demographic Variables Psychological Variables Social Environment Variables Physical Environment Variables	Hierarchical Linear Regression (R^2)	N/A
MVPA (Females)	Demographic Variables Psychological Variables Social Environment Variables Physical Environment Variables	Hierarchical Linear Regression (R^2)	N/A

Table 9: Section 4.4 Physical Activity Enjoyment Analyses

Dependent Variable	**Independent Variables**	**Statistical Test**	**Measure of Effect Size**
PA Enjoyment	Gender	Independent t test (*t*)	Effect size (*r*)
	Age Category	One way ANOVA(F)	Wilson's Omega Squared (ω^2)
	Area of Residence	Independent t test (*t*)	Effect size (*r*)
	SES	One way ANOVA(F)	Wilson's Omega Squared (ω^2)
PA Enjoyment	MVPA Rec	Independent t test (*t*)	Effect size (*r*)
	Active Commuting	Independent t test (*t*)	Effect size (*r*)
	PE Rec	Independent t test (*t*)	Effect size (*r*)
	Frequency of EC participation	One way ANOVA(F)	Wilson's Omega Squared (ω^2)
	Frequency of EC participation	One way ANOVA(F)	Wilson's Omega Squared (ω^2)
MVPA	Demographic Variables Psychological Variables	Hierarchical Linear Regression	N/A
PA Enjoyment	Demographic Variables Psychological Variables Physical Environment Variables	Hierarchical Linear Regression	N/A

Chapter Four

4.0 Results

This chapter will present the main findings divided into four sections. Section 4.1 will focus on the PA and sedentary behaviour data. Section 4.2 will concentrate on analysis of physical health data and its relationship with demographic characteristics, PA and sedentary behaviour. Section 4.3 analyse the personal, psychological and environmental correlates of PA. The final section, section 4.4, will involve an investigation of physical activity enjoyment in terms of its relationship with PA, and personal, behavioural and social environmental influences on enjoyment.

4.1 Physical Activity and Sedentary Behaviour Analysis

This section will examine PA participation and sedentary behaviour (SB) with respect to demographic factors. The relationship between PA and SB will also be investigated. PA participation will be assessed through analysis of the number of days per week of moderate to vigorous physical activity ≥ 60 minutes (MVPA ≥60 min), active commuting (AC), physical education (PE), extracurricular sport and physical activity (EC) and club sport and physical activity (CB). SB will be assessed through analysis of the daily time spent using the computer, sitting playing video games, doing homework, reading, sitting during school breaks, sitting talking with friends, talking on the phone and TV/DVD watching. The demographic characteristics of interest in examining the data are gender (male/female), age category (10-11 years/12-13 years/14-15 years/16-18 years), area of residence (urban/rural) and socioeconomic status (SES) (upper/middle/lower).

Demographic Characteristics of the Sample

Over five thousand children and adolescents participated in the CSPPA study (N=5397, age 13.85 ± 1.97, range 10-18 years). The descriptive statistics of the sample by demographic factors are presented in Table 10.

Table 10: Demographics of the Sample

Demographic Variables	N	Percentage (%)
Gender		
Male	2524	47
Female	2873	53
Age Category		
10-11 years	677	13
12-13 years	1899	35
14-15 years	1438	26
16-18 years	1383	26
Area of Residence		
Urban	1904	35
Rural	3493	65
SES*		
Upper	2205	45
Middle	1921	39
Lower	752	16

***Note n=519 cases missing due to inability to accurately classify SES**

Physical Activity

Average Days per week of MVPA ≥ 60 minutes

On average, participants engaged in MVPA ≥60 minutes on 4.14 ± 1.74 days a week. Males had a higher average for days of MVPA ≥60 minutes (M= 4.51, SD= ± 1.67) than females (M=3.81, SD=±1.74), $t(5320) = -14.75$, $p<.001$, with a small to medium sized effect ($r=.20$). There was a medium effect for age category on average days of MVPA per week $F(3, 5318) = 122.88$, $p< .001$, $\omega^2=.06$. The 10-11 year olds and 12-13 year olds were not different from each other; however, MVPA decreased as age category increased between all other age categories. No associations were found between area of residence and MVPA. Upper SES participants (M= 4.21, SE=.04, SD= ± 1.67) had higher MVPA than lower SES participants (M= 4.02, SE=.07, SD= ± 1.80), $F(2, 4818) = 4.15$, $p< .05$, with a small sized effect ($\omega^2=.001$). These results are presented in full in Table 11.

Table 11: Average Days per week of MVPA ≥ 60 minutes by Demographics

Demographic Variables	Days per week of MVPA ≥60 minutes (± S.D)	Significance and Effect
Gender*		
Male	4.5 ± 1.7	Male>Female
Female	3.8 ± 1.7	$p<.001$, $r=.20$
Age Category*		
10-11	4.7 ± 1.56	10-11>14-15,16-18
12-13	4.5 ± 1.67	12-13>14-15-16-18
14-15	4.0 ± 1.76	14-15>16-18
16-18	3.5 ± 1.69	$p<.001$, $\omega^2=.06$
Area of Residence*		
Urban	4.1 ± 1.71	NS
Rural	4.1 ± 1.76	
SES**		
Upper	4.2 ± 1.67	Upper>Lower
Middle	4.1 ± 1.79	$p<.001$, $\omega^2=.001$
Lower	4.0 ± 1.81	

***Note: N=5322, 75 cases missing PA recommendation data, **SES sample=4821, additional 501 cases missing SES data due to inability to accurately classify, NS= Non Significant**

MVPA Recommendation

Participants were categorised as meeting the moderate to vigorous physical activity (MVPA) recommendation vs. not meeting the MVPA recommendation based on the DOHC (2009) guideline that children receive at least 60 minutes of MVPA daily. Figure 2 shows that 14% met the MVPA recommendation and 86% did not.

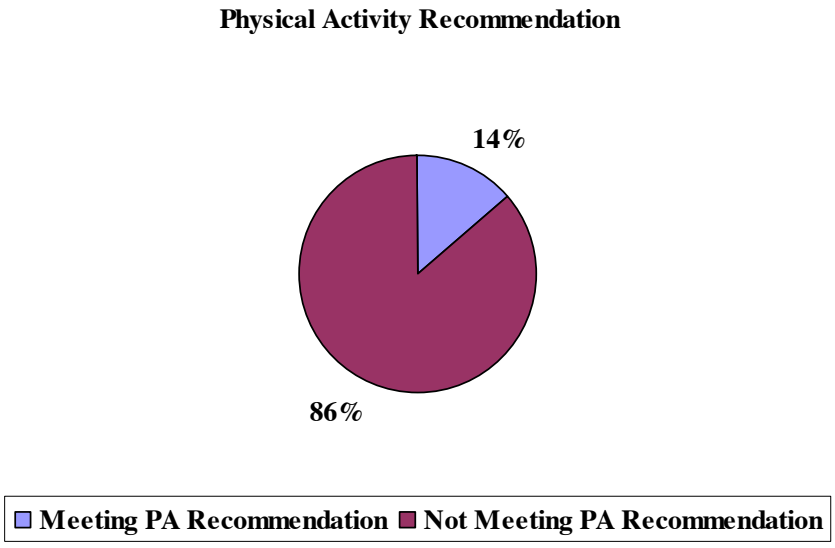

Figure 2 MVPA Recommendation

Males were 1.9 times more likely to meet the MVPA recommendation than females (18% vs.10%, $\chi^2(1) = 66.00$, $p<.001$). The odds of meeting recommendations decreased with age, with the exception of 10-11 year olds and 12-13 year olds, with small sized effect ($\chi^2(3) = 113.63$, $p<.001$, $\nu=.15$). No associations were found between meeting the MVPA recommendation and area of residence or SES. These results are presented in Table 12.

Table 12: MVPA Recommendation by Demographics

Demographic Variables	% Meeting PA Recommendation (N)	Significance and Effect
Gender*		
Male	18% (439)	Male>Female,
Female	10% (283)	$p<.001$
Age Category*		
10-11 years	18% (118)	10-11>14-15,16-18
12-13 years	19% (346)	12-13>14-15,16-18
14-15 years	12% (172)	14-15>16-18
16-18 years	6% (86)	$p<.001$, $\nu=.15$
Area of Residence*		
Urban	13.3% (240)	NS
Rural	13.7% (457)	
SES*		
Upper	12.5 % (268)	
Middle	13.8% (255)	NS
Lower	14.2% (103)	

***Note: N=5322, 75 cases missing PA recommendation data, **SES sample=4821, additional 501 cases missing SES data due to inability to accurately classify, NS= Non Significant**

Active Commuting

Mode of transport on Journey to School

Table 13 shows the proportions of males and females travelling to school on foot, by bicycle, by car, by bus and by train on the journey to school. Travelling by car was the most frequently reported mode of transport for males (41%) females (41%) and overall (41%). Walking to school was the second most frequently reported mode of transport for males (28% males). For females the bus and walking were equally common (29% bus, 29% walking). The train was the least frequently reported mode of transport for males (1%) but for females it was cycling (.2%).

Table 13: Mode of Transport to School by Gender

To School	Male %(N)	Female % (N)	Total % (N)
Walk	28% (697)	29% (829)	28% (1526)
Cycle	5% (136)	.2% (7)	3% (143)
Car	41% (1038)	41% (1163)	41% (2201)
Bus	24 % (611)	29% (821)	27% (1432)
Train	1% (29)	1% (38)	1% (67)

***Note: Sample size= 5369, 28 cases missing mode of transport to school data**

Mode of transport on Journey Home from School

Table 14 shows the proportions of males and females commuting by mode on the journey home from school. Travelling by car was the most frequently reported mode of transport for the journey home for males (34%) followed by walking (33%). For females, travelling by car and walking were equally reported (34% vs.34%). Travelling by train was the least frequently reported mode of transport reported by males (1%) but for females cycling was the least frequently reported mode of transport on the journey home (0.2%).

Table 14: Mode of Transport Home from School by Gender

Way Home	Male %(N)	Female % (N)	Total % (N)
Walk	33% (839)	34% (978)	34% (1817)
Cycle	5% (127)	0.2% (7)	3% (134)
Car	34% (857)	34% (962)	34% (1819)
Bus	26% (658)	30% (866)	29% (1524)
Train	1% (32)	2% (46)	2% (78)

***Note: N=5372, 25 cases missing mode of transport home from school data**

Comparison of Journey to School vs. Home from School

Figure 3 shows a comparison of the modes of transport reported on the journey to and from school by all participants. For the journey to school, travelling by car was most frequently reported (41%) followed by on foot (28%), by bus (27%) by bicycle (3%) and lastly by train (1%). However, for the journey home travelling by car and walking were equally reported (34%) followed by bus (29%) by bicycle (3%) and by train (2%).

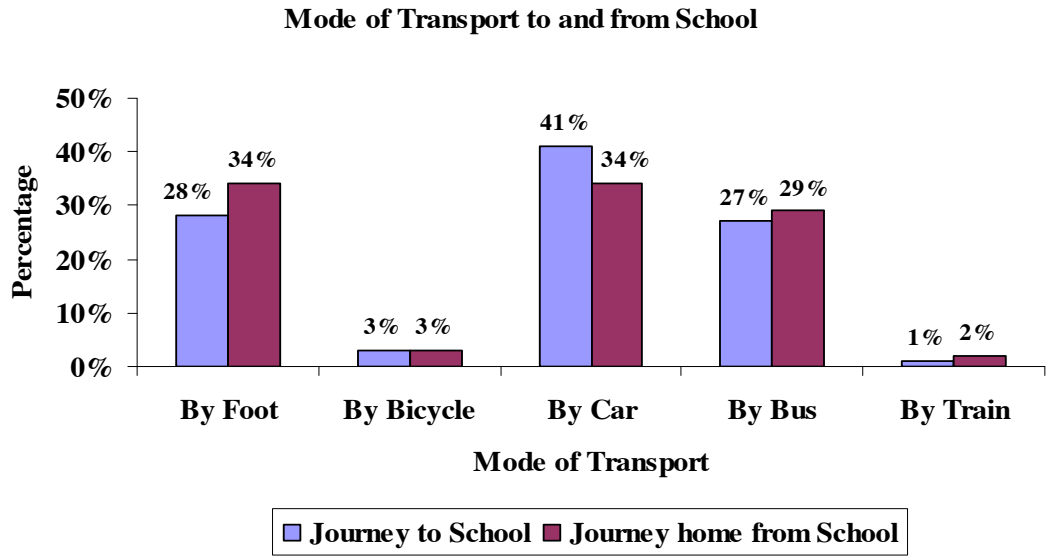

Figure 3 Comparison of Mode of Transport on Commute to and from School

Distance and Time Taken to Travel to School

Table 15 shows the mean distance in kilometres and the mean time in minutes taken to travel to school by mode of transport for post primary participants. The average distance and time travelled to school was 5.93 km ± 7.03 and 15.48 minutes ± 11.68. Overall 58% percent lived within 4km (2.5miles). The majority of those that walked and cycled lived within 4km (99.5% of walkers, 90% of cyclists, and 97% in total). Fifty-four percent of those that travelled by car, 21% percent of those that travelled by bus and 24% of those that travelled by train also lived within 4km (68% in total).

Table 15: Mode of Transport, Distance and Time Taken to Travel to School

	Frequency (%)	Distance (km)	Range (km)	Time (mins)	Range (mins)
Foot	36	1.30	(01-4.5)	14.38	(.5-60)
Bicycle	3	2.40	(0.5-12)	11.61	(1-42)
Car	27	6.09	(0.25-40)	11.75	(.5-90)
Bus	32	10.39	(1-80)	22.38	(2-120)
Train	2	11.73	(1-76)	23.36	(5-120)

***Note Post Primary participants only N=3792, 330 missing cases**

Active vs. Passive School Commuting

Active commuting (AC) was defined as walking or cycling either to or from school or both ways. Passive commuting (PC) was defined as travelling by car bus or

train to and from school. Figure 4 shows that 62% were passive commuters and 38% were active commuters. Of the active commuters, 29% commuted actively on both the journey to and from school, and 9% commuted actively on one leg of the journey either to or from school.

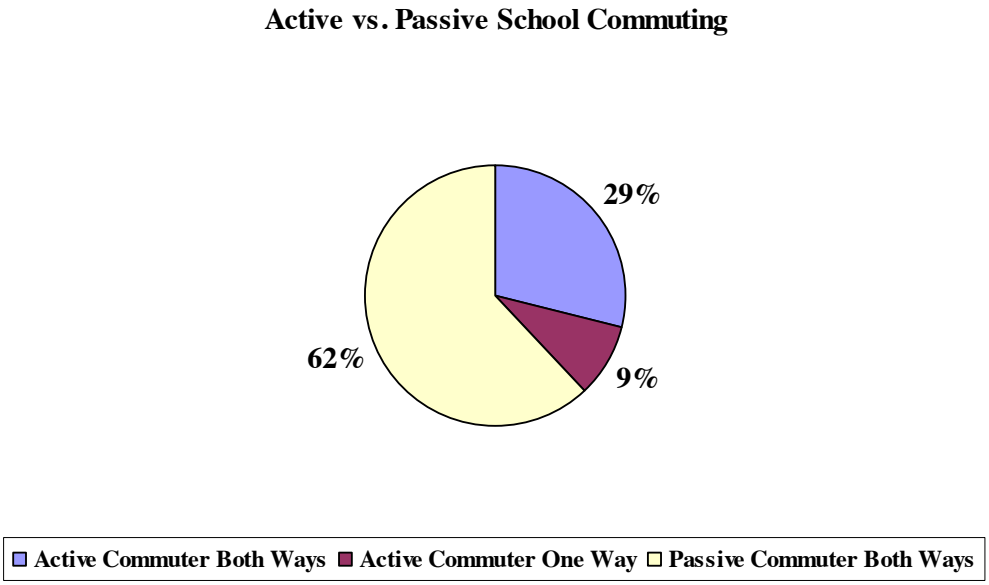

Figure 4: Active School Commuters vs. Passive School Commuters

Males were 1.2 times more likely to AC than females (40% vs. 36%; $\chi^2(1) = 11.96$, $p<.01$). AC increased with age, with small effect ($\chi^2(3) = 18.19$, $p<0.001$, $\nu=.06$). Urban participants were 4.8 times more likely to AC than rural participants (61% vs. 25%; $\chi^2(1) = 689.11$, $p<0.001$). Middle and lower SES participants were more likely to AC than upper SES participants ($\chi^2(2) = 9.83$, $p<0.01$, $\nu=.05$). Those that met the MVPA recommendation were more likely to AC (16% vs.12% $\chi^2(1) = 10.66$, $p<0.05$). These results are presented in Table 16.

Table 16: School Commuting by Demographics

Demographic Variables	% Active Commuting (N)	Significance and Effect
Gender*		
Male	40% (1017)	Male>Female
Female	36% (1026)	$p<.01$
Age Category*		
10-11 years	32.1% (219)	12-13>10-11,14-15,16-18
12-13 years	36.8% (699)	14-15>10-11,16-18
14-15 years	41.5% (599)	16-18>10-11
16-18 years	37.9% (526)	$p<.001$, $\nu=.06$
Area of Residence*		
Urban	61% (1176)	Urban>Rural
Rural	25% (877)	$p<.001$
SES**		
Upper	34% (759)	Middle>Upper
Middle	39% (743)	Lower>Upper
Lower	39% (282)	$p<.01$, $\nu=.05$

***Note: N=5390, 7 cases missing active vs. passive school commuting data, **SES sample=4873, additional 517 cases missing SES data due to inability to accurately classify**

Physical Education

Physical Education (PE) activities and PE minutes will be analysed separately for primary and post primary participants due to differing syllabi and PE recommendations.

PE Activities in the last 12 months

Table 17 shows the types of activities participated in during PE within the last 12 months split by school level and gender. The top 3 activities reported for primary males were soccer (77%), gaelic football (71%), and basketball (65%). The top 3 activities for primary females were basketball (71%), gaelic football (58%) and dance (56%). The top 3 activities reported for post primary males were soccer (62%) basketball (47%), athletics (38%). The top 3 activities for post primary females were basketball (63%), baseball/rounders (57%) and badminton (53%).

Table 17: Types of Physical Education Activities by School Level and Gender

	Primary		Post Primary	
PE Activity	**% Male**	**% Female**	**% Male**	**% Female**
Adventure Activities	12	10	22	26
Aerobics	9	12	17	31
Athletics	43	47	38	48
Badminton	12	14	38	53
Baseball/ Rounders	56	55	35	57
Basketball	65	71	47	63
Camogie	0	36	0	21
Cross Country Running	14	12	13	16
Dance	26	56	12	35
Gaelic Football	71	58	32	27
Gymnastics	23	35	21	34
Handball	18	20	24	21
Hockey	19	27	20	34
Horse Riding	5	3	3	5
Hurling	50	0	19	0
Martial Arts	6	8	5	7
Rugby	44	26	26	20
Soccer	77	49	62	46
Squash	4	6	6	6
Swimming	54	47	14	15
Tennis	15	22	17	29
Weight Training	2	.6	14	7

Primary Minutes of Physical Education per week

On average primary participants received 45.90 minutes of PE per week (Range 100-140 minutes, ± SD 20.20). Table 18 shows PE minutes analysed by demographic factors among primary participants. There was no difference between weekly PE minutes among primary males and females. Fifth class children received more PE than 6th class children $t(1274) = 5.79$, $p<0.001$, $r=.16$. There was no association for area of residence or SES for primary participants.

Table 18: Weekly Primary Physical Education Minutes by Demographics

	Average minutes of PE per week (± SD)	Significance and Effect Size
Gender*		
Male	45.37 ± 19.42	NS
Female	46.34 ± 20.79	
Class in School*		
5th Class	49.27 ± 21.38	5th>6th
6th Class	42.79 ± 18.50	$p<.001, r=.16$
Area of Residence*		
Urban	44.19 ± 20.86	NS
Rural	46.61 ± 19.88	
SES**		
Upper	45.32 ± 19.89	
Middle	47.43 ± 20.60	NS
Lower	49.50 ± 24.04	

***Note: Primary only, sample size=1275, **SES sample=1125, additional 150 cases missing SES data due to inability to accurately classify, NS= Non Significant**

Primary PE Recommendations

Primary participants were classified as meeting the PE recommendation or not meeting the PE recommendation based on DES guidelines (1999) that primary school students receive at least 60 minutes of PE per week. Figure 5 shows that 35% of primary participants are met the recommendation and 65% did not.

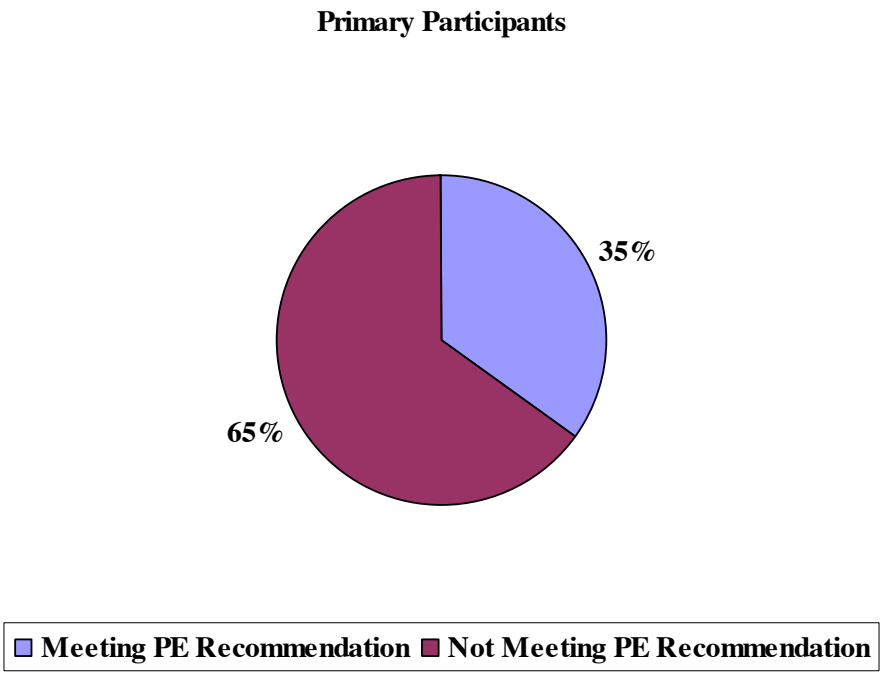

Figure 5: Primary PE Recommendation

There was no association between meeting the PE recommendation and gender among primary participants. 5th class children were twice as likely to meet recommendation as 6th class children (44% vs. 27%, $\chi^2(1) = 39.01$, $p<.001$). Rural primary children were 0.6 times more likely to meet the PE recommendation than urban children (38% vs. 28%, $\chi^2(1) = 11.90$, $p<.01$). There was no association observed for SES. These results are shown in full in Table 19.

Table 19: Primary Physical Education Recommendation by Demographics

	% Meeting Primary PE Recommendation (N)	Significance and Effect Size
Gender*		
Male	33% (186)	NS
Female	37% (262)	
Class in School*		
5th Class	44% (269)	5th class>6th class
6th Class	27% (179)	$p<.001$
Area of Residence*		
Urban	28% (346)	Rural>Urban
Rural	38% (102)	$p<.01$
SES**		
Upper	33% (168)	
Middle	40% (173)	NS
Lower	40% (61)	

***Note: Primary Only, sample size=1275, **SES sample=1125, additional 150 cases missing SES data due to inability to accurately classify, NS= Non Significant**

Post Primary Minutes of Physical Education per week

On average, post primary participants received 76.36 minutes of PE per week (Range 0-160 minutes, ± SD 26.84). Table 20 presents post primary PE minutes analysed by demographic factors. Post primary males (M=79.99, SD= ± 27.34) received more PE minutes per week than post primary females (M=73.08, SD= ± 25.95), with small sized effect ($t(4120) = 8.32$, $p<0.05$, $r=.13$). PE minutes decreased as year in school increased with the exception of 2nd and 3rd years that were not different from each other and 4th year (transition year) participants who had higher weekly PE minutes than any other year group $F(5, 4116) = 154.27$, $p<0.001$, $\omega^2 = 0.19$). Urban post primary participants (M=78.14, SD= ± 39.47) received more weekly PE minutes than rural participants with very small effect (M=75.27, SD= ± 22.23), $t(4120) = -3.33$, $p<0.01$, $r=.05$. Weekly PE minutes increased as SES

category increased from lower to middle to upper with very small effect ($F(2, 3750) = 11.92, p<0.001, \omega^2 = 0.005$)

Table 20: Weekly Post Primary Physical Education Minutes by Demographics

	Average minutes of PE per week (±SD)	Significance and Effect Size
Gender*		
Male	79.99 ± 27.34	Male>Female
Female	73.08 ± 25.95	$p<.05$
Year in School*		
1st year	82.68 ± 18.45	1st> 2nd,3rd,5th,6th
2nd year	75.80 ± 24.97	2nd > 5th, 6th
3rd year	76.64 ± 11.10	3rd > 5th, 6th
4th year	94.82 ± 18.84	4th > 1st, 2nd,3rd, 5th ,6th
5th year	63.26 ± 33.60	5th >6th year
6th year	53.61 ± 35.19	$p<.001, \omega^2 = .19$
Area of Residence*		
Urban	80.3 ± 39.47	Urban>Rural
Rural	75.27 ± 22.23	$p<.001, r=.05$
SES**		
Upper	74.8 ± 30.4	Upper>Middle, Lower
Middle	73.4 ± 28.8	Middle>Lower
Lower	71.6 ± 33.8	$p<.001, \omega^2 = .005$

***Note: Post Primary only, sample size=4122, **SES sample=3753, additional 369 cases missing SES data due to inability to classify**

Post Primary PE Recommendation

Post primary participants were classified as meeting the PE recommendation or not meeting the PE recommendation based on DES (2003) guidelines that post primary school students receive at least 120 minutes of PE per week. Figure 6 shows that 8% of primary participants met the PE recommendation and 92% did not.

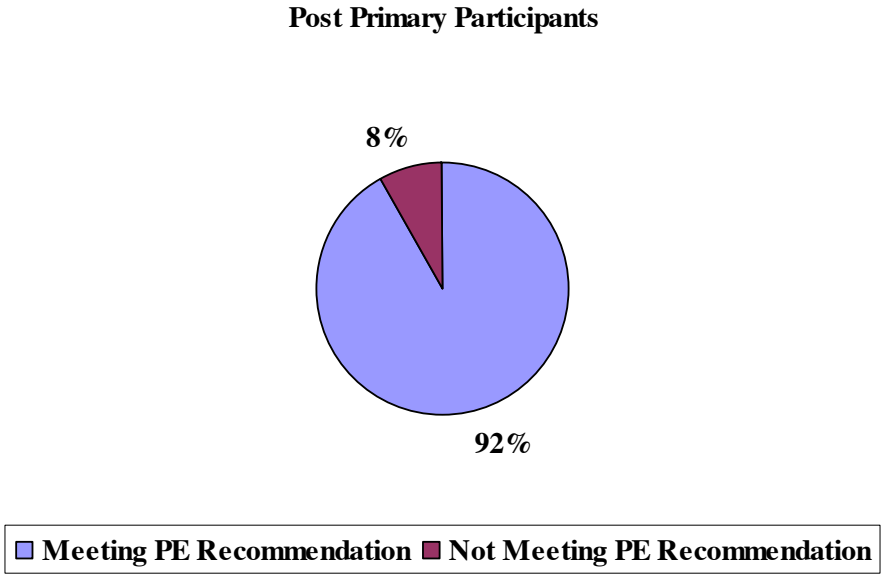

Figure 6: Post Primary PE Recommendation

Post primary males were 1.7 times more likely to meet the PE recommendation than females (10% vs. 6%, $\chi^2(1) = 22.47$. $p<0.001$, $\nu=.07$). Fourth year participants more likely to meet the PE recommendation than any other year group ($\chi^2(5) = 221.25$. $p<0.001$, $\nu=.23$). There was no association for area of residence. Upper SES participants were more likely to meet the PE recommendation than lower SES participants, with small effect ($\chi^2(2) = 9.56$. $p<0.01$, $\nu=.05$). Significantly more participants that met the MVPA recommendation also met the PE recommendation (8% vs. 10%, ($\chi^2(1) = 4.20$, $p<0.05$). These results are shown in Table 21.

Table 21: Post Primary Physical Education Recommendation by Demographics

	% Meeting Post Primary PE Recommendation (N)*	Significance and Effect Size
Gender*		
Male	10% (198)	Male>Female
Female	6% (132)	$p<.001$, $\nu=.07$
Year in School*		
1st year	30% (435)	1st >2nd,3rd, 5th ,6th
2nd year	18% (446)	2nd>3rd, 6th
3rd year	0% (0)	4th>1st, 2nd, 3rd, 4th,5th
4th year	35% (114)	$p<.001$, $\nu=.23$
5th year	17% (56)	
6th year	0% (0)	
Area of Residence*		
Urban	7% (92)	NS
Rural	9% (238)	
SES**		
Upper	9% (157)	Upper> Lower
Middle	8% (114)	$p<.01$, $\nu=.05$
Lower	5% (30)	

***Note: Post Primary only, sample size=4122, **SES sample=3753, additional 369 cases missing SES data due to inability to classify**

Extracurricular Sport and Physical Activity

Extracurricular Sports and Physical Activity in the last 12 months

Extracurricular sport and physical activity (EC) was defined as any organised sport or PA that participants took part in during lunch time or after school (outside PE time) with the help of a teacher. Table 22 shows the types of EC activities that participants indicated participation in at least once a week within the last 12 months. The top 3 EC activities reported for males were soccer (21%), gaelic football (18%) and hurling (13%). The top 3 activities for females were gaelic football (14.8%), basketball (15%) and camogie (11%).

Table 22: Types of Extracurricular Activities by Gender

EC Activity	% Male	% Female
Adventure Activities	2	2
Aerobics	3	4
Athletics	8	9
Badminton	4	5
Baseball/ Rounders	6	7
Basketball	11	15
Camogie	0	11
Cross Country Running	3	5
Dance	3	10
Gaelic Football	18	15
Gymnastics	3	4
Handball	3	3
Hockey	2	7
Horse Riding	1	2
Hurling	13	0
Martial Arts	2	2
Rugby	9	3
Soccer	21	9
Squash	2	1
Swimming	6	8
Tennis	3	5
Weight Training	2	1

Extracurricular Sport and Physical Activity: Frequency of Participation

Table 23 shows the proportions of males and females participating in EC either 4 or more days a week, 2-3 days a week, 1 day a week, less often or never. The majority of males report participating 4 or more days per week (37%) whereas the majority of females report participating 2-3 days per week (27%). More females than males report that they participate 1 day a week or that they never participate ($\chi^2(4) = 223.48$ $p<0.001$, $\nu=.21$)

Table 23 Frequency of Extracurricular Participation by Gender

	Male %(N)	Female % (N)	Total % (N)*
4+ days/week	37 (914)	19(552)	28(1466)
2-3 days/week	24 (601)	27 (775)	26 (1376)
1 day/week	13 (333)	20(570)	17 (903)
Less often	12 (290)	12 (334)	12 (624)
Never	14 (354)	21 (612)	18 (966)

***Note**: **Sample Size N= 5335, 62 cases missing frequency of EC participation data**

Extracurricular Sport and Physical Activity: Participant vs. Non Participant

Participants were classified EC participants (engaged extracurricular sport or physical from 4+days per week to less than once a week) or non EC participants (those who indicated that they never took part in EC). Males were 1.7 times more likely to be EC participants than females (86% vs. 79%; $\chi^2(1) = 48.00$, $p < 0.001$). The odds of being an EC participant increased from the 10-11 year old category to the 12-13 and 14-15 year old categories but a drop in participation was observed for the 16-18 year olds ($\chi^2(3) = 52.47$, $p < 0.001$, $\nu = .10$. There were no associations found between EC participation and area of residence. The upper SES were 0.7 and 0.8 times more likely to be EC participants than middle and lower SES respectively ($\chi^2(2) = 13.11$, $p < 0.01$, $\nu = .05$). Those that met the MVPA recommendation were 0.8 times more likely to be EC participants than those that reported non-participation (14% vs. 11%; $\chi^2(1) = 5.58$, $p < 0.05$). Table 24 presents these findings in full.

