The Development of the 'PE Product':

Physically Educated and Physically Active Individuals

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Abstract

The promotion of physical activity is a public health priority, and school Physical Education (PE) has been highlighted as an influential setting that can engage young people in physical activity. PE has a number of aims which include striving to produce physically educated and active youth (i.e., the 'PE product'), which can be described in terms of young people who engage in recommended levels of habitual physical activity, and who have competent levels of physical activity ability, knowledge, and understanding. The overall aim of this thesis was therefore to establish how PE influences the outcomes representing the 'PE product.' Key objectives were to: a) develop and test a scale to assess students' Perceived PE Worth and Perceived PE Ability, to explore how these two constructs are related, and to investigate age and sex differences (Study 1); b) investigate which secondary school PE factors most strongly correlate with outcomes representing the 'PE product,' (Study 2) and; c) qualitatively explore the views of PE students to help understand the development of physically educated and active young people, and clarify the results from the second study (Study 3).

Study 1 developed and tested the Physical Education Predisposition Scale (PEPS). Predisposing items including perceptions of competence, self-efficacy, enjoyment and attitude in relation to PE were incorporated into the PEPS. Initially Year 8 and 9 students from four schools in the North West of England were invited to participate. Three hundred and fifteen completed PEPS were returned, students then completed the PEPS 14 days later to enable the assessment of test-retest reliability. The PEPS included 11 of the original items,

six Perceived PE Worth items and five Perceived PE Ability items and demonstrated an acceptable level of internal consistency and test-retest reliability. Consequently, the PEPS has potential as a concise and straightforward measurement tool for teachers and researchers to use in the PE setting. Results demonstrated that there was a strong positive association between Perceived PE Worth and Perceived PE Ability ($r = 0.69$). Furthermore, boys reported significantly higher values on both variables, than girls, and Year 8 students scored significantly higher than their Year 9 counterparts.

Within Study 2, 146 schools were initially invited to participate in the study and the Heads of each PE department were sent a PE environment audit. The response rate was 27.4%, with 17 schools demonstrating a willingness to take further part in the research. The main outcome variables from the PE environment audit were then used as the basis of school selection, with three schools being chosen. All Year 8 and 9 students from these schools were invited to participate in the research; the response rate was 28.9% (90 boys, 209 girls). Predictor variables representing predisposing (e.g., Perceived PE Worth and PE Ability), enabling (school PE environment), and personal demographic factors (e.g., socio-economic status), as described in Welk's (1999) Youth Physical Activity Promotion Model (YPAPM) were measured. Outcome variables involved physical activity (assessed by accelerometry and the Physical Activity Questionnaire for Older Children), knowledge and understanding of health-related exercise, and PE ability (teachers' ratings). A number of factors including, sex, year group, BMI, deprivation score, Perceived PE Ability, Perceived PE Worth, number of students on roll, and number of

indoor spaces, most strongly correlated with outcomes relating to the 'PE product.'

The final study involved a sub-sample of students from Study 2. These were selected to take part in focus group interviews based on their teachers' normative ratings of their PE ability. Focus groups topics were developed based on Welk's (1999) YPAPM and results from Study 2. The detailed focus group data suggest that girls' negative perceptions of PE Worth and PE Ability, learned helplessness beliefs, sex issues in PE, and perceived barriers to physical activity, may partly explain the observed sex differences in physical activity. The students highlighted numerous sources of Perceived PE Ability and PE Worth that could also potentially clarify the relationship between perceptions of competence, enjoyment and physical activity. The enhanced Health Related Exercise (HRE) messages from female PE teachers may account for girls' superior knowledge and understanding of HRE and students who perceive PE to be fun and enjoyable may be positively engaged and more motivated to learn and exert effort. Finally, both students' perceptions of progression in PE over time and PE teachers' positive feedback clarifies why teachers' rating of their students improves with increasing year group.

The overall findings of this thesis suggest that PE teachers should provide students with enjoyable, successful experiences, positive feedback, choice and as much variety as is feasible. In addition, a classroom climate that fosters learning and improvement, rather than competition and winning is required. This study highlighted the need for interventions targeting girls and their perceptions of barriers to physical activity. Finally, a number of physical activity issues and

themes were raised in this study, and *reinforcing* variables of parents, family and peers were highlighted as central to the students' physical activity interests and participation (Welk, 1999). Therefore, future work is needed to unravel the complex interrelationships of *reinforcing* factors on students' thoughts and feelings on school PE.

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Glossary of Terms

Term	Thesis definition
Adolescents	This term covers the chronological age range 12 to 17 years.
BMI	Body mass index, calculated using body mass and stature: BMI = body mass (kg) / stature² (m²).
Children	This term covers the chronological age range 4 to 11 years.
Moderate physical activity (MPA)	"[an] activity usually equivalent to brisk walking, which might be expected to leave the participant feeling warm and slightly out of breath" (Biddle et al., 1998, p. 2). Corresponds to energy expenditure between 3 and 6 metabolic equivalents (Freedson et al., 1998).
Moderate-to-vigorous physical activity (MVPA)	Physical activity of at least moderate intensity that encompasses bouts of vigorous physical activity (VPA). Equivalent or greater than moderate intensity (≥ 3 metabolic equivalents). Results in increasing heart rate, sweating and breathing harder of being out of breath, including for example brisk walking, skating or bike riding (Janssen and Leblanc, 2010; NICE, 2009).
Physical activity	Defined as "any bodily movement produced by skeletal muscles resulting in energy expenditure" (Caspersen et al., 1985, p. 126).
PE	Physical Education.
PEPS	The Physical Education Predisposition Scale.
PESSYP	Physical Education and School Sport Strategy for Young People.
Vigorous physical activity (VPA)	"[an] activity usually equivalent to at least slow jogging, which might be expected to leave the

	participant out of breath and sweaty" (Biddle et al., 1998, p. 2). Corresponds to energy expenditure between 6 and 9 metabolic equivalents (Freedson et al., 1998).
YPAPM	Youth Physical Activity Promotion Model (Welk, 1999).

Chapter 1

Introduction

Introduction

1.1: The Research Problem

Physical activity is a behaviour, defined as any bodily movement produced by skeletal muscles resulting in energy expenditure above resting levels (Caspersen et al., 1985; Thompson et al., 2003). Higher levels of physical activity in children and adolescents are associated with fewer risk factors for disease (Andersen et al., 2006), and decreased morbidity and delayed mortality (Blair et al., 1989; Paffenbarger et al., 1986). However, there is much debate as to whether most youth are sufficiently active in order to achieve health benefits (Riddoch et al., 2007). The most recent physical activity guidelines propose that children and young people should undertake a range of moderate to vigorous activities, for at least 60 minutes each day (National Association for Sport and Physical Education [NASPE], 2004; Department of Health [DH], 2004). Current evidence though suggests that young people are not meeting guidelines and that sedentary lifestyles remain a problem (Muller-Riemenschneider et al., 2008).

The identification of factors that are associated with participation in physical activity is typically referred to as the study of correlates. Distinguishing and understanding correlates of youth physical activity is considered to be of public health significance, and to promote physical activity in youth, the factors that influence the acquisition of this behaviour must first be understood (Trost et al., 1999a; Van Der Horst et al., 2007; Wu et al., 2003). Higher levels of physical activity are associated with being male (Cardon et al., 2005; Riddoch et al.,

2007; Wenthe et al., 2009), and being younger (Biddle et al., 2005; Pate et al., 1996; Saxena et al., 2002). Furthermore, variables that have been consistently associated with physical activity in youth include self-efficacy, enjoyment, perceived competence, environment, beliefs, attitudes, and social support (Biddle et al., 2005; Chase, 1998; DiLorenzo et al., 1998; Sallis et al., 1999; Trost et al., 1997; Trost et al., 1999a; Trost et al., 1999b; Vilhjalmsson and Thorlindsson, 1998).

School PE has been identified as a key vehicle for health promotion and an influential mechanism to engage young people in physical activity (Biddle et al., 1998; Fairclough and Stratton, 2005; United States Department of Health and Human Services [USDHHS], 1996). Furthermore, Sallis and McKenzie (1991) suggest that school PE is the most important institution that can address the health-related physical activity needs of almost all children. Although Welk's (1999) YPAPM aims to explain the relationships between factors affecting habitual physical activity, it may also be applied to the PE setting, as PE can play a primary role in influencing predisposing, enabling and reinforcing correlates of physical activity (Welk, 1999). The most commonly identified PE correlates of physical activity involve predisposing factors of perceived competence, self-efficacy, enjoyment, and attitude. Research in this area has found that enjoyment and perceived competence in PE can determine the level of children's physical activity participation outside of school (Barr-Anderson et al., 2007; Carroll and Loumidis, 2001). In addition, enabling factors of fundamental movement skills and the school physical environment are seen as important for the promotion of physical activity and other healthful behaviors (Centers for Disease Control [CDC], 1997; Department for Education and

Skills/Department of Health, 2005). Reinforcing factors include PE teachers, parents, and coaches who are powerful influencing forces in shaping students' attitudes and enjoyment toward PE, (Rikard and Banville, 2006; Scanlan et al., 1993; Silverman and Subramaniam, 1999).

In England the basic principles of PE involves facilitating all young people, to take part in, enjoy and succeed in PE, to learn about the value of leading a healthy, active lifestyle, and to improve and achieve in line with their age and potential (Department for Education and Skills [DfES], 2004; Qualifications and Curriculum Authority [QCA], 2007). A key goal of PE is therefore to "develop physically educated individuals who have the knowledge, skills and confidence to enjoy a lifetime of physical activity" (NASPE, 2004, p.11). To achieve these goals PE must strive to produce physically educated and active youth. The evidence of this 'PE product' can be described in terms of young people who engage in recommended levels of habitual physical activity, and who have competent levels of physical activity skill, knowledge, and understanding (NASPE, 2004). However, there is little evidence to support the notion that PE produces physically educated and active young people.

Objective 22-10 of the American Healthy People 2010 policy document (United States Department of Health and Human Services [USDHHS], 2000) is to improve the number of students who are engaged in physical activity for at least 50% of PE lesson time. Fairclough and Stratton (2005) suggest that there are potential difficulties of achieving this ambitious target, because of the diverse aims of PE, which can be inconsistent and compromise each other. For example emphasis on children's motor, cognitive, social, spiritual, cultural and

moral development may not be conductive to engagement in appropriate amounts of physical activity during PE class time. It is apparent from PE research and intervention studies that PE is limited in how much it can supplement young people's daily volume of physical activity (McKenzie et al., 1995). Indeed, Fox et al. (2004) suggest that a major limitation to PE's utility as a vehicle for physical activity participation is the limited time allocated to it. Nevertheless, when PE activity is combined with other forms of physical activity, (including extra-curricular, and out of school physical activity) support is lent to the premise that PE lessons can directly benefit young people's health status (Fairclough and Stratton, 2005).

Physical activity interventions within school PE have been conducted successfully to increase the proportion of time children spend in moderate to vigorous physical activity (MVPA) during PE lessons (McKenzie et al., 1995; McKenzie et al., 2004; Rowlands et al., 2008a; Sallis et al., 1997). In addition, Felton et al.'s (2005) Lifestyle Education and Activity Program (LEAP) showed increases in both habitual VPA and MVPA from 8th to 9th grade. It was reported that enjoyment and increased self-efficacy mediated improvements in physical activity levels (Dishman et al., 2004; Dishman et al., 2005; Felton et al., 2005). Further research in school PE has suggested that providing students with choice leads to significantly higher physical activity levels (Lonsdale et al., 2009), and greater self-determination and intrinsic motivation in PE (Goudas et al., 1995; Prusak et al., 2004; Ward et al., 2008). However, there is little evidence to support the claim that PE is producing physically educated and active individuals. Therefore, there is a need for empirical research to establish how PE influences outcomes representing the 'PE product.'

1.2: Conceptual Framework: Welk's (1999) Youth Physical Activity Promotion Model

Welk (1999) synthesised existing physical activity correlates literature and theoretical frameworks into a more usable and heuristic model, the Youth Physical Activity Promotion Model (YPAPM; Figure 1.1). This model is based on Green and Kreuter's (1991) Precede-Proceed health promotion planning model, which was developed to provide guidelines for establishing health education programmes for a variety of different behaviours (Green and Kreuter, 1991). An advantage of this framework is that it accepts multiple theoretical perspectives and it employs a "bottom-up" approach in which a specific population's characteristics and needs are fully determined prior to programme development (Welk, 1999). Within the Precede-Proceed model (Green and Kreuter, 1991), the preliminary stage is behavioural and environmental diagnosis to identify primary determinants of physical activity; the second step is an educational and organisational diagnosis to classify the determinants into factors that predispose, enable or reinforce, the last step is an administrative and policy diagnosis in which interventions are planned, based on available resources and potential barriers (Welk, 1999). This same approach was used to develop the YPAPM which conceptualizes a broad perspective on the factors that influence school-age children's habitual physical activity (Welk, 1999). The YPAPM is organised into a hierarchical structure to facilitate youth physical activity promotion and research. It is a conceptual model that utilises a social-ecological framework, recognising that physical activity participation is influenced by various personal, social, and environmental factors. Within the YPAPM, physical activity

participation is described as the result of interactions among four categories of correlates labelled, *predisposing*, *enabling*, *reinforcing*, and *personal demographics* (Welk, 1999).

Predisposing factors increase the likelihood that youth will engage in regular physical activity (Rowe et al., 2007), and include self-evaluative and decision-balance constructs (Welk, 1999). Fox (1991) provided a conceptualisation of exercise behaviour to unite these themes, where decisions about physical activity behaviour are reduced to two fundamental questions that young people may ask themselves when considering physical activity participation: (1) *"Is it worth it?"* and (2) *"Am I able?"* The first question addresses the cost–benefit assessment of participating in physical activity (Fox, 1994). This is similar to Fox and Biddle's (1988) effort-benefit ratio, and includes two elements of attitude: cognitive component (i.e., beliefs about physical activity) and affective component (i.e., degree of emotional attraction or feeling towards physical activity) (Subramaniam and Silverman, 2000). The second question encapsulates how individuals think and feel about their abilities in the physical domain and include constructs such as perceived competence, self-efficacy, and physical self-worth (Welk, 1999). It is postulated that young people who answer "yes" to both questions are more likely to lead active lifestyles and engage in regular physical activity (Rowe et al., 2007; Welk, 1999). The didactic nature of the questions suggests that they are two related but distinct categories (Barr-Anderson et al., 2008; Carroll and Loumidis, 2001; Welk, 1999). Predisposing factors of enjoyment, self-efficacy, perceived competence and attitudes have been found to be some of the most commonly identified correlates of physical activity (Barr-Anderson et al., 2008; Carroll and Loumidis,

2001; Craig et al., 1996; Dzewaltowski et al., 2007; Graber et al., 2007; Portman, 1995; Scanlan and Lewthwaite, 1986; Welk, 1999).

Biological and environmental variables are viewed as enabling factors which allow youth to be physically active (Welk, 1999). These are necessary yet not sufficient determinants of physical activity, and therefore can directly influence this behavior (Sallis et al., 1997). Variables include the environment, access to physical activity programmes, physical skills, and fitness (Welk and Joens-Matre, 2007). Reinforcing factors include social influences that encourage and help to shape a child's predisposition towards physical activity (Rowe et al., 2007; Welk, 1999). This domain highlights the role of significant others (such as parents, peers, teachers, and coaches) as directly and indirectly influencing a child's physical activity behaviour (Rowe et al., 2007; Welk, 1999). Finally, personal demographics were included as the model presents a more generalized view of activity behaviour by incorporating age, sex, ethnicity/culture, and socio-economic status (Erwin et al., 2007). The YPAPM explains that demographic variables can influence each major component of the model (Welk, 1999).