Table 24: Extracurricular Participation by Demographics

	% EC Participant (N)	Significance and Effect
Gender*		
Male	86% (2138)	Male>Female
Female	79% (2231)	$p<.001$
Age Category*		
10-11	76% (508)	
12-13	85% (1587)	12-13>10-11,16-18
14-15	85% (1209)	14-15>10-11,16-18
16-18	78% (1065)	$p<.001$, $\nu = .10$
Area of Residence*		
Urban	82% (1533)	NS
Rural	82% (2836)	
SES**		
Upper	84% (1848)	Upper>Middle
Middle	81% (1540)	Upper>Lower
Lower	80% (588)	$p<.01$, $\nu = .05$

***Note: Sample Size N= 5335, 62 cases missing EC participation data, **SES sample=4836, additional 499 cases missing SES data, NS= Non Significant**

Club Sport and Physical Activity

Club Sport and Physical Activity in the last 12 months

Club sport and physical activity (CB) is defined as participation in organised sport or PA in a club outside of school. Participants were asked to indicate the type of club sports or physical activities that they had participated in weekly within the last 12 months. Table 25 shows the breakdown of types of CB activities by gender. The top 3 CB activities reported for males were soccer (36%), gaelic football (31%) and hurling (21%). The top 3 activities for females were dance (27%), swimming (21%) and gaelic football (20%).

Table 25: Types of Club Activities by Gender

CB Activity	% Male	% Female	% Total
Adventure Activities	4	4	4
Aerobics	2	5	4
Athletics	9	10	10
Badminton	4	4	4
Baseball/ Rounders	3	3	3
Basketball	7	9	8
Camogie	0	17	9
Cross Country Running	4	6	5
Dance	4	27	16
Gaelic Football	31	20	26
Gymnastics	1	5	3
Handball	4	2	3
Hockey	2	5	4
Horse Riding	4	10	7
Hurling	21	0	11
Martial Arts	6	4	5
Rugby	13	3	8
Soccer	36	11	24
Squash	2	2	2
Swimming	13	21	17
Tennis	6	8	7
Weight Training	10	3	7

Club Sport and Physical Activity: Frequency of Participation

Table 26 shows the proportions of males and females participating in CB either 4 or more days a week, 2-3 days a week, 1 day a week, less often or never. The most common frequency reported for all participants was 2-3 days per week. More females than males reported that they never participate (33% vs. 25%, χ^2 (4) =127.64, p<0.001).

Table 26 Frequency of Participation by Gender

	Male %(N)	Female % (N)	Total % (N)
4+ days/week	30 (735)	18 (522)	24 (1257)
2-3 days/week	34 (832)	31 (888)	32 (1720)
1 day/week	10 (241)	14 (406)	12 (647)
Less often	2 (59)	2 (78)	3 (137)
Never	25 (614)	33 (938)	29 (1552)

***Note**: **Sample Size N= 5313, 84 cases missing frequency of CS participation data**

Club Sport and Physical Activity: Participant vs. Non Participant

Participants were classified CB participants (those that had engaged club sport or PA from 4+days per week- less than once a week) or non CB participants (those who never participate). Table 27 shows classification of CB participation by demographic factors. Males were 1.5 times more likely to participate in CB than females (75% vs. 67%; $\chi 2(1) = 44.84$, $p < 0.001$). CB participation decreased with age, with a small- medium effect size ($\chi 2(3) = 298.45$, $p < 0.001$, $\nu = .24$). Rural participants were 1.3 times more likely to participate in CB than their urban counterparts, with very small effect (73% vs. 67%, $\chi 2(1) = 20.66$, $p < 0.001$, $\nu = .06$). CB participation increased with each increasing SES category ($\chi 2(2) = 68.59$, $p < 0.001$, $\nu = .12$). Those that met the MVPA recommendation were 0.5 times more likely to report being CB participants 0.5 than non CB participants (16% vs. 8%, $\chi 2(1) = 54.86$, $p < 0.001$).

Table 27: Club Participation by Demographics

	% Club Sport/PA Participant (N)	Significance and Effect
Gender*		
Male	75% (1867)	Male>Female
Female	67% (1894)	p>.001
Age Category*		
10-11	92% (618)	10-11>12-13,14-15,16-18
12-13	76% (1425)	12-13>14-15,16-18
14-15	66% (927)	14-15>16-18
16-18	58% (791)	p>.001, ν=.24
Area of Residence*		
Urban	67% (1249)	Rural>Urban
Rural	73% (2512)	p>.001
SES**		
Upper	77% (1669)	Upper> middle, lower
Middle	70% (1320)	Middle> Lower
Lower	61% (455)	p>.001, ν= .12

***Note: N= 5313, 84 cases missing CS participation data, **SES sample=4811, additional 502 cases missing SES data**

Sedentary Behaviour

Types of Sedentary Behaviour by Gender

The time participant's spent engaged in individual sedentary behaviour (SB) per day is presented in minutes for interpretation purposes. Table 28 shows a comparison of the average minutes per day over the previous 7 days that male and female participants spent engaging in SB by type of activity. Males spent more minutes per day playing video games ($t(2416) = 9.96$ $p<0.001$, $r=.20$) and TV/DVD watching than females ($t(4471) = 3.35$, $p<0.01$, $r = .05$). Females spent more minutes per day than males doing homework/studying ($t(4221) = 6.67$, $p<0.001$, $r=.10$), reading ($t(2431)=3.83$, $p<0.001$, $r=.08$), sitting during school breaks ($t(2487) = 5.24$, $p<0.001$, $r = .10$), sitting talking with friends (t $(3858) = 3.58$, $p<0.001$, $r = .06$) and talking on the phone ($t(3293) = 8.50$, $p<0.001$, $r=.15$). The largest effect size observed between genders was for video games ($r=.20$). There was no significant difference in the average hours that males and females spent on the computer/ internet over the previous 7 days.

Table 28: Average Minutes of Sedentary Behaviours per day in Last 7 Days by Gender

Sedentary Behaviour (SB)	Males Average Minutes per day (±SD)	Female Average Minutes per day (±SD)	Significance and Effect Size
Computer/ Internet	35.25 ± 49.47	32.52 ± 46.81	NS
Sitting Playing Video Games	38.62 ±60.52	16.21 ± 25.50	Male>Female $p<.001$, $r=.20$
Homework/ Studying	51.42 ± 48.30	62.60 ± 58.22	Female>Male $p<.001$, $r=.10$
Reading (not for School)	29.46 ± 35.04	36.59 ± 49.21	Female>Male $p<.001$, $r=.08$
Sitting During School Breaks	23.29 ± 22.15	28.48 ± 23.98	Female>Male $p<.001$, $r=.10$
Sitting Talking with Friends	49.70 ± 71.12	58.52 ± 79.58	Female>Male $p<.001$, $r=.06$
Talking of the Phone	18.90 ± 36.75	33.73 ± 56.58	Female>Male $p<.001$, $r=.15$
TV/DVD Watching	68.98 ± 71.12	62.24 ± 63.37	Male>Female $p<.01$, $r=.05$

Average Daily Hours of Sedentary Behaviour

The time participant's spent engaged in SB per day overall is presented in hours for interpretation purposes. The average time spent in SB per day was 3.80 hours ± 2.57. Females engaged in more SB per day than males (3.98 ± 2.63 vs. 3.61 ± 2.48, $t(5115) = -5.32$, $p<0.001$, $r=.07$). Daily time spent engaged in SB increased with age $F(3, 5113) = 128.49$, $p<0.001$ $\omega^2 = .07$). Urban area participants spent more hours per day engaging in SB than rural area participants (4.18 ± 2.73 vs. 3.61 ± 2.45, $t(5115) = -7.60$, $p<0.001$, $r=.11$). There was no association between SB and SES. These results are presented in full in Table 29.

Table 29: Average Daily Hours of Sedentary Activity by Demographics

Demographic Variables	Average Daily Hours of Sedentary Activity (±S.D)	Significance and Effect Size
Gender*		
Male	3.61 ± 2.48	Female>Male
Female	3.98 ± 2.63	$p<.001$, $r=.07$
Age Category*		
10-11	2.44 ± 1.63	10-11>14-15,16-18
12-13	3.46 ± 2.44	12-13>14-15-16-18
14-15	4.31 ± 2.74	14-15>16-18
16-18	4.47 ± 2.60	$p<.001$, $\omega^2=.06$
Area of Residence*		
Urban	4.18 ± 2.73	Urban>Rural
Rural	3.61 ± 2.45	$p<.001$, $r=.11$
SES**		
Upper	4.2 ± 1.67	
Middle	4.1 ± 1.79	NS
Lower	4.0 ± 1.81	

***Note: N=5117, 280 cases missing average daily sedentary hours data, **SES sample=4660, additional 457 cases missing SES data due to inability to accurately classify, NS= Non Significant**

Sedentary Screen Time

Daily sedentary screen time (SST) is an average of the amount of time participants indicated that they watched TV, used a computer or played video games. Based on the recommendation that children receive $\leq$2 hours minutes of daily, participants were classified into meeting the SST recommendation or not meeting the SST recommendation (American Academy of Pediatrics Committee on Public Education, 2001). Figure 7 shows that 70% of participants met the SST recommendation ($\leq$ 2 hours of daily SST) and 30% did not meet the recommendation ($\geq$ 2 hours of daily SST).

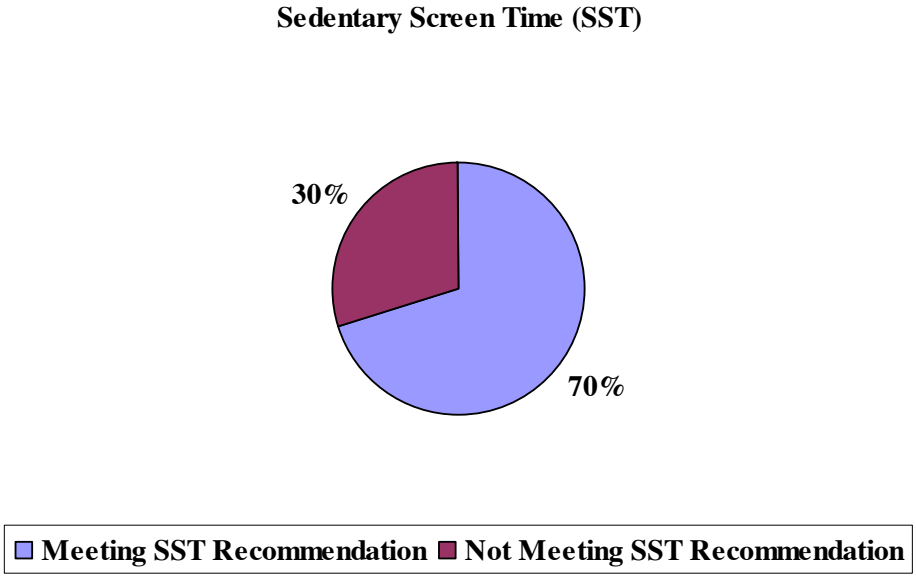

Figure 7: Sedentary Screen Time Recommendation

Females were 0.6 times more likely to meet the SST recommendation than males (75% vs. 64%, $\chi^2(1) = 69.76$, $p<0.001$). As age increased percentage meeting the SST recommendation decreased ($\chi^2(3) = 108.34$, $p<0.001$, $\nu=.15$). There was no association between meeting of SST recommendation and area of residence or SES. Table 30 presents these results in full.

Table 30: SST Recommendation by Demographics

Demographic Variables	% Meeting SST Recommendation (N)	Significance and Effect Size
Gender*		
Male	64% (1520)	Female>Male
Female	75% (2061)	$p<.001$
Age Category*		
10-11	83% (547)	10-11>12-13, 14-15,16-18
12-13	74% (1335)	12-13>14-15-16-18
14-15	66% (868)	$p<.001$, $\nu=.15$
16-18	63% (831)	
Area of Residence*		
Urban	71% (1260)	NS
Rural	70% (2321)	
SES**		
Upper	71% (1515)	
Middle	70% (1279)	NS
Lower	67% (472)	

***Note: N=5107, 290 cases missing SST data, **SES sample=4650, additional 457 cases missing SES data, NS= Non Significant**

Physical Activity and Sedentary Behaviour

There was a small negative correlation found between days of MVPA ≥60 minutes and hours of SB and per day when controlling for the effects of age and gender (r=-.07, p<0.001). Table 31 shows that those that met the MVPA recommendation engaged in less daily hours of SB than those who did not meet the MVPA recommendation (t(5046) =3.47, p<0.01, r=.05). Those that actively commuted to or from school reported higher SB hours than those who passively commuted to school (t(5109) =3.91, p<0.001, r=.05). Individuals who were allocated the DES recommended minutes of PE per week spent less time per day engaged SB than those that did not meet the PE recommendation (t(5093)=11.18, p<0.001, r=.18) . Those that reported that they never participate in EC activities had higher daily SB hours than those that participate 2 to 3 days per week or 4+ days per week (F(4,5060)=3.77, p<0.01, ω^2=.002). Those that never participate in CB spent more time engaged in SB than those that participate less often, 1 day /week, 2-3 days/week and 4+ days/week respectively (F(4,5060)=42.82, p<0.001, ω^2=.03).

Table 31: Relationship between Physical Activity and Sedentary Activity

Physical Activity Variables	Average Hours of Daily Sedentary Behaviour	Significance and Effect
Physical Activity		Not
Meeting MVPA Rec	3.49 ± 2.57	Meeting>Meeting
Not Meeting MVPA Rec	3.86 ± 2.56	p<.01, r=.05
School Commuting		
Active Commuter	3.99 ± 2.70	Active>Passive
Passive Commuter	3.70 ± 2.48	p<.01, r=.05
Physical Education		Not
Meeting PE Rec	2.93 ± 2.09	Meeting>Meeting
Not meeting PE Rec	4.06 ± 2.64	p<.001, r=.18
Extracurricular Sport and PA		
Participate 4+ days/week	3.68 ± 2.57	4+ days/week>Never
Participate 2-3 days/week	3.69 ± 2.42	2-3 days/week>Never
Participate 1 day a week	3.91 ± 2.72	p<.01, ω^2=.002
Participate Less Often	3.86 ± 2.41	
Never Participate	4.03 ± 2.66	
Club Sport and PA		
Participate 4+ days/week	3.45 ± 2.33	4+ days/week>Never
Participate 2-3 days/week	3.56 ± 2.38	2-3 days/week>Never
Participate 1 day a week	3.48 ± 2.45	1/dayweek>Never
Participate Less Often	3.71 ± 2.76	Less Often>Never
Never Participate	4.54 ± 2.83	p<.001, ω^2=.03

Summary of Section 4.1

In summary, males participated in more PA than females. This pattern was observed average weekly MVPA, AC, minutes of PE (post primary only), EC and CB participation. Males spent less time engaged in SB per day than females. Males spent more time playing video games and watching TV per day whereas females spent more time engaged in homework, reading sitting during school breaks, sitting talking with friends and talking on the phone. This result meant that fewer males than females met the SST recommendation.

In terms of age category, activity decreased as age increased across average weekly MVPA and CB participation. However, the opposite was true of AC and EC with these forms of activity increasing up to the age of 14-15. PE minutes decreased as year in school increased, with the exception of fourth year (transition year) that had more weekly PE minutes than any other year. Daily time spent engaged in SB increased with age and meeting of SST recommendation decreased with age.

Area of residence was found to be an insignificant factor in terms of average MVPA and meeting of MVPA recommendation, but there were significant findings in terms of AC with those in urban areas showing a much higher incidence than those in rural areas. EC participation was also more prevalent in rural areas.

SES was a significant factor in terms of MVPA ≥ 60 minutes, post primary PE minutes and EC and CB participation, with the upper SES category reporting higher engagement in these forms of activity than the lower SES category and the middle SES category in some cases. The opposite was found for AC, with the lower and middle SES categories being more likely to actively commute than the upper SES category.

In terms of the relationship between PA and SB, those that met the MVPA recommendation or the PE recommendation spent less time engaged in SB per day. SB decreased with increasing frequency of participation in EC and CB.

4.2 Physical Health Measures Analysis

This section will concentrate on the analysis of physical health (PH) data. The PH measures included assessments of aerobic fitness (AF), body mass index (BMI), waist circumference (WC) and blood pressure (BP). An examination each of these measures by demographic factors will be conducted followed by an examination of the relationship between PH, physical activity (PA) and sedentary behaviour (SB).

Physical Health Measures Sample

Physical health data was collected and analysed among a 25% sub-sample of the study participants (N=1351, mean age=13.58 ± 2.13, range 10-18 years). Table 32 presents the demographics of the physical health measures sample.

Table 32: Demographics of the Physical Measures Sample

Variables	N	Percentage (%)
Gender		
Male	697	52
Female	654	48
Age Category		
10-11 years	255	19
12-13 years	524	39
14-15 years	182	13
16-18 years	390	29
Area of Residence		
Urban	633	47
Rural	718	53
SES*		
Upper	532	43
Middle	506	41
Lower	197	16

Note: SES sample= 1235, 116 cases removed from SES analysis due to inability to accurately classify SES

Aerobic Fitness

Classification of Aerobic Fitness

Participants were classified as having a healthy aerobic fitness (AF) level or an unhealthy AF level based on age and gender standardised criteria for number of total runs completed in the 20MST (The Cooper Institute for Aerobics Research,

2004). Figure 8 shows that 76% of the sample had a healthy AF level and 24% had an unhealthy AF level.

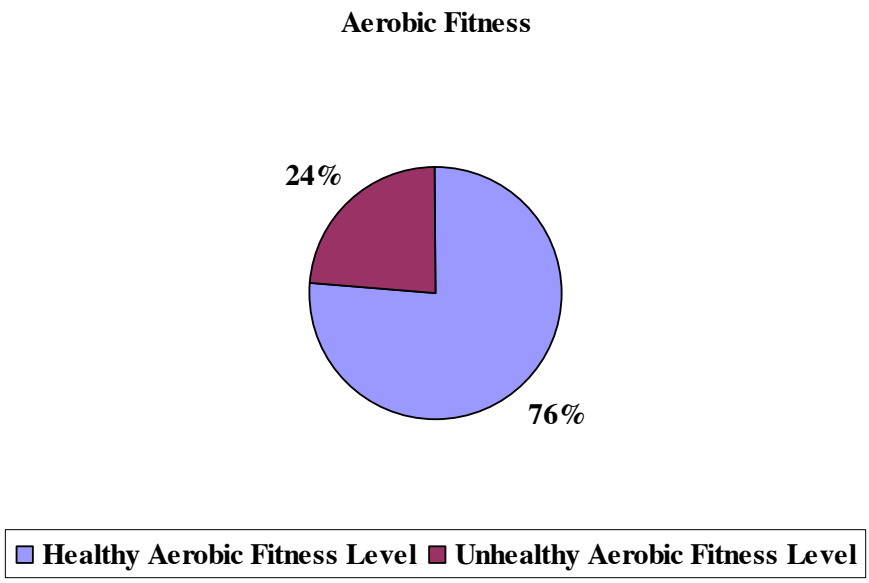

Figure 8: Aerobic Fitness Classification

Table 33 shows the breakdown of AF by demographics. Females were 0.6 times more likely to meet the healthy AF criteria than males (80% vs. 71%; $\chi^2(1) = 14.16$, $p<0.001$) and AF decreased with age. The 10-11 year old children were has a healthy AF than any other age category. The 12-14 year old category were also more likely to have a healthy AF level than the 16-18 year olds ($\chi^2(3) = 42.99$, $p<0.001$, $\nu=.19$). There was no association between AF and area of residence. A higher proportion of upper SES participants than middle or lower SES participants had a healthy AF level ($\chi^2(2) = 11.85$, $p<0.01$, $\nu=.10$).

Table 33: Healthy Aerobic Fitness levels by Demographics

	% Healthy Aerobic Fitness Level (N)	Significance and Effect
Gender*		
Male	71% (452)	Female>Male
Female	80% (493)	$p<.001$
Age Category*		
10-11	90% (225)	10-11>12-13,14-15,16-18
12-13	76% (382)	12-13>16-18
14-15	72% (183)	$p<.001$, $\nu=.19$
16-18	67% (215)	
Area or Residence*		
Urban	77% (435)	NS
Rural	75% (510	
SES**		
Upper	82% (400)	Upper>Middle
Middle	74% (351)	Upper>Lower
Lower	72% (129)	$p<.01$, $\nu=.10$

***Note Sample Size= 1247, 104 cases missing aerobic fitness data, **SES sample=1139, additional 108 cases removed due to inability to classify SES, NS=Non Significant**

Body Mass Index

Classification of Body Mass Index

Participants were classified as having a healthy body mass index (BMI) or an unhealthy BMI based on age and gender standardised criteria for height and weight (Cole et al., 2000; Cole et al., 2007). Figure 9 shows that 21% percent was either overweight (17%) or obese (4%), 2% were underweight and 77% had a normal BMI.

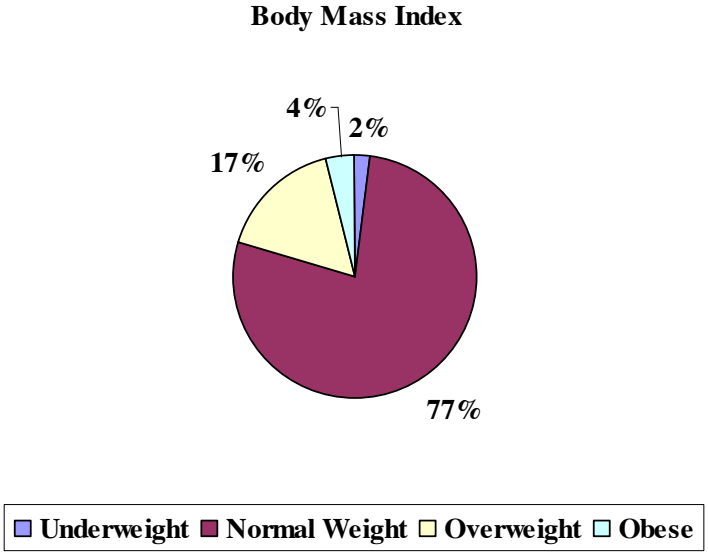

Figure 9: Body Mass Index Classification

The distribution of the sample across BMI categories is shown in Table 34. No associations were found between BMI and demographic factors.

Table 34: BMI by Demographics

	Underweight %	Normal Weight %	Overweight %	Obese %	Significance and Effect
Gender*					
Male	2%	78%	15%	5%	NS
Female	3%	76%	18%	3%	
Age Category*					
10-11	3%	80%	16%	1%	
12-13	2%	74%	19%	5%	NS
14-15	2%	81%	13%	4%	
16-18	1%	79%	16%	4%	
Area of Residence*					
Urban	3%	78%	16%	4%	NS
Rural	2%	77%	18%	4%	
SES**					
Upper	1%	80%	16 %	3%	
Middle	3%	78%	15%	4%	NS
Lower	4%	74%	19%	4%	

Note: *Sample= 1343, 8 cases missing BMI data, ** SES sample= 1229, additional 114 cases removed from SES analysis due to inability to accurately classify SES, NS=Non Significant

Waist Circumference

Classification of Waist Circumference

Participants were classified as having a healthy waist circumference (WC) or an unhealthy WC based on age and gender standardised criteria (Taylor et al., 2000). Figure 10 depicts that 88% of the sample had a healthy WC for their age and gender while 12% had an unhealthy WC.

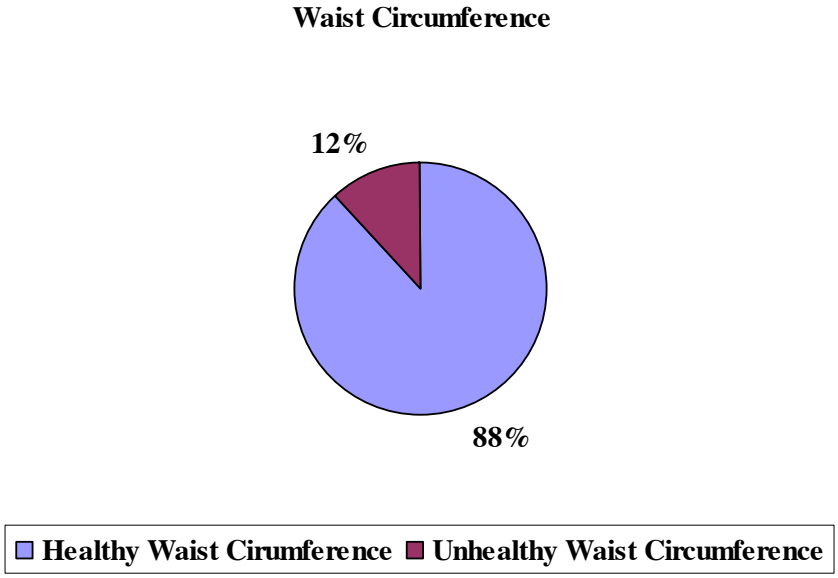

Figure 10: Waist Circumference Classification

Table 35 shows the breakdown of healthy WC by demographics. Females were more likely to have a healthy WC than males (91% vs. 86%, $\chi^2(1) = 6.70$, $p<0.05$). The 10-11 year olds were more likely to have a healthy WC measurement than any other age category ($\chi^2(3) = 21.17$, $p<0.001$, $\nu=.13$). There were no associations between WC and area of residence or SES.

Table 35: Waist Circumference by Demographics

	Healthy WC %	Significance and Effect
Gender*		
Male	86 % (588)	Female>Male
Female	91% (578)	$p<.05$
Age Category*		
10-11	96% (244)	10-11>12-13.14-15,16-18
12-13	87% (448)	$p<.001$, $\nu=.13$
14-15	87% (147)	
16-18	85% (327)	
Area of Residence*		
Urban	89% (543)	NS
Rural	88% (623)	
SES**		
Upper	89% (470)	
Middle	88% (434)	NS
Lower	88% (168)	

Note: *Sample= 1324, 27cases missing Waist Circumference data, ** SES sample= 1213, additional 111 cases removed due to inability to accurately classify SES NS=Non Significant

Blood Pressure

Classification of Blood Pressure

Blood Pressure (BP) was classified into healthy and unhealthy based on age, gender and percentile of height (National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents, 2004). Figure 11 illustrates that three quarters (75%) of the sample had a healthy BP for and one quarter (25%) had an unhealthy BP.

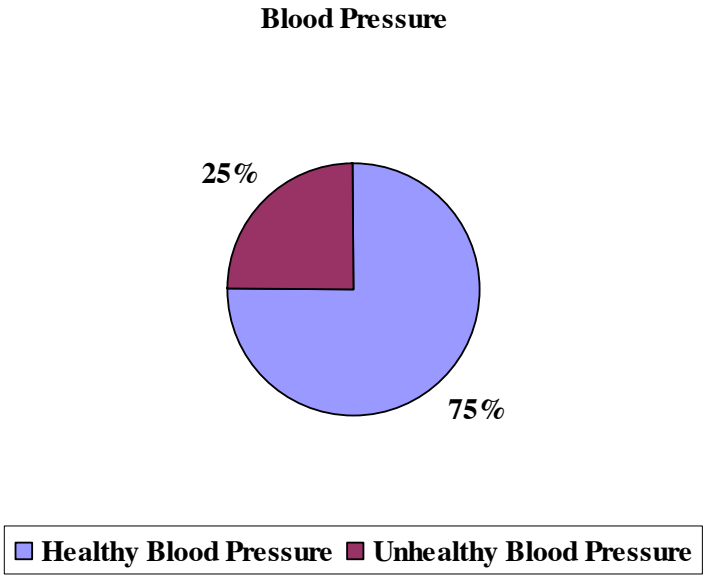

Figure 11: Blood Pressure Classification

Table 36 shows the breakdown of BP by demographics. There was no association between BP and gender. The 10-11 year olds, the 12-13 year olds and the 14-15 year olds were all more likely to have a healthy BP than the 16-18 year olds ($\chi^2(3) = 28.00$, $p<0.001$, $\nu=.15$). There was no association between BP and area of residence or SES.

Table 36: Blood Pressure Classification by Demographics

	Healthy BP % (N)	Significance and Effect
Gender*		
Male	74% (505)	NS
Female	75% (489)	
Age Category*		
10-11	78% (198)	10-11>16-18
12-13	79% (408)	12-13>16-18
14-15	78% (142)	14-15>16-18
16-18	65% (246)	$p<.001$, $\nu=.15$
Area of Residence*		
Urban	74% (449)	NS
Rural	76% (545)	
SES**		
Higher	75% (146)	
Middle	74% (370)	NS
Lower	75% (394)	

Note: *Sample= 1331, 20 cases missing Blood Pressure data, ** SES sample= 1217, additional 114 cases removed due to inability to accurately classify SES, NS=Non Significant

Health Index Score

For each of the four physical health measures, participants that had healthy measurement were assigned a score of 1 and participants with unhealthy measurement were assigned a score of 0. The scores on the four physical health measures were then summed to create a health index for each participant. Therefore the maximum health index a participant could receive was 4 (most healthy) and the minimum was 0 (least healthy). Figure 12 shows the proportions of each health index.

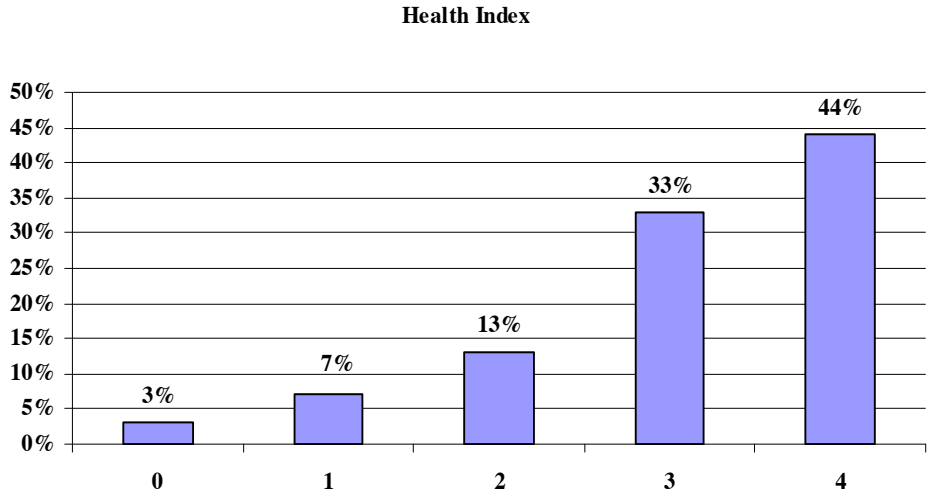

Figure 12: Health Index Proportions
Note: 0= Least Healthy, 4= Most Healthy

Physical Health and Physical Activity

Average days of MVPA ≥60 minutes per week and Physical Health Measures

Participants that has a healthy level of AF (M=4.44, SD= ± 1.64) had a higher average of MVPA days ≥60 minutes than those who were not fit (M=3.70, SD=± 1.80), $t(1232) = -6.54$, $p<0.001$, $r=.18$. Those that were classified as having a healthy BMI (normal weight=77%) had a higher average of MVPA days ≥60 minutes than those that had an unhealthy BMI (underweight=2%, obese, 4%, overweight=17%) (4.29 vs. 4.07, $t(1328) = -2.04$, $p<0.05$, $r=.06$. Those that were classified as having a healthy WC had a higher average of MVPA days ≥60 minutes than those that had an unhealthy WC (4.29 vs. 3.94, $t(1310) = -2.38$, $p<0.05$, $r=.07$. Those that were classified as having a healthy BP had a higher average of MVPA days ≥60 minutes than those that had an unhealthy BP (4.31 vs. 3.95 +, $t(1315) = -3.37$, $p<0.01$, $r=.09$). The largest effect size observed was for AF. These results are presented in Table 37.

Table 37: Average Days of MVPA ≥60 minutes per week by Physical Health Measures

Physical Health Measures	Average MVPA	Significance and Effect
Aerobic Fitness (AF)		
Healthy	4.44 ± 1.64	Healthy>Unhealthy
Unhealthy	3.70 ± 1.80	$p<.001$, $r=.18$
Body Mass Index (BMI)		
Healthy	4.29 ± 1.75	Healthy>Unhealthy
Unhealthy	4.07 ± 1.64	$p<.05$, $r=.06$
Waist Circumference (WC)		
Healthy	4.29 ± 1.73	Healthy>Unhealthy
Unhealthy	3.94 ± 1.56	$p<.05$, $r=.07$
Blood Pressure (BP)		
Healthy	4.31 ± 1.77	Healthy>Unhealthy
Unhealthy	3.95 ± 1.57	$p<.01$, $r=.09$

Average days of MVPA ≥60 minutes per week and Health Index

Figure 13 shows that as days of MVPA ≥60 minutes increase there is an increase in average health index. Those that met the MVPA recommendation of 7 days of MVPA ≥60 minutes had the highest health index $F(5,1331)= 7.78$, $p<0.001$, $\omega^2=.02$.