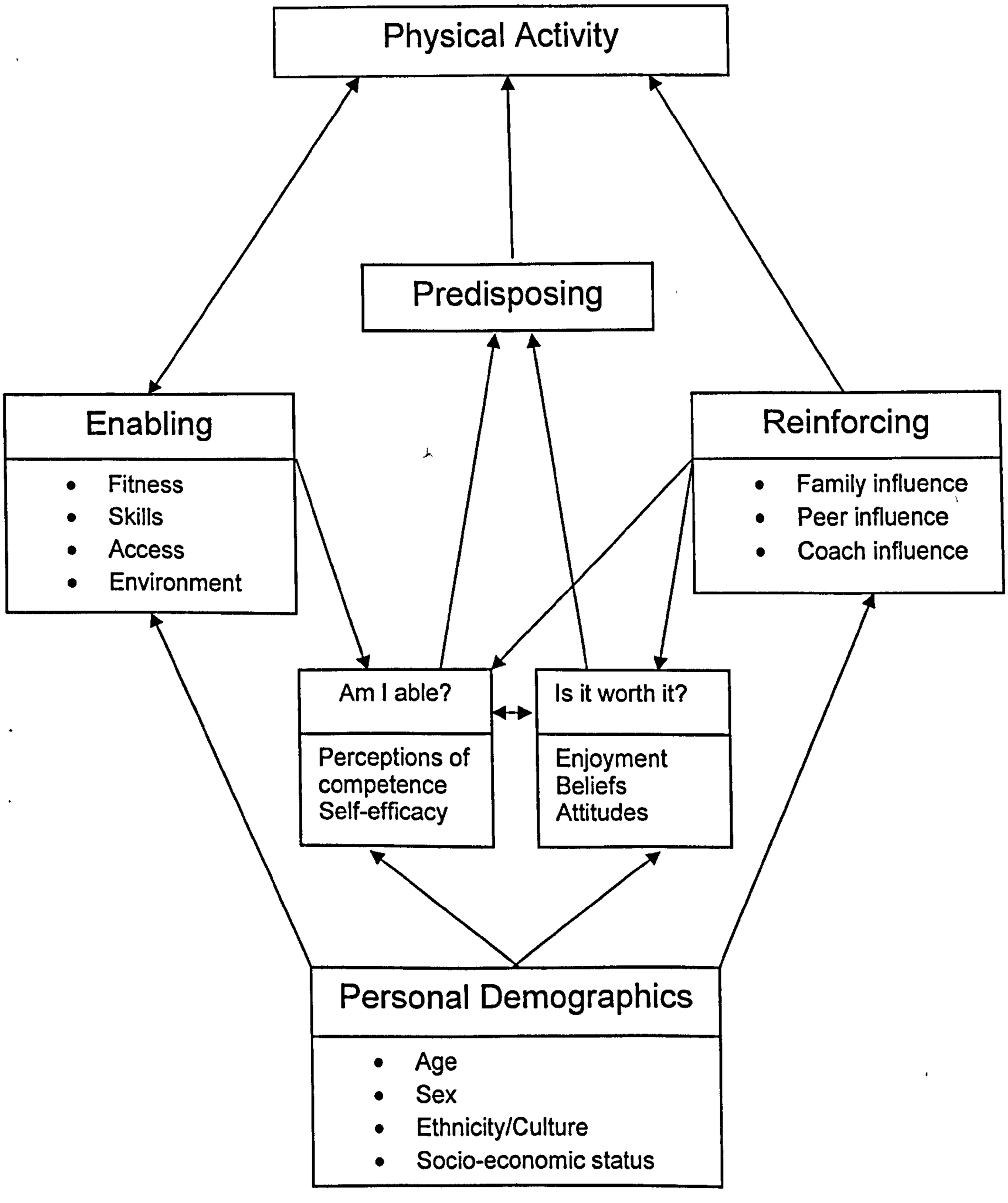

Figure 1.1. Conceptual diagram of Welk's (1999) YPAPM

Organisation of the Thesis

The central theme of this thesis is to establish how PE influences the level to which young people become physically educated and active individuals (i.e., the 'PE product'). **Chapter 2** provides a review of the literature. The key topics addressed are physical activity and health, the prevalence and correlates of physical activity, the aims and importance of school PE, and PE's contribution towards daily physical activity guidelines. The review attempts to critique the current literature, and highlight gaps which provide a rationale for the current research. In **Chapter 3,** Study 1 presents the development and factorial validation of the Physical Education Predisposition Scale, which assesses secondary school students' self-perceptions and cost/benefit assessments of participating in PE. In **Chapter 4,** Study 2 explores the contribution of school-based correlates to outcomes representing the 'PE product,' including physical activity levels, knowledge and understanding of health-related exercise and PE ability levels. Study 3, reported in **Chapter 5,** is a qualitative investigation, aiming to address students' views on the effectiveness of PE in developing the 'PE product' and to help further elucidate results from Study 2. To conclude, **Chapter 6** synthesises results from the three studies, **Chapter 7** draws together conclusions from the research, and **Chapter 8** suggests future recommendations for both research and practice.

Chapter 2

Literature Review

Literature Review

2.1: Physical Activity and Health

Physical activity has been identified as an important contributor to a healthy lifestyle (McKenzie et al., 2000a; Nelson et al., 2007) and can provide immediate and future health benefits (Strong et al., 2005). Boreham and Riddoch (2001) suggest that the evidence that physical activity is beneficial to health, comes almost exclusively from studies with adults. These studies have concluded that strong relationships exist between physical activity and health, with higher levels of physical activity leading to reduced risks of coronary heart disease, hypertension, non-insulin-dependent diabetes mellitus, stroke, colon cancer, osteoporotic fractures and depression (Barbour and Blumenthal, 2005; Berlin and Colditz, 1990; Helmrich et al., 1991; Jaglal et al., 1993; Thune and Furberg, 2001; USDHHS, 1996; Wannamethee and Shaper, 1992).

However, evidence for causal relationships between physical activity and health in children and adolescents is relatively weak (Boreham and Riddoch, 2001). Potential reasons for this involves methodological weaknesses of assessing health, fitness and physical activity in children and a lack of well conducted, large scale studies, especially longitudinal studies (Biddle et al., 2004; Fox and Riddoch, 2000; Tolfrey et al., 2000). Additionally, the relationship for children appears to be less clear cut because health cannot be judged by mortality statistics, as the onset of diseases like coronary heart disease and stroke are more likely to occur in adulthood (Boreham and Riddoch, 2001; Riddoch and Boreham, 1995). Instead, researchers have to rely upon risk factors in

paediatric populations, including blood pressure, fatness, blood lipids and bone mineral density. The relationships between physical activity and health though, is further complicated because these biological risk factors are perturbed during adolescence as a result of maturation and the stage of a child's development (Raitakari et al., 1994).

Despite these difficulties research has found that children's physical activity is inversely related to clustering of cardiovascular disease risk factors, diastolic blood pressure, waist circumference (Andersen et al., 2006), metabolic syndrome; triglycerides and insulin resistance (Brage et al., 2004). Klasson-Heggebo et al. (2006) found curvilinear relationships between cardio respiratory fitness and anthropometrical measures (waist circumference and sum of four skin folds) in children. In contrast, Armstrong et al. (1991) and Boreham et al. (2002) reported that no such relationships were apparent between adolescents' physical activity and selected coronary risk factors (blood pressure, sum of skin fold thickness and serum cholesterol). It has been acknowledged that the wide variety of methods employed to assess physical activity may have confounded the evidence (Armstrong et al., 1991; Tolfrey et al., 2000). However, a consistent long term protective effect of adolescent physical activity on bone health has been established (Boot et al., 1997; Branca, 1999; Khan et al., 2000; Kohrt et al., 2004). Bailey et al. (1999) conducted a longitudinal study to investigate the influence of physical activity, assessed by self-report measures, on bone mineral accrual during the adolescent years. It was concluded that the growing skeleton responds to daily physical activity by increased bone mineral accrual, with a 9% and 17% greater bone mineral content of the total body for active boys and girls, respectively, compared to their inactive peers.

A number of reviews of adolescent physical activity and health have been conducted (Biddle et al., 2004; Boreham and Riddoch, 2001; Hallal et al., 2006; Strong et al., 2005), concluding that there is evidence of the beneficial effects of physical activity on muscoskeletal health, cardio respiratory fitness, several components of cardiovascular disease, adiposity in overweight youth and blood pressure in mildly hypertensive adolescents. Bunker (1998) also suggested that physical activity can improve young people's psychological well-being and promote moral reasoning, positive self-concepts, and social interaction skills. Reviews therefore generally propose that physical activity has apparent advantages and should be promoted in youth (Biddle et al., 2004; Boreham and Riddoch, 2001; Hallal et al., 2006; Strong et al., 2005; USDHHS, 1996). In addition, it is generally accepted that the onset of many diseases and conditions lie in early life (Klasson-Heggebo et al., 2006), as a result preventive strategies, including beneficial physical activity patterns, should start at an early age (Bradley et al., 2000; Kemper et al., 1990; Twisk, 2001).