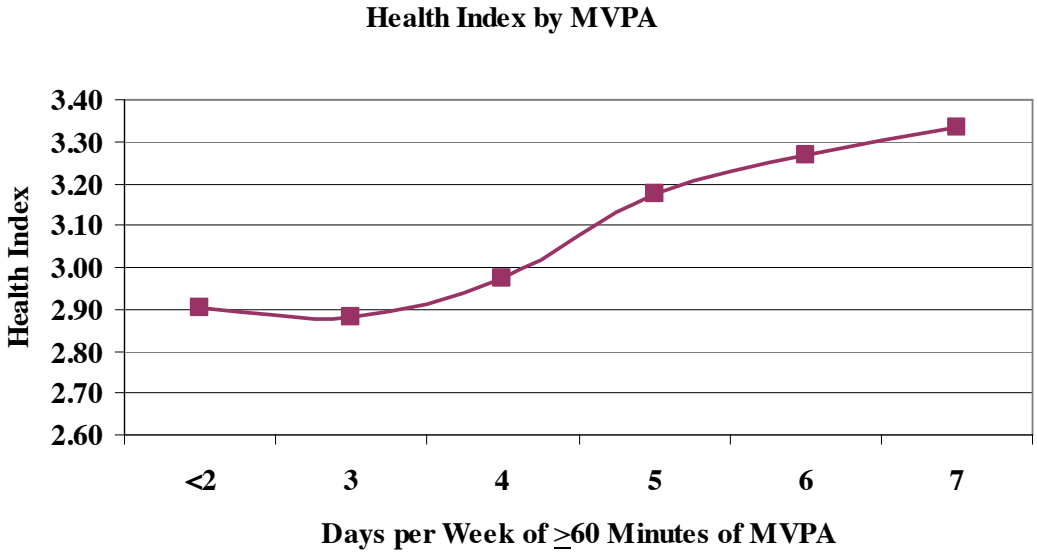

Figure 13: Health Index by MVPA Days ≥60 minutes per Week

Extracurricular and Club Sport/PA and Health Index

Figure 14 shows that as frequency of EC participation increases from never to 4+ days a week, health index increases $F(3, 1181) = 5.28$, $p<.01$, $\omega^2=.001$. The relationship is stronger and more linear for CB participation, with those that never participate having a lower health index than those that participate 2-3 days a week and 4+days a week $F(2,1277)= 16.66$, $p<0.001$, $\omega^2=.04$. In both cases, those that never participate have the lowest health index, and those that participate 4+ days a week have the highest health index.

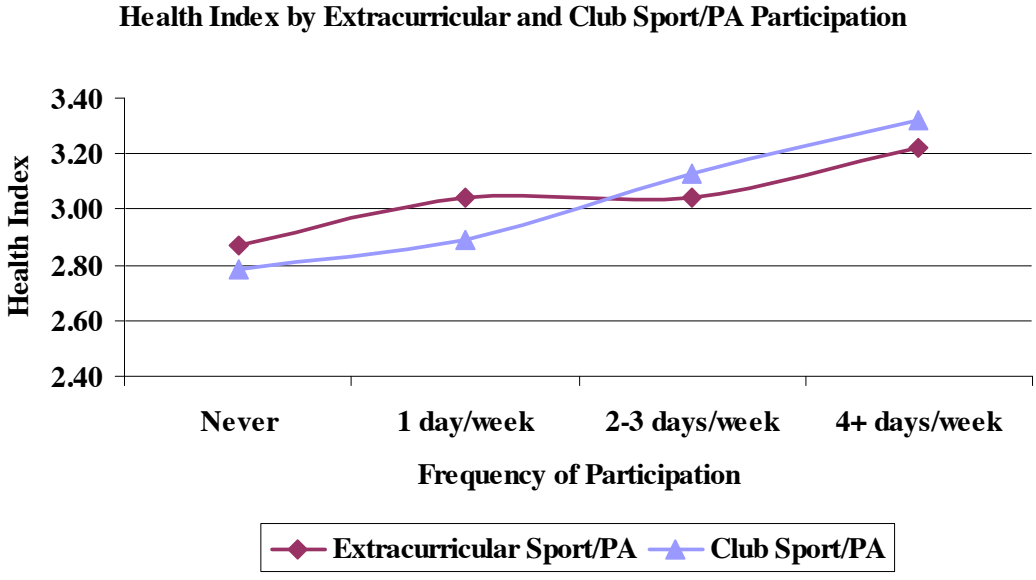

Figure 14 Health Index by Frequency of Extracurricular and Club Sport/PA

Physical Health and Sedentary Behaviour

Average Daily Sedentary Activity and Physical Measures

Those that were classified as having a healthy level of AF engaged in less hours of sedentary activity per day (3.18 vs. 3.93, $t(1195) = 4.68$, $p<0.001$, $r=.13$. There was no association found between average daily sedentary activity and the other three physical health measures. These results are shown in full in Table 38.

Table 38: Average Daily Hours of Sedentary Activity by Physical Health Measures

Physical Health Measures	Average Daily Sedentary Hours	Significance and Effect
Aerobic Fitness		
Healthy	3.18 ± 2.22	Unhealthy>Healthy
Unhealthy	3.93 ± 2.74	$p<.001$, $r=.13$
Body Mass Index		
Healthy	3.38 ± 2.37	NS
Unhealthy	3.33 ± 2.35	
Waist Circumference		
Healthy	3.34 ± 2.37	NS
Unhealthy	3.59 ± 2.32	
Blood Pressure		
Healthy	3.34 ± 2.47	NS
Unhealthy	3.44 ± 2.06	

Note: NS= Non Significant

Average daily sedentary hours and Health Index

Figure 15 shows that as average daily hours of sedentary activity increases, there is a linear decrease in health index. However this relationship was not statistically significant.

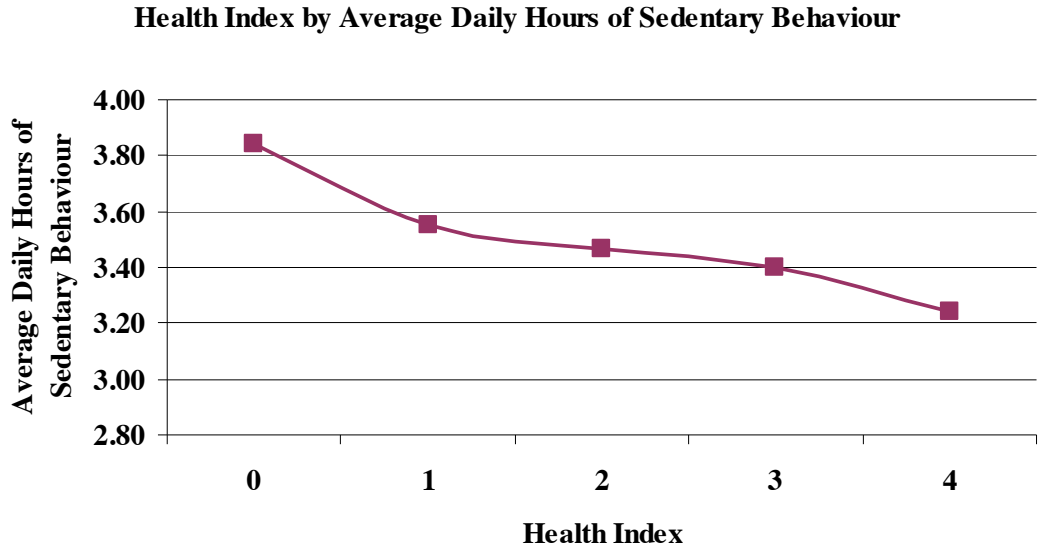

Figure 15: Health Index by Average Daily hours of Sedentary Behaviour

Summary of Section 4.2

Three quarters of the sample had a healthy level of AF (76%), a healthy or normal BMI (77%) and a healthy BP (75%). Slightly higher proportions had a healthy WC (88%). Just under half of participants (44%) were classified as healthy on all four physical health measures. No gender differences were found for healthy levels of BP or BMI. Females were more likely have a healthy AF level and WC than males. Age category was the strongest demographic indicator of health, with proportions classified as healthy decreasing as age category increased across all four physical health measures. More rural participants were classified as having a health BP than their urban counterparts, but this statistical association was weak in terms of effect size. More participants from upper SES than middle or lower categories had a healthy level of AF.

In terms of the relationship between MVPA and physical health, those that were classified as healthy for each of the physical measures had a higher average of MVPA ≥60minutes than those that were classified as unhealthy, with the strongest relationship evident for AF. As average days of MVPA ≥60 minutes increased, health index increased. Those that met the MVPA recommendation of 7 days had the most favourable health profile. Those that participated in EC or CB had a higher health index than those that never participated, with both forms of activity showing a linear increase in health index as frequency of participation increased.

The relationship between sedentary behaviour and physical health was not as strong, with AF being the only measure in which whose that were classified as healthy spent less time per day engaged in SB than those that were classified as unhealthy.

4.3 Correlates of MVPA Analysis

This section will examine the personal, psychological, social environmental and physical environmental correlates of physical activity (PA) by gender. Regression analyses will be employed to examine the correlates that predict the variance in average days of moderate to vigorous physical activity ≥60minutes per week (MVPA ≥60 minutes) for males and females.

Demographics of the Correlates of Physical Activity Sample

A number of correlate measures were not included in the primary questionnaire as they were deemed unsuitable for the age and comprehension level of 5th and 6th class children. Primary children were excluded from the correlates analysis. Only post primary participants with full data sets on personal, psychological, social environment and physical environment correlates of PA were included in this analysis. The exclusion of post primary cases with missing data resulted in a reduced sample size of (N=1939, mean age 14.76 ± 1.56, range 12-18 years). This complete correlates sample was compared to those that were excluded due to missing data (N=2183, mean age 14.47 ± 1.61, range 12-18 years) to investigate differences on demographic variables. There was no difference in gender breakdown between the two samples. The full correlates sample was older with less 12-13 year olds and more 16-18 year olds ($\chi^2(2) = 40.85$, $p<0.001$, $\nu=.10$). There were slightly less urban participants in the full sample ($\chi^2(1) = 6.30$, $p<0.05$). There were more upper SES participants and fewer lower SES participants in the full correlates sample ($\chi^2(2) = 26.92$, $p<0.001$, $\nu=.07$). These comparisons and the descriptive statistics of the correlates of PA sample by demographic factors are presented in Table 39.

Table 39: Demographics of Main Sample vs. Correlates Sample

	Missing Correlates Sample (N=2183)		Full Correlates Sample (N=1939)		Missing vs. Full
	N	%	N	%	
Gender					
Male	1025	47	933	48	NS
Female	1158	53	1006	52	
Age Category					<12-13
12-13 years	777	36	524	27	>16-18
14-15 years	749	34	689	36	p<.001,
16-18 years	657	30	726	37	ν=.10
Area of Residence					
Urban	870	40	699	36	<Urban
Rural	1313	60	1240	64	*p*<.05
SES					
Upper	745	41	952	49	>Upper
Middle	757	42	730	38	<Lower
Lower	312	17	257	13	p<.001,
					ν=.09

Note: <= Significantly less in Full Sample, >= significantly more in Full Sample

Influence of Gender on MVPA and Correlates of Physical Activity

Males had a higher average of MVPA ≥ 60minutes per week than females (4.33 ± 1.62 vs. 3.58 ± 1.73, $t(1937) = 9.91$, $p<0.001$, $r = .22$). Table 40 presents the frequencies, means, standard deviations, t values, χ^2 values and effect sizes of the personal, psychological, social environment and physical environment correlates of PA divided by gender. Fourteen of the 19 correlate scales were influenced by gender ($p<0.05$). There was no difference between male and female scores on fear of injury as a barrier, teacher social support, perception of pedestrian safety, perception of places for walking and cycling or perception of access to services. The analysis revealed a trend across correlate scales, with males generally exhibiting a more positive correlate profile than females. Males had a higher score than females for self efficacy, PA enjoyment, PE enjoyment, peer and family social support and perception of safety from crime. Males had lower scores on all barriers indicating that they perceived fewer barriers than females. Females had a higher perception of aesthetics and walkability of their neighbourhood streets than males. Overall, the effect sizes for the influence of gender on correlate scales would be classified as small to medium (r=.10-.30). Self efficacy showed the largest gender difference in terms of effect size (r=.27).

Table 40: Correlates Analysis by Gender

Variables	Male (M)	Female (F)	t/χ^2	Effect
Personal				
Age Category				12-13 F>M
• 12-13	23%	31%		14-15 M>F
• 14-15	37%	34%	$\chi^2(2)= 17.75$**	16-18 M>F
• 16-18	40%	35%		ν=.10
Area of Residence				Urban F>M
• Urban	34%	38%	$\chi^2(1)= 4.08$*	Rural M>F
• Rural	66%	62%		ν=.05
SES				
• Upper	51%	47%		
• Middle	37%	38%	$\chi^2(2)= 4.20$	NS
• Lower	12%	15%		
Psychological				
PA Enjoyment	68.6±9.9	65.3±11.9	6.68**	*r*=.15, M>F
PE Enjoyment	44.7±7.0	42.7±7.5	6.21**	*r*=.14, M>F
Self Efficacy	57.9±19.3	47.2±18.5	12.40**	*r*=.27, M>F
Lack of Time [B]	2.7 ± 2.4	3.9 ± 2.7	10.20**	*r*=.23, F>M
Social Influence [B]	2.4 ± 2.1	3.2 ± 2.3	7.91**	*r*=.18, F>M
Lack of Energy [B]	2.9 ± 2.4	4.0 ± 2.6	9.61**	*r*=.21, F>M
Lack of Willpower [B]	2.9 ± 2.5	4.0 ± 2.7	8.85**	*r*=.20, F>M
Fear of Injury [B]	1.9 ± 2.1	2.0 ± 2.1	1.19	NS
Lack of Skill [B]	2.0 ± 2.2	2.6 ± 2.5	5.90**	*r*=.13, F>M
Lack of Resources [B]	2.5 ± 2.1	3.0 ± 2.2	4.58**	*r*=.10, F>M
Social Environment				
Peer Support	17.0 ± 3.7	15.3 ± 3.6	9.92**	*r*=.22, M>F
Family Support	15.4 ± 4.3	14.4 ± 4.1	4.66*	*r*=.11, M>F
Teacher Support	10.6 ± 4.3	10.5 ± 4.1	.34	NS
Physical Environment				
Aesthetics	11.0 ± 2.8	11.3 ± 2.8	2.68*	*r*=.06, F>M
Safety - Pedestrian	18.2 ± 4.1	18.3 ± 4.0	.63	NS
Safety - Crime	4.4 ± 2.1	4.7 ± 2.1	-3.23*	*r*=.07, M>F
Places for Walking/Cycling	15.5 ± 4.7	15.5 ± 4.6	.16	NS
Neighbourhood Streets	7.6 ± 2.1	8.0 ± 2.1	3.42*	*r*=.08, F>M
Access to Services	16.7 ± 4.0	16.6 ± 4.2	.50	NS

Note: *p<.01, **p<.001, [B] = Barriers: higher score equals higher barrier

Bivariate Relationship between Correlates and MVPA

Bivariate correlation analyses were employed to investigate the relationship between each of the correlates and average days of MVPA ≥60 minutes for males and females separately (Table 41-44). Demographic factors and correlate scales that were correlated (p<0.05) with MVPA were to be included in the separate male and female regression analyses to follow. Due to the nature of regression, raw age (12-18 years) and SES scores (social class 1-7) were used rather than composite categorisation scores. Among male participants, pedestrian safety, crime safety, places for walking and cycling, walkability of neighbourhood streets and access to

services did not correlate significantly with MVPA and were excluded from the subsequent regression analysis. Area of residence did not show a significant correlation, and an additional t-test found no differences between MVPA scores among rural and urban male participants. The variable was therefore excluded from the regression analysis.

Among females, area of residence, pedestrian safety, crime safety and neighbourhood streets were the only variables that did not show significant correlations with MVPA. Exclusion of area of residence from further analysis was confirmed through an independent t test, which found no association. Eighteen variables showed significant correlations with MVPA and will therefore be included in the female regression analysis.

Table 41: MVPA Pearson Correlations among Males Part 1

	MVPA	Age	AR	SC	PAE	PEE	SE	LT	SI	LE	LW	FI	LS	LR
MVPA	1													
Personal														
Age	-.243**	1												
Area of Residence (AR)	-.062	.087**	1											
Social Class (SC)	-.075*	.015	-.050	1										
Psychological														
PA Enjoyment (PAE)	.308**	-.061	.025	-.118**	1									
PE Enjoyment (PEE)	.274**	-.032	.024	-.079*	.559**	1								
Self Efficacy (SE)	.346**	.066*	.049	-.108**	.396**	.312**	1							
Lack of Time Barrier (LT)	-.293**	.034	-.001	.034	-.434**	-.285**	-.340**	1						
Social Influence Barrier (SI)	-.320**	.033	-.006	.116**	-.450**	-.327**	-.355**	.652**	1					
Lack of Energy Barrier (LE)	-.305**	.057	.018	.048	-.430**	-.299**	-.351**	.714**	.638**	1				
Lack of Willpower Barrier(LW)	-.360**	.030	.033	.139**	-.457**	-.311**	-.382**	.612**	.652**	.648**	1			
Fear of Injury Barrier (FI)	-.098**	-.077*	-.054	.118**	-.267**	-.170**	-.217**	.480**	.569**	.445**	.499**	1		
Lack of Skill Barrier (LS)	-.248**	-.048	.004	.093**	-.479**	-.345**	-.354**	.582**	.657**	.565**	.647**	.572**	1	
Lack of Resources Barrier (LR)	-.111**	.012	-.026	.070*	-.252**	-.154**	-.112**	.485**	.546**	.458**	.483**	.472**	.502**	1

Table 42: MVPA Pearson Correlations among Males Part 2

	MVPA	PSS	FSS	TSS	A	PS	CS	PWC	NS	AS
MVPA	1									
Social Environment										
Peer Social Support (PSS)	.423**	1								
Family Social Support(FSS)	.380**	.503**	1							
Teacher Social Support (TSS)	.241**	.385**	.396**	1						
Physical Environment										
Aesthetics (A)	.145**	.063	.164**	.043	1					
Pedestrian Safety (PS)	.049	.144**	.069*	.109**	-.036	1				
Crime Safety (CS)	-.072*	.027	-.047	.106**	-.270**	.024	1			
Places for walking/cycling (PWC)	.051	.145**	.084*	.095**	-.102**	.626**	.156**	1		
Neighbourhood Streets (NS)	.051	.064*	.032	.034	.018	.194**	.018	.239**	1	
Access to Services (AS)	.034	.116**	.094**	.058	-.187**	.495**	.187**	.581**	.191**	1

Note: *p<.05, **p<.01

Table 43: MVPA Pearson Correlations among Females Part 1

	MVPA	Age	AR	SC	PAE	PEE	SE	LT	SI	LE	LW	FI	LS	LR
MVPA	1													
Personal														
Age	-.238**	1												
Area of Residence (AR)	.054	-.069*	1											
Social Class (SC)	-.062*	-.034	-.028	1										
Psychological														
PA Enjoyment (PAE)	.354**	-.060	-.023	-.088**	1									
PE Enjoyment (PEE)	.301**	-.033	-.094**	-.077*	.584**	1								
Self Efficacy (SE)	.369**	-.063*	.001	-.112**	.447**	.412**	1							
Lack of Time Barrier (LT)	-.338**	.136**	.062*	.062	-.393**	-.331**	-.377**	1						
Social Influence Barrier (SI)	-.378**	.110**	.032	.136**	-.377**	-.343**	-.403**	.603**	1					
Lack of Energy Barrier (LE)	-.471**	.192**	.053	.118**	-.401**	-.289**	-.389**	.607**	.611**	1				
Lack of Willpower Barrier(LW)	-.471**	.192**	.053	.118**	-.401**	-.289**	-.389**	.607**	.611**	.656**	1			
Fear of Injury Barrier (FI)	-.085**	-.138**	.059	.166**	-.214**	-.192**	-.180**	.334**	.356**	.304**	.298**	1		
Lack of Skill Barrier (LS)	-.328**	.044	.038	.132**	-.451**	-.346**	-.385**	.535**	.626**	.560**	.625**	.495**	1	
Lack of Resources Barrier (LR)	-.176**	.034	-.077*	.139**	-.146**	-.119**	-.164**	.414**	.486**	.396**	.382**	.391**	.461**	1

Table 44: MVPA Pearson Correlations between among Females Part 2

	MVPA	PSS	FSS	TSS	A	PS	CS	PWC	NS	AS
MVPA	1									
Social Environment										
Peer Social Support (PSS)	.423**	1								
Family Social Support(FSS)	.430**	.590**	1							
Teacher Social Support (TSS)	.285**	.484**	.458**	1						
Physical Environment										
Aesthetics (A)	.157**	.114**	.160**	.049	1					
Pedestrian Safety (PS)	.041	.119**	.096**	.095**	.080*	1				
Crime Safety (CS)	-.058	-.102**	-.116**	-.043	-.278**	-.025	1			
Places for walking/cycling (PWC)	.071*	.109**	.047	.081*	-.035	.633**	.041	1		
Neighbourhood Streets (NS)	-.018	.087**	.061	.055	.051	.175**	-.047	.200**	1	
Access to Services (AS)	.067*	.047	.016	.046	-.157**	.440**	.127**	.571**	.126**	1

Note: *p<.05, **p<.01

Regression Analyses to Predict MVPA ≥ 60 Minutes per Week

Males

A hierarchical linear regression was performed on the male participant data with MVPA as the dependent variable. Age and social class were entered into block 1. The psychological correlate scales, social environment scales and physical environment scales were entered into the second block as predictor (independent) variables.

Step 1, including age and social class was significant in predicting 6% of the variance in MVPA ($F(2,930) = 32.00$, $p < 0.001$). The addition of psychological, social and physical environmental correlates increased the variance significantly in accounting for an additional 27% of the variance in MVPA, with the total adjusted model predicting 33% of the variance $F(16, 916)=29.12$, $p < 0.001$ (Table 45). Age was a significant negative predictor of MVPA in the first step with the negative B score indicating that as age category increases MVPA decreases among males. Social class was also negative and significant indicating that as social class went from high to low, MVPA decreased. Significant predictors ranked in order of standardised beta scores in step 2 included: age (negative), self efficacy, peer social support, lack of willpower barrier (negative), social influence barrier (negative), family social support, teacher social support and aesthetics.

Table 45: Regression analysis to predict MVPA among males

Step 1	**B**	**SE B**	**β**
Constant	8.37	0.51	
Personal/Demographic			
Age	-0.26	0.03	-.24***
Social Class	-0.07	0.03	-.07*
Step 2			
Constant	4.44	0.68	
Personal/Demographic			
Age	-0.21	0.03	-.20***
Social Class	0.00	0.03	.00
Psychological			
PA Enjoyment	0.00	0.01	-.03
PE Enjoyment	0.00	0.01	.02
Self Efficacy	0.02	0.00	.18***
Lack of Time	-0.01	0.03	-.02
Social Influence	-0.08	0.03	-.11*
Lack of Energy	-0.01	0.03	-.02
Lack of willpower	-0.11	0.03	-.17***
Fear of Injury	0.03	0.03	.04
Lack of skill	0.03	0.03	.04
Lack of Resources	0.05	0.03	.07
Social Environment			
Peer Social Support	0.08	0.02	.18***
Family Social Support	0.04	0.01	.10**
Teacher Social Support	0.03	0.01	.08*
Physical Environment			
Aesthetics	0.04	0.02	.07**

Note: **R^2= .06 Step 1, R^2 = .33 Step 2 (*p*<.001), *=*p*<.05, **= *p*<.01, ***=*p*<.001**

Females

A hierarchical linear regression was performed on the female participant data with MVPA as the dependent variable. Age and social class were entered into block 1 as they were the only personal demographic variables that correlated with MVPA. The psychological correlate scales, social environment scales and physical environment scales were entered into the second block as predictor (independent) variables.

Step 1, including age and social class was significant in predicting 6% of the variance in MVPA F(2, 1003) = 32.98, p <0.001. The addition of psychological, social and physical environmental correlates increased the variance significantly in accounting for an additional 29% of the variance in MVPA, with the total adjusted model predicting 35% of the variance F(16,987)= 30.38, p <0.001 (Table 46). Age and social class were significant negative predictors of MVPA in the first step with

the negative B score indicating that as age and social class increased, MVPA decreased among females. Significant predictors ranked in order of standardised beta scores in step 2 included: lack of willpower barrier (negative), family social support, lack of energy barrier (negative), self efficacy, peer social support, age (negative), aesthetics and access to services.

Table 46: Regression analysis to predict MVPA among females

Step 1	**B**	**SE B**	**β**
Constant	7.66	0.51	
Personal/Demographic			
Age	-0.26	0.03	-.241***
Social Class	-0.08	0.03	-.07*
Step 2			
Constant	2.07	0.68	
Personal/Demographic			
Age	-0.09	0.03	-.09**
Social Class	0.01	0.03	.01
Psychological			
PA Enjoyment	0.01	0.01	.04
PE Enjoyment	0.00	0.01	.02
Self Efficacy	0.01	0.00	.11**
Lack of Time	0.03	0.03	.05
Social Influence	-0.03	0.03	-.05
Lack of Energy	-0.07	0.03	-.11*
Lack of willpower	-0.17	0.03	-.26***
Fear of Injury	0.03	0.03	.04
Lack of skill	0.02	0.03	.03
Lack of Resources	0.02	0.03	.03
Social Environment			
Peer Social Support	0.05	0.02	.10**
Family Social Support	0.05	0.01	.13***
Teacher Social Support	0.03	0.01	.06
Physical Environment			
Aesthetics	0.04	0.02	.06*
Places for Walking/cycling	0.00	0.01	.01
Access to Services	0.03	0.01	.06*

Note: R2= .06 Step 1, R2= .35 (p<.001), *=p<.05, **= p<.01, ***=p<.001

Summary of Section 4.3

Within this sub-sample of 12-18 year olds, males were found to be more active than females in terms of average MVPA days ≥60 minutes. Gender associations were found for 14 of the 19 psychological, social environment and physical environment scales. Males generally had a more favourable correlate profile with higher scores than females on all scales apart from neighbourhood aesthetics

and walkability of neighbourhood streets. Females perceived higher barriers than males across 6 of the 7 barriers to physical activity subscales. Variables in which there was no gender association included fear of injury barrier, teacher social support, pedestrian safety, places for walking and cycling and access to services. Self efficacy showed the largest gender difference in terms of effect size (r=.27).

Regression analyses to predict the variance in MVPA found that a range of personal demographic factors, psychological, social and physical environment correlates are significant in contributing to MVPA for males and females. Significant factors for males included age (negative), self efficacy, peer social support, lack of willpower barrier (negative), social influence barrier (negative), family social support, teacher social support and aesthetics. For females significant predictors included lack of willpower barrier (negative), family social support, lack of energy barrier (negative), self efficacy, peer social support, age (negative), aesthetics and access to services. Social environment variables also contributed differently between genders with peer social support being the most important social support variable for males and family social support being more important for females and teacher social support not contributing to MVPA at all for females. Access to services was an additional physical environment variable to aesthetics that contributed to MVPA for females but not males.

4.4 Physical Activity Enjoyment Analysis

This chapter will focus on examination of physical activity enjoyment (PAE). The relationship between PAE and demographic factors will be analysed. The relationship between PAE and physical activity (PA) will be explored to determine if PAE has a significant impact on average days of MVPA ≥60 minutes per week (MVPA ≥60 minutes). Finally, the significance of previously examined demographic factors, behavioural PA variables and social environment variables in predicting PAE will be investigated.

Physical Activity Enjoyment Sample

The physical activity enjoyment (PAE) analysis will involve use of regression models so only cases with full data sets for demographic factors, PA variables, PAE and social support (SS) variables were included in the analysis (N=3826, mean age 13.99 ± 1.99, range 10-18 years). Excluded cases due to missing data (N=1571, mean age 13.51, range 10-18 years) were compared to those that were included in the analysis to analyse differences between samples. There was no difference in gender breakdown between the two samples. The full sample was older with less 12-13 year olds and more 16-18 year olds ($\chi^2(3) = 68.92$, $p<0.001$, $\nu=.11$). There were also small breakdown differences between samples for area of residence ($\chi^2(1) = 6.54$, $p<0.05$) and SES ($\chi^2(2) = 14.77$, $p<0.01$, $\nu=.06$). There were small differences for proportions meeting the MVPA recommendations ($\chi^2(1) = 10.30$, $p<0.01$), actively commuting ($\chi^2(1) = 14.80$, $p<0.001$), meeting the PE recommendations ($\chi^2(1) = 11.70$, $p<0.01$), and for frequency of CB participation ($\chi^2(4) = 18.26$, $p<0.01$, $\nu=.06$). There were differences between samples for average day of MVPA ≥60 minutes ($t(5190) = 3.57$, $p<0.001$, $r=.05$, teacher social support ($t(5320) = 5.39$, $p<0.001$, $r=.07$) and PE minutes ($t(5373) = 2.27$, $p<0.05$, $r=.03$). All effect sizes were below the 0.10 criterion for small effect, indicating that significance is due to large sample size. The descriptive statistics of the PAE sample by demographic variables, PA variables and psychological and social variables are presented in Table 47.

Table 47: Descriptives for Full vs. Missing Physical Activity Enjoyment Sample

	Missing (N=1571)	Full (N=3826)	Missing vs. Full
Personal Demographic Variables			
Gender			
Male	47	47	NS
Female	53	53	
Age Category (%)			
10-11 years	14	12	
12-13 years	41	33	F<p<.001 ν=.11
14-15 years	26	27	F>p<.001 ν=.11
16-18 years	19	28	
Area of Residence (%)			
Urban	38	34	F<, p<.05
Rural	62	66	
SES Category (%)			
Upper	41	46	F>,p<.01, ν=.06
Middle	41	39	
Lower	18	15	
Physical Activity Variables			
Physical Activity			
Average days of MVPA (M±SD)	4.28 ± 1.77	4.09 ± 1.73	F<,p<.001,r=.05
Meeting MVPA Rec (%)	16	13	F<, p<.01
Active Commuting (%)	42	36	F<, p<.001
Physical Education			
Average PE minutes (M±SD)	74.93±30.41	72.87±30.02	F< p<.05, r=.03
Meeting PE Recommendation (%)	24	20	F<, p<.01
Frequency of EC Participation (%)			
4+ days/week	29	27	
2-3 days/week	24	26	
1 day/week	17	17	NS
Less Often	10	12	
Never	20	18	
Frequency of club Participation (%)			
4+ days/week	24	23	
2-3 days/week	29	34	F>,p<.01, ν=.06
1 day/week	12	12	
Less Often	4	2	
Never	31	29	
Psychological/Social Variables			
PA Enjoyment (M±SD)	66.84±11.32	67.57±10.39	NS
Peer Social Support (M±SD)	16.48±3.80	16.32±3.62	NS
Family Social Support (M±SD)	15.56±4.71	15.38±4.61	NS
Teacher Social Support (M±SD)	11.67±4.61	10.92±4.32	F<,p<.001,r=.07

Note: F< = significantly Lower in Full PA Enjoyment Sample, F>= significantly Greater in Full PA Enjoyment sample, NS= Non Significant

Influence of Demographic Variables on Physical Activity Enjoyment

Table 48 shows PAE data analysed by demographic variables. Male participants had higher PAE scores than females ($t(3824) = 6.83$, $p<0.001$, $r=.11$). The 10-11 year olds had higher PAE scores than any other age category ($F(3, 3822) = 47.88$, $p<0.001$, $\omega^2=.04$). This decrease in PAE with age was evident for both males ($F(3, 1781) = 12.24$ $p<0.001$, $\omega^2=.02$) and females ($F(3, 2037) = 42.49$, $p<0.001$, $\omega^2=.06$) with small and medium effect respectively (Figure 16). There was no association for area of residence. PAE increased with each increasing SES category ($F(2, 3822) = 11.32$, $p<0.001$, $\omega^2=.005$).

Table 48: Physical Activity Enjoyment by Demographics

	N	Mean Enjoyment (±SD)	Significance and Effect Size
Gender			
Male	1785	68.85 ± 9.98	Male>Female
Female	2041	66.45 ± 11.51	$p<.001$, $r=.11$
Age Category			
10-11 years	443	72.68 ± 7.50	10-11>12-13,14-15,16-18
12-13 years	1261	68.19 ± 10.86	12-13>14-15,16-18
14-15 years	1035	66.21 ± 11.67	$p<.001$, $\omega^2=04$.
16-18 years	1087	66.06 ± 10.63	
Area of Residence			
Urban	1309	67.35 ± 11.18	NS
Rural	2517	67.69 ± 10.73	
SES			
Upper			
Middle	1179	68.31 ± 10.19	Upper>Lower
Lower	1487	67.32 ± 11.41	Middle>Lower
	560	65.89 ± 11.41	$p<.001$, $\omega^2=005$.

Note: NS=Non Significant

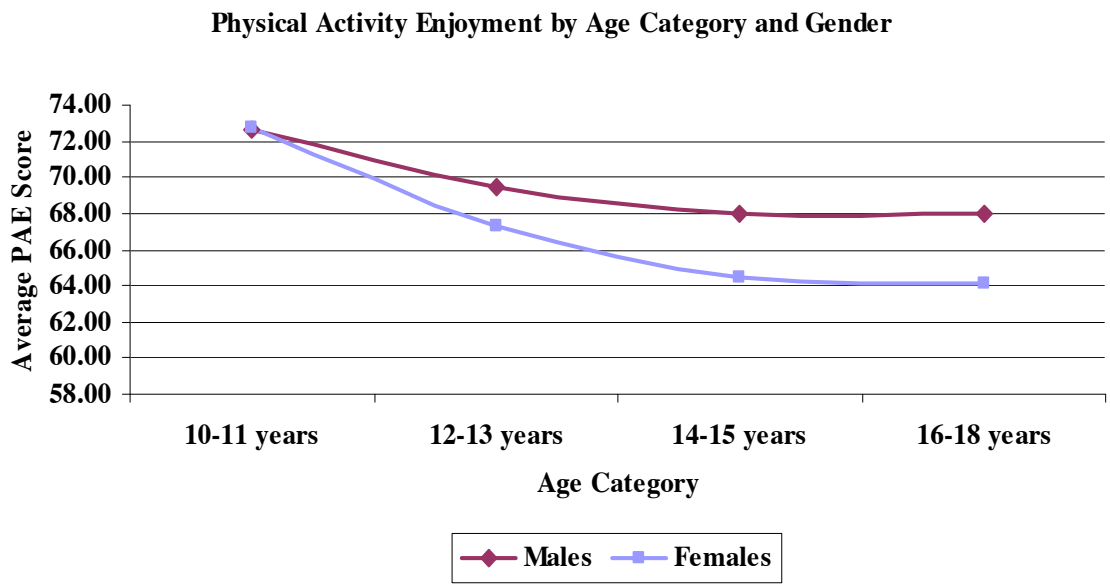

Figure 16: Physical Activity Enjoyment by Age Category and Gender

Influence of Type of Activity on Physical Activity Enjoyment

Table 49 presents the PAE and behavioural PA data. The PAE score of participants meeting the MVPA recommendation was higher than the PAE score of those not meeting the recommendation ($t(3824) = 8.29$, $p<0.001$). Figure 17 shows that PAE increased as days of MVPA ≥60 minutes increased, with those who reported 0 days of MVPA ≥60 minutes having the lowest PAE score and those who met the MVPA recommendation having the highest score (7 days) with large effect for both males ($F(7, 1777) = 36.10$, $p<0.001$, $\omega^2=.12$) and females ($F(2, 2033) = 52.88$, $p<0.001$, $\omega^2=.15$). There was no association between PAE and active commuting. The PAE score of participants meeting the PE recommendation was higher than PAE score of those not meeting the PE recommendation ($t(3824) = -6.65$, $p<0.001$, $r=.11$). PAE increased with increasing frequency of participation in EC, with medium effect ($F(4, 3821) = 57.73$, $p<0.001$, $\omega^2=.06$) and large effect for CB participation ($F(4, 3821) = 169.21$, $p<0.001$, $\omega^2=.15$). Figure 18 shows that those that reported participation in EC or CB 4+ days a week had the highest PAE and those that reported that they never participate had the lowest PAE score.

Table 49: Physical Activity Enjoyment and Physical Activity Variables

Behavioural Variables	N	Mean Enjoyment (SD)	Significance and Effect
Physical Activity			
Meeting MVPA Rec	483	71.38 ± 9.54	Meeting>Not
Not Meeting MVPA Rec	3343	67.02 ± 10.96	p<.001, r=.13
Commuting			
Active Commuter	1388	67.35 ± 11.12	NS
Passive Commuter	2438	67.69 ± 10.75	
Physical Education			
Meeting PE Rec	772	69.89 ± 11.05	Meeting>Not
Not Meeting PE Rec	3054	66.99 ± 9.91	p<.001, r=.11
EC Participation			
4+ days/week (4+)	1034	79.53 ± 9.03	4+>2-3,1,LO,N
2-3 days/week (2-3)	1008	68.82 ± 9.32	2-3>1,LO,N
1 day/week (1)	640	67.20 ± 10.52	1>N, LO
Less Often (LO)	467	64.87 ± 11.48	p<.001, ω^2=.06
Never (N)	677	63.41± 13.54	
Club Sport Participation			
4+ days/week (4+)	894	72.37 ± 7.80	4+>2-3,1,LO,N
2-3 days/week (2-3)	1290	69.77 ± 8.65	2-3>1,LO,N
1 day/week (1)	471	66.85 ±11.00	1>N
Less Often (LO)	85	66.33 ± 9.29	LO>N
Never (N)	1086	61.42 ±12.53	p<.001, ω^2=.15

Note: NS= Non Significant

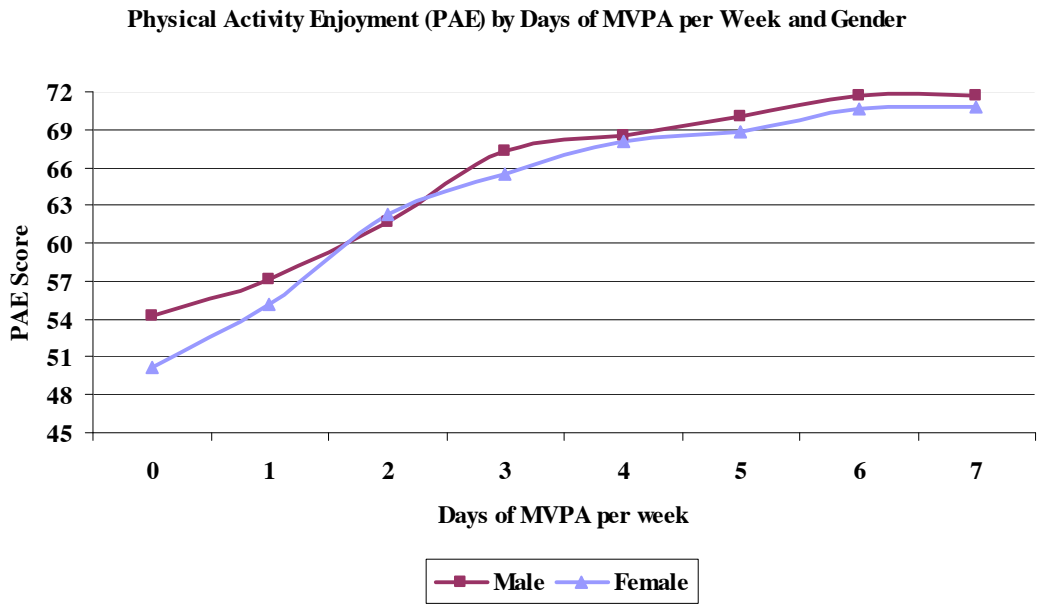

Figure 17: Physical Activity Enjoyment by Days of MVPA

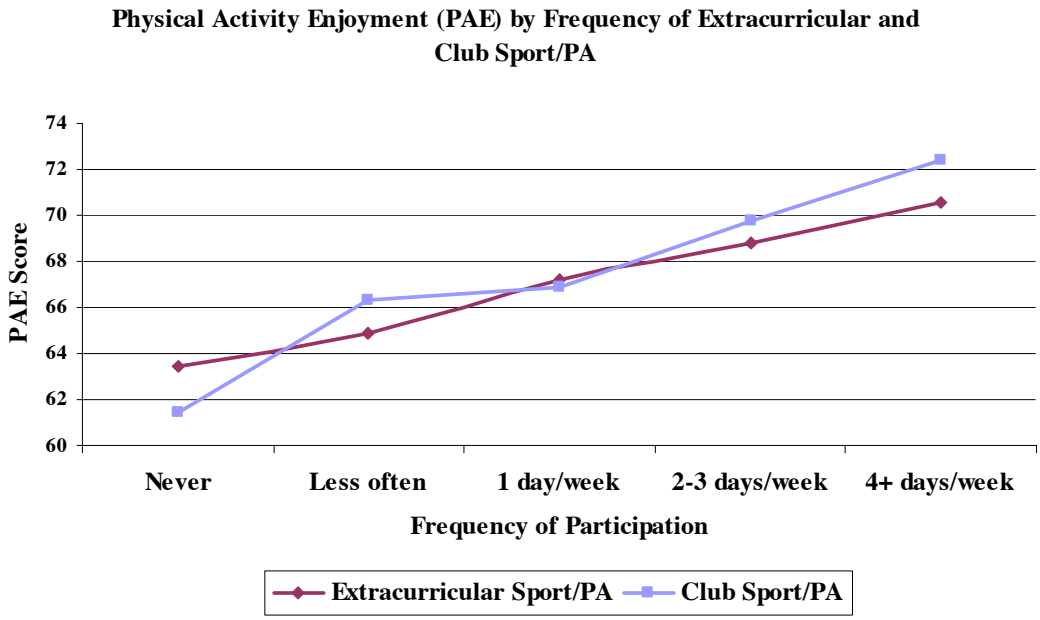

Figure 18: Physical Activity Enjoyment by Frequency of Extracurricular and Club Sport/PA

Impact of Physical Activity Enjoyment on MVPA≥ 60 minutes per week

A linear regression analysis was used to evaluate the impact of PAE in predicting the variance in average days of MVPA ≥60 minutes per week while controlling for the demographic factors of gender, age, and social class. Table 50 shows that area of residence was the only variable that did not correlate with MVPA ≥ 60 minutes per week within this sample.

Table 50: Bivariate Correlation between MVPA, personal demographics and Enjoyment

	MVPA	Gender	Age	AR	SC	PAE
MVPA	1					
Gender	.191**	1				
Age	-.283**	-.074**	1			
Area of Residence (AR)	-.018	.106**	.023	1		
Social Class (SC)	-.053**	.015	.000	-.044**	1	
PA Enjoyment (PAE)	.355**	-.110**	-.167**	-.015	-.086**	1

Note: **p<.01

Variables were entered into the regression model in the following order: Step 1, demographic variables (gender, age, social class) and Step 2: PAE. Table 51 presents the results of the analysis.

Step 1, including only demographic variables was significant in predicting 13% of the variance in MVPA $F(3, 3822) = 186.73$, $p < 0.001$. The addition of PAE in Step 2 accounted for an additional 8% in the variance with the full adjusted model explaining 21% of the variance in MVPA $F(4, 3821) = 252.29$, $p < 0.001$. In step 1 all demographic variables were significant; however in step 2 social class was no longer a significant factor. In terms of standardised beta scores, PAE was the most significant predictor followed by age (negative) and gender (positive, male).

Table 51: Regression Analysis to Predict MVPA

Step 1	**B**	**SE B**	**β**
Constant	8.29	0.20	
Demographic			
Gender (male)	0.74	0.05	.21**
Age	-0.26	0.01	-.30**
Social Class	-0.05	0.02	-.05
Step 2			
Constant	4.37	0.27	
Demographic			
Gender(male)	0.61	0.05	.18**
Age	-0.22	0.01	-.25**
Social Class	-0.03	0.02	-.03*
Psychological			
PA Enjoyment	0.05	0.00	.29**

Note: **R^2= .12 Step 1, R^2 = .21 Step 2 (p<.001), *= p<.01, ***=p<.001**

Regression Analysis to Predict Physical Activity Enjoyment

This section will detail the results of a regression analysis aiming to predict the variance in PAE by previously examined demographic variables, behavioural PA variables and social environment variables. In preparation for the regression, correlations between all variables and PAE were analysed (Table 52). Commuting behaviour did not correlate significantly and was excluded from the regression analysis.

Table 52: Physical Activity Enjoyment Pearson Correlations

	PAE	G	A	AR	SC	PA	AC	PE	EC	CB	PSS	FSS	TSS
PA Enjoyment (PAE)	1												
Demographic Variables													
Gender(G)	-.11**	1											
Age (A)	-.17**	-.07**	1										
Area of Residence (AR)	-.02	.11**	.02	1									
Social Class (SC)	-.09**	.02	.00	-.04**	1								
Physical Activity Variables													
MVPA (PA)	.36**	-.19**	-.28**	-.02	-.05**	1							
Active Commuting(AC)	-.02	-.05**	.02	.36**	.05**	.05**	1						
PE Recommendation (PE)	.11**	-.01	-.39**	-.11**	-.00	.14**	-.07**	1					
EC frequency (EC)	.24**	-.16**	-.03	-.01	-.03*	.31**	.02	-.01	1				
Club Sport Frequency(CB)	.39**	-.14**	-.20**	-.05**	-.14**	.42**	-.04*	.10**	.33**	1			
Social Support Variables													
Peer Social Support (PSS)	.47**	.19**	-.21**	-.02	-.02	.44**	.04*	.11**	.32**	.41**	1		
Family Social Support (FSS)	.40**	.10**	.31**	.06**	-.09 **	.42**	.04*	.12**	.26**	.47**	.54**	1	
Teacher Social Support (TSS)	.19**	-.01	-.20**	-.03*	.04**	.27**	.00	.15**	.23**	.22**	.41**	.44**	1

Note: *p<.05 **p<.01

A hierarchical linear regression was performed with PAE as the dependent variable. The non modifiable variables that were found to affect PAE (gender, age, social class) were entered into the first block. The behavioural PA variables were entered into the second block as predictor (independent) variables (days of MVPA ≥60 minutes, meeting of PE recommendation vs. not meeting PE recommendation, frequency of EC participation and frequency of club sport participation). Step 3 included social environment variables (peer social support, family social support, and teacher social support).

Step 1, including only demographic variables was significant in predicting 5% of the variance in PAE $F(3, 3882) = 67.25$, $p < 0.001$. The addition of behavioural variables increased the variance significantly in accounting for a further 16% of the variance in PAE, $F(7, 3818 = 142.27$, $p < 0.001$. The addition social environment variables accounted for an additional 8% of the variance with the total model predicting 29% of the variance in PAE $F(10, 3815) = 156.62$, $p < 0.001$. Significant predictors in order of rank in the final adjusted model included: peer social support, club sport participation, family social support, days of MVPA ≥60 minutes, teacher social support, extracurricular sport participation, meeting the PE recommendation and social class (negative). These results are presented in Table 53.

Table 53: Regression Analysis to Predict Physical Activity Enjoyment

Step 1	**B**	**SE B**	**β**
Constant	84.23	1.29	
Gender (Male)	2.65	0.35	.12***
Age	-0.96	0.09	-.18***
Social Class	-0.57	0.11	-.08***
Step 2			
Constant	61.36	1.56	
Gender (Male)	-0.57	0.33	-.03
Age	-0.25	0.09	-.05**
Social Class	-0.26	0.10	-.04**
MVPA	1.24	0.11	.20***
PE Rec	1.03	0.43	.04*
Frequency EC	0.65	0.12	.09***
Frequency CS	1.80	0.12	.25***
Step 3			
Constant	44.76	1.69	
Gender (Male)	0.14	0.31	.01
Age	0.00	0.09	.00
SES	-0.25	0.09	-.04**
MVPA	0.66	0.10	.11***
PE Rec	1.09	0.41	.04**
Frequency EC	0.32	0.11	.04**
Frequency CS	1.05	0.12	.15***
Peer SS	0.87	0.05	.29***
Family SS	0.33	0.04	.14***
Teacher SS	-0.16	0.04	-.07***

Note: R2= .05 Step 1, R2= .21, Step 3: R2= .29 (*p*<.001), *=*p*<.05, **= p<.01, ***=p<.001

Summary Section 4.4

Looking at the analysis of PAE by demographic factors, males had higher PAE than females. The negative relationship between PAE and age was strong, with PAE decreasing with age for males and females. PAE was also higher in the upper SES category.

In terms of the relationship between behavioural variables and enjoyment those that met the MVPA recommendation or met the PE recommendation had higher PAE than those that did not. PAE increased with each additional day of MVPA >60 minutes for males and females, with the highest PAE score observed for those achieving 7 days of MVPA. PAE increased linearly with increasing participation in EC and CB with medium and large sized effect respectively. With regards to the overall power of PAE in predicting days of MVPA $\geq$ 60 minutes per

week, PAE accounted for 8% of the variance in MVPA or 21% in total including demographic variables.

In relation to predicting PAE, demographic variables alone accounted for 5 % of the variance, the addition of behavioural PA variables accounted for another 16% and social environment variables added another 8%. Social class emerged as the only significant demographic variable in the final adjusted model. Peer social support was the most significant variable followed by club sport participation, suggesting that PAE is influenced heavily by encouragement from peers and involvement in club sport and physical activity within the community.

Chapter Five

5.0 Discussion

The main aim of this study was to examine PA participation, sedentary behaviour, physical health, correlates of PA and physical activity enjoyment. This section will discuss findings relative to study objectives with reference to previously examined research.

5.1 Exploring PA participation and sedentary behaviour

Average MVPA ≥ 60 minutes per week and MVPA Recommendations

Participants engaged in 4.14 days of MVPA ≥60 minutes per week. Among the HBSC 2006 data, Borracino and colleagues found that the average across 32 countries was slightly lower at 3.82 days per week (Borraccino et al., 2009). The average for Ireland specifically was more comparable at 4.4 days per week. Interestingly, Ireland had the highest average of MVPA days ≥60 minutes per week over all 32 countries sampled, followed by Canada and the USA. It must be noted that the participant's of the HBSC study were 11, 13 and 15 year olds whereas the current research had a much broader age range from 10-18 years, meaning that results are not directly comparable.

In Ireland, the DOHC (Department of Health and Children, Health Service Executive 2009) have recommended that children and adolescents receive at least 60 minutes of daily moderate to vigorous activity (MVPA) (2009). Among the CSPPA participants, only 14% of children aged 10-18 were meeting the MVPA recommendation. This finding is in contrast to the findings of the HBSC Ireland 2006, which reported that 27% of 10-17 year olds engaged in MVPA ≥60 minutes per day. Similarly, the 2006 International HBSC study across 41 countries found that 21% of 11, 13 and 15 year olds reported that they engaged in at least 60 minutes of MVPA over the last 7 days (Currie et al., 2008). The Take PART Study of 15-17 year olds found that 35% were moderately to vigorously active for at least 60 minutes a day on ≥4 days per week, dropping to 20% when the criterion was moved to ≥5 days which is more comparable to the 14% of CSPPA participants (Woods et

al., 2004). In terms of measurement, the HBSC studies asked children to indicate the number of days they engaged in MVPA over the last 7 days, rather than using a composite measure of the last week and a typical or usual week that limits the effect of sporadic or unusual activity. The CSPPA study used this composite measure as research has indicated that it is reliable and correlates moderately well with accelerometer data (ICC=.77, r=.40, $p<.001$). The Take PART study also used this measure but it used a lower cut off point for meeting recommendations as Ireland's recommendation of 60 minutes of daily MVPA had not been published at that time.

The proportions achieving ≥60 minutes of MVPA daily internationally also show large differences. In Australia, the 2007 National Children's Nutrition and Physical Activity survey reported that 32% of 9-16 year olds met the national recommendation of at least 60 minutes of MVPA per day on all of the four days sampled (Department of Health and Ageing, 2007). This study used a computer personal interview and a telephone interview 21 days later in which participants were asked to give a detailed account of their activity over the previous 48 hours using the Multimedia Activity Recall for Children and Adolescents (MARCA) (Ridley et al 2006). Only recoding 2 days of activity could possibly overestimate activity if the previous two days happened to be a weekend. The YRBSS 2009 data found that 18% of students in grade 9-12 (equivalent 3rd-6th year in Ireland) were physically active at least 60 minutes per day on each of the 7 days before the survey. The use of the previous 7 days as oppose to a composite average again poses some concern for overestimation due to the possibility recording of out of the ordinary PA behaviour. The objective data from the 2003-2004 National Health and Nutrition Examination Survey (NHANES) in the United States showed that 8% of those aged 12-18 met the 60 minutes per day of MVPA recommendation, suggesting that self report overestimates activity (Troiano et al., 2008).

Differences across national and international studies are likely due to age differences between samples and measurement issues and also variation by country. These findings highlight the difficulties surrounding use of self report measures and highlight the need for a standardised and validated method of measuring participation across studies for comparison purposes. Objective measures should also be employed where possible, although this is not always possible for cross sectional population research. The use of a validated measure of PA is strength of this study but the finding that only 14% met recommendations is cause for concern. This finding

indicates that 86% of participants were insufficiently active under Department of Health and Children standards. This situation requires immediate attention and reinforces the need to look at demographic variations and target those most at risk.

MVPA, Meeting of MVPA Recommendations and Demographic Factors

This research mirrored the findings of national and international research in establishing that males engaged in more MVPA per week than females (4.51 days vs. 3.81 days). Borraccino et al. (2009), found similar results among the HSBC data where Irish males were more active than Irish females (4.13 vs. 3.52). Among CSPPA participants, this difference in MVPA translated to males being 1.9 times more likely to meet recommendations than females (18% vs. 10%). This finding is consistent across the research. The CANPLAY study reported that males were more active than females with 16% of males meeting their national recommendation of 90 minutes of activity per day versus 8% of females (Canadian Fitness and Lifestyle Research Institute, 2009). This gender gap was evident in Australia's latest population study in 2007 among 9-16 year olds (38% of males vs. 25% of females) (Department of Health and Ageing, 2007). The International HBSC study reported that Irish males were more likely to report being active for at least 60 minutes a day as compared to girls, with this finding proving consistent across the three age groups studied (Currie et al., 2008). The HBSC Ireland study found of 10-17 year olds, 63% of males exercised ≥4 days per week while only 43% of females exercised to the same extent (Nic Gabhainn et al., 2007). This gender gap was also evident in the Take Part Study in which 42% of males reported being active on ≥4 days per week compared to 30% of females (Woods et al., 2004).

The current study found that MVPA decreased significantly with age after the age of 12-13. Similarly, the odds of meeting the MVPA recommendation decreased with age after this age cohort. Results indicated that proportions meeting the recommendations dropped sharply from 19% at age 12-13 to 12% among 14-15 year olds to 6% among 16 year olds indicating that this oldest age group of adolescents are particularly at risk. Age related declines within adolescence have also been found by many researchers internationally and nationally (Borraccino et al., 2009; Canadian Fitness and Lifestyle Research Institute, 2009; Currie et al., 2008; Department of Health and Ageing, 2007; Troiano et al., 2008).

CSPPA found that those in the upper SES category (SC1-2) reported more days of MVPA ≥60 minutes per week than those in the lower SES category (SC 5, 6 and 8). However, the differences found between upper and lower SES categories did not translate into a significant SES association for meeting the MVPA recommendations. In support of this finding, the International HBSC data indicated that Ireland was one of 23 countries out of a total of 41 in which higher family affluence was not associated with meeting MVPA recommendations (Currie et al., 2008). Although several international studies have found that higher social class is associated with meeting recommendations (Canadian Fitness and Lifestyle Research Institute, 2009; Craig et al., 2008), previous Irish research has reported no association between SES and meeting recommendations (Nic Gabhainn et al., 2007; Woods et al., 2004).

The analysis of MVPA and MVPA recommendations by demographic factors confirms the consistent finding that males are more active than females highlighting the continuing need to increase participation among females. The finding that activity decreases with age is also consistent with research and suggests that older age groups should be targeted for participation in particular. Area of residence was found to be an insignificant factor in terms of MVPA and meeting the MVPA recommendations. The findings of the current study suggest that although the upper SES may engage in slightly more MVPA than the lower SES, there is no association with meeting the MVPA recommendation, consistent with previous research.

Active Commuting

Walking and cycling to school provide a convenient opportunity to incorporate PA into an adolescent's daily routine (Nelson et al., 2008). Only 38% of the CSPPA participants actively commuted to school, which is consistent with international and national research (Cragg et al., 2006; Nelson et al., 2008). Nelson et al (2008) found that 38% of the 4013 15-17 year olds surveyed actively commuted to school, with more males than females walking or cycling (41% vs. 34%). The CSPPA findings show a higher proportion of active commuters when compared to the 2004 ESRI 2004 study which found that 30% of post primary students actively commuted to school (Fahey et al., 2005). This finding could perhaps indicate that active commuting has increased slightly since 2004 although this observation is speculative given that there were different participants and different age groups

between the CSPPA study and the ESRI study. CSPPA participants that met the MVPA recommendation were more likely to actively commute (16% vs.12%) indicating that increasing active commuting is a viable way to increase proportions achieving the recommendations.

Active commuting has been given substantial government attention within recent years. The DOHC participated in an inter Departmental Group, lead by the DOT , which helped to develop *Smarter Travel – A Sustainable Transport Future*, the transport and travel policy for the next decade (Department of Transport, 2009b). This policy recognises the need to increase active commuting, with €2 million being made available in 2008 and 2009 (with similar funding projected in the years to 2012) to enable a significant expansion of support for the Green Schools Travel Module. This scheme is funded by the Department of Transport (DOT), and is run by An Taisce through the Dublin Transportation Office. The module aims to reduce dependency on car transport for journeys to and from school and create a life-long culture of using alternatives to the car. It is being considered as an important element of implementing the Smarter Travel policy and the National Cycle Policy Framework published in 2009 (Department of Transport, 2009a). In 2008, the Green Schools Travel Module reached around 70,000 school children in 264 schools. Initiatives such as this are promising, but require nationwide implementation to substantially increase active commuting among school children in Ireland.

Mode of Transport to and From School

An analysis of mode of transport found that travelling by car was the most popular mode on the way to school for males and females (41%) followed by walking (28%). However on the journey home travelling by car and on foot were equally likely (34%). This finding indicates that the journey to school should be targeted to increase active commuting, given that reasons for passively commuting in the morning are often due to barriers such as having to get up earlier. The train was the least frequently reported mode of transport for males (1%) but for females it was cycling (0.2%). In contrast cycling was reported by 5% of males. The reasons that females, and to a lesser degree males, choose not to cycle needs to be researched further and should be addressed under the aims of the National Cycle Policy Framework.(Department of Transport, 2009a).

Distance and Time Taken to Travel to School

The vast majority (99.5%, 90.5%) of post primary participants that walked or cycled lived with 2.5 miles (4km). This finding supports the findings of Nelson and colleagues which reported distance to school as a significant predictor of active commuting and suggested that 2.5miles is a viable distance for walking. However, 33% of post primary passive commuters also lived within 2.5 miles. This result indicates that one third of adolescents living within a commutable distance from their school are passively commuting as opposed to increasing their daily minutes of MVPA. Increasing active commuting over achievable distances among school children needs to be prioritised. Active commuting over achievable distances could be promoted at a national level, for example within the development of the National Walking Policy by the DOHC.

Active Commuting and Demographic Factors

Males were found to be 1.2 times more likely to active commute than females. This finding is consistent with the gender gap among MVPA findings and supports the findings of previous research (Davison et al., 2008; Nelson et al., 2008). Davison et al. (2008) suggested that lower rates of walking to school among females may also reflect social tendencies of parents to be more protective of girls and to place greater restrictions on girls' independent mobility().

The CSPPA study found that active commuting increased with age consistent with other research. Davison suggested that lower commuting among younger children may be due to parents' safety concerns and adolescents' age-related gains in independent mobility may be linked with higher rates of active commuting until they are old enough to begin driving themselves to school (Davison et al., 2008).

Urban CSPPA participants were 4.8 times more likely to actively commute to school than their rural counterparts. This finding was consistent with research by Nelson and colleagues which found that adolescents living in more densely populated areas had greater odds of active commuting to school than those in the most sparsely populated areas, reflecting an urban rural divide. This divide is likely to be caused by unsafe walking routes in rural areas. Nelson et al. (2008) comments that alternative strategies to increase PA participation are required to compensate for this urban rural divide.

CSPPA participants from the middle and lower SES were 1.2 times more likely to be active commuters than upper SES participants. This finding is in contrast to MVPA findings. Davison et al. (2008) also found that children from low socioeconomic backgrounds are more likely than children from high socioeconomic backgrounds to actively commute to school. This finding was also supported within the Take PART study (Woods et al., 2004).

In summary the examination of active commuting by demographic factors found that the gender gap between males observed among MVPA is also evident among active commuting. This result suggests that increasing active commuting to school among girls, particularly by bicycle, could be one way to increase their overall MVPA. Active commuting increased with age in contrast to MVPA, highlighting the importance of this behaviour to increase the proportions of older children that are meeting the MVPA recommendations. The fact that active commuting decreased with increasing SES is also in contrast to MVPA. This finding suggests the functional nature of active commuting and the possibility that lower SES participants have no choice but to walk or cycle to school as their parents are working or do not have access to a car. The contrasting findings to MVPA emphasise that active commuting is a unique behaviour that needs to be encouraged and facilitated through previously discussed governmental support.

Physical Education

Range of PE Activities

Previous research has indicated that there are discrepancies between the content of the primary and post primary PE curriculum and what is actually taught within schools (Connor, 2003; Fahey et al., 2005). It seems that team games dominate, with curriculum strands such as dance and aquatics receiving less attention, particularly at post primary level (MacPhail & Halbert, 2005). This research supports these findings for the most part, however there does seem to be some variation. The top 3 activities reported for primary males were the team sports of soccer (77%), gaelic football (71%) and basketball (65%). The top 3 activities for primary females were basketball (71%), gaelic football (58%) and dance (56%). It is encouraging that dance is reported among 56% of primary females, but it is much less frequently reported by primary males even though it is an element of the

curriculum (26%). The top 3 activities reported for post primary males were soccer (62%) basketball (47%) and athletics (38%), while the top 3 activities for post primary females were basketball (63%), baseball/rounders (57%), and badminton (53%). Although there is evidence of children being exposed to the other curriculum strands such as athletics and net games, team sports are still the dominant PE activity at primary and post primary level. This raises concerns as research has found that individual activities appear to carry over into adulthood more readily because they generally only need one or two people, they require little structure, few time constraints and minimal equipment and cost (Fairclough et al., 2002). The findings also suggest that the PE curriculum is not being adhered in schools, with only 11%, and 15% of primary children indicating they did adventure activities and swimming in PE within the last 12 months. This lack of variation suggests that adolescents are not being given the opportunity to develop a broad base of motor skills during their school years. It is during this time that adolescents should have the opportunity to learn the skills required for a range of different activities so that they have the basic skill set to engage in a range of sports throughout their adolescence and into adulthood. It could be argued that if adolescents do not learn these skills in school, it is unlikely that they will engage in sports requiring a steep learning curve and completely unfamiliar skills during adulthood.

These findings suggest that the majority of schools would not meet the requirements of the DOHC's "Active Schools Flag" in relation to adhering to the curriculum. The Active Schools Flag is a Department of Education scheme which aims to reward schools for improving the standard of PE and extracurricular activity. With regards to PE, the school is required to show evidence of implementing the recommended PE curriculum, providing the recommended frequency and duration of PE and providing equal opportunities for PE. Although this is a positive development for PE, it is entirely optional and is left to up to the individual school to take the initiative of meeting its requirements.

Adherence to PE Recommendations

Adherence to PE recommendations within schools is not monitored, and research suggests that high proportions of students do not receive the recommended duration and frequency of PE. CSPPA primary participants reported that they received an average of 46 minutes of PE per week, with 35% meeting the DES

recommendation (1999) of 60 minutes of PE per week. At post primary level, 8% of participants received ≥120 minutes of PE recommended by the DES (2003) with an average of 77 minutes of PE per week. This is a slightly higher average than the finding of 69 minutes of PE per week among 2nd-6th years in the ESRI study (Fahey et al., 2005). However, due to different participants and age groups, direct comparison with the ESRI finding is not possible. The slightly higher PE minutes among CSPPA participants could be due to the inclusion of 1st year students driving up the average in the CSPPA study. In any case, the CSPPA participants still received significantly less PE than the recommended duration and frequency. The fact that only 35% of primary schools and 8% of post primary schools met the respective PE recommendations requires immediate policy recommendation. Significantly post primary participants that met the MVPA recommendation also met the PE recommendation, perhaps suggesting that increasing PE is a viable way to increase likelihood of meeting recommendations, although it could not be described as cause and effect.