2.2: Tracking of Physical Activity, Sedentary Behaviour and Obesity

Hallal et al. (2006) suggest that people establish many of their lifestyle choices during adolescence; therefore what they choose to do in their teenage years may set the pattern for adulthood. Blair et al. (1989) proposed a model for the health consequences of childhood physical activity including that; (1) childhood physical activity influences adult physical activity, which may affect adult health, (2) childhood physical activity has a direct beneficial effect on child health, which predicts adult health and, (3) childhood physical activity has a direct

beneficial effect on adult health. Consequently it is important to track physical activity and health behaviours. Tracking has been defined as the stability of health behaviours over time or the maintenance of a relative position in rank within a group over time (Kelder et al., 1994; Malina, 1996). Tracking of physical activity from childhood and adolescence to adulthood implies that engagement in physical activity during youth will have beneficial effects for adulthood (Twisk, 2001). A short term study of 2-3 years indicated that physical activity tracks moderately ($r = 0.57 - 0.66$) from early to middle childhood (Pate et al., 1996). Self-reported physical activity measures from childhood to adolescence were fairly consistent over 5 years across Kelder et al.'s (1994) and Janz et al.'s Muscatine study (2000), suggesting physical activity tracked moderately well ($r = 0.32 - 0.65$). However, longitudinal studies over 7 to 36 years tracking physical activity from childhood and adolescence to adulthood, have reported weak associations ($k = 0.02 - 0.20$; $r = 0.12 - 0.22$) (Beunen et al., 2004; Boreham et al., 2004; Campbell et al., 2001; Trudeau et al., 2004). Beunen et al. (2004) concluded that these weak correlations do not permit predictions of adult physical activity. Data from the Amsterdam Growth and Health Study over a 14 year period (ages 13 to 27 years) concluded that the long term stability of physical activity can be considered as low to moderate (Twisk et al., 2000; Twisk et al., 1997; Van Mechelen et al., 2000).

Participation in organised sport during youth has been identified as a key predictor of adult physical activity in both men and women (Alfano et al., 2002; Barnekow-Bergkvist et al., 2001; Kraut et al., 2003). In addition, Tammelin et al. (2003) concluded that participation in sports at least once a week in adolescent females and twice a week in adolescent males was associated with higher

levels of physical activity in later life. These results propose that participation in sports may provide adolescents with a skill set, positive attitudes and enjoyment towards sport that lay the foundation for physical activity habits later in life (Kraut et al., 2003; Tammelin et al., 2003). Overall, reviews of tracking of physical activity from childhood to adulthood conclude a low to moderate relationship (Hallal et al., 2006; Malina, 1996; Malina, 2001). However, Boreham and Riddoch (2001) propose that substantial tracking should not be expected in the case of physical activity as many factors can influence this behaviour (e.g. major life events including school to work transition, leaving home, marriage and illness). In addition, physical activity is a complex multidimensional behaviour where accurate assessment is difficult and measures vary across studies, making comparisons difficult (Barnekow-Bergkvist et al., 2001; Boreham and Riddoch, 2001; Malina, 2001). Despite the apparent lack of tracking evidence, it is likely that physical activity will provide some benefit to children and adolescents' current and future health (Biddle et al., 2004; Strong et al., 2005).

There exists a relatively new field of research addressing the negative health consequences of leading a sedentary lifestyle (Graber et al., 2007), with sedentary behaviours involving television viewing, computer use and reading (Shields and Tremblay, 2008). Negative health behaviours include the risk of developing several chronic diseases; coronary heart disease, colon cancer, obesity, non-insulin dependent diabetes and hypertension (Branca, 1999; Gutin et al., 1994; Saunders et al., 1997; USDHHS, 1996). Moreover, research and reviews of European and North American studies conclude that sedentary behaviour tracks more strongly than physical activity (Janz et al., 2005; Janz et

al., 2000; Malina, 1996; Raitakan et al., 1994). Within Janz et al.'s (2005) Iowa Bone Development Study children's TV viewing was more predictable and stable (r = 0.37 – 0.52) than overall activity (r = 0.18 – 0.39), over a 3 year period.

Furthermore, Shields and Tremblay (2008) found that TV viewing was also associated with obesity for both sexes. Baur (2002) defines obesity as a complex condition with genetic, metabolic, behavioural and environmental factors all contributing to its development. Obesity and overweight in childhood and adolescence have been associated with negative health consequences including risk factors for cardiovascular disease, non-insulin dependent diabetes, hypertension and low self-esteem (Dietz, 1998; Gutin et al., 1994; Hill and Trowbridge, 1998). It has also been suggested that the most significant long - term effect of childhood obesity is its persistence into adulthood, and its link to future health consequences (Baur, 2002; Must, 2003). Obesity in preadolescents has been found to be a strong predictor of excessive weight gain over 1 and 2 years (O'Loughlin et al., 2000). Longitudinal studies have consistently reported a moderate to high degree of BMI tracking (r = 0.54) from childhood and adolescence to adulthood (Guo et al., 2000; Kvaavik et al., 2003; Whitlock et al., 2005), suggesting that the foundation for adult body weight is laid during adolescence. In addition, further longitudinal studies have concluded that obesity tracked significantly from youth to adulthood (r = 0.36 – 0.42), and that high BMI values at young ages were independent predictors of being overweight in adulthood in both men and women (Barnekow-Bergkvist et al., 2001; Wang et al., 2000; Yang et al., 2007).

2.3: Physical Activity Guidelines

It has been stated that there are intuitive biological and behavioural arguments in favour of promoting physical activity for all children and adolescents (Boreham and Riddoch, 2001), despite that lack of unequivocal evidence of the link to health outcomes. Therefore, physical activity promotion is a public health priority and numerous physical activity guidelines have been developed to encourage participation (Trudeau et al., 1999). The most recent guideline proposes that children and young people should engage in moderate to vigorous physical activities, for at least 60 minutes each day (NASPE, 2004; DH, 2004). Furthermore, it is advocated that at least twice a week this should include weight bearing activities that produce high physical stresses to improve bone health, muscle strength and flexibility, which can be achieved in a number of short, 10 minute bouts (DH, 2004). These recommendations are in line with proposals from the USA (United States Department of Health and Human Services [USDHHS], 2008) and more recently, Canada (Janssen and Leblanc, 2010). MVPA refers to activity which results in increasing heart rate, sweating and breathing harder of being out of breath, including for example brisk walking, skating or bike riding (Janssen and Leblanc, 2010; NICE, 2009).

2.4: Physical Activity Levels

There is much debate as to whether youth are sufficiently active in order to achieve health benefits, and current evidence suggests that young people are not meeting guidelines and that sedentary lifestyles remain a problem (Muller-Riemenschneider et al., 2008). However, the prevalence of children's physical

activity varies depending upon assessment method employed (Corder et al., 2008). Numerous physical activity measures have been utilised, with recent large scale self report studies in England reporting that 70% of boys and 59% of girls take part in 60 minutes or more of physical activity on all 7 days in the previous week (National Health Service [NHS], 2008). In a nationally representative sample in the US, data from the Youth Risk Behavior Survey reported 24.8% of boys and 11.4% of girls were physically active for at least 60 minutes on all 7 days (Centers for Disease Control [CDC], 2010). Furthermore, Eisenmann et al.'s (2002) study employed the same survey on 14-18 years olds, and concluded that 44.6% reported participating in MPA 3 or more days per week, whereas 64.7% reported participating in VPA 3 or more days per week. Phone surveys with adolescents and their parents have also been conducted with results suggesting that under half of the adolescents (40% of girls and 57% of boys, aged 14-17) complied with the physical activity guidelines, which in this study was defined as being physically active for at least 60 minutes for 5 or more days per week (Butcher et al., 2008). However, the accuracy of self-report measures is questionable as responses are generally over-estimations and may be influenced by the ability of children and adolescents to recall retrospectively, and the potential for youth to respond in a socially desirable manner (Biddle et al., 2009; Corder et al., 2008; Gorely et al., 2009).