PE and Demographic Factors

Gender did not significantly influence PE at primary level. At post primary level males received more minutes of PE than females (79.99 minutes vs. 73.08 minutes) and more males met the PE recommendations. This is consistent with previous research (Fahey et al., 2005; MacPhail et al., 2005)

In terms of year in school, a decrease in meeting recommendations was observed at the primary level, with more 5th class children meeting the recommendation than 6th class children. This decrease in meeting PE recommendations was observed at the post primary level with the exception of 4th year (transition year) participants who had higher weekly PE minutes than any other year group and were far more likely to meet PE recommendations (35%). This decrease in PE throughout the school cycle and "bounce" in activity in transition year is consistent with the 2004 ESRI report (Fahey et al., 2005). Mac Phail et al. (2005) reported similar findings among a qualitative study of 417 post primary principals and 316 PE teachers in Ireland. This study found a trend of diminishing time allocation for PE from 1st year to 6th year, with the exception of transition year. The authors concluded that this rise in PE in Transition year may be evidence of the recognition that PE can contribute to the holistic aims of the Transition year, while in

other years the curriculum time for PE is decreased due to timetable competition from exam subjects. This is despite the fact that there is no evidence that academic performance is hindered in any way by PE (Active Healthy Kids Canada, 2009).

Rural primary participants were 0.6 times more likely to meet PE recommendations than urban participants. Given the small odds, it is likely that this finding reached significance due to large sample size. At post primary level, the opposite was found with urban participants having higher PE minutes than rural participants but this did not translate into a significant association between meeting of recommendations and area of residence.

The odds of meeting PE recommendations decreased with decreasing SES category. However the effect size was very small (ν=.05). The ESRI Study of Sport and Social Disadvantage in Ireland found that those from fee paying post primary schools had significantly higher weekly minutes of PE than those in disadvantaged schools (80 minutes vs. 75 minutes) (Lunn, 2006). This perhaps indicates that this is an inequality that requires further attention.

The fact that gender inequalities are evident in PE in addition to overall MVPA and active commuting emphasises that females need to be targeted for participation. It is unclear whether this is a choice of post primary females to participate in less PE. If it is, then it is possible that the range of PE activities on offer do not suit their preferences. The decrease in PE throughout the school cycle requires attention. The importance of PE within the curriculum needs to be highlighted through policy action so that it is not decreased as exam pressure increases. The SES findings were inconclusive with no significant findings for meeting recommendations, indicating that this area requires further research. Overall, the demographic inequalities evident within this study would indicate that very schools would be eligible of an Active School Flag (Department of Education and Science, 2009).

Extracurricular Sport and Physical Activity

Range of Extracurricular Activities

Research has suggested that the range of extracurricular sport opportunities on offer to students in Ireland focuses on team games rather than individual activities, although the divide does not seem to be as strong as for PE (Fahey et al.,

2005). This research found that team games dominate the extracurricular programme for males and females. The top 3 extracurricular activities reported for males were soccer (21%), gaelic football (18%), hurling (13%). The top 3 activities for females were gaelic football (14.8%), basketball (15%) and camogie (11%). Whether this is a matter of choice or provision is unclear, but it is evident the extracurricular programmes in place in Irish schools for the most part do not meet the criteria for the Department of Education's "Active Schools Flag" which requires schools to make a range of extracurricular activities available to students on an individual and team basis within the school (Department of Education and Science, 2009). Individual activities need to be actively promoted given that research has shown that it is these activities that track better into to adulthood (Fairclough et al., 2002),

Frequency of Extracurricular Participation

Among the CSPPA participants 18% report that they never participate in extracurricular sport and PA. Although direct comparison is not possible, the ESRI report found that almost a quarter (24%) of participants reported that they never participate in extracurricular sport or PA (Fahey et al., 2005). Although variation in the programmes has not been observed, it is positive to see that the frequency of participation may be on the increase. These results could suggest that initiatives such as The Active Schools Flag and the development of MVPA recommendations overall are beginning to raise the profile of participating in PA and encouraging participation within the school. However this is speculative and would require longitudinal research to investigate further. Those that met the MVPA recommendation were more likely to report participating in extracurricular sport or PA than non-participants (14% vs. 11%) indicating that extracurricular participation should be facilitated to increase overall MVPA significantly to meeting the MVPA recommendation.

Extracurricular Sport/ Physical Activity and Demographic Factors

Males were 1.7 times more likely to be EC participants than females (86% vs. 79%), consistent with previous research (Fahey et al., 2005). Interestingly, the odds of participating in extracurricular sport/PA increased from the 10-11 year old up to the 14-15 year old categories but a drop in participation was observed for the 16-18 year olds, suggesting low participation due to exams. This emphasises that

extracurricular activity is important in combating the decrease in activity with age. Consistent with the findings of previous research (Fahey et al., 2005; Lunn, 2006), CSPPA participants from an upper SES background were more likely to be extracurricular participants than those in the middle and lower SES categories, perhaps suggesting that those in upper SES areas have more opportunities to engage in these activities. However this result must be interpreted with caution as the association was very weak (ν=.05). Overall, demographic inequalities were evident within extracurricular activity, with gender emerging as the most conclusive finding.

Club Sport and Physical Activity

Range of Club Activities

Among the CSPPA participants, the top 3 CS activities reported for males were soccer (36%), gaelic football (31%) and hurling (21%) and among females they were dance (27%), swimming (21%) and gaelic football (20%). The ESRI study of school children in sport report found that traditional team games were the dominant club sports for males, with females reporting that they participated in a range of individual and team sports (Fahey et al., 2005). The CSPPA findings show an even further increase in females' preference towards individual activities than the ESRI study. Team games still dominate among CSPPA males, perhaps reflecting the interest in these types of sports for males, but also the existence of designated development officers and strong club support and infrastructure for recruitment with the Football Association of Ireland (FAI) and the Gaelic Athletic Association (GAA). The Irish Sports Council has provided considerable support for team sports, in providing €32.5 million funding to the GAA, FAI, and the IRFU from 2001-2005 to assist in increasing youth participation (Office of the Minister for Children and Youth Affairs, 2007). The results of this study suggest that there is scope to increase participation in PA among females by increasing the funding allocated to individual activities and by increasing the provision of individual activities within the PE and extracurricular programmes in schools. Among males, participation in individual sports in clubs and in the school should be encouraged to increase carryover participation into adulthood, as adult club participation in Ireland has been found to be largely dominated by individual sports (Lunn et al., 2007).

Frequency of Club Participation

Twenty-nine percent of CSPPA participants reported that they never participate in club sport and PA. Although direct comparison is not possible, this is higher than the 17% rate of non participation observed by Fahey and colleagues in 2004 (Fahey et al., 2005) . This decrease in club sport coupled with an increase in extracurricular sport may reflect a heavier reliance on schools for PA provision. Although the reasons for this can not be stated conclusively, perhaps this is a reflection of a change in the economic situation of parents given that club sport participation requires monetary investment. However this would require longitudinal research to investigate conclusively. With regards to the contribution of club sport to overall PA participation, those that met the MVPA recommendation were more likely to report club participation. This emphasises that club sport is an important source of daily minutes of PA for children and youth that should be supported with promoted and maintained through sports policy.

Club Sport and Demographic Factors

Males were 1.5 times more likely to participate in club sport and PA than females. The gender gap in club sport and PA has been widely documented in other research (Connor, 2003; De Roiste & Dineen, 2005). In contrast to extracurricular sport, club participation decreased with age. Previous research has indicated that the vast majority of adults (68%) do not participate in club sport (Lunn et al., 2007), further highlighting the importance of promoting involvement throughout childhood and adolescence to increase chances of continuing participation into adulthood. Interestingly, rural participants were found to be more likely to participate in club sport than urban participants, perhaps suggesting a strong sense of community within rural areas and strong representation of team sports, particularly gaelic football, consistent with the range of activities reported. Club sport participation increased with each increasing SES category, consistent with previous national and international research (Canadian Fitness and Lifestyle Research Institute, 2008; Connor, 2003). Connor (2003) comments that due to financial constraints, community based sport may exaggerate disparities among social class. Research for the *Teenspace* report supports this in finding that those in lower socio-economic groups reported more financial barriers to participation in recreation (De Roiste & Dineen, 2005). This is worrying given that these trends may have become more

pronounced since this data was collected, given the worsened economic situation in Ireland since 2009. The challenges facing the lower SES in participating in club sport merit further research.

Sedentary Behaviour

Types of Sedentary Activity

An examination of type of sedentary behaviour revealed pronounced gender differences. Males spent more time engaged in technological sedentary activities such as playing video games and watching TV/DVD's whereas females spent more time on school or social based sedentary activities such as doing homework/studying, reading, sitting during school breaks, sitting talking with friends, and talking on the phone. Interestingly, there was no difference in the average time that males and females spent on the computer/internet, perhaps reflecting the rise in use of the internet and the popularity of social networking sites among both genders. A study in the United States among 800 adolescents aged 12-18 found that 93% go online, with 63% doing so everyday and no difference in usage between males and females. This study also illustrated the rise in social networking use among adolescents with 73% using social networking sites in 2010, 65% in 2008 and 55% in 2006 (Lenhart, Purcell, Smith, & Zickuhr, 2010). In contrast to computer use, higher TV watching among males has been frequently reported within the research (Currie et al., 2008; Woods et al., 2004). Although the ESRI study did not find any significant gender differences (Fahey et al., 2005). Marshall et al. (2002) highlighted the different preferences for sedentary activity among males and females in finding the presence of clusters high levels of technological use among male participants and the presence of high levels of socialising sedentary activity among females. The finding that females engaged in more sitting during school breaks and homework after school is concerning. Fahey and colleagues found that 30% of females spent 3 hours a day or more a day doing homework compared to 17% of males. This raises the question of whether females are choosing to spend more time on their homework or whether or schooling systems are reinforcing sedentary behaviour among females in particular.

Average Daily Hours of Sedentary Activity and Demographic Factors

Overall, it was found that females engage in more hours of sedentary behaviour per day than males (3.98 vs. 3.61). Sedentary behaviour also increased with age, consistent with a decrease in PA. The HBSC study would support this finding with regards to TV viewing (Currie et al., 2008). There was no sizable association between average hours of sedentary activity and area of residence or SES among CSPPA participants. In contrast, the HBSC did find an effect for SES, with higher levels of TV watching being associated with lower family affluence in Ireland and just over half of other countries (Currie et al., 2008). The demographic variations in sedentary behaviour require further research to clarify these relationships.

Sedentary Screen Time

The American Academy of Paediatrics (2001) recommend that children and youth do not exceed 2 hours per day of sedentary screen time (SST) (TV viewing, sitting playing video games, using computer). Although this recommendation has not been adopted in Ireland, 30% of CSPPA participants exceeded the SST recommendation. This is a much lower percentage than the proportions reported by the HBSC study for TV watching which found that 62% watched ≥2 hours of TV per day and the Take PART study, which reported 65% watching ≥ 2hours (Currie et al., 2008; Woods et al., 2004). This discrepancy could be due to the differences in age between the CSPPA sample and the HBSC and Take PART samples and the fact that these studies only included TV viewing as opposed to a composite average including videogames and computer use. Different measures were also used which could indicate measurement issues. The HBSC figures represent the percentage of participants watching TV for 2 hours or more on every weekday while the CSPPA figures were calculated by asking participants to indicate the number of days they watched TV and the time which was then multiplied and divided by seven to provide an average over 7 days. Overall these results can not be conclusively compared with existing research. Further measurement issues are highlighted in the fact that males were more likely to exceed the SST recommendation than females, despite the fact that females engage in more sedentary behaviour overall. Although proportions meeting the SST recommendation decreased with age consistent with overall sedentary behaviour findings, the inconsistencies with regard to gender suggests that the exclusion of school or social based activities from this recommendation

underestimates the sedentary behaviour of females. This emphasises a limitation of the use of this recommendation to analyse the prevalence of sedentary behaviour and suggests that there is a need for a more comprehensive evidence based recommendation.

Physical Activity and Sedentary Behaviour

This study found a small negative correlation (r=.07) between days of MVPA $\geq$ 60 minutes and daily sedentary minutes when controlling for the effects of age and gender. A much higher correlation was found by Marshall et al. (2002) (r=.22) although still considered small in magnitude. Despite this small correlation, those who met the MVPA recommendation or who actively commuted to school or who received the recommended amount of PE engaged in less daily hours of sedentary behaviour than those who did not meet recommendations or those who passively commuted. In terms of extracurricular sport and PA and club sport there was a decrease in sedentary behaviour with increasing frequency of participation, with those participating 4 or more days engaging in the least sedentary activity and those never participating engaging in the most. This relationship was particularly linear among club sport, with a medium sized effect. The link between sedentary behaviour and PA, especially among children has been found to be somewhat unclear within the literature. One theory is that involvement in sedentary behaviour limits the time available for participation in PA. Findings by Marshall and colleagues showed that one could still engage in high levels of sedentary behaviour and meet PA recommendations and that sedentary behaviour and PA didn't necessarily displace each other. This is in contrast to the findings of this study, which suggest that there is a relationship between PA and sedentary behaviour**,** that sedentary behaviour decreases with increased frequency of participation in extracurricular and club sport and PA, and emphases the importance of these forms of activity.

5.2 Exploring the physical health profile of Irish adolescents

Aerobic Fitness

Participants were classified as fit or unit based on gender and age criterion referenced standards (The Cooper Institute for Aerobics Research, 2004). Seventy

six percent were classified as aerobically fit. The fact that nearly one quarter of the sample were unfit is very worrying given that longitudinal studies have shown that criterion referenced fitness tracks moderately from youth to adulthood (Malina, 2001) and that fitness levels during adolescence predict adult total and central body fatness (Eisenmann et al., 2005), blood pressure (Boreham et al., 2001), blood lipids (Carnethon et al., 2005) and prevalence of metabolic syndrome (Ferreira et al., 2005). This represents a public health concern because these adolescents may be at higher risk for the development of cardiometabolic diseases and mortality. Lobelo et al. (2009) found that 70% of children aged 12-18 were classified as fit which is comparable to the findings of this study.

Comparison of the percentage of participants that were classified as fit (75%) vs. the proportion of participants that met MVPA recommendation (14%) raises an interesting discussion point. Although these samples were different and are thus not directly comparable, the discrepancy is rather large in magnitude. It would seem that if fitness is high than these individuals must be active enough to be benefiting their current and future health given that fitness tracks well into adulthood. This could suggest that the current recommendations of 7 days of MVPA ≥60 minutes may be somewhat higher than necessary. However results also indicated that participants with the healthiest overall profile were those that met the MVPA recommendation and those that were fit were more active than those that were unfit. Further research comparing level of fitness in those active 0-7 days is necessary to investigate this issue in more detail.

Aerobic Fitness and Demographic Factors

This study found that females were slightly more likely to be classified as aerobically fit for their age and gender than males (80% vs. 71%). This is surprising given the self report findings of higher activity among males. The Cooper Institute (2004) states that the FITNESSGRAM criteria slightly overestimate fitness for younger females. However, the use of the FITNESSGRAM criterion referenced standards for aerobic fitness has been shown to be a valid method to identify those with those with a high cardiovascular risk profile (Lobelo et al., 2009). Lobelo et al. (2009) found that more males than females were fit overall (71% vs. 68%) but this finding was not statistically significant. Also of note in the work of Lobelo et al. (2009), was that slightly more females than males aged 12-15 met the criterion (70%

vs. 69%) consistent with the possibility of overestimation among young females. The authors commented that the presence of oestrogen may provide a protective effect against CVD risk factors for females (Lobelo et al., 2009). The proportion of aerobically fit participants decreased with age with more 10-11 year old CSPPA participants classified as aerobically fit than any other age category, possibly reflecting higher activity levels among this age group. A higher proportion of upper SES participants than middle or lower SES participants were classified as aerobically fit. This could perhaps be reflective of higher MVPA overall among the upper SES although this is speculative given the MVPA SES association was small.

Body Mass Index

Participants were classified as having an unhealthy body mass index (BMI) or a healthy BMI, with 21% of the sample was either overweight (17%) or obese (4%), 2% were underweight and 77% had a normal BMI. The Take Part Study found that roughly the same percentage (22%) was overweight or obese (Woods et al., 2004) with the ESRI reporting a figure of 23% (Fahey et al., 2005). Despite differing samples, age groups, and methods of measurement, the findings are fairly consistent across the research, with 1 in 4-5 young people reported as overweight or obese.

BMI and Demographic Factors

Interestingly, no associations were found between BMI and demographic variables among CSPPA participants, consistent with the 2004 ESRI report (Fahey et al., 2005), indicating that males and females and older and younger children are equally at risk of overweight and obesity. This high incidence across the board is of great concern given that obesity is a risk factor for cardiovascular disease, Type 2 diabetes and the metabolic syndrome (Lloyd et al., 2009).

Waist Circumference

Participants were classified as having a healthy or an unhealthy waist circumference, with 88% of the sample having a healthy waist circumference while 12% had an unhealthy waist circumference measurement. Research has indicated that waist circumference is a good measure of central adiposity and obesity, perhaps better than BMI as it gives an indication of distribution (McCarthy, 2006). A central distribution of body fat, rather than a more peripheral distribution, carries a higher

risk for obesity-related ill health. In a review of waist circumference, McCarthy (2006) comments that abdominal fatness is as important in children as it is in adults. Excess abdominal fatness in children results in metabolic alterations associated with features of metabolic syndrome and hence risk for CVD in later life such as increased insulin sensitivity, increased LDL cholesterol, increased blood lipids and increased blood pressure (McCarthy, 2006). The fact that 12% of the sample had an unhealthy waist circumference is of major concern.

Waist Circumference and Demographic Factors

Consistent with fitness findings, females were found to be more likely to have a healthy waist circumference than males (91% vs. 86%). The 10-11 year old age categories were more likely to have a healthy waist circumference measurement than any other age category. This could be due the fact that the majority of this age group are likely prepubescent, or it may also reflect higher activity among the younger age group.

Blood Pressure

Blood Pressure was classified into healthy and unhealthy based on age, gender and percentile of height (National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents, 2004). Three quarters (75%) of the sample had a healthy blood pressure reading and one quarter (25%) had an unhealthy reading. However these results must be interpreted with caution given that an automated blood pressure cuff was used and diagnosis of high blood pressure must be done over a number of readings. Although every effort was made to get participants to sit and relax before having their BP taken, the situations under which the readings were recorded were not ideal given the unavoidable noise and excitement levels during testing. Despite this consideration, research has indicated that high blood pressure is a risk factor for cardiovascular disease (McGee, 2010), so the incidence of a high reading in a quarter of the sample is a concern.

Health profile

Only 44% of the sample was classified as healthy on all four indicators. This finding indicates that the majority of the sample (54%) had at least one or more risk factors for cardiovascular disease, type 2 diabetes or the metabolic syndrome. Three

percent of participants were not classified as healthy on any of the measures, indicating a very strong possibility of existing cardiometabolic complications among this group. There have been no Irish studies to date that have used a similar health indices however there has been international research that has examined the effects of having multiple risk factors during youth. A study by Berenson et al (1998) examined the percentage of the intimal surface of the heart covered by lesions during post mortems of 93 males and females aged 19.6 + 5.3 years at the time of death. These individuals had previously been surveyed as part of the Bogalusa Heart Study and therefore had provided data on antemortem risk factors. The risk factors evaluated were body-mass index, systolic blood pressure, serum triglyceride concentration, and serum LDL cholesterol concentration. In subjects with 0, 1, 2, and 3 or 4 risk factors, 19.1 percent, 30.3 percent, 37.9 percent, and 35 percent, respectively, of the intimal surface area was involved with fatty streaks in the aorta. In the coronary arteries, 1.3 percent, 2.5 percent, 7.9 percent, and 11.0 percent, respectively, of the intimal surface was involved with fatty streaks and 0.6 percent, 0.7 percent, 2.4 percent, and 7.2 percent was involved with collagenous fibrous plaques. The extent of fatty-streak lesions in the coronary arteries was 8.5 times as great in persons with three or four risk factors as in those with none. Furthermore the extent of fibrous-plaque lesions in the coronary arteries was 12 times as great for those with 3 or 4 risk factors. These findings indicate that as the number of cardiovascular risk factors increases, so does the severity of coronary and aortic atherosclerosis in young people. This research emphasises the severity of the findings of the current study and highlights the importance of looking at multiple health indicators to get a full picture of physical health. Another study by Raitakari et al. (2003) examined if CVD risk factors in adolescence were related to the development of atherosclerosis later in life. This was a prospective cohort study conducted at 5 centres in Finland among 2229 white adults aged 24 to 39 years who were examined in childhood and adolescence at ages 3 to 18 years and re-examined 21 years later. Results indicated that the number of risk factors measured in 12- to 18-year-old adolescents, including high levels (i.e., extreme age- and sex-specific 80th percentile) of LDL-C, systolic blood pressure, body mass index, were directly related to existence of carotid artery intima-media thickness (IMT) in adulthood at ages 33 through 39 years for both men and women. Given that IMT is a marker of preclinical atherosclerosis these results suggest that exposure to cardiovascular risk

factors during adolescence may induce changes in arteries that contribute to the development of atherosclerosis. The current study involves the same age cohort 12-18 years, so the finding that 54% had at least one risk factor and 3% had 4 risk factors is cause for immediate action to improve the health profile of Irish adolescents and protect long term health.

Physical Health and Physical Activity

Participants that were classified as aerobically fit had a higher average of MVPA days ≥60 minutes than those who were not fit, with small to medium effect r=.18. This has been observed in previous research which has found a positive correlation between objectively measured PA and meeting of criterion referenced fitness standards in children and adolescents (Gutin et al., 2005). CSPPA participants that were classified as being of normal weight or having a healthy waist circumference or a healthy blood pressure engaged in more MVPA days ≥60 minutes than those that were unhealthy on these measures indicating that PA is associated with numerous health indicators. The relationship was strongest for aerobic fitness. The strength of this health indictor is reflected within the research, with some studies reporting that fitness tracks better than activity into adulthood (Malina, 2001). This indicates that measurement of physical fitness as health indictor, rather than BMI, which achieves the majority of the research attention, may be more robust.

There was a dose response between PA and health observed with health profile increasing as days of MVPA increased and a similar finding among frequency of extracurricular and club sport. Those that met the MVPA recommendation had the highest health index, reinforcing the protective health benefits of achieving the MVPA recommendations for adolescents.

Physical Health and Sedentary Behaviour

Those that were classified as having a healthy level of aerobic fitness for their age and gender engaged in less hours of sedentary activity per day, again showing the importance physical fitness. This is a unique finding as there have been no Irish studies which have looked at the relationship between these two variables. However there was no association found between sedentary behaviour and the other three physical health measures; BMI, waist circumference and blood pressure. Health profile did decrease linearly with increasing sedentary behaviour but this relationship

was not significant indicating the need for more research in this area. This lack of consensus is reflected within the research. The WHO (2002) study on risk factors identified sedentary behaviour as an independent risk factor for at least 35 chronic health conditions. However cross-sectional and longitudinal data between TV viewing and adiposity has found somewhat weak associations (Andersen et al., 1998; Robinson et al., 1993; Wolf et al., 1993). Within the Take PART Study, more obese respondents had a high sedentary leisure habit (i.e.≥2 hours per day), in comparison to normal weight, overweight or underweight adolescents (Woods et al., 2004). In contrast, the ESRI report found no clear association between hours watched TV/video games and risk of obesity or overweight (Fahey et al., 2005). Other research has also suggested that prolonged periods of sedentary behaviour may negate the protective health benefits of PA (Salmon, Bauman, Crawford, Timperio, & Owen, 2000). The reasons for discrepancies between studies could be attributed to the fact that most studies only look at TV viewing whereas this study looked at a range of 8 different sedentary behaviours. Additional studies looking at a range of sedentary behaviours, both technological and sedentary behaviours is needed to clarify the relationship between sedentary behaviour and physical health. The results of the current research would suggest that physical fitness is the only health indicator that positively influences time spent in sedentary behaviour, further emphasising the need to shift the physical activity promotion focus from BMI/obesity to fitness in among adolescents.

5.3 Exploring the correlates of PA for Irish adolescents

Influence of Gender on Correlates of Physical Activity

An analysis of the influence of gender on personal, psychological, social environment and physical environment correlates of PA found that 14 of the 19 correlate scales were influenced by gender. There was no difference between male and female scores on fear of injury as a barrier, teacher social support, perception of pedestrian safety, perception of places for walking and cycling or perception of access to services. This suggests that gender differences are more attributable to personal, psychological or social environment factors rather than physical environment variables. Reflective of higher activity among males, males generally

exhibited a more positive correlate profile than females. Males had a higher score than females for self efficacy, PA enjoyment, PE enjoyment, peer and family social support and perception of safety from crime. Males had lower scores on all barriers indicating that they perceived fewer barriers than females. Females had a higher perception of aesthetics and walkability of their neighbourhood streets than males.

Correlates of MVPA

Given the gender differences in MVPA participation, the correlates of PA were examined separately for males and females. A hierarchical linear regression was performed on the male participant data with MVPA as the dependent variable. The total adjusted model predicted 33% of the variance in MVPA which is quite significant. Predictors ranked in order of contribution to MVPA included age (negative), self efficacy, peer social support, lack of willpower barrier (negative), social influence barrier (negative), family social support, teacher social support and aesthetics. The fact that age was the most significant predictor highlights the importance of attention to demographic variables in relation to MVPA, consistent with the PA participation findings. Self efficacy was the second most significant variable for males, which is not surprising given the support for self efficacy within the literature (Berger et al., 2007; DiLorenzo et al., 1998). The third most important variable was peer social support. This reaffirms the importance of ones friends in shaping behaviours in adolescence (Duncan, Duncan, & Strycker, 2005; Jago et al., 2009; Robbins, Stommel, & Hamel, 2008). This is further emphasised by the fact that the social influence barrier was significant. This indicated that males perceive the fact that their family or friends didn't do activity as a significant barrier to being active themselves as the activities they do together don't usually involve PA. Overall, a range of personal, psychological, social environmental and physical environmental correlates predicted MVPA, supporting the application of the social ecological model to understand PA participation. However personal, psychological and social environment variables appear to be stronger in terms of predicting MVPA among males than physical environment variables. Research by Salmon and colleagues found that environmental barriers were not strongly related to participation in PA (Salmon, Owen, Crawford, Bauman, & Sallis, 2003). Among male CSPPA participants, lack of willpower and social influence were the only significant barriers affecting PA. Lack of resources, which considers costs and access

to services, was not significant, providing support for this theory. However, this could be a measurement issue given that the ICC scores for some of the measures were slightly low. The contribution of aesthetics suggests that that a pleasant environment in ones locality does impact MVPA. Overall, it appears that a social ecological approach to PA promotion is suitable among males.

A similarly constructed regression analysis was conducted for females. The total adjusted model predicted 35% of the variance, which was slightly higher than the male model. Significant predictors ranked in order of significance were lack of willpower barrier (negative), family social support, lack of energy barrier (negative), self efficacy, peer social support, age (negative), aesthetics and access to services. This is a different profile than that of males. These results suggest that a range of personal, psychological social environmental and physical environmental correlates predict MVPA among females consistent with a review by Biddle et al. (2005). It appears that for females, personal barriers to PA are more significant predictors. This is supported by the fact that females had higher barrier scores than males on all of the 7 subscales. The lack of willpower barrier was top of the rank, indicating that feelings of being unable to get started or stick to PA significantly affect behaviour among females, with the negative score indicating that as lack of willpower goes up, MVPA goes down. The importance of barriers to PA for females was supported by a review of the correlates of PA undertaken by Sallis et al. (1999) . Perception of general barriers contributed to PA for females in grades 10-12 but it did not contribute significantly for males. Similarly, the review by Biddle et al (2001) found a significant negative relationship between barriers and PA among females while other reviews not specific to females have reported no association (Van der Horst et al., 2007). This is a significant finding in terms of effective intervention and PA programme design for females, which indicates that females may respond well to motivational techniques. The fact that teacher social support was insignificant for females coupled with the previous finding that females engage in more school based sedentary behaviour, could be a further indication that PA is not promoted and encouraged effectively among females in the school environment in the same way as it is among males. Access to services was an additional physical environment variable to aesthetics that contributed to MVPA for females but not males. The reasons for this are inconclusive but it does appear that the physical environment, in general, is more important in terms of MVPA participation for females than males.

Overall these results support the social-ecological theory in finding that a range of personal, psychological, social environment and physical environment variables influence MVPA among males and females. This study could not analyse the effect of policy on participation as there is no existing policies or legislation relating to MVPA among females at this point in time. However it is clear that PA promotion and intervention design for males and females needs to adopt an ecological approach towards increasing PA.

5.4 Exploring Physical Activity Enjoyment

Physical Activity Enjoyment and Demographic Factors

Male participants had higher physical activity enjoyment scores than females. Enjoyment has not been compared between genders within the literature but it is likely a reflection of higher PA participation among males given that research has indicated that those that exercise more are more likely to enjoy PA (Dishman et al., 2005). The 10-11 year olds had higher PAE scores than any other age category. Recent research would support that enjoyment is more important for younger children (DiLorenzo et al., 1998; Moore et al., 2009). Physical activity enjoyment increased with each increasing SES category perhaps indicating higher MVPA and club sport participation among the upper SES results in higher PAE. Alternatively, the ability of the upper SES to choose the activities they want to do given that financial issues are not a concern may lead to greater uptake of club activities and ultimately higher physical activity enjoyment.

Physical Activity Enjoyment and Type of Physical Activity

Participant's that met the MVPA recommendation had higher physical activity enjoyment than those who did not meet the MVPA recommendation. Enjoyment increased linearly with increasing PA participation. Those who reported 0 days of MVPA $\geq$60 minutes had the lowest enjoyment score and those who met the MVPA recommendations (7 days) had the highest score with large effect for both males and females. Therefore, the hypothesis that physical activity enjoyment would increase with increasing MVPA is accepted and the null hypothesis is rejected. There was no association between physical activity enjoyment and active commuting which emphasises the functional nature of this behaviour. Participants that met the PE

recommendation had higher physical activity enjoyment than of those not meeting the PE recommendation. Physical activity enjoyment increased with medium effect for increasing frequency of participation in extracurricular sport and PA and large effect for club sport/PA. Those that reported participation in extracurricular or club sport 4 or more days per week had the highest enjoyment and those that reported that they never participate had the lowest enjoyment score. This is very significant as it shows even very little engagement in club activity can lead to a significant increase in enjoyment. These findings suggest that those that are involved in a sport or activity of their choice within a club environment are more likely to enjoy PA overall. This echoes the findings of Wankel (2003).who identified enjoyment as a key indictor of commitment to sport. It could be argued that socialization factors, club affiliation and other social-ecological variables associated with club participation may facilitate this enjoyment. Regardless of the reasons, it is positive to see that increased involvement in clubs positively effects the PA enjoyment of Irish children.

The Impact of Physical Activity Enjoyment on MVPA

A regression analysis was employed to quantify the impact of physical activity enjoyment on MVPA. Demographic variables were included to control for the confounding effect on MVPA. The addition of physical activity enjoyment accounted for 8% of the variance in MVPA with the full, adjusted model explaining 21% of the variance in MVPA. Physical activity enjoyment was the most significant predictor followed by age (negative) and gender (positive, male). Considering that physical activity enjoyment is a complex behaviour that is thought to be influenced by many factors, 8% is quite a sizable figure. However, enjoyment was not found to be a significant predictor in the correlates analysis among participants aged 12-18 years. This suggests that enjoyment of MVPA has a stronger influence among younger children, which is supported in the univariate findings. It may also suggest that for older children, the impact of enjoyment is not as straight forward when other variables are also considered. This may suggest a mediator role of physical enjoyment as opposed to a direct path to physical activity enjoyment. Dishman et al. (2005) found an indirect effect of physical activity enjoyment on PA operated by influence on self efficacy. Further research could investigate this with structural equation modelling techniques. Univariate findings showed that enjoyment increased

linearly with increasing participation in PA, particularly club sport, perhaps indicating enjoyment would be a significant predictor among the whole sample if PA levels were higher. Although it is not possible to state conclusively, this suggests that enjoyment is a mediator that promotes maintenance of PA participation that could have positive implications for continuing participation into adulthood. This theory is supported by Wankel (1993) who identified enjoyment as a key predictor of commitment to sport.