Other available self-report methods include ecological momentary assessment (EMA) diaries, which allow participants to report their current behaviour, plus additional factors such as the environmental and social context (Biddle et al., 2009). Utilising this instrument with boys in 15 schools throughout different regions in the UK, Gorely et al. (2009) reported that 63% reached

recommended physical activity levels on weekdays, and 50% at weekends. In comparison, Biddle et al. (2009) reported that Scottish children on average, achieved 55 minutes (girls) to 62 minutes (boys) of leisure time physical activity on weekdays, and 47 minutes (girls) to 91 minutes (boys) on weekends. Limitations of EMA are that it does not incorporate an intensity component so all forms of physical activity are included. Moreover, in these two studies behaviours during school were not assessed, as the focus of the research was on volitional leisure time behaviours, therefore figures for weekday are likely to be underestimated (Biddle et al., 2009; Gorely et al., 2009). In Taiwan, Liou and Chiang (2004) compared the percentage of 9-12 year old children who met numerous physical activity recommendations, employing a 3-day physical activity log. Results were that over 90% of children met the Physical Activity Guidelines for Adolescents (90 minutes of MVPA per week) and the Healthy People Objective No.22.6 (150 minutes of MVPA per week), 78.2% of boys and 80.8% of girls met the UK expert consensus group guidelines (420 minutes of MVPA per week) and almost 70% met the Healthy People Objective No.22.7 (60 minutes of VPA per week). In a similar study comparing the percentages of children and youth meeting recommended physical activity guidelines in the US, Pate et al. (2002) measured physical activity objectively using accelerometers. They found that over 90% of the students met the Healthy People Objective No.22.6, 69.3% met the UK expert consensus guidelines, however less than 3% met the Healthy People Objective No.22.7 requirements. These results demonstrate that compliance with the guidelines were dramatically different for the three guidelines examined, and are dependent upon how physical activity is measured.

Accelerometry is the most commonly used objective measure of physical activity (Corder et al., 2008). Accelerometers are relatively unobtrusive, practical, as they easy to use and can be worn without impeding movement, and have the ability to store large amounts of data related to duration, patterns, and intensity of movement (Freedson et al., 2005; Nilsson et al., 2002). However, they are limited by their capacity to assess static physical activities, non weight-bearing activities that require little body movement in the vertical plane like cycling, and they do not accurately capture certain terrain changes such as gradient (Corbin et al., 2004; Trost et al., 2002). Notwithstanding the limitations of accelerometers, these instruments may arguably be the best method of assessing children's free living physical activity (Cooper et al., 2005). This is evidenced by the fact that in recent years they have been used in population-based studies such as the European Youth Heart Study (EYHS) (Riddoch et al., 2004) and the Avon Longitudinal Study of Parents and Children (ALSPAC) (Riddoch et al., 2009). In the EYHS (Riddoch et al., 2004) accelerometry data were collected from 9 and 15 years olds from defined areas in four European countries. The 9 year olds were more active, accumulating on average 192 minutes (boys) and 160 minutes (girls) of MVPA, compared to 15 year olds (99 minutes (boys); 73 minutes (girls). In addition, Riddoch et al. (2004) concluded that at age 9 years, 97% achieved current recommendations, compared to 82% of 15 year old boys and 62% of 15 year old girls. This reduction in physical activity with increasing age has also been reported in Canada (Sherar et al., 2007) and the US, with 9 year old children engaging in 3 hours of MVPA on both weekdays and weekends, compared to 15 year olds who were only accruing 49 minutes per weekday and 35 minutes of MVPA per weekend (Nader et al., 2008). Furthermore, Trost et al. (2002) concluded that

mean values of MVPA per day ranged from 50 – 200 minutes, and that daily MVPA and VPA exhibited a significant inverse relationship with school grade. These results strongly support the concept that physical activity declines rapidly during childhood and adolescence.

Riddoch et al.'s (2007) ALSPAC reported figures which were considerably lower than those previously reported for European and American children (Riddoch et al., 2004; Trost et al., 2002). Only 2.5% of children from this study met the internationally recognised recommendations, and the median time spent in MVPA was 20 minutes per day (Riddoch et al., 2007). In contrast, Martinez-Gomez et al. (2009) reported 71.1% of their Spanish sample of 13-16 years olds reached the physical activity guideline. Also, research in Canada has found that girls accumulate on average 104 minutes of MVPA and boys 150 minutes of MVPA (Sherar et al., 2007). These contrasting results may be explained by the use of different cut-points of accelerometer counts to define the lower threshold of MPA (Riddoch et al., 2007; Trost et al., 2000). Accelerometers are typically validated against indirect calorimetry and calibrated in terms of resting metabolic equivalents (METs) (Puyau et al., 2002). Adult MET thresholds used to classify time spent in light (<3 METs), moderate (3 – 6 METs), vigorous (6 – 9 METs) and very vigorous (>9 METs) activity (Freedson et al., 1998) have been applied in children and adolescents (Mattocks et al., 2007). Calibration studies have used laboratory and field–based protocols (Bailey et al., 1995; Puyau et al., 2002). However, inconsistencies between studies have resulted in a range of activity count thresholds being created for MET thresholds (Rowlands, 2007; Strath et al., 2003). This array of thresholds has produced discrepancies in the number of children and adolescents classified as being sufficiently active (Mota

et al., 2007). This is a contentious issue and the number of thresholds available highlights the lack of agreement among leading researchers, as no consensus exists on how to satisfactorily tackle this problem (Ekelund et al., 2004a; Rowlands and Eston, 2007). Moving away from arbitrary count-based cut-points, Ekelund et al. (2003) applied individual calibrated activity thresholds to habitual physical activity, ArteACC (the activity-related time equivalents based on accelerometry index. It is calculated as: ArteACC (minutes per day) = total daily activity counts (ACs) (counts per day)/reference exercise ACs (counts per minute). However, this approach is time consuming and consequently difficult to apply to large samples (Jago et al., 2007). Furthermore, Stone et al. (2009) examined whether the relationship between time spent in MVPA and various health outcomes in boys differed according to how activity intensity is classified (i.e., sample-specific thresholds, published thresholds (Mattocks et al., 2007), and the ArteACC (Ekelund et al., 2003)). Stone et al. (2009) concluded that the choice of threshold did not impact on relationships detected between activity and health outcomes, however, intensity thresholds clearly matter when the reporting the percentage of children meeting MVPA guidelines.

Reviews in this area have suggested reasons for the varied conclusions surrounding physical activity levels include measurement error, different measurement methods, population and age group differences, and the measurement of different dimensions of physical activity (Boreham and Riddoch, 2001; Riddoch and Boreham, 1995). Riddoch and Boreham (1995) conclude that the physical activity evidence of children and youth is equivocal and methodologically diverse, as measurement is problematic. However, Biddle et al.

(2004) suggest that it remains a concern that a sizeable portion of young people continue to have what might be described as inactive lifestyles.

2.5: Correlates of Physical Activity Behaviour

Identifying factors that are associated with participation in physical activity is typically referred to as the study of determinants or correlates (Biddle et al., 2004). Correlates will be used throughout this thesis, as many correlates may not be true determinants, as studies often show associations but may not be able to conclude causality (National Institute for Health and Clinical Excellence [NICE], 2007). Buckworth and Dishman (2002) refer to determinants as "reproducible associations that are potentially causal" (p. 191). Distinguishing and understanding correlates of youth physical activity is considered to be of public health significance, and to promote physical activity in youth, the factors that influence the acquisition of this behaviour must first be understood (Trost et al., 1999a; Trost et al., 1999b; Van Der Horst et al., 2007; Wu et al., 2003). Such information could then help inform effective interventions that seek to increase physical activity levels (Brodersen et al., 2005; Sallis and Owen, 1999; Sallis et al., 2000). Findings relating to non-modifiable biological factors of sex and age are consistent in the literature, showing that higher levels of physical activity are associated with being male (Cardon et al., 2005; Ekelund et al., 2004b; Riddoch et al., 2007; Sallis et al., 2000; Wenthe et al., 2009; Wu et al., 2003), and being younger (Biddle et al., 2005; DiLorenzo et al., 1998; Pate et al., 1996; Saxena et al., 2002; Strauss et al., 2001; Trost et al., 1999a).