Predicting Physical Activity Enjoyment

Research suggests there is a need to identify personal, behavioural and environmental factors that that can be manipulated to facilitate increased physical activity enjoyment (Dishman et al., 2005). In the current study, the investigation of factors effecting physical activity enjoyment was limited to demographic, behavioural and social environmental factors, given that the primary school questionnaire did not include many of the psychological measures and the physical environment measure. Demographic, behavioural PA and social support variables predicted 29% of the variance in physical activity enjoyment. Significant predictors in order of rank in the final adjusted model included: peer social support, club sport participation, family social support, days of MVPA ≥ 60 minutes, teacher social support, extracurricular sport participation, meeting the PE recommendation and social class. These findings confirm the hypothesis that social support is important extrinsic factor for physical activity enjoyment consistent with The Sport Commitment Model (Scanlan et al., 1993). Club sport participation was also very important, which is in agreement with the univariate analysis which found significant increases in enjoyment with small increases in participation. The influence of club sport participation is not surprising given the opportunities to engage in a preferred form of activity with other adolescents and receive support and encouragement from parents and coaches for achievements. In this way it allows opportunities for intrinsic rewards and extrinsic rewards, also consistent with the Sport Commitment Model (Scanlan et al., 1993). MVPA participation was a further significant factor in predicting MVPA, again suggesting that those that do more MVPA enjoy it more. Twisk (2001) comments that children that enjoy regular physical activity experiences are more likely to develop long term habits and experience associated health benefits into adulthood.

5.5 Limitations of the Research

There were a number of limitations within this study that may have had an impact on the results discussed above.

- Cross sectional research by nature is correlation and therefore does not infer any causal relationships. Although this research provides a valuable snapshot of Irish adolescents' health behaviours, interventions are required to investigate these relationships further through longitudinal or experimental designs.
- The use of a self report questionnaire in this study means that the answers given may not have been completely true. In order to limit inaccuracy, validated and reliable measures were used. Participants were also instructed to be as honest as possible and told that their name would not be connected with their answers in anyway. Comprehension of items was facilitated through detailed explanation in before completion and participants were encouraged to ask questions if they were unsure. Physical health was measured objectively using standardized protocols.
- The fact that there were different primary and post primary questionnaires poses a limitation. It was decided that the questionnaire for primary students needed to be simplified to ensure comprehension and adequate completion. Accordingly, certain measures such as self efficacy, barriers to PA and the physical environment were not included in the primary questionnaire, meaning that these variables could only be examined within the post primary sample. This meant that the analysis of the correlates of PA could only reflect post primary participants and that the physical activity enjoyment analysis could not include psychological variables or physical environment variables
- Given the size of the sample, the scale of the data collection and the length of the questionnaire, not all measures had complete data sets. Some students missed certain items or refused to complete them for personal reasons. In the case of the physical measures sample, some students were not comfortable with having certain measurements taken or were ill or injured preventing them for taking part in the 20MST. This is a limitation in that the students who refused to have certain measurements taken or who did not respond in full to questionnaire items may be those that are most at risk of unhealthy behaviours. Missing data also poses a limitation in that only full data sets could be included in the regression analyses

in section 4.3 and 4.4. Comparisons between those with full and missing data did reveal some significant findings, indicating findings may have differed if all participants had full data sets.

- The collection of blood pressure data proved to be difficult as automated blood pressure machines are somewhat unreliable. In addition the environment when collecting blood pressure data was not ideal. Although students were asked to sit quietly and calmly for 5 minutes before having their blood pressure taken and the measurements were taken in a private room, some students were excitable or nervous given they had never had blood pressure taken before. This may have resulted in their blood pressure being higher than it would have been when they were completely relaxed and at rest. As discussed, diagnosis of high blood pressure requires more than one reading. The blood pressure results should therefore be interpreted with the fact that they are a once off reading in mind.
- The lack of an appropriately sized hall to complete the 20MST in some schools was a limitation. This resulted in having to do the test outdoors on some occasions, where wind resistance and inadequate surface grip for turning could have affected performance.

Chapter Six
6.0 Conclusion and Recommendations

6.1 Implications of the Study

The first objective of this study was to examine the PA participation and sedentary behaviour of Irish adolescents by demographic factors and to investigate if there is a relationship between PA and sedentary activity. The vast majority of participants did not meet current MVPA recommendations. This may have negative consequences for their current and also future health. The results confirmed that females are less active than males and that activity decreases with age throughout adolescence. Socioeconomic differences were also observed for some forms of activity. Results indicated that those that actively commuted, met PE recommendations and participated in extracurricular sport were more likely to meet recommendations, indicating that these are all viable ways in which adolescents can meet the recommended 60 minutes of daily activity.

This study found that adolescents engage in high levels of sedentary behaviour everyday. Although the majority met sedentary screen time recommendation, examination of type of activity showed that technological avenues are just one of many sedentary behaviours that youths, particularly males, choose to engage in. Females spent more time engaged in sedentary school based activities and sedentary social activities. This study supported the link found between sedentary activity and PA found in other research, as sedentary behaviour increased PA decreased. This highlights the need to discourage sedentary behaviour and to maximise opportunities for PA.

A second objective of this study was to examine the physical health profile of Irish adolescents with respect to demographic factors and to investigate the relationship between physical health, PA and sedentary behaviour. More than 1 in 5 (21%) were classified as overweight or obese in this sample. It is possible that these overweight and obese adolescents will become overweight and obese adults, possibly developing further health complications. One quarter of the sample also had high blood pressure or was unfit, and slightly less had an unhealthy waist circumference. The majority of the sample had at least one negative health indicator. Evidence of these cardiovascular disease and metabolic syndrome risk factors in this young

sample are worrying and pose major implications for the future overburdening of the Irish healthcare system. Those who met MVPA recommendations were the healthiest, highlighting that increasing PA participation is essential to improve the current and future health of our young people.

A third aim of this study was to investigate the demographic, psychological and environmental correlates of PA for male and females. It appears that for females barriers to PA are more significant negative predictors of activity. These barriers need to be addressed among females with the goal of increasing participation. Self efficacy was an important psychological predictor for both genders, and should be an integral part of PA interventions. It should be facilitated through performance accomplishments, vicarious experiences, verbal persuasion and emotional arousal (Bandura, 1977). The significance of social support in increasing PA was highlighted for both genders consistent with previous research. Direct and indirect support from family and peers is a vital element for youth PA programmes. Aesthetics contributed for females and males, indicating the importance of urban planning, and conducive PA environments. These findings emphasize that males and females are very different and need to be targeted for participation separately. A range of demographic, psychological and environmental factors contributed for both genders, indicating that a social-ecological approach to increasing PA is appropriate.

The final aim of this study was to investigate physical activity enjoyment. Although enjoyment was not a significant predictor in the correlates analysis among 12-18 year olds, it was found to contribute significantly to MVPA among the whole sample of 10-18 year olds. Enjoyment was found to decrease with age. However, enjoyment increased linearly with increasing participation in PA, particularly club sport, perhaps indicating enjoyment would be a significant predictor if PA levels were higher. Although it is not possible to state conclusively, this suggests that enjoyment is a mediator that promotes maintenance of PA participation. This could have positive implications for continuing participation into adulthood. The investigation of demographic, environmental and behavioural factors influencing physical activity enjoyment revealed that social support from peers plays a crucial role in predicting physical activity enjoyment. It also revealed that enjoyment increases significantly with increasing frequency of club sport participation. Nearly 1 in 3 participants in this study reported never participating in club sport, indicating

vast scope to increase physical activity enjoyment in this group and perhaps encourage maintenance of PA.

6.2 Future Research Recommendations

Cross sectional research of this nature is essential to gain a baseline picture of health behaviours. This research can act as a starting point in informing future experimental, longitudinal and intervention research. Females have been consistently found to be less active across all forms of activity. It appears that their preferences are not being catered for in terms PE and extracurricular activities. A study that involved implementation of the recommended varied PE curriculum and a preference- based extracurricular programme to investigate effect on PA levels, particularly among females, would perhaps enlighten this area further. It may also be interesting to assess fundamental motor skills in addition to activity level and physical fitness, to investigate if those exposed to the varied PE curriculum are more active and have a greater degree of fitness and motor skill proficiency. In terms of SES inequalities, further research is needed to determine the reasons why fewer lower SES adolescents participate in club sport and extracurricular sport and perhaps why their enjoyment is lower. A mixed quantitative/ qualitative design with focus groups would perhaps help to understand the challenges facing this demographic.

Future research on health behaviours among adolescents should examine the link between PA and sedentary behaviour further to determine if there is a cross over point at which sedentary behaviour begins to displace PA. This would aid in development of sedentary behaviour guidelines, which would be more telling than sedentary screen time recommendations that only consider technological activities. The finding that females engage in more school based sedentary activity than males and that teacher social support was not an indictor of PA need to be investigated further to determine if our schooling systems are reinforcing the gender gap in PA and sedentary behaviour. The link between PA and health and sedentary behaviour and health also needs to be investigated further with longitudinal studies tracking the fitness, BMI, waist circumference and blood pressure of Irish youth in accordance with any changes in PA and sedentary behaviour.

Physical activity enjoyment merits further research. It was shown to increase with increasing frequency of PA participation and increasing social support. The role

of PA participation in meditating adherence to PA participation should be investigated with longitudinal research.

6.3 Recommendation for Intervention

Intervention is needed to address the findings of this study. An ecological approach which targets PA participation at 4 levels is proposed, consistent with findings that activity is influenced by personal, social and environmental factors. The 4 levels from the top down are; the legislative policy level; which calls for a laying of the groundwork in terms of national intervention through development and implementation of supportive policy; the organisational/institutional level; which considers the importance of creating a supportive physical environment for PA in schools, sport clubs and neighbourhoods; the interpersonal level; which considers the strong social influence of parents, peers, teachers and coaches; and finally the individual level, which takes into account the need for individual intervention with consideration of personal factors. Examples of intervention that could be implemented at each level are presented in Tables 54-57.

Level 1: Legislative/ Policy Intervention

In order to effect behaviour change, intervention must be made at the highest level. In terms of PA in general, an interdepartmental approach is needed to increase the proportions of children meeting MVPA recommendations. A National Physical Activity Policy for children and youth needs to be developed that considers increase in activity in all its forms and allows for creation of a task force to implement, monitor and assess its aims. In accordance with evidence based research, a sedentary behaviour recommendation for children and youth also needs to be developed and implemented. In terms of management on the ground, the employment of active school coordinators would be invaluable to forge links between government, schools and communities and build on the requirements of the Active Schools Flag initiative currently running in Ireland (Department of Education and Science, 2009). Active schools coordinators have been successful in increasing participation in all types of PA in Scotland (Kay, Lyle, & Jeanes, 2008). The development of a surveillance system to monitor the efficacy of interventions and changes such as this would be a further long term investment and would provide regular, standardised health

behaviour data on Ireland's youth. It would allow identification of any emerging patterns in activity and identification of target groups. The Center for Disease and Prevention has been effective in implementing the Youth Risk Behaviours Surveillance System (YRBSS) which has monitored the health behaviours of adolescents from 9^{th}-12^{th} grade every two years since 1991 through school and household surveys (Center for Disease Control and Prevention, 2009).

In terms of active commuting there has been much work done to date on the national cycle policy framework and the Sustainable Transport Policy and the Green Schools Travel Module. A steering group aimed specifically at implementing this initiative with adequate assessment and monitoring would be a significant move towards increasing active commuting.

The recommendations for PE and the curriculum content at primary and post primary level need to be mandated, as research has indicated massive discrepancies. If weekly PE minutes were increased this could contribute significantly to increasing the percentage meeting MVPA recommendations. Compulsory implementation of the PE curricula and development of a proposed complementary EC programme may increase interest in "lifetime activities" during adolescence, which could have implications for carry over participation into adulthood. The groundwork for these policies has been made with the Active Schools Flag but meeting these requirements needs to be compulsory as oppose to optional.

In terms of club sport, funding needs to be allocated more evenly across all sports rather than just team games. A multi-sport model (one club, several sports, one premises) rather than the largely uni-sport model (one club, one sport one premises) that is largely in place at the moment would facilitate this further.

Table 54: **Examples of Legislative and Policy Intervention**

Level 1: Legislative/Policy	Example
PA and Sedentary Behaviour	• DHC to lead in developing/implementing a national physical activity policy for children and youth with interdepartmental strategy and task force • DHC to develop national sedentary behaviour guidelines. • DHELG to input policy to mandate conducive environments • DHC to employ active school coordinators • DHC and DES to implement surveillance system
Active Commuting	• DOT Implementation of national cycle policy and sustainable transport policy
PE and EC	• DES/NCCA to make PE recommendations mandatory • DES/NCCA to make varied PE curriculum mandatory • DES to develop a proposed extracurricular programme
Club Sport	• DAST/ISC to increase funding to "lifetime activity" sports • DAST/ISC to encourage multi sport model

Note: DHC=Department of Health and Children; DHELG=Department of Environment Heritage and Local Government; DES=Department of Education and Science; DOOT= Department of Transport; DAST: Department of Arts, Sport and Tourism; ISC: Irish Sports Council; NCCA: National Council for Curriculum and Assessment

Level 2: Institutional/ Physical Environment Intervention

The influence of a supportive physical environment must be addressed with appropriate intervention. Local authorities, health agencies, schools and community based sports clubs all play an important role in increasing PA.

Health agencies such as the Irish Heart Foundation could potentially help to design school/community-based PA schemes to target young people and their parents, particularly among low activity groups that are at risk of negative health consequences. Publicising the many benefits of PA through mass media on TV radio and social networking sites, either by government agencies or health agencies, may increase the awareness of PA benefits further and help contribute to a physically active lifestyle becoming a social norm.

This study found that aesthetic environments contributed significantly to MVPA for males and females. Local authorities can play a role in providing a supportive built environment in assisting the DOT in the development of safe and attractive walking and cycling routes to schools within local authority development plans.

Schools provide an important environment to promote PA through active commuting, PE and extracurricular sport and PA. Schools could potentially alert

those living within a walkable distance of safe walking routes and raise awareness among parents of the benefits of active commuting. Through adoption of a health promoting schools approach, schools can also increase PA and health behaviour knowledge among children and create a safe and supportive PA environment. As well as cooperating with DES to implement PE recommendations and curriculum, schools could provide additional opportunities for positive PA experiences in school such as having an activity week and an activity council that is led by students in line with recommendations of The Active Schools Flag. In primary school busy breaks are an ideal way to incorporate more fun PA experiences in to a child's days and have been found to be effective for increasing classroom attention. Encouraging students to organise break time PA in advance may be a further way to increase activity at break time and decrease sedentary behaviours.

In terms of club sport, links between schools and community clubs to raise awareness of opportunities available and share facilities would serve as a valuable sharing of resources. In addition, local authorities should ensure that clubs are accessible to all genders, ages and social classes and to ensure that working with young people are facilitating education, motivation, confidence and enjoyment.

Table 55: **Examples of Institutional/ Physical Environment Intervention**

Level 2: Institutional/ Environmental	**Example**
PA	• Health agencies to design school/community-based PA schemes to target young people and their parents • Health agencies to publicise positive health outcomes of PA and opportunities on TV/ radio/social networks
Active Commuting	• Local authorities to assist in development of safe and attractive walking and cycling routes to schools • Schools to alert students of safe walking cycling routes • School to raise awareness of active commuting
PE and EC	• Schools to adopt a health promoting schools approach • Increase chances for positive PA experiences in school • Implement busy breaks, • Organised activity during school breaks
Club Sport	• Link with schools to increase awareness of opportunities to participate in the community and to share facilities • Local authorities to ensure that the management of local facilities encourages participation among all • Local authorities to ensure those working with young people are qualified for their role

Level 3: Interpersonal Intervention

Intervention at an interpersonal level feeds into the strength of social factors in influencing PA. Opportunities for intervention include parent organised walking groups to school, or parental volunteering at school. In terms of encouragement and intangible support, parental encouragement of PA achievements in PE class to the level of other subjects may foster a sense of social support for PA. Along these lines teachers and coaches could facilitate self efficacy by providing opportunities for achievements and mastery in PA, and by rewarding effort as oppose to just winning. Clubs could further increase enjoyment and tap into the influence the strong influence of peer social support by encouraging members to bring their friends along to try out the sport or activity.

Table 56: Examples of Interpersonal Intervention

Level 3: Interpersonal	Example
Active Commuting	• Parental organisation of walking groups for those living in same area
PE and EC	• Parental volunteering • Parent encouragement of achievements in PE class • Teachers of every sport to actively encourage participation, • PE teachers to recognise and reward improvement and effort
Club Sport	• Members to encourage friends to join and try out sport/activity • Coaches to rewards individual achievement, skill mastery, effort and improvement

Level 4: Individual Intervention

Individual intervention may help to emphasise the importance of PA, and is an appropriate way to target those that may be at risk of negative health consequences due to their lifestyle. Health professionals, in partnership with local authorities, should provide information for young people and parents on local opportunities for participation in PA, perhaps through post, including safe and attractive play areas, walking and cycling routes, and sports and recreation programmes and facilities. This study found that 1 in 5 adolescents were overweight or obese and 3% were unhealthy across all health indictors investigated. Individual medical attention may be required to assess current consequences and prevent the chances of further health complications in this population through doctor referral to

activity programmes. Recommendations by health professionals to increase activity to those that are less active in general, could also serve to prevent future health complications and raise awareness to parents and adolescents of the importance of PA participation.

In addition, adolescents need to be encouraged to use self regulation to change their health behaviours. This could involve setting specific and measurable goals towards increasing PA. A decisional balance could also be employed. This requires one to identify the pros and cons of altering their behaviour with the aim of overcoming perceived barriers by focusing on the many positives of changing. This would be especially useful among girls given that barriers to PA were found to be strong negative predictors of PA among females in this study. These techniques could be brought to the attention of adolescents in health care settings or within the SPHE curriculum in the school.

Table 57: Examples of Individual Intervention

Level 4: Individual	**Example**
	• Health professionals to provide information for young people and parents on local opportunities for participation in PA and raise awareness of benefits of PA • Health professional referral to activity programmes for those that are inactive or have CV risk factors or overweight/obesity/ or for low activity groups • Use of self regulatory techniques

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Appendices

Appendix A:
School Recruitment Letter

School of Health and Human Performance
Dublin City University
Dublin 9

Dear Principal,

Dublin City University in collaboration with the University of Limerick and University College Cork are currently undertaking a study to evaluate 'Children's Sport Participation and Physical Activity' (CSPPA) in 5th and 6th class in primary and all years in post primary schools. The study will examine the level of participation in, and enjoyment of, physical activity, physical education and youth sport in this cohort. The study is funded by the Irish Sports Council. Your school has been randomly selected as one of a number of schools that would provide a representative national sample.

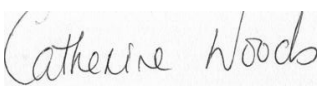
High levels of overweight and obesity, coupled with reports of type 2 diabetes in children and adolescents highlights the importance of promoting a physically active lifestyle among youth. Current guidelines recommend that young people participate daily in ≥ 60 min of physical activity that is developmentally appropriate, involves a variety of activities and is enjoyable. Adherence to these guidelines reduces the risk for cardiovascular disease and enhances mental and musculoskeletal health. The purpose of this research is to study the health/fitness status of boys and girls and to gather information that can be used to design interventions to promote long-term involvement in leisure-time physical activity.

Participation in the study will involve a research team travelling to your school for a single session. Your students will complete a questionnaire after which the research team may assess a number of health/fitness parameters. We will also be asking you to complete a short questionnaire on physical education, physical activity and youth sport.

Participation in the study is optional. Ethical approval has been granted by the Research Ethics Committee in DCU. Students will be asked to give their individual assent. Any student under the age of 16 will be required to have parental/guardian consent prior to participating in the study.

Thank you for taking the time to read this letter. A member of the research team will call your office in the near future. We look forward to your participation in this important research project. If you would like to contact me in relation to the project, my phone number is 01-7008008 or email: Catherine.Woods@dcu.ie.

Yours Sincerely,



Dr. Catherine Woods,
Head of School of Health and Human Performance,
CSPPA Research Director

Appendix B:
School Recruitment Telephone Script

School Recruitment Telephone Script

Hello is that … (name of school). My name is….. and I am phoning you from the School of Health and Human Performance at Dublin City University. Can I speak to the Principal please?

If No:
Is there a convenient time to call back today or tomorrow?

If Yes:
My name is….. and I am phoning you from the School of Health and Human Performance at Dublin City University. I am following up on a letter we sent out a few days ago in relation to a study we are carrying out in schools throughout Ireland. Did you get a chance to read the letter?

If the principal hasn't read the letter explain study:
Dublin City University in collaboration with the University of Limerick and University College Cork are currently undertaking a study to evaluate 'Children's Sport Participation and Physical Activity' (CSPPA) in 5th and 6th class in primary and all years in post primary schools. The study will examine the level of participation in, and enjoyment of, physical activity, physical education and youth sport in this cohort. The study is funded by the Irish Sports Council. Your school has been randomly selected as one of a number of schools that would provide a representative national sample. Would you be interested in taking part?

If principal has read letter:

Are you interested in becoming involved in the project?

If interested:

Thanks, that's great. Can I ask you a few questions in relation to the school?
(If principal doesn't have time to answer questions, ask to speak to secretary or arrange call back time for later that day or tomorrow.)
Questions:

1. Can I confirm your name for our database?
2. Can I confirm the school address?
3. Can I confirm the school number?
4. What is the EXACT total number of students in each year group (1st to 6th)
5. How many classes in each year group?
6. How many students in each form/tutor class in each year? (approx)
7. We will be visiting schools from February to May 2009 so…
    a. Can I get the dates of your mock exams or
    b. in-service days or
    c. Any days you will be closed out of normal school holidays?
8. Do you have an indoor hall at least 20m in length?
    a. If not do you have an outside area at least 20m in length? Must be suitable for running i.e. hard surface, non-slippery and even(not grass)

Thanks for that. We are currently in the process of organising the dates we will be visiting schools and the year groups involved. We will be in contact again in early January to arrange these with you. Is there a direct line I can reach you on?

If No (not interested)

Thanks for your time. For our database can I just confirm the school address and roll number?

If maybe/not sure:

Would you like some more information or do you have any questions about the project? (Reiterate rationale for doing study). Do you want to think about it and I can call back? If you want to speak to the research director here are her contact details:

Dr. Catherine Woods
School of Health and Human Performance
Dublin City University
01-7008008

Appendix C:
Opt-Out Information Sheet and Consent

CSPPA Study: Children's Sport Participation and Physical Activity

Dear Parent/Guardian,

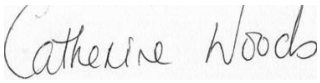
Please find overleaf an informed consent form for your child's participation in the "CSPPA" study. "CSPPA" stands for "Children's Sport Participation and Physical Activity". This study is being carried out by Dublin City University, the University of Limerick and University College Cork in a selection of schools through out the country. The "CSPPA" study is supported by the Irish Sports Council.

1. In order for your child to **participate** in this study, please read and explain the study to your child. If you would like them to participate **NO further action is necessary**.

2. If you would prefer that your child **did not take part** in the study, please **sign the attached form and return to the teacher**.

Thank you for your time.

Yours sincerely,



Dr. Catherine Woods,
Head of School of Health and Human Performance,
Research Director – CSPPA.

DCU

THE IRISH SPORTS COUNCIL

UNIVERSITY of LIMERICK
OLLSCOIL LUIMNIGH

UCC
Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

Information Sheet: CSPPA Study

(Please read this information with your child)

- ✓ My school is involved in a physical activity study called the 'Children's Sport Participation and Physical Activity' study.
- ✓ The research project will be carried out by Dublin City University, University of Limerick, and University College Cork. It is funded by the Irish Sports Council.
- ✓ Dublin City University will be carrying out the study in my school.
- ✓ My parents/guardians have talked to me about being part of a research study.
- ✓ During the study:
  - I will complete a physical activity questionnaire. This questionnaire will be filled out in with the help of my teacher and a researcher.
  - I may be asked to take part in a group discussion. These discussions will be done in groups in school with two researchers present. Discussions will be audio taped and notes will be taken but all tapes and notes will be labelled in such a way that no link can be made between any individual and the data.
- ✓ I understand that I can stop being part of this study any time. I will let my parent/guardian, teacher or the researcher know and I will not have to take part.
- ✓ I understand that all the information I give will be completely confidential. My name will be removed from all data and replaced with an ID number known only to the research team. My identity will not be revealed in any publication or presentation arising from the project. This will be within the limitations of the law. It is possible for data to be subject to subpoena, freedom of information claim or mandated reporting by some professions.
- ✓ If I have any questions about the study I will ask my parents/guardians, my teacher or one of the researchers.

Primary Investigators and Contact Details:

Name	Institution	Phone	Email
Dr. Catherine Woods	DCU	01-7008008	catherine.woods@dcu.ie
Dr, Niall Moyna	DCU	01-7008802	niall.moyna@dcu.ie
Ms. Aoileann Quinlan	DCU	01-7008847	aoileann.quinlan@dcu.ie

If you have any queries regarding the conduct of this project you can contact:

The Secretary, Research Ethics Committee, Office of the Vice-President for Research, Dublin City University. Tel: 01-7008000, Fax: 01-7008002.

Informed Consent Form: CSPPA Study

Project Title: Children's Sport Participation and Physical Activity

Investigators: Dr. Catherine Woods (DCU), Dr Deborah Tannehill (UL), Dr. Julia Walsh (UCC), Prof. Niall Moyna (DCU) and Aoileann Quinlan (DCU).

Introduction to the study: Physical activity has been shown to be extremely beneficial to youth, however in order to develop effective physical activity programmes for children of different ages, it is important that researchers understand what influences them to become and remain active.

During the research project:

- Your child will be asked to complete a physical activity questionnaire. This will take place during normal school hours, and will take about 40 minutes to complete. The questionnaire will ask them about their lifestyle and their views on physical education, physical activity and youth sport. These questions have been used with other young people.
- Your child may be asked to take part in a group discussion. These discussions will be done in groups in school with two researchers present. Discussions will be audio taped and notes will be taken but all tapes and notes will be labelled in such a way that no link can be made between any individual and the data.

All information gathered will be treated in the strictest of confidence. To ensure this, your child's name will be removed from all data and replaced with an ID number. Only the researcher will know their ID number. 'Confidentiality of information provided can only be protected within the limitations of the law. It is possible for data to be subject to subpoena, freedom of information claim or mandated reporting by some professions.'

Please read Option 1 and Option 2 below and complete as appropriate.

Option 1: Child to be **INCLUDED** in the study

I have read and understood the information in this form. I have read and explained the information in the form to my child. I have a copy of the information sheet. I understand that my child **will be included** in this study.

ACTION: No further action necessary. Please file this consent form.

_____

_

Option 2: Child to be **REMOVED** from the study

I have read and understood the information in this form. I have read and explained the information in the form to my child. I have a copy of the information sheet. I request that my child is **not** included in the study. I understand that my child will not be penalised in any way for doing this.

Parent/Guardian Signature:_____

Name in Block Capitals:_____

Childs Name in Block Capitals: _____

Witness:_____**Date:**_____

ACTION: To advise the research team of your decision please sign and return this form to your child's teacher for attention of Dr. Catherine Woods.

Appendix D:
Physical Measures Information Sheet and Consent

CSPPA Study: Children's Sport Participation and Physical Activity

Dear Parent/Guardian,

Please find overleaf an information sheet and an informed consent form for your child's participation in the "CSPPA" study. "CSPPA" stands for "Children's Sport Participation and Physical Activity". This study is being carried out by Dublin City University, the University of Limerick and University College Cork in a selection of schools through out the country. The "CSPPA" study is supported by the Irish Sports Council.

Please ensure that you read the study information attached and explain it to your child. Please decide whether you would like your child to participate in the research project or not, **complete the parental consent and give it to your child to return their teacher.**

Thank you for your time.

Yours sincerely,

Catherine Woods

Catherine Woods, Ph.D.
Head of School of Health and Human Performance,
Research Director – CSPPA

DCU THE IRISH SPORTS COUNCIL UNIVERSITY of LIMERICK OLLSCOIL LUIMNIGH UCC Coláiste na hOllscoile Corcaigh, Éire University College Cork, Ireland

Information Sheet: CSPPA Study

(Please read this information with your child)

- ✓ My school is involved in a physical activity study called the 'Children's Sport Participation and Physical Activity' study.
- ✓ The research project will be carried out by Dublin City University, University of Limerick, and University College Cork. It is funded by the Irish Sports Council.
- ✓ Dublin City University will be carrying out the study in my school.
- ✓ My parents/guardians have talked to me about being part of a research study.
- ✓ During the study:
  - I will complete a physical activity questionnaire. This questionnaire will be filled out in with the help of my teacher and a researcher from DCU.
  - I will be measured to see:
    - How tall I am
    - How much I weigh
    - How fit I am
    - What my blood pressure is like
    - What size my waist is
  - I may be asked to wear a small device that measures how quickly and often I move in a specific length of time (7 days). This device is worn around the waist and I will be shown how to put it on. If I can't put it on, another adult and my teacher will be there to help me.
  - I may be asked to take part in a group discussion. These discussions will be done in groups in school with two researchers from DCU present. Discussions will be audio taped and notes will be taken but all tapes and notes will be labelled in such a way that no link can be made between any individual and the data.
- ✓ I understand that I can stop being part of this study any time I want to. I will let my parent/guardian, teacher or the DCU researcher know and I will not have to take part.
- ✓ I understand that all the information I give will be completely confidential. My name will be removed from all data and replaced with an ID number known only to the research team. My identity will not be revealed in any publication or presentation arising from the project. This will be within the limitations of the law. It is possible for data to be subject to subpoena, freedom of information claim or mandated reporting by some professions.
- ✓ If I have any questions about the study I will ask my parents/guardians, my teacher or one of the researchers.

Primary Investigators and Contact Details:

Name	Institution	Phone	Email
Dr. Catherine Woods	DCU	01-7008008	catherine.woods@dcu.ie
Dr, Niall Moyna	DCU	01-7008802	niall.moyna@dcu.ie
Ms. Aoileann Quinlan	DCU	01-7008847	aoileann.quinlan@dcu.ie

If you have any queries regarding the conduct of this project you can contact:
The Secretary, Research Ethics Committee, Office of the Vice-President for Research, Dublin City University. Tel: 01-7008000, Fax: 01-7008002

Informed Consent: CSPPA Study

Project Title: Children's Sport Participation and Physical Activity.

Investigators: Dr. Catherine Woods (DCU), Dr Deborah Tannehill (UL), Dr. Julia Walsh (UCC), Prof. Niall Moyna (DCU) and Aoileann Quinlan (DCU).

Introduction to the study: Physical activity has been shown to be extremely beneficial to youth, however in order to develop effective physical activity programmes for young people, it is important that researchers understand what influences them to become and remain active.

During the research project: Your child will take part in a 2-3 hour session, which will take place in their school. The session will involve:

- Completing a questionnaire, that asks them about their lifestyle and their views on physical activity and sport. These questions have been used with other children.
- A qualified person measuring their height, weight, waist girth, and blood pressure.
- Taking part in a fitness test, called the 20m shuttle run test. It requires each individual to run between 2 lines (20m apart) in time to a bleep sound. The test will approximately last between 3 and 12 minutes depending on their fitness level.
- The possibility of being asked to wear a small motion sensor device (an accelerometer), which will measure their physical movement for a period of 7 days. This will be worn on his/her hip; it is small and unobtrusive and so will not affect participation in physical activity. It requires relatively little time and effort on their part to operate and previous research has found it pleasant to wear.
- The session may also involve taking part in a small group discussion. These discussions will be done in groups with a minimum of two researchers present. Discussions will be audio taped and notes will be taken by the researcher. To ensure anonymity, all tapes and notes will be labelled in such a way that no link can be made between any individual and the data.

All information gathered will be treated in the strictest of confidence. To ensure this, your child's name will be removed from all data and replaced with an ID number. Only the researcher will know your child's ID number. 'Confidentiality of information provided can only be protected within the limitations of the law. It is possible for data to be subject to subpoena, freedom of information claim or mandated reporting by some professions.'

PLEASE READ AND COMPLETE AS APPROPRIATE

I have read and understood the information in this form. I have read and explained the information in the form to my child. The researchers have answered my questions and concerns, and I have a copy of the information sheet. I understand that my child will <u>be included / not included</u> (delete as appropriate) in this study.

Parent/Guardian Signature: _____

Name in Block Capitals: _____

Childs Name in Block Capitals: _____

Witness: _____ **Date:** _____

<u>ACTION:</u> To advise the research team of your decision please sign and return this form to your Child's teacher for attention of Dr. Catherine Woods. Please keep the other information sheets provided.

Appendix E:

16+ Information Sheet and Consent

Information Sheet for those aged 16 and over: CSPPA Study

(Please read this information)

- ✓ My school is involved in a physical activity study called the 'Children's Sport Participation and Physical Activity' study.
- ✓ The research project will be carried out by Dublin City University, University of Limerick, and University College Cork. It is funded by the Irish Sports Council.
- ✓ Dublin City University will be carrying out the study in my school.
- ✓ My parents/guardians have talked to me about being part of a research study.
- ✓ During the study:
  - I will complete a physical activity questionnaire. This questionnaire will be filled out in with the help of my teacher and a researcher from DCU.
  - I will be measured to see:
    - How tall I am
    - How much I weigh
    - How fit I am
    - What my blood pressure is like
    - What size my waist is
  - I may be asked to wear a small device that measures how quickly and often I move in a specific length of time (7 days). This device is worn around the waist and I will be shown how to put it on. If I can't put it on, another adult and my teacher will be there to help me.
  - I may be asked to take part in a group discussion. These discussions will be done in groups in school with two researchers from DCU present. Discussions will be audio taped and notes will be taken but all tapes and notes will be labelled in such a way that no link can be made between any individual and the data.
- ✓ I understand that I can stop being part of this study any time I want to. I will let my parent/guardian, teacher or the DCU researcher know and I will not have to take part.
- ✓ I understand that all the information I give will be completely confidential. My name will be removed from all data and replaced with an ID number known only to the research team. My identity will not be revealed in any publication or presentation arising from the project. This will be within the limitations of the law. It is possible for data to be subject to subpoena, freedom of information claim or mandated reporting by some professions.
- ✓ If I have any questions about the study I will ask my teacher or one of the researchers.

Primary Investigators and Contact Details:

Name	Institution	Phone	Email
Dr. Catherine Woods	DCU	01-7008008	catherine.woods@dcu.ie
Dr, Niall Moyna	DCU	01-7008802	niall.moyna@dcu.ie
Ms. Aoileann Quinlan	DCU	01-7008847	aoileann.quinlan@dcu.ie

If you have any queries regarding the conduct of this project you can contact:
The Secretary, Research Ethics Committee, Office of the Vice-President for Research, Dublin City University. Tel: 01-7008000, Fax: 01-7008002

Informed Consent Form for over 16's: CSPPA Study

Project Title: Children's Sport Participation and Physical Activity

Investigators: Dr. Catherine Woods (DCU), Dr Deborah Tannehill (UL), Dr. Julia Walsh (UCC), Prof. Niall Moyna (DCU) and Aoileann Quinlan (DCU).

Introduction to the study:
Physical activity has been shown to be extremely beneficial to youth, however in order to develop effective physical activity programmes for your age group, it is important that researchers understand what influences adolescents in Ireland to become and remain active.

This is what will happen during the research project:
I will take part in a 2-3 hour session, which will take place in your school. The session will involve:

- Completing a questionnaire that asks me about my lifestyle and my views on physical activity. These questions have been used with other children of my age.
- A qualified person will measure my height, weight, hip and waist girth, and blood pressure.
- A fitness test, which requires me to run between 2 lines (20m apart) in time to a bleep sound. The test will approximately last between 3 and 12 minutes depending on your fitness level and is called the 20m shuttle run test.
- I will be asked to wear a small motion sensor device (an accelerometer), which measures my physical movement for a period of 7 days. This will be worn on my hip; it is small and unobtrusive and so will not affect my participation in physical activity. It requires relatively little time and effort on my part to operate and previous research has found it pleasant to wear.
- I may be asked to take part in a group discussion. These discussions will be done in groups in school with two researchers from DCU present. Discussions will be audio taped and notes will be taken but all tapes and notes will be labelled in such a way that no link can be made between any individual and the data.

All information gathered will be treated in the strictest of confidence. To ensure this, your name will be removed from all data and replaced with an ID number. Only the researcher will know your ID number. 'Confidentiality of information provided can only be protected within the limitations of the law. It is possible for data to be subject to subpoena, freedom of information claim or mandated reporting by some professions.'

PLEASE READ AND COMPLETE

I have read and understand the information on this form. The researchers have answered all my questions. I consent to participate in this study. I understand that I can withdraw from the study at any stage should I choose to do so. I will not be penalised in any way for doing this.

Student's Signature:
_____

Printed Name:
_____

Witness: _____ **Date:** _____

Appendix F:
Primary CSPPA Questionnaire

Questionnaire

CSPPA

(Primary)

DCU

THE IRISH SPORTS COUNCIL

UNIVERSITY of LIMERICK
OLLSCOIL LUIMNIGH

UCC
Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

Please read and tick (✓) ONE box only

1. I gave the permission form to my parents/guardian NO ❑ YES ❑
2. My parents/guardian have talked to me about taking part in the research project. NO ❑ YES ❑
3. I have been told that being part of this project will involve me filling out a questionnaire and may involve health measurements. NO ❑ YES ❑
4. I know that I am free to decide not to take part in this study or change my mind if I wish. NO ❑ YES ❑

SIGNED: _____ DATE: _____

Please PRINT all information in CAPITALS

1. Are you a Boy 1❑ Girl 2❑

2. Age: _____

3. First Name:_____ 4. Surname: _____

5. Date of Birth: __/ ____/ _____ (dd/mm/year)

6. Home Address: _____

7. What is the name of your school? _____

8. Are you in? 5th 7❑ 6th 8❑ class

9. Do you have a physical disability, a learning or sensory disability or a special education need which affects your ability to do physical activity?
   NO 1❑ YES 2❑

(If YES, Please specify or describe) _____

10. Sometime in the future we may want to:
    a) Contact you to follow up on this research. Would that be OK ? NO 1❑ YES 2❑

OFFICE USE ONLY: **Actigraph ID CODE** [ ]

Section 1:

Physical activity is any body movement.

It can be done at different levels of effort:

- **Moderate Effort** makes your heart rate and breathing rate faster than normal. You may also sweat a little. Brisk walking and jogging are good examples.
- **Vigorous Effort** makes your heart rate much faster and you have to breathe deeper and faster than normal. You will probably sweat. Playing football or tennis are good examples.
- Physical activity includes:

Exercise	Running, dancing, etc.
Sports	Basketball, football, athletics, swimming, etc.
General	Brisk walking, washing the car, walking or cycling to school, etc.

Please try to think carefully and be as accurate as possible with your answers. For these next two questions, add up all the time you spend in physical activity each day.

Only include activities of either MODERATE or VIGOROUS effort.

Q1. Over the <u>past 7 days</u>, on how many days were you physically active for a total of at least <u>60 minutes</u> per day? Please circle one number.

0 days 1 2 3 4 5 6 7 days

Q2. Over a <u>typical or usual week</u>, on how many days are you physically active for a total of at least <u>60 minutes</u> per day? Please circle one number.

0 days 1 2 3 4 5 6 7 days

Section 2: In this section we want to know about things you have done in the last seven days that involve sitting down.

For each activity listed, answer three questions:

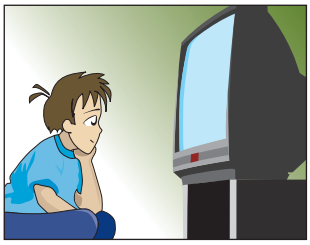
1. Did you do this activity in the past 7 days? **Tick NO ☑ or YES ☑**
2. **If YES**, on how many days did you do the activity?
3. On average, how many minutes did you do this activity on the days that you did it?

Q1. Please answer this section for the past 7 days.

SITTING DOWN ACTIVITIES	Have you done this activity in the last 7 days? NO	YES	Number of **Days** in last 7 days	**Minutes** per day
1. Computer /Internet	1 ❑	2 ❑		
2. Sitting playing video games	1 ❑	2 ❑		
3. Homework, studying	1 ❑	2 ❑		
4. Reading (not for school)	1 ❑	2 ❑		
5. Sitting during school breaks	1 ❑	2 ❑		
6. Sitting and talking with friends (not on phone),listening to music	1 ❑	2 ❑		
7. Talking on the phone	1 ❑	2 ❑		
8. Television or DVD watching	1 ❑	2 ❑		
9. Other (specify):	1 ❑	2 ❑		

Q2. Do you watch much sport on TV? Please tick (✓) ONE box only

I never watch sport on TV ..... 1 ❑
I occasionally watch sports programmes ..... 2 ❑
I frequently watch sports programmes ..... 3 ❑



Q3. How many hours per week do you spend at music, singing, drama, or dance classes (including time spent practising)?

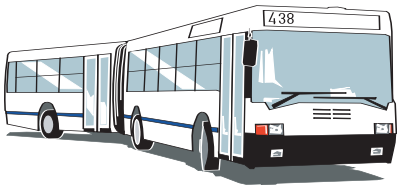
I don't attend any such class ..... 1 ❑
About 0-2 hours per week ..... 2 ❑
About 3-4 hours per week ..... 3 ❑
About 5 or more hours per week ..... 4 ❑

Q4a. How do you usually travel to school?
Please tick one box only – for the LONGEST distance of your usual journey **to school**.

Walk 1 ❑

Cycle 2 ❑

Car 3 ❑



Bus 4 ❑

Q4b. How long does your journey **to school** usually take?

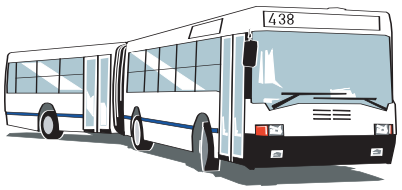
_____ **Minutes**

Q4c. How do you usually travel home from school?
Please tick one box only – for the LONGEST distance of your usual journey **home from school**.

Walk 1 ❑

Cycle 2 ❑

Car 3 ❑



Bus 4 ❑

Q4d. How long does your journey **home from school** usually take?

_____ **Minutes**

Q4e. If you travel by car or bus give reasons why you choose not to walk or cycle.

_____

_____

SECTION 3: This section is about what you do in PE/Games class at school

Q1. Please tick (✓) all the sports you have done at school in your P.E. and games classes since the beginning of the school year. This includes indoor and outdoor sports.

Since the beginning of the school year I have...	Participated in
1. Adventure activities*	❑ 1
* This includes orienteering, canoeing, abseiling and mountaineering	
2. Aerobics	❑ 1
3. Athletics	❑ 1
4. Badminton	❑ 1
5. Baseball or Rounders	❑ 1
6. Basketball	❑ 1
7. Camogie	❑ 1
8. Cross country running	❑ 1
9. Dance	❑ 1
10. Gaelic Football	❑ 1
11. Gymnastics	❑ 1
12. Handball	❑ 1
13. Hockey	❑ 1
14. Horse riding	❑ 1
15. Hurling	❑ 1
16. Martial Arts	❑ 1
17. Rugby	❑ 1
18. Soccer	❑ 1
19. Squash	❑ 1
20. Swimming	❑ 1
21. Tennis	❑ 1
22. Weight training	❑ 1
23. Any other sport	❑ 1
24. I don't do PE at school	❑ 1

Q2a. How many times do you have PE per week?
Please tick (✓) ONE box only

0 ❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 times ❑

Q2b. And on average, how long is each PE class? _____ hours and _____ minutes

SECTION 4: This section is about sports that you might play at lunch time or after school with the help of a teacher

Q1. Please tick (✓) any sports/activities you have played at lunch time, after school since the beginning of this school year in each of the following situations

(a) Played each sport/activity **at least once** WITH the help of a teacher since the beginning of this school year

(b) Played each sport/activity **at least once a week** WITH the help of a teacher since the beginning of this school year

Please exclude sports played in PE classes

Since the beginning of the school year I have...	(a) Played at least **once** with help of **teacher**	(b) Played at least **once a week** with the help of **teacher**
1. Adventure activities*	❑ 1	❑ 1
2. Aerobics	❑ 1	❑ 1
3. Athletics	❑ 1	❑ 1
4. Badminton	❑ 1	❑ 1
5. Baseball or Rounders	❑ 1	❑ 1
6. Basketball	❑ 1	❑ 1
7. Camogie	❑ 1	❑ 1
8. Cross country running	❑ 1	❑ 1
9. Dance	❑ 1	❑ 1
10. Gaelic Football	❑ 1	❑ 1
11. Gymnastics	❑ 1	❑ 1
12. Handball	❑ 1	❑ 1
13. Hockey	❑ 1	❑ 1
14. Horse riding	❑ 1	❑ 1
15. Hurling	❑ 1	❑ 1
16. Martial Arts	❑ 1	❑ 1
17. Rugby	❑ 1	❑ 1
18. Soccer	❑ 1	❑ 1
19. Squash	❑ 1	❑ 1
20. Swimming	❑ 1	❑ 1
21. Tennis	❑ 1	❑ 1
22. Weight training	❑ 1	❑ 1
23. Any other sport	❑ 1	❑ 1
24. Did not play any sport with help of teacher	❑ 1	

* This includes orienteering, canoeing, abseiling and mountaineering

Q2. About how often do you play sports and physical activities at lunch-time or after school with your friends WITHOUT the help of a teacher? Please tick (✓) ONE box only

4 or more days a week.....1 ❑

2-3 days a week.....2 ❑

One day a week.....3 ❑

Less often.....4 ❑

Never .....5 ❑

Q3. About how often do you take part in sports and physical activities at lunch-time or after school WITH the help of a teacher? Please tick (✓) ONE box only

4 or more days a week.....1 ❑

2-3 days a week.....2 ❑

One day a week.....3 ❑

Less often.....4 ❑

Never .....5 ❑

Q4. Why don't you take part in more sports and activities at lunch-time or after school? Please tick (✓) any of the boxes that are a reason for you.

I already do enough sports outside class time.....1 ❑

I don't like playing sports.....1 ❑

I haven't got enough spare time.....1 ❑

I'm not good enough at sport .....1 ❑

I've never been asked to take part .....1 ❑

It's difficult to get home if I stay late after school.....1 ❑

My school doesn't offer any sports outside class time that I like.....1 ❑

Q5. Have you had any coaching during lunch-time or after school to help you get better at any of these sports?
Please tick (✓) ONE box only.

NO .....1 ❑

YES.....2 ❑

I don't play sports at school outside class time .....3 ❑

Q6. During the past 12 months on how many school sports or dance teams did you play?

0 ❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7 or more ❑

SECTION 5: This section is about sports which you might play with sports clubs that are not school clubs.

Q1. Please tick (✓) any sports/activities you have played with a club, which is not a school club, since the beginning of this school year in each of the following situations

(a) Played each sport/activity in a club **at least once** since the beginning of this school year
(b) Played each sport/activity in a club **at least once a week** since the beginning of this school year
Please exclude sports/activities played in PE classes

Since the beginning of the school year I have...	(a) Played **in a club** at least **once**	(b) Played **in a club** at least **once a week**
1. Adventure activities*	❑ 1	❑ 1
* This includes orienteering, canoeing, abseiling and mountaineering		
2. Aerobics	❑ 1	❑ 1
3. Athletics	❑ 1	❑ 1
4. Badminton	❑ 1	❑ 1
5. Baseball or Rounders	❑ 1	❑ 1
6. Basketball	❑ 1	❑ 1
7. Camogie	❑ 1	❑ 1
8. Cross country running	❑ 1	❑ 1
9. Dance	❑ 1	❑ 1
10. Gaelic Football	❑ 1	❑ 1
11. Gymnastics	❑ 1	❑ 1
12. Handball	❑ 1	❑ 1
13. Hockey	❑ 1	❑ 1
14. Horse riding	❑ 1	❑ 1
15. Hurling	❑ 1	❑ 1
16. Martial Arts	❑ 1	❑ 1
17. Rugby	❑ 1	❑ 1
18. Soccer	❑ 1	❑ 1
19. Squash	❑ 1	❑ 1
20. Swimming	❑ 1	❑ 1
21. Tennis	❑ 1	❑ 1
22. Weight training	❑ 1	❑ 1
23. Any other sport	❑ 1	❑ 1
24. I did not play any sport/activity in a club	❑ 1	

Q2. How often do you take part in sports and physical activities with a sports club, which is not a school club? Please tick (✓) one box only.

4 or more days a week ..... 1 ❑

2-3 days a week ..... 2 ❑

One day a week ..... 3 ❑

2-3 days a month ..... 4 ❑

One day a month ..... 5 ❑

Less often ..... 6 ❑

Never ..... 7 ❑

Q3. Have you had any coaching at your club to help you get better at any of these sports?
Please tick (✓) one box only.

NO ..... 1 ❑

YES ..... 2 ❑

I don't play sports in a club ..... 3 ❑

Q4. How often do you go to a sports field/ground or sports/leisure centre to take part in some form of sports or physical activity? Please tick (✓) one box only.

4 or more days a week ..... 1 ❑

2-3 days a week ..... 2 ❑

One day a week ..... 3 ❑

2-3 days a month ..... 4 ❑

One day a month ..... 5 ❑

Less often ..... 6 ❑

Never ..... 7 ❑

Q5. In the past 7 days, how much physical activity did you do on?
Please tick (✓) one box only.

	None	Up to 30 minutes	Between 30minutes and 1 hour	Between 1 hour and 1 1/2 hours	Between 1 1/2 hours and 2 hours	Greater than 2 hours
(a) An average weekday Mon-Fri	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑	6 ❑
(b) An average weekend day Sat-Sun	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑	6 ❑

Section 6:

Q1. SWIMMING ABILITY please mark your swimming level below.
Please tick (✓) ONE box only

Non-Swimmer ☐ 0 Beginner ☐ 1 Intermediate ☐ 2 Competitive ☐ 3

If non-swimmer please go to section 7.

If swimmer please mark your swimming level at the following skills. Please tick (✓) ONE box only

	Beginner	Intermediate	Competitive	Unable to do this stroke
1. Treading water	☐ 1	☐ 2	☐ 3	☐ 4
2. Front crawl	☐ 1	☐ 2	☐ 3	☐ 4
3. Back stroke	☐ 1	☐ 2	☐ 3	☐ 4
4. Butterfly	☐ 1	☐ 2	☐ 3	☐ 4
5. Breast stroke	☐ 1	☐ 2	☐ 3	☐ 4

What is your favourite swimming stroke? _____

Section 7:

Q1. Physical Activity Enjoyment Scale

When I am active...	Disagree a lot	Disagree a little	Neither disagree nor agree	Agree a little	Agree a lot
1. I enjoy it	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
2. I feel bored	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
3. I dislike it	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
4. I find it pleasurable	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
5. It's no fun at all	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
6. It gives me energy	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
7. It makes me depressed	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
8. It's very pleasant	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
9. My body feels good	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
10. I get something out of it	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
11. It's very exciting	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
12. It frustrates me	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
13. It's not at all interesting	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
14. It gives me a strong feeling of success	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
15. It feels good	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
16. I feel as though I would rather be doing something else	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q2. DURING A TYPICAL WEEK, how often: Please tick (✓) ONE box only

	None	Once	Sometimes	Almost every day	Every day
1. Do you **encourage your friends** to do physical activities or play sports?	1❑	2❑	3❑	4❑	5❑
2. Do your friends **encourage you** to do physical activities or play sports?	1❑	2❑	3❑	4❑	5❑
3. Do your friends do physical activities or play sports **with you**?	1❑	2❑	3❑	4❑	5❑
4. Do other kids **tease you** for not being good at physical activity or sports?	1❑	2❑	3❑	4❑	5❑
5. Do friends **tell you** that you are doing well in physical activities or sports?	1❑	2❑	3❑	4❑	5❑

Q3. DURING A TYPICAL WEEK, how often has someone in your house/member of your family:
(For example, your father, mother, guardian, brother, sister, grandparent, or other relative)
Please tick (✓) ONE box only

	None	Once	Sometimes	Almost every day	Every day
1. **Encouraged you** to do physical activities or play sports?	1❑	2❑	3❑	4❑	5❑
2. Done a physical activity or played sports **with you?**	1❑	2❑	3❑	4❑	5❑
3. **Provided transportation** to a place where you can do physical activities or play sports?	1❑	2❑	3❑	4❑	5❑
4. **Watched you** participate in physical activities or sports?	1❑	2❑	3❑	4❑	5❑
5. **Told you** that you are doing well in physical activities or sports?	1❑	2❑	3❑	4❑	5❑

Q4. DURING A TYPICAL WEEK, how often has a teacher in your school:
Please tick (✓) ONE box only

	None	Once	Sometimes	Almost every day	Every day
1. **Encouraged you** to do physical activities or play sports?	1❑	2❑	3❑	4❑	5❑
2. Done a physical activity or played sports **with you?**	1❑	2❑	3❑	4❑	5❑
3. **Provided transportation** to a place where you can do physical activities or play sports?	1❑	2❑	3❑	4❑	5❑
4. **Watched you** participate in physical activities or sports (not including supervision)?	1❑	2❑	3❑	4❑	5❑
5. **Told you** that you are doing well in physical activities or sports?	1❑	2❑	3❑	4❑	5❑

Q.5 At present are you on a diet or doing something else to lose weight?

No, my weight is fine ..... 1❑
No, but I should lose some weight ..... 2❑
No, because I need to put on weight ..... 3❑
Yes ..... 4❑

Q.6 Do you think your body is…?

Much too thin ..... 1❑
A bit too thin ..... 2❑
About the right size ..... 3❑
A bit too fat ..... 4❑
Much too fat ..... 5❑

SECTION 8:

Q1. FATHER/GUARDIAN

a. Does your father/male guardian do exercise or play sports regularly? (For example gym, swimming, golf) Please tick (✓) one box ONLY

Yes .....1 ❑
No .....2 ❑
Don't Know .....2 ❑
Don't have or see father .....4 ❑

b. Does your father/male guardian volunteer or help out with any sports clubs? (For example coaching, refereeing, provide transportation) Please tick (✓) one box ONLY

Yes .....1 ❑
No .....2 ❑
Don't Know .....2 ❑
Don't have or see father .....4 ❑

c. Does your father have a job?

Yes .....1 ❑
No .....2 ❑
Don't know .....3 ❑
Don't have or see father .....4 ❑

d. If yes, say in what place he works:
(For example hospital, bank, restaurant…)

_____

e. Please write down exactly what job he does
(For example doctor, clerk, manager…)

_____

f. If no, why does your father not have a job?

He is sick, or retired or a student .....1 ❑
He is looking for a job.....2 ❑
He takes care of others, or is
full time in the home .....3 ❑
I don't know .....4 ❑

2. MOTHER/GUARDIAN

a. Does your mother/female guardian do exercise or play sports regularly? (For example gym, swimming, golf) Please tick (✓) one box ONLY

Yes .....1 ❑
No .....2 ❑
Don't Know .....2 ❑
Don't have or see mother .....4 ❑

b. Does your mother/female guardian volunteer or help out with any sports clubs? (For example coaching, refereeing, provide transportation) Please tick (✓) one box ONLY

Yes .....1 ❑
No .....2 ❑
Don't Know .....2 ❑
Don't have or see mother .....4 ❑

c. Does your mother have a job?

Yes .....1 ❑
No .....2 ❑
Don't know .....3 ❑
Don't have or see mother .....4 ❑

d. If yes, say in what place she works:
(For example hospital, bank, restaurant…)

_____

e. Please write down exactly what job she does
(For example doctor, clerk, manager…)

_____

f. If no, why does your mother not have a job?

She is sick, or retired or a student ....1 ❑
She is looking for a job.....2 ❑
She takes care of others, or is .....
full time in the home .....3 ❑
I don't know .....4 ❑

You're finished! Well done!
Thank you for your time and effort!

Appendix G:
Post Primary CSPPA Questionnaire

Questionnaire

CSPPA

(Post Primary)

DCU

THE IRISH SPORTS COUNCIL
AN CHOMHAIRLE SPÓIRT

UNIVERSITY of LIMERICK
OLLSCOIL LUIMNIGH

ucc
Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

ASSENT FORM FOR CHILDREN

Please tick (✓) ONE box only

1. I have given the informed consent form to my parents/guardian **No** ₁❑ **Yes** ₂❑
2. My parents/guardian have talked to me about being part of a research study. **No** ₁❑ **Yes** ₂❑
3. It has been explained to me that the study will involve me completing a physical activity questionnaire and may involve physical measures. **No** ₁❑ **Yes** ₂❑
4. I know that I am free to decide not to take part in this study or change my mind if I wish. **No** ₁❑ **Yes** ₂❑

SIGNED: _____ **DATE:** _____

Demographics

Please **PRINT** all information in **CAPITALS**

1. Gender (please tick one): **Male** ₁❑ **Female** ₂❑

2. Age: _____

3. First Name: _____ **4. Surname:** _____

5. Date of Birth: ____/ _____/_____ (dd/mm/year) **6. Nationality:** _____

7. Home Address: _____

8. Area of Residence: This question refers to the permanent area of residence you live in. Would you describe the place that you live in as?

₁❑ A big city (more than than 70, 000 inhabitants)

₂❑ Suburbs, large town or outskirts of city (less than 70, 000 inhabitants.)

₃❑ Town (less than 20, 000 inhabitants)

₄❑ Village / Rural area (less than 3,000 inhabitants)

9. What is the name of your school? _____

10. Are you in? **1st** ❑ **2nd** ❑ **3rd** ❑ **4th** ❑ **5th** ❑ **6th** ❑ **year**

11. Do you have a physical disability, a learning or sensory disability or a special education need which affects your capacity to participate in certain physical activities?
No ₁❑ **Yes** ₂❑

(If **YES**, Please specify or describe) _____

12. Sometime in the future we may want to:

a) Contact you to follow up on this research. Would that be OK ? **No** ₁❑ **Yes** ₂❑

b) Contact your school to obtain your exam results. Would that be OK? **No** ₁❑ **Yes** ₂❑

This information will be treated with the strictest confidence; it will be anonymous, that means your name will not be associated with it in any way.

OFFICE USE ONLY: **Actigraph ID CODE** _____

Section 1:

Physical activity is any body movement.

It can be done at different levels of effort:

- **Moderate Effort** makes your heart rate and breathing rate faster than normal. You may also sweat a little. Brisk walking and jogging are good examples.
- **Vigorous Effort** makes your heart rate much faster and you have to breathe deeper and faster than normal. You will probably sweat. Playing football or tennis are good examples.
- Physical activity includes:

Exercise	Weight training, aerobics, jogging, dancing, etc.
Sports	Hurling, football, athletics, swimming, etc.
General	Brisk walking, washing the car, walking or cycling to school, etc.

Please try to think carefully and be as accurate as possible with your answers. For these next two questions, add up all the time you spend in physical activity each day. **Only include activities of either MODERATE or VIGOROUS effort.**

Q1. Over the <u>past 7 days</u>, on how many days were you physically active for a total of at least <u>60 minutes</u> per day? Please circle one number.

0 days 1 2 3 4 5 6 7 days

Q2. Over a <u>typical or usual week</u>, on how many days are you physically active for a total of at least <u>60 minutes</u> per day? Please circle one number.

0 days 1 2 3 4 5 6 7 days

Q3a. What distance is your journey to school and how long does it usually take?

_____**km*** _____**Minutes**

* 1 km = 1000 metres

Q3b. How do you usually travel to school?
Please tick one box only – for the **<u>LONGEST</u>** distance of your usual journey to school.

By foot 1❑ Bicycle 2❑ Car 3❑ Bus 4❑ Train 5❑

Q3c How do you usually travel home from school?
Please tick one box only – for the **<u>LONGEST</u>** distance of your usual journey to school.

By foot 1❑ Bicycle 2❑ Car 3❑ Bus 4❑ Train 5❑

Q3d If you travel by car, bus or train give reasons why you choose not to walk or cycle.

_____

_____

Q4. **<u>Outside of school P.E. classes</u>,**
Please read through all games/activities and tick either the NO or YES box for each activity you have taken part in during the **past 7 days**.

There are no right or wrong answers. No one does all these activities.
Please be as accurate and honest as possible.

For each activity listed:

1. Did you do this activity in the **past 7 days?** Tick NO ☑ or YES ☑ for each activity.

ACTIVITY	Have you done this activity in **the past 7 days?**	
Sports & Dance	**NO**	**YES**
1. Athletics	1❑	2❑
2. Badminton	1❑	2❑
3. Basketball	1❑	2❑
4. Boxing	1❑	2❑
5. Cricket	1❑	2❑
6. Cue games (pool and snooker)	1❑	2❑
7. Cycling (Mountain Biking, Road Racing)	1❑	2❑
8. Dance (Irish, ballet, jazz, modern, tap)	1❑	2❑
9. Dancing (social, recreational)	1❑	2❑
10. Gaelic Football	1❑	2❑
11. Golf/Pitch 'n' putt	1❑	2❑
12. Gymnastics, trampoline	1❑	2❑
13. Hockey (field, ice, or roller)	1❑	2❑
14. Hurling/Camogie	1❑	2❑
15. Judo	1❑	2❑
16. Karate	1❑	2❑
17. Skating (ice, roller, in-line, skate boarding)	1❑	2❑
18. Skiing (downhill, cross-country, water)	1❑	2❑
19. Soccer	1❑	2❑
20. Softball/rounders	1❑	2❑
21. Squash	1❑	2❑
22. Swimming	1❑	2❑
23. Tennis	1❑	2❑
24. Rugby	1❑	2❑
25. Volleyball	1❑	2❑
26. Water sports: sailing, rowing, canoeing	1❑	2❑
27. Other (specify):	1❑	2❑

Exercise	NO	YES
28. Aerobics/aerobic dancing/step aerobics	1❑	2❑
29. Push-ups, sit-ups, jumping jacks	1❑	2❑
30. Jogging	1❑	2❑
31. Skipping	1❑	2❑
32. Swimming laps	1❑	2❑
33. Walking for exercise	1❑	2❑
34. Weight lifting/weight training	1❑	2❑
35. Exercise machine: cycle, treadmill, rower, climber	1❑	2❑
36. Other (specify):	1❑	2❑

General Physical Activities	NO	YES
37. Bicycling	1❑	2❑
38. Hiking	1❑	2❑
39. Walking to get places	1❑	2❑
40. Water play: in pool, lake, or ocean	1❑	2❑
41. Outdoor chores: mowing, raking, gardening	1❑	2❑
42. Indoor chores: mopping, vacuuming, sweeping	1❑	2❑
43. Physically demanding part-time work: stacking shelves, newspaper round	1❑	2❑
44. Play guitar/drums etc:	1❑	2❑
45. Free running/ Parkours:	1❑	2❑
46. Other (specify):	1❑	2❑

Q5. In the last 7 days, how much physical activity did you do on? Please tick (✓) one box only.

	None	Up to 30 minutes	Between 30minutes and 1 hour	Between 1 hour and 1½ hours	Between 1½ hours and 2 hours	Greater than 2 hours
(a) An average weekday Mon-Fri	1❑	2❑	3❑	4❑	5❑	6❑
(b) An average weekend day Sat-Sun	1❑	2❑	3❑	4❑	5❑	6❑

Q6. A. Looking back on all your answers, was the amount of physical activity you did in the last 7 days **typical** of the amount that you would **normally** do? Please tick one box

Yes 1❑ No, I usually do more 2❑ No, I usually do less 3❑

B. If no, why was this week unusual?

_____

Section 2:

There are no right or wrong answers. No one does all these activities. Please be as accurate and honest as possible.

For each activity listed, answer three questions:

1. Did you do this activity in the past 7 days? Tick NO ☑ or YES ☑
2. **If yes**, on how many days did you do the activity?
3. On average, how many minutes did you do this activity on the days that you did it?

Q1. Please answer this section relating to sitting activities for the past 7 days.

ACTIVITY	Have you done this activity in the last 7 days? NO	YES	Number of **Days** in last 7 days	**Minutes** per day
1. Computer /Internet	1 ❑	2 ❑		
2. Sitting playing video games	1 ❑	2 ❑		
3. Homework, studying	1 ❑	2 ❑		
4. Reading (not for school)	1 ❑	2 ❑		
5. Sitting during school breaks	1 ❑	2 ❑		
6. Sitting and talking with friends (not on phone),listening to music	1 ❑	2 ❑		
7. Talking on the phone	1 ❑	2 ❑		
8. Television or dvd watching	1 ❑	2 ❑		
9. Other (specify):	1 ❑	2 ❑		

Q2. Do you watch much sport on TV? Please tick (✓) ONE box only

I never watch sport on TV ..... 1 ❑
I occasionally watch sports programmes ..... 2 ❑
I frequently watch sports programmes ..... 3 ❑

Q3. How many hours per week do you spend at music, singing, drama, or dance classes (including time spent practising? Please tick (✓) ONE box only

I don't attend any such class ..... 1 ❑
About 0-2 hours per week ..... 2 ❑
About 3-4 hours per week ..... 3 ❑
About 5 or more hours per week ..... 4 ❑

Good effort, keep it going

Section 3:

Q1. PLEASE TICK (✓) ANY SPORT/ACTIVITY THAT YOU MIGHT

[1] HAVE DONE AT SCHOOL IN YOUR TIMETABLED P.E. OR GAMES CLASSES
[2] PLAY AT YOUR SCHOOL AT **LUNCH TIME** OR **AFTER SCHOOL** WITH THE HELP OF A TEACHER
[3] PLAY WITH SPORTS OR ACTIVITY CLUBS

In the **past 12 months** I have...	In School			In a Club	
	P.E. or Games Classes [1]	Lunch time and after school [2]		Not School Club [3]	
	(a) Participated in	(b) Played **at least once** with help of teacher	(c) Played **once a week** with help of teacher	(d) Played in club **at least once**	(e) Played in club **once a week**
1. Adventure activities* *e.g. orienteering, canoeing, abseiling and mountaineering	❑	❑	❑	❑	❑
2. Aerobics	❑	❑	❑	❑	❑
3. Athletics	❑	❑	❑	❑	❑
4. Badminton	❑	❑	❑	❑	❑
5. Baseball or Rounders	❑	❑	❑	❑	❑
6. Basketball	❑	❑	❑	❑	❑
7. Camogie	❑	❑	❑	❑	❑
8. Cross country running	❑	❑	❑	❑	❑
9. Dance	❑	❑	❑	❑	❑
10. Gaelic Football	❑	❑	❑	❑	❑
11. Gymnastics	❑	❑	❑	❑	❑
12. Handball	❑	❑	❑	❑	❑
13. Hockey	❑	❑	❑	❑	❑
14. Horse riding	❑	❑	❑	❑	❑
15. Hurling	❑	❑	❑	❑	❑
16. Martial Arts	❑	❑	❑	❑	❑
17. Rugby	❑	❑	❑	❑	❑
18. Soccer	❑	❑	❑	❑	❑
19. Squash	❑	❑	❑	❑	❑
20. Swimming	❑	❑	❑	❑	❑
21. Tennis	❑	❑	❑	❑	❑
22. Weight training	❑	❑	❑	❑	❑
23. Any other sport (specify)	❑	❑	❑	❑	❑
.....					
.....					
	In School			In a Club	

Section 4:

Q1a. How many times do you have a <u>Single</u> PE class per week? Please tick (✓)ONE box only

0 ❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 times ❑

Q1b. How many times do you have a <u>Double</u> PE class per week?