Numerous psychological variables have been identified as correlates of youth physical activity participation. It has been frequently reported that perceived competence, which refers to a global belief in one's ability in a specific domain (Chase, 1998), and self-efficacy, which is the belief in one's capabilities to successfully perform a task or activity (Bandura, 1997; Chase, 1998), are important correlates of youth physical activity behaviour (Barr-Anderson et al., 2007; Biddle et al., 2004; Biddle et al., 2005; Craig et al., 1996; Sallis et al., 2000; Trost et al., 1997). This may be because self-efficacy beliefs determine the goals people set for themselves, how much effort they expend, how long they persevere and how resilient they are in the face of failures and setbacks (Bandura, 1997). Moreover, it is a pervasive finding that if children and adolescents experience fun and enjoyment, they are more likely to participate, persist, exert effort and be committed to that particular activity (Carroll and Loumidis, 2001; Craig et al., 1996; Scanlan et al., 1993; Scanlan and Lewthwaite, 1986; Scanlan et al., 1989). Also, after interviews with children and their mothers Stucky-Ropp and DiLorenzo (1993), reported that enjoyment of physical activity was the most salient predictor of exercise behaviour. In line with this Biddle and Armstrong (1992) explored the psychological correlates of children's physical activity, and found that intrinsic motivation for PE and sports was significantly correlated with activity levels. However, this was only for boys which may suggest that boys can enjoy physical activity for its own sake, whereas girls were more likely to be characterised by extrinsic motivation (Biddle and Armstrong, 1992). Physical activity in this study was measured utilising heart rate monitors, assessing sustained 10 minutes periods of elevated heart rate. Therefore because of the sporadic, highly transitory, short duration and intermittent nature of children's physical activity, many children

may have been categorised incorrectly as inactive (Bailey et al., 1995; Baquet et al., 2007). Also, there are numerous reasons for elevations in heart rate, for example emotional states, climatic conditions and other factors which are unrelated to physical activity (Biddle and Armstrong, 1992).

Social and cognitive aspects including instrumental parental support (e.g. transportation, encouragement, and observation), family cohesion, and parent-child communication have been found to be significantly related to child physical activity (Biddle et al., 2004; Ornelas et al., 2007; Trost et al., 2003). Saunders et al. (2004) reported that social provisions (subscales included guidance, nurturance and reassurance of worth) and family support were significant correlates of MVPA in girls. Support from significant others, including siblings and peers, has also been frequently related to physical activity levels in young people (Dowda et al., 2007; Sallis et al., 2000). In line with this McKenzie et al. (2008) directly observed children's physical activity, and associated physical and social environments at home. They found that increased physical activity was associated with siblings and other children being present, active behaviour being prompted, and number of children living in the household (McKenzie et al., 2008). However, this sample was relatively small and only involved Mexican-American families who were observed for 1 hour on an afternoon, therefore findings should not be generalised and children may have modified their behaviour during observations (McKenzie et al., 2008).

Environmental variables are of interest as ecological approaches to physical activity promotion acknowledge the interaction between an individuals' behavior and multiple levels of their environment (Sallis and Owen, 1997). The physical

environment is represented by objects with which individuals interact, and the more opportunities provided by the environment for physical activity the more likely that youth will participate (Fein et al., 2005). The strongest associations between youth physical activity and environmental correlates relate to time spent outdoors and access to physical activity spaces, equipment, facilities and programmes (Davison and Lawson, 2006; Sallis et al., 1998; Wechsler et al., 2000). Therefore, variables that have been consistently associated with physical activity in youth include self-efficacy, enjoyment, perceived competence, environment, beliefs, attitudes, and social support (Biddle et al., 2005; Chase, 1998; DiLorenzo et al., 1998; Sallis et al., 1999; Trost et al., 1997; Trost et al., 1999a; Trost et al., 1999b; Vilhjalmsson and Thorlindsson, 1998). However, because of the cross-sectional design of these studies, cause and effect relationships among variables cannot be established, and other variables not accounted for may also play a causative role (Strauss et al., 2001; Stucky-Ropp and DiLorenzo, 1993; Van Der Horst et al., 2007). Additionally, reliance upon self report data regarding correlates and physical activity may bias results because of social desirability, recall errors and reporting biases (Brodersen et al., 2005; Butcher et al., 2008; Wu et al., 2003).

Longitudinal studies within this field have increased understanding and offer unique insights into antecedents of children's and adolescents' physical activity participation and potential opportunities for intervention (Richards et al., 2009). These studies have further highlighted the importance of family influences on physical activity participation, as Dowda et al. (2007) in South Carolina collected data on girls at grade 8, 9 and 12 and concluded that girls with higher perceived family support had higher total MET scores. Furthermore, New Zealand

adolescents were assessed at ages 15 and then followed up at 18 years, and results suggested that persistent physical activity was associated with higher family SES, higher family active-recreation orientation during childhood and participation in activities at home, and better childhood motor skill ability (Richards et al., 2009). Other longitudinal studies have reported the significance of daily school PE classes and the use of community facilities as being associated with an increased likelihood of engaging in high levels of MVPA (Gordon-Larsen et al., 2000). In the US, DiLorenzo et al. (1998) collected data from children when they were in the 5th and 6th grade, and again three years later (8th and 9th grade). Children's enjoyment of physical activity was the only consistent predictor of physical activity during 5th and 6th grade. During 8th and 9th grade for girls, exercise knowledge, mother's physical activity, child's mother/friend support and modelling emerged as predictors, whilst for boys, self-efficacy, exercise knowledge, parental modelling, and interest in sports media were key. Potential issues during longitudinal studies involve the impact of data attrition, as in Richards et al. (2009) study, those with complete physical activity data had higher SES, family active recreation orientation, motor skill score, and were more likely to be non-smokers. Therefore, estimates of association may be conservative. Also, many of the studies reply upon self report measures (Dowda et al., 2007; Gordon-Larsen et al., 2000); therefore findings need to be replicated with more extensive, objective techniques (Dowda et al., 2007; Richards et al., 2009).

Sallis et al. (2000) reviewed studies on correlates of physical activity of children and adolescents, published between 1970 and 1998. Significant variables were found in all categories of correlates (demographic and biological, psychological,

cognitive and emotional, behavioural attributes and skills, and social and cultural factors), with the most frequent and consistent finding being that boys are more active than girls. Correlates consistently relating to children's physical activity (aged 4-12 years) were psychological, cognitive and emotional, demographic and biological. Correlates frequently associated with adolescents' physical activity (aged 13-18 years) were psychological, cognitive and emotional, behavioural attributes and skills. The only variables listed for both age groups were sex (male), intention to be active and previous physical activity (Sallis et al., 2000). However, Sallis et al. (2000) proposed that the diversity of variables, subject samples and analysis strategies prevented a true meta-analysis. Van Der Horst et al. (2007) provided a systematic update of Sallis et al.'s (2000) review, including studies published from 1999 to January 2005. Reviewed studies of children (aged 4-12), revealed evidence of a positive association between children's physical activity and sex (male), self-efficacy, parental physical activity (for boys) and parental support. For adolescents (aged 13-18) positive associations with physical activity were found for sex (male), parental education, attitude, self-efficacy, goal orientation/motivation, PE/school sports participation, family influences, and friend support (Van Der Horst et al., 2007).

Biddle et al. (2005) reviewed papers published from 1999 to 2003, focusing upon the identification of correlates of physical activity in girls. This review showed that lower levels of physical activity were associated with being older and female, which is a robust and highly consistent finding. Furthermore, physical activity was associated with enjoyment, perceived competence, self-efficacy, physical self-perceptions, organised sport involvement and parent and

family support (Biddle et al., 2005). Gustafson and Rhodes (2006) reviewed literature on parental influences on children's physical activity and concluded significant correlations between parental support and modelling. Overall, these studies and reviews have reported significant associations between physical activity and demographic, biological, psychological, cognitive, social, behavioural and environmental correlates. This demonstrates that youth physical activity is a complex and multifaceted behaviour determined by many factors (Sallis et al., 2000; Van Der Horst et al., 2007). However, as reviews typically include only published studies some relevant research may be omitted, due to publication bias towards research reporting significant findings (Van Der Horst et al., 2007). Again there is a reliance upon cross-sectional and longitudinal studies, yet experimental studies are essential to successfully develop intervention strategies (Gustafson and Rhodes, 2006).

2.6: Physical Education Curriculum and Aims

In England PE is delivered in the context of the national Physical Education and School Sport Strategy for Young People (PESSYP), which aims to give every young person access to five hours of PE and School Sport that is accessible, attractive, affordable and appropriate to each individual's needs (Youth Sport Trust, 2009). The basic principles of PE involve facilitating all young people, whatever their circumstances or ability, to take part in, enjoy and succeed in PE, to learn about the value of leading a healthy, active lifestyle, and to improve and achieve in line with their age and potential (DfES, 2004; QCA, 2007). These principles are echoed in the US, where NASPE (2004) defines a physically educated person as one who has the knowledge, skills and confidence to enjoy

a lifetime of physical activity. Specifically, a physically educated person is one who:

1. Demonstrates competency in motor skills and movement patterns needed to perform a variety of physical activities.
2. Demonstrates understanding of movement concepts, principles, strategies, and tactics as they apply to the learning and performance of physical activities.
3. Participates regularly in physical activity.
4. Achieves and maintains a health-enhancing level of physical fitness.
5. Exhibits responsible personal and social behaviour that respects self and others in physical activity settings.
6. Values physical activity for health, enjoyment, challenge, self-expression, and/or social interaction (NASPE, 2004, p.11).

PE also helps to raise standards, improve behaviour and health, increase attendance and develop social skills (DfES, 2004). High quality PE addresses all five of the Every Child Matters outcomes, which is a new approach to the well-being of children and young people from birth to age 19 (afPE, 2008). Every Child Matters aims to ensure that every child, whatever their background or circumstances, has the support they need to be healthy, stay safe, enjoy and achieve, make a positive contribution and achieve economic well-being which relate to PE outcomes (Department for Children Schools and Families and Department of Culture Media and Sport, 2009). PE therefore aims to introduce children to a variety of sports and physical activities to improve their physical skilfulness, their conceptual understanding of physical activity, and enhance their positive attitudes towards active and healthy lifestyles, to help prepare them for lifetime physical activity (afPE, 2008; Graber, et al., 2007; QCA, 2007).

To achieve these goals PE must strive to produce physically educated and active youth. The evidence of this 'PE product' can be described in terms of young people who engage in recommended levels of habitual physical activity, and who have competent levels of physical activity skill, knowledge, and understanding.

2.7: School Physical Education as a Health Promotion Context

PE offers a logical and plausible context for regular, structured physical activity (Biddle et al., 1998; Fairclough and Stratton, 2005; Goudas et al., 1995; Tappe and Burgeson, 2004; USDHHS, 1996). Furthermore, Sallis and McKenzie (1991) suggest that school PE is the most important institution that can address the health-related physical activity needs of almost all children. This is because the majority of children spend around 40% of their waking hours in school (Trudeau et al., 1999; United States Department of Health and Human Services [USDHHS], 2001). In addition, PE is mandatory in many countries and therefore offers a rare setting where the full spectrum of the population can be reached (Fairclough and Stratton, 2005; Fox et al., 2004). Although Welk's (1999) YPAPM aims to explain the relationships between factors affecting habitual physical activity, it may also be applied to the PE setting, as PE can play a primary role in influencing predisposing, enabling and reinforcing correlates of physical activity (Welk, 1999).

The most commonly identified PE correlates of physical activity involve predisposing factors of perceived competence, self-efficacy, enjoyment, and attitude. Welk (1999) suggests that PE can play a primary role in influencing

students' cost–benefit assessment of participating in physical activity, relating to attitudes, enjoyment and self-perceptions. Enjoyment is identified by generalised feelings such as pleasure, liking and fun, and PE teachers often report that one of their main goals is to make PE classes enjoyable (Placek, 1983). Research in this area has found that enjoyment in PE can determine the level of children's physical activity participation outside of school (Barr-Anderson et al., 2007; Carroll and Loumidis, 2001). Moreover, enjoyment of PE has been found to be a major indicator of student attitudes, which in turn may play a mediating role in maintaining active lifestyles outside school (Subramaniam and Silverman, 2007). For example, significant relationships have been reported between attitudes toward PE and leisure-time exercise (Chung and Phillips, 2002). Though it has been found that students have moderately positive attitudes toward PE (Stelzer et al., 2004; Subramaniam and Silverman, 2007). It has been reported that up to 20% of students find PE humiliating, frustrating, embarrassing and barely tolerable (Carlson, 1995; Ennis, 1996; Portman, 1995). These students may select to avoid participation in physical activity outside of school and in later life (Allender et al., 2006; Carlson, 1995). In addition, Carroll and Loumidis (2001) found that children who perceived themselves as more competent in PE participated in significantly more physical activity outside school and at a higher intensity, than those who perceived themselves to be less competent. Conversely, the dynamic relationship between perceived competence in PE and activity outside of school may be observed when children who have negative perceptions of their competencies in PE may decide not to participate in physical activity during their leisure time (Brustad, 1993; Carroll and Loumidis, 2001).

Enabling factors of the school physical environment are seen as important for the promotion of physical activity and other healthful behaviors (CDC, 1997; Department for Education and Skills/Department of Health, 2005). Perhaps unsurprisingly, Dunton et al. (2007) found that most of young people's weekday physical activity is accumulated at school. Cradock et al. (2007) concluded that larger school campuses, buildings and play areas per enrolled student were associated with increased physical activity. In addition, opportunities to exercise, access to facilities, and physical improvements (e.g. tennis courts, football goals) are positively associated with adolescent physical activity (Sallis et al., 2001; Sallis et al., 2000). Furthermore, research investigating the association between school physical environments and physical activity has generally reported positive and significant correlations (Cradock et al., 2007; Fein et al., 2004; Sallis et al., 2001). School PE classes also offer an essential opportunity to equip children with the necessary fundamental movement skills that facilitate lifetime physical activity participation (Van Beurden et al., 2003). It has been reported that the ability to perform fundamental movement skills is significantly related to participation in organised physical activity among adolescents (Okley et al., 2001). Reinforcing factors include PE teachers and coaches who are powerful influencing forces in shaping students' attitudes and enjoyment toward PE, in either positive or negative ways (Figley, 1985; Rikard and Banville, 2006; Scanlan et al., 1993; Silverman and Subramaniam, 1999). This influence may come through teaching style, class environment, behaviour, reinforcement, and differential treatment which can have an effect on physical activity participation and persistence (Carroll and Loumidis, 2001; Craig et al., 1996; Goudas et al., 1995; Portman, 1995; Scanlan et al., 1989; Stucky-Ropp and DiLorenzo, 1993).

2.8: Physical Education's Contribution to Physical Activity Levels

Objective 22-10 of the American Healthy People 2010 policy document (USDHHS, 2000) aims to improve the number of students who are engaged in physical activity for at least 50% of PE lesson time. Fairclough and Stratton (2005) suggest that there are potential difficulties of achieving this ambitious target, because of the diverse aims of PE. Such aims include taking part in appropriate amounts of physical activity, becoming educated with the knowledge and skills to achieve lifetime physical activity, as well as motor, cognitive, social, spiritual, cultural and moral development (Bailey et al., 2008; Fairclough and Stratton, 2005; Sallis and McKenzie, 1991). These varied aims can be inconsistently emphasised, compromise each other and not be conductive to physical activity engagement (Fairclough and Stratton, 2005). Simons-Morton et al. (1993) observed PE classes in 355 elementary schools in Texas, and noted students' sex, activity intensity, type of activity, whether the student was 'on task' or 'off task', and instructional mode. In the average PE class 8.6% (10.4 minutes) of activity was MVPA and 68.1% was sedentary. In comparison, McKenzie et al. (2000b) observed 430 lessons utilising the System for Observing Fitness Instruction Time (SOFIT) (McKenzie et al., 1991) and reported that approximately 16.5 minutes of the lesson time was spent in MVPA. Furthermore Martin and Kulinna (2005) employed the computerised version of SOFIT (CSOFIT) (Keating et al., 1999), to observe PE teachers and their students in US elementary, middle and high schools. Results from CSOFIT suggested that the PE teachers spent most of their time (92%) instructing, managing or observing students, whilst time spent promoting fitness (1%) and demonstrating fitness (3%) was minimal. Martin and Kulinna (2005) concluded

that students spent 21% of their PE time walking and 18% being very active, therefore 39% of PE class time was spent in MVPA.