0 ❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 times ❑

Q1c. How many times do you have a <u>Triple</u> PE class per week?

0 ❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 times ❑

Q1d. And on average, how long is a single PE class? _____ hours and _____ minutes

Q2a. How many times do you have Games* Classes per week? Please tick (✓)ONE box only

0 ❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 times ❑

*Games classes means sport or activity classes that are not part of PE

Q2b. And on average, how long is each Games Class? _____ hours and _____ minutes

Q3. Factors Influencing Enjoyment of Physical Education, Please tick (✓) ONE box only

When I am in PE class...	**(1) Dislike a lot**				**Enjoy a lot (5)**
1. Learning new skills is something that I	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
2. Changing clothes is something that I	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
3. Working out with other students is something that I	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
4. Doing different types of physical activities is something that I	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
5. Getting warmed up and breaking a sweat is something that I	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
6. Being with the other students in the class is something that I	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
7. Getting a break from the other classes is something that I	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
8. Being in the gym or on the playing field is something that I	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
9. Showering after class is something that I	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
10. Learning about physical fitness and health is something that I	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
11. Being with the PE teacher is something that I	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
12. Getting some exercise is something that I	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑

Section 5:

Q1. About how often do you take part in sports and physical activities at school lunch-time and after school (exclude PE class)? Please tick (✓) ONE box only

4 or more days a week 1❑ 2-3 days a week 3❑ One day a week 5❑
2-3 days a month 2❑ One day a month 4❑ Less often 6❑ Never 7❑

Q2. During the past 12 months on how many school sports or dance teams did you play?

0 ❑ 1 ❑ 2 ❑ 3 ❑ 4 ❑ 5 ❑ 6 ❑ 7 or more ❑

Q3. In your opinion, how adequate are the sports facilities (courts, fields, equipment) for the pupils in your school?

Please tick (✓) the box that best describes the sports facilities at your school

very adequate.....1❑ Not at all adequate.....3❑
Fairly adequate.....2❑ Not sure/don't know .....4❑

Section 6:

Q1. Are you currently participating in a club that is organised for a purpose of doing one particular sport or activity?
Exclude youth club which may sometimes offer a number of sports

NO 1❑ If **NO** go to question 8.

YES 2❑ If **YES** please list: (i) _____ (ii)_____ (iii) _____

Q2.What was <u>the most important</u> reason why you took up <u>EACH</u> sport/activity?
Please tick (✓) ONE box only

	(i)	(ii)	(iii)
Something to do	1❑	1❑	1❑
Because of my friends	2❑	2❑	2❑
Because of my father	3❑	3❑	3❑
Because of my mother	4❑	4❑	4❑
Because of elder brother/sister	5❑	5❑	5❑
To keep fit	6❑	6❑	6❑
Because of school	7❑	7❑	7❑
Seemed interesting	8❑	8❑	8❑
Seemed challenging	9❑	9❑	9❑
To practise skills	10❑	10❑	10❑
To learn new skills	11❑	11❑	11❑
I thought I would be good	12❑	12❑	12❑
Saw it on the TV/Video etc.	13❑	13❑	13❑
Don't know/can't remember	14❑	14❑	14❑
Other _____	15❑	15❑	15❑

Q3. At what age did you try sport or activity for the first time? Please tick (✓) ONE box only

4 or under 1❑ 5-7 years 2❑ 8-9 years 3❑ 10-11 years 4❑ 12 or Older 5❑

Q4a. What is your current involvement? Please tick (✓) all that apply

Active participant 1 ❑ Administrator 2 ❑ Coach 3 ❑ Official (e.g. referee, judge) 4 ❑

Q4b. If active participant, what is the highest standard that you achieved?
Please tick (✓) ONE box only

1. Basic (family recreation; play; school clubs open to all) ..... 1 ❑
2. Competitive (Competitive club level, selected school team) ..... 2 ❑
3. Elite (country; regional and nationally recognised standard) ..... 3 ❑

Q5. If active participant, what is <u>the most important</u> reason for continuing to participate?
Please tick (✓) ONE box only

Something to do ..... 1 ❑
Because of my friends ..... 2 ❑
Because of my father ..... 3 ❑
Because of my mother ..... 4 ❑
Because of elder brother/sister ..... 5 ❑
To keep fit ..... 6 ❑
Because of school ..... 7 ❑
Seemed interesting ..... 8 ❑
Seemed challenging ..... 9 ❑
To practise skills ..... 10 ❑
To learn new skills ..... 11 ❑
Other _____ 12 ❑

Q6. Since the start of the school year have you represented your school in a competition or match against another school? Please tick (✓) ONE box only

NO ..... 1 ❑ YES ..... 2 ❑ Don't Know ..... 3 ❑

Q7. About how often do you take part in sports and physical activities in non-school sports clubs? Please tick (✓) ONE box only

4 or more days a week ..... 1 ❑
One day a week ..... 2 ❑
One day a month ..... 3 ❑
Never ..... 4 ❑
2-3 days a week ..... 5 ❑
2-3 days a month ..... 6 ❑
Less often ..... 7 ❑

Q8. Thinking about sports and activities that might be offered by local clubs or organised by your school outside of class time. Why <u>don't you take part in more</u> of this type of activity?
Please tick (✓) any of the boxes that are a reason for you.

I don't like playing sports ..... 1 ❑
I haven't got enough spare time ..... 1 ❑
I'm not good enough at sport ..... 1 ❑
I've never been asked to take part ..... 1 ❑
Transport difficulties prevent me playing/exercising more ..... 1 ❑
No suitable sports/activities that I like ..... 1 ❑
I already do enough sports/exercise ..... 1 ❑
It's too expensive ..... 1 ❑
I don't know about local clubs ..... 1 ❑
No particular reason ..... 1 ❑

Section 7:

Q1. How common are detached single-family residences in your immediate neighbourhood?
None 1❑ A few 2❑ Some 3❑ Most 4❑ All 5❑

Q2. How common are townhouses or row houses of 1-3+ stories in your immediate neighbourhood?
None 1❑ A few 2❑ Some 3❑ Most 4❑ All 5❑

Q3. How common are apartments or flats 1-3+ stories in your immediate neighbourhood?
None 1❑ A few 2❑ Some 3❑ Most 4❑ All 5❑

Neighbourhood/community Surroundings and Safety

Please tick the box that best applies to you and your neighbourhood.

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
Q4. There are trees along the streets in my neighbourhood	1❑	2❑	3❑	4❑
Q5. There are many interesting things to look at while walking in my neighbourhood	1❑	2❑	3❑	4❑
Q6. There are many attractive natural sights in my neighbourhood (such as landscapes, views)	1❑	2❑	3❑	4❑
Q7. There are attractive buildings / homes in my neighbourhood	1❑	2❑	3❑	4❑
Q8. There is so much traffic on nearby streets that it makes it difficult to walk in my neighbourhood	1❑	2❑	3❑	4❑
Q9. The speed of traffic on the street I live on is usually slow – about 30mph/50kmph or less	1❑	2❑	3❑	4❑
Q10. Most drivers exceed the speed limits while driving in my neighbourhood	1❑	2❑	3❑	4❑
Q11. My neighbourhood streets are well lit at night	1❑	2❑	3❑	4❑
Q12. Walkers and bikers on the streets in my neighbourhood can be easily seen by people in their homes	1❑	2❑	3❑	4❑
Q13. There are pedestrian crossings and signals to help walkers cross busy streets	1❑	2❑	3❑	4❑
Q14. There is a high crime rate in my neighbourhood	1❑	2❑	3❑	4❑
Q15. The crime rate in my neighbourhood makes it unsafe to go walking during the day	1❑	2❑	3❑	4❑
Q16. The crime rate in my neighbourhood makes it unsafe to go walking at night	1❑	2❑	3❑	4❑
Q17. The pedestrian crossings in my neighbourhood help walkers feel safe crossing busy streets	1❑	2❑	3❑	4❑

Places for Walking and cycling

Please tick the box that best applies to you and your neighbourhood.

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
Q18. There are pathways on most of the streets in my neighbourhood	1 ❑	2 ❑	3 ❑	4 ❑
Q19. The pathways in my neighbourhood are well maintained (paved, even and not a lot of cracks)	1 ❑	2 ❑	3 ❑	4 ❑
Q20. There are bicycle or pedestrian paths in or near my neighbourhood that are easy to get to	1 ❑	2 ❑	3 ❑	4 ❑
Q21. Pathways are separated from the road/traffic by parked cars	1 ❑	2 ❑	3 ❑	4 ❑
Q22. There is a grass/dirt strip that separates the streets from the pathways in my neighbourhood	1 ❑	2 ❑	3 ❑	4 ❑
Q23. It is safe to ride a bike in or near my neighbourhood	1 ❑	2 ❑	3 ❑	4 ❑

Streets in my neighbourhood

Q24. The streets in my neighbourhood do not have many cul-de-sacs (dead end streets)	1 ❑	2 ❑	3 ❑	4 ❑
Q25. The distance between crossroads in my neighbourhood is usually short (the length of a football field or less)	1 ❑	2 ❑	3 ❑	4 ❑
Q26. There are many alternative routes for getting from place to place in my neighbourhood (I don't have to go the same way every time)	1 ❑	2 ❑	3 ❑	4 ❑

Access to Services

Both local and within walking distance mean within a 10 – 15 minute walk from your home.

Q27. Shops are within easy walking distance of my home	1 ❑	2 ❑	3 ❑	4 ❑
Q28. Parking is difficult in local shopping areas	1 ❑	2 ❑	3 ❑	4 ❑
Q29. There are many places to go within easy walking distance of my home	1 ❑	2 ❑	3 ❑	4 ❑
Q30. It is easy to walk to a bus or train stop from my home	1 ❑	2 ❑	3 ❑	4 ❑
Q31. The streets in my neighbourhood are hilly, making my neighbourhood difficult to walk in	1 ❑	2 ❑	3 ❑	4 ❑
Q32. There are many valleys/hills in my neighbourhood that limit the number of routes for getting from place to place	1 ❑	2 ❑	3 ❑	4 ❑

Shops, facilities and other things in your neighbourhood

About how long would it take to get from your home to the nearest businesses or facilities listed below if you walked to them? Please put only one tick mark (✓) for each business or facility.

	1-5 min	6-10 min	11-20 min	21-30 min	30+ min	Don't know
Example: petrol station	5 ☐	4 ☐	3 ☑	2 ☐	1 ☐	1 ☐
Q33. Newsagents	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q34. Supermarket	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q35. Hardware shop	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q36. Fruit/vegetable market	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q37. Laundry/dry cleaners	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q38. Clothing shop	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q39. Post office	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q40. Library	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q41. Primary school	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q42. Other schools	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q43. Bookshop	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q44. Fast food restaurant	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q45. Coffee place	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q46. Bank/credit union	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q47. Non-fast food restaurant	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q48. Video shop	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q49. Pharmacy	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q50. Salon/Barber shop	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q51. Your school	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q52. Bus or train stop	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q53. Aerobic dance studio	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q54. Basketball court	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q55. Bike lane	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q56. Bowling alley	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q57. Golf course/Pitch & Putt	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q58. Health spa/gym	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q59. Public park	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q60. Community Centre	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q61. Handball/Squash court	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q62. Running track	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q63. Skating rink	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q64. Soccer or football field	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q65. Sporting goods store	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q66. Swimming pool	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q67. Tennis court	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q68. All weather pitch	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q69. Sea/beach	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐
Q70. Walking Trail	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	1 ☐

Section 8:

PHYSICAL ACTIVITY is any body movement. It includes

EXERCISE	e.g. Gym, aerobics, jogging, dance, etc.
SPORT	e.g. Hurling, football, athletics, swimming, etc.
GENERAL	e.g. P.E., brisk walking, washing the car, walking to school, etc

Q1. Please read through all statements listed below and tick either the NO or YES box for each section:

		NO	YES
1	I am currently **physically active**	1 ❑	2 ❑
2	I intend to become more **physically active** in the next 6 months	1 ❑	2 ❑

For activity to be **regular**, it must equal **60 mins** of moderate and/or vigorous physical activity on most or all days of the week

		NO	YES
3	I currently engage in **<u>regular</u> physical activity**	1 ❑	2 ❑
4	I have been **<u>regularly</u> physically active** for the past 6 months	1 ❑	2 ❑

Q2. Physical Activity Enjoyment Scale

When I am active...	**(1) Disagree a lot**				**Agree a lot (5)**
1. I enjoy it	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
2. I feel bored	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
3. I dislike it	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
4. I find it pleasurable	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
5. It's no fun at all	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
6. It gives me energy	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
7. It makes me depressed	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
8. It's very pleasant	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
9. My body feels good	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
10. I get something out of it	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
11. It's very exciting	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
12. It frustrates me	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
13. It's not at all interesting	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
14. It gives me a strong feeling of success	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
15. It feels good	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
16. I feel as though I would rather be doing something else	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑

Q3. DURING A TYPICAL WEEK, how often: Please tick (✓) ONE box only

	None	Once	Sometimes	Almost every day	Every day
1. **Do you** encourage your friends **to do physical activities or play sports?**	1❑	2❑	3❑	4❑	5❑
2. Do your **friends encourage** you to do physical activities or play sports?	1❑	2❑	3❑	4❑	5❑
3. Do your **friends do physical activities** or play sports with you?	1❑	2❑	3❑	4❑	5❑
4. **Do** other kids tease you **for not being** good at physical activity or sports?	1❑	2❑	3❑	4❑	5❑
5. **Do friends** tell you **that you are doing** well in physical activities or sports?	1❑	2❑	3❑	4❑	5❑

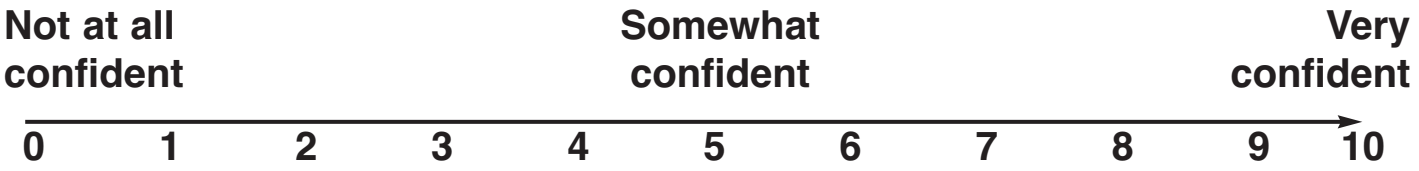
Q4. DURING A TYPICAL WEEK, how often has a member of your household:
(For example, your father, mother, guardian, brother, sister, grandparent, or other relative)
Please tick (✓) ONE box only

	None	Once	Sometimes	Almost every day	Every day
1. **Encouraged you** to do physical activities or play sports?	1❑	2❑	3❑	4❑	5❑
2. Done a physical activity or played sports **with you?**	1❑	2❑	3❑	4❑	5❑
3. **Provided transportation** to a place where you can do physical activities or play sports?	1❑	2❑	3❑	4❑	5❑
4. **Watched you** participate in physical activities or sports?	1❑	2❑	3❑	4❑	5❑
5. **Told you** that you are doing well in physical activities or sports?	1❑	2❑	3❑	4❑	5❑

Q5. DURING A TYPICAL WEEK, how often has a teacher in your school:
Please tick (✓) ONE box only

	None	Once	Sometimes	Almost every day	Every day
1. **Encouraged you** to do physical activities or play sports?	1❑	2❑	3❑	4❑	5❑
2. Done a physical activity or played sports **with you?**	1❑	2❑	3❑	4❑	5❑
3. **Provided transportation** to a place where you can do physical activities or play sports?	1❑	2❑	3❑	4❑	5❑
4. **Watched you** participate in physical activities or sports (not including supervision)?	1❑	2❑	3❑	4❑	5❑
5. **Told you** that you are doing well in physical activities or sports?	1❑	2❑	3❑	4❑	5❑

Q.6 Use the scale below (0-10) to indicate how confident you are that you could be physically active in each of the following situations:



I am confident I can participate in regular physical activity when…

1. I am tired ..... _____
2. I am in a bad mood ..... _____
3. I feel I don't have time ..... _____
4. I am on vacation ..... _____
5. It is raining or snowing ..... _____
6. I have homework to do ..... _____
7. My friends call me to go out ..... _____
8. I need to do house chores ..... _____
9. There is a good TV show on ..... _____
10. I am on my own ..... _____

Q.7 At present are you on a diet or doing something else to lose weight?

No, my weight is fine .....1 ❑
No, but I should lose some weight .....2 ❑
No, because I need to put on weight .....3 ❑
Yes .....4 ❑

Q.8 Do you think your body is…?

Much too thin .....1 ❑
A bit too thin .....2 ❑
About the right size .....3 ❑
A bit too fat .....4 ❑
Much too fat .....5 ❑

Q9. What keeps you from being more active?

Directions: Listed below are reasons that people give to describe why they do not get as much physical activity as they think they should. Please read each statement and indicate how likely you are to say each of the following statements:

How likely are you to say?		Very Likely	Somewhat Likely	Somewhat Unlikely	Very Unlikely
1.	My day is so busy now, I just don't think I can make the time to include physical activity in my regular schedule	1 ❑	2 ❑	3 ❑	4 ❑
2.	None of my family members or friends like to do anything active, so I don't have a chance to be physically active	1 ❑	2 ❑	3 ❑	4 ❑
3.	I'm just too tired after school/work to be active	1 ❑	2 ❑	3 ❑	4 ❑
4.	I've been thinking about becoming more physically active, but I just can't seem to get started	1 ❑	2 ❑	3 ❑	4 ❑
5.	Participating in physical activities can be risky	1 ❑	2 ❑	3 ❑	4 ❑
6.	I don't get enough exercise because I have never learned the skills for any one sport	1 ❑	2 ❑	3 ❑	4 ❑
7.	I don't have access to jogging trails, swimming pools, bike paths, etc.	1 ❑	2 ❑	3 ❑	4 ❑
8.	Physical activity takes too much time away from other commitments - like work, family, etc.	1 ❑	2 ❑	3 ❑	4 ❑
9.	I'm embarrassed about how I will look when I participate in physical activity with others	1 ❑	2 ❑	3 ❑	4 ❑
10.	I don't get enough sleep as it is. I just couldn't get up early or stay up late to be physically active	1 ❑	2 ❑	3 ❑	4 ❑
11.	It's easier for me to find excuses not to be physically active than to go out and do something	1 ❑	2 ❑	3 ❑	4 ❑
12.	I know of too many people who have hurt themselves by overdoing it when they are physically active	1 ❑	2 ❑	3 ❑	4 ❑
13.	I really can't see myself learning a new sport	1 ❑	2 ❑	3 ❑	4 ❑
14.	It's just too expensive. You have to take a class or join a club or buy the right equipment	1 ❑	2 ❑	3 ❑	4 ❑
15.	My free times during the day are too short to include physical activity	1 ❑	2 ❑	3 ❑	4 ❑
16.	My usual social activities with family or friends do not include physical activity	1 ❑	2 ❑	3 ❑	4 ❑
17.	I'm too tired during the week and I need the weekend to catch up on my rest	1 ❑	2 ❑	3 ❑	4 ❑
18.	I want to be more physically active, but I just can't seem to make myself stick to anything	1 ❑	2 ❑	3 ❑	4 ❑
19.	I'm afraid I might injure myself	1 ❑	2 ❑	3 ❑	4 ❑
20.	I'm not good enough at any physical activity to make it fun	1 ❑	2 ❑	3 ❑	4 ❑
21.	If we had exercise facilities and showers at school, then I would be more likely to be physically active	1 ❑	2 ❑	3 ❑	4 ❑

Q10. SWIMMING ABILITY please mark your swimming level below.
Please tick (✓) ONE box only

Non-Swimmer 0❑ Beginner 1❑ Intermediate 2❑ Competitive 3❑

If non-swimmer please go to section 9.

If swimmer please mark your swimming level at the following skills. Please tick (✓) ONE box only

	Beginner	Intermediate	Competitive	Unable to do this stroke
1. Treading water	1❑	2❑	3❑	4❑
2. Front crawl	1❑	2❑	3❑	4❑
3. Back stroke	1❑	2❑	3❑	4❑
4. Butterfly	1❑	2❑	3❑	4❑
5. Breast stroke	1❑	2❑	3❑	4❑

What is your favourite swimming stroke? _____

Section 9:

Q1. FATHER/GUARDIAN
a. Does your father have a job?

No 1❑
Yes 2❑
Don't know 3❑
Don't have or see father 4❑

b. If yes, say in what place he works:
(For example hospital, bank, restaurant…)
_____

c. Please write down exactly what job he does
(For example doctor, clerk, manager…)
_____

d. If no, why does your father not have a job?

He is sick, or retired or a student 1❑
He is looking for a job 2❑
He takes care of others, or is full time in the home 3❑
I don't know 4❑

2. MOTHER/GUARDIAN
a. Does your mother have a job?

No 1❑
Yes 2❑
Don't know 3❑
Don't have or see mother 4❑

b. If yes, say in what place she works:
(For example hospital, bank, restaurant…)
_____

c. Please write down exactly what job she does
(For example doctor, clerk, manager…)
_____

d. If no, why does your mother not have a job?

She is sick, or retired or a student 1❑
She is looking for a job 2❑
She takes care of others, or is full time in the home 3❑
I don't know 4❑

You're finished! Well done!
Thank you for your time and effort!

DCU

THE IRISH SPORTS COUNCIL
AN CHOMHAIRLE SPÓIRT

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OLLSCOIL LUIMNIGH

ucc
Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

Appendix H:
Physical Activity Readiness Questionnaire (PAR-Q)

Physical Activity Readiness Questionnaire

ID NUMBER: _____

PLEASE READ AND CIRCLE YES OR NO FOR EACH QUESTION

1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor? If yes, please explain _____	Yes	No
2. Do you feel pain in your chest when you do physical activity? If yes, please explain _____	Yes	No
3. In the past month, have you had chest pain when you were not doing physical activity? If yes, please explain _____	Yes	No
4. Do you lose your balance because of dizziness or do you ever lose consciousness? If yes, please explain _____	Yes	No
5. Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity? If yes, please explain _____	Yes	No
6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition? If yes, please explain _____	Yes	No
7. Do you know of any other reason why you should not do physical activity? If yes, please explain _____	Yes	No

Appendix I:

Aerobic Fitness

20 metre Shuttle Run Protocol

20 Metre Shuttle Run Test Protocol

Description

The 20-meter Shuttle Run (Ramsbottom et al., 1988) is a progressive running test that gives an estimate of maximum oxygen carrying capacity ($V0_2$ max). It is a validated field measure of aerobic fitness with a correlation of 0.92 between lab measured $V0_2$ max and shuttle level achieved (Ramsbottom et al., 1988). Low levels of cardio respiratory fitness can result in premature death from cardiovascular diseases.

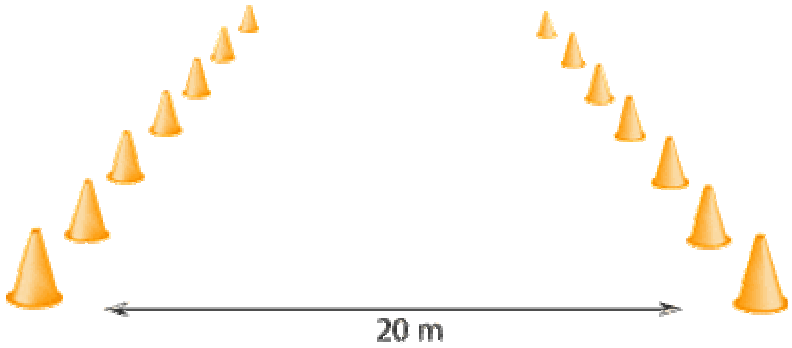
The 'shuttle' runs are done in time to pre-recorded 'bleep' sounds on an audio cassette. The test usually consists of 23 levels. A level is a series of 20 metre 'shuttle runs'. Each level lasts 60 seconds and the time between the recorded 'bleeps' decreases for each new level. The starting speed is normally 8.5 km/hr and then increases by 0.5km/hr with each new level.

Equipment

- Tape measure
- Flat, non-slippery surface of at least 20 meters in length
- Markers or cones or lines
- Recorded 'bleep' audio cassette and a tape player. Have a spare tape!
- Extension lead for cassette player if indoor? Spare batteries if taken outdoor
- Recording sheets
- Bibs (Coloured & numbered)

Procedure

1. Measure 20m area and mark out with cones at each end.



2. Measure width of hall and determine number of participants (Guide: 1 student per metre with adequate clearance of obstacles at each side)
3. Rewind cassette and place in tape recorder ready to start. If consecutive tests are to be run, there should be 2+ cassettes.
4. Calibrate. At the start of the tape there is a calibration section, which consists of two, beeps 60 seconds apart, this is to ensure that the tape has not been stretched and the speed of the tape player is accurate. Accuracy is sufficient within 0.5 seconds either way.
5. Hand out bibs and note bib number and colour on relevant sheet.
6. Warm-up: consist of 5-10 minutes of moderate intensity aerobic activity (light jogging) followed by activity specific stretches for neck, shoulders, hamstrings, quadriceps, groin, calf and ankles.
7. Cool-down will consist of 5 minutes of moderate intensity aerobic activity (light jogging) followed by activity specific stretches as described above.

Instructions to participant:

1. Before switching on the tape, explain the test to the participants

2. **Tell them:**
    a. The test commences with a 5 second countdown to the start.
    b. Following this and for the duration of the test, single bleeps are released at regular intervals.
    c. Try to reach the opposite end to the start before the next bleep is heard.
    d. If you get there before the bleep is emitted, wait there until the bleep is heard before running back to the opposite end. This is important in the first level, as the speed is very slow.
    e. After each level, the time between bleeps will decrease so you need to run faster.
    f. Each level lasts one minute; changing levels is marked by a triple bleep and from instruction on the tape.
    g. Place one foot on or before the line at the end of each shuttle run.
    h. Give your maximum effort at the end of the test and to attempt to reach the highest level possible level that you can.
    i. You can drop out from the test at any stage but you should try to keep going as long as possible

Procedure for withdrawing students:

1. If participants are not complying with the instructions, they should be given two warnings before being withdrawn from the test.
2. Examples of this would be participants not touching the line at the end of each shuttle, or starting each shuttle before the bleeps are emitted.
3. N.B. Protocol: Two people will be watching the lines and motivating students. If you see that someone has missed the line, call out his or her number (e.g. "yellow number 1, make the next line") loud enough so the other tester can hear. The second tester watches the second line. If the student misses the second line, the second tester must pull them out (e.g. "yellow number 1, stop running"). Follow through with this; if they continue to run stop them.

Precautions:

- In order for the test results to be accurate and reproducible, as well as comparable with scores obtained elsewhere, it is essential that the test procedure be carried out properly. This includes exact measurements of the 20-meter distance, as well as standardisation of the running surface, pre test preparations and environmental conditions.
- The Multistage Fitness Test requires maximal effort if the test result is to be valid. Anyone with any doubts over his or her ability to take part in the test should seek medical advice beforehand. Individuals with any injury or illness are advised not to take the test.
- Since the test starts very slowly, there is a gentle warm - up as the test progresses. However, it is advisable to have some very light jogging and gentle stretching before starting
- The width of the indoor/outdoor facility will determine how many students can participate in the test at one time.
- There should be at least three individuals looking after the 20 MST at any given time.

Appendix J:
Height, Weight and Body Mass Index
Protocol

Height Protocol

Equipment:

1. Standard collapsible portable stadiometer
2. Data collection sheets

Set-up:

1. Construct stadiometer following instructions.
2. Place it on a level, flat, hard surface with the stabilizing bar against a vertical surface such as a wall or door.

Instructions to participant:

1. Remove shoes
2. If the hairstyle affects their height, ask them to adjust it for the test
3. Stand with heels and toes together on the base plate
4. Arms loosely by their side
5. Back straight against the vertical measuring rods
6. Look straight ahead
7. Take a deep breath and stand as straight as possible without their heels lifting off the ground.

Note: These can be difficult instruction for children/youth to follow – make sure the head is not tilted or the shoulders raised, breath normally. Check posture before measuring.

Record in metres to nearest 1/10th of a centimetre

Weight Protocol

Equipment:

1. Standard portable calibrated scales
2. Data collection sheets

Set-up:

1. Ensure scales are pre-calibrated with a known weight
2. Place scales on a hard, level surface

Instructions to participant:

1. Wear only light garments
2. Remove items such as keys and money from pockets
3. Remove shoes.
4. Stand on the scales, with both feet fully on the weighing platform, heels towards the back edge, and their arms loosely by their side.
5. Remain as still as possible with their head facing forward.
6. Step down from the scale.

Record in kilograms to nearest ½ gram

Height and weight will be used to calculate Body Mass Index (BMI)

BMI = Weight (kg) / Height (m)^2

Appendix K:
Waist Circumference Protocol

Waist Circumference Protocol

Equipment:

- Standard anatomical measuring tape
- Data collection sheets

Set-up:

- The measurements will be taken in an enclosed place so the participant feels comfortable.
- Two subjects at a time (same gender).
- Same-gender tester will take measurements.

Instructions to participant:

1. Stand comfortably up straight facing tester.
2. Pull up and tuck their jumpers or t-shirts so that you can see the naval/belly button.
3. Hands by side.
4. Breathe normally.
5. Do not contract your stomach muscles.

Procedure:

1. Pull a length of the measuring tape, holding both ends in left hand, and bring it around the participant.
2. Stretch tape out. Unite both ends at the front by inserting catch. Take slack out of tape by pressing button. (Skin should not be compressed, and there should not be space between skin and tape).
3. Measure the narrowest point of the abdomen, ensuring the tape is level.
4. If no one point is evident, measure half way between the lowest rib and the iliac crest landmark or an inch above the belly button.

Record in centimetres to the nearest 0.1cm

Appendix L:
Blood Pressure Protocol

Blood Pressure Protocol

Blood pressure reflects the force (pressure) exerted by blood against the arterial walls during a cardiac cycle. Systolic blood pressure is higher of the two pressure measurements.

Equipment:

- Automated blood pressure monitor (use appropriate cuff size)
- Data collection sheets

Set-up:

- Quiet room
- Chair
- Table facing chair

Instructions to participant:

1. Sit down with back against chair and with feet flat on the floor
2. Relax and breath normally
3. Expose your upper left arm and don't clench your fist
4. I will place the cuff on your arm and inflate it, so you will feel it getting tighter
5. Then using the monitor I will read your blood pressure

Procedure:

1. Place the cuff on the upper arm with the tube facing out
2. Locate the pulsation of the brachial artery at the inner side of the upper arm, approximately 1 inch above the bend in the elbow
3. Support the participants arm at the elbow with the arm in a horizontal position at heart level.
4. Turn the monitor on, the cuff will inflate and then deflate.
5. The systolic and diastolic blood pressures will be displayed on the screen.
6. Record on the data collection sheet in mmHG
7. If the blood pressure reading is greater than 135/85 a second measurement is needed. A minute interval should be given between measurements.

Record in mmHG