Numerous self-report measures have also been employed to measure physical activity during PE. Research in the US suggests that students enrolled in PE report more MVPA and VPA overall, compared to non-enrolled students (Gordon-Larsen et al., 2000; Pate et al., 2007). These findings suggest that expanded enrolment in PE may increase adolescents' physical activity levels, which could be explained through enhanced opportunities, experiences, self-efficacy, positive attitudes, fitness and skills. The Bogalusa Heart Study involved 995 participants from grades 5-8 and also applied a self-report physical activity measure (Myers et al., 1996). The impact of PE was noted as they found that students who reported PE classes had more median minutes of physical activity during school in all ethnicity and sex groups (Myers et al., 1996). Reliance upon participants' ability to recall and estimate their physical activity levels is a major limitation of these studies, and Pate et al. (2007) suggest that an objective measure may have added more precision to the physical activity data. Fairclough (2003) and Fairclough and Stratton (2005) made use of heart rate telemetry to measure physical activity in students during PE time. Fairclough (2003) reported that students engaged in MVPA for 36.9 ± 22.6% of the PE lessons, and in comparison Fairclough and Stratton (2005) found that students engaged in MVPA and VPA for 34.3 ± 21.8% and 8.3 ± 11.1% of PE time, respectively, which equates to around 18 minutes of MVPA. These findings approximate a third of the recommended volume of MVPA proposed for youth, which is a significant proportion. However, data were cross-sectional and collected over a relatively short time frame therefore there was potential for

reactivity by staff and students (Fairclough and Stratton, 2005). Furthermore, heart rate is subject to emotional and environmental factors when no physical activity is occurring (Fairclough and Stratton, 2005; Fairclough, 2003).

Pedometers are an alternative to heart rate telemetry, and Morgan et al. (2007) measured activity time in 64 regularly scheduled PE classes over two weeks. Mean activity time was 14 minutes/lesson or 50% of the lesson time, and participants accumulated significantly more steps/day on school days with PE. In addition, Morgan et al. (2007) concluded that there was no evidence that any compensatory increases in daily physical activity levels occurred on school days without PE, which is in line with the findings of Myers et al. (1996). In another study which restricted school time physical activity (i.e., children had no PE classes and worked on computers during break periods), after-school physical activity was significantly lower than on days when children participated in PE and had outdoor breaks, as measured by accelerometery (Dale et al., 2000). Children in this study did not compensate by increasing physical activity during the afternoon and evening following a restricted school day. This study reinforces the important contribution of regular PE classes to youth physical activity. However, in another study employing accelerometers, Mallam et al. (2003) measured physical activity in three primary schools, with differing amounts of timetabled PE (9, 2.2 and 1.8 hours/week). Students with 9 hours of PE per week recorded the most physical activity in school time but this was barely twice that of students in the other two schools, despite timetabling more than four times the amount of PE. Total physical activity was similar because children obtaining 2.2 and 1.8 hours of PE per week did correspondingly more physical activity out of school. Therefore, Mallam et al. (2003) concluded that

the total amount of physical activity done by primary school children does not depend on how much PE is timetabled at school because children compensate out of school. These authors proposed that physical activity is controlled by an 'activitystat' which determines that children take part in a certain amount of physical activity regardless of environmental influences such as exposure to PE (Mallam et al., 2003). However, as Trudeau and Shephard (2005) point out, the longer PE programmes in Mallam et al.'s (2003) study may have failed to deliver the physical activity they promised, and it was not clear what types of PE programmes were delivered in each of the three schools. Therefore, the quality of the PE lessons in Mallam et al.'s (2003) study warrant further exploration as confounding variables, such as predisposing factors proposed in the YPAPM (Welk, 1999) may have also been a key influences on the reported physical activity levels of the students. Furthermore, the study was cross-sectional and did not involve manipulation of physical activity within PE lessons (Rowlands et al., 2008a). Overall it is apparent that PE is limited in its capacity to supplement young people's daily volume of physical activity (McKenzie et al., 1995). However, when PE activity is combined with other forms of physical activity, (including play, break times, extra-curricular, and out of school physical activity) support is lent to the premise that PE lessons can directly benefit young people's health status (Fairclough and Stratton, 2005). Yet Fox et al. (2004) suggest that a major constraint to PE's utility as a vehicle for physical activity participation is the limited time allocated to it. Longer or more frequent PE lessons should be available to allow students more opportunities for more physically activity (McKenzie et al., 1995).

2.9: Physical Education Intervention Studies

Physical activity interventions within school PE have been conducted successfully to increase the proportion of time children spend in MVPA. In England a fitness company (Motive8) provided school PE lessons, which aimed to develop sport specific motor skills and to provide 20 minutes of MPA and 10 minutes of VPA (Rowlands et al., 2008a). Physical activity in these Motive8 lessons was compared to normal PE lessons for 14 consecutive days. Rowlands et al. (2008a) found that Motive8 provided more MPA (20.5 ± 3.8 vs. 15.9 ± 6.1 minutes), and VPA (7.9 ± 2.6 vs. 5.1 ± 3.8 minutes) as measured by accelerometry. The impact of PE on overall activity though, appeared to be negligible, as days without PE were either more active than, or at least as active as days with PE lessons, which supports Mallam et al.'s (2003) conclusions that the total amount of physical activity accumulated does not depend on timetabled PE. However, as with Mallam et al.'s (2003) study, the quality of these PE lessons needs to be questioned, as they were led by a fitness company rather than trained PE professional. Further successful interventions with elementary aged school children have been reported in the US, including the Child and Adolescent Trial for Cardiovascular Health (CATCH) (McKenzie et al., 1995), and Sports, Play, and Active Recreation for Kids project (SPARK) (Sallis et al., 1997). The CATCH cardiovascular health promotion programme reported that students in lessons taught by specialist PE teachers and generalist teachers who had received training, spent significantly more time being very active and engaging in MVPA compared to those students taught by classroom teachers who had not received training (McKenzie et al., 1995). Other reasons for increased physical activity in this study involved the CATCH

curriculum, resources and staff training (McKenzie et al., 1995). Sallis et al.'s (1997) SPARK intervention involved one of three conditions, including a specialist-led, teacher-led and a control PE group. Students in the two intervention conditions spent more time in MVPA in PE (control = 17.8 minutes, teacher-led = 32.7 minutes, and PE specialist-led = 40.2 minutes). Furthermore, The Middle School Physical Activity and Nutrition (M-SPAN) study used environmental, policy, and social marketing to increase physical activity and improve healthy eating of middle school students (McKenzie et al., 2004). Following in service training for PE teachers, lessons were observed using SOFIT and the intervention resulted in significant overall increases in the time students spent in MVPA (approximately 3 minutes per lesson or an 18% increase in physical activity). This increase in physical activity may be seen as small, yet it was achieved through a staff development programme, without requiring increases in class frequency or duration (McKenzie et al., 2004). Furthermore, these schools surpassed the Healthy People 2010 objective (USDHHS, 2000) with 52% of students engaging in MVPA during class time.

Felton et al.'s (2005) Lifestyle Education and Activity Program (LEAP) targeted high school girls with its core components including; (a) PE (girls only classes, fun and enjoyment, lifelong and non-competitive physical activities), (b) school environment (opportunities to be physically active outside of PE, health education reinforcing PE messages), (c) school-community linkages (community and family involvement), and (d) organizational change (active LEAP team and administrative support). After one year of academic exposure to the intervention the girls showed increases in both VPA and MVPA from 8th to 9th grade and qualitative findings showed that 90% of the girls liked PE (Felton

et al., 2005). Furthermore, it was reported that enjoyment and increased self-efficacy mediated improvements in physical activity levels (Dishman et al., 2004; Dishman et al., 2005; Felton et al., 2005). From this randomised controlled trial, Dishman et al. (2005) concluded that increased enjoyment resulted in increased physical activity among adolescent girls. Further research in school PE has aimed to assess the effect of choice on student physical activity and motivation. Results suggest that providing choice leads to significantly higher physical activity levels, as Lonsdale et al. (2009) reported step counts of 68.14 in a free choice condition (which involved students being told that they had '20-minutes of free time' to do whatever they chose, in this condition basketballs were made available but no other instruction or equipment was provided), compared to 44.12 steps in the structured lesson in which the students participated in a 20-minute basketball shooting lesson led by the teacher. However, this is a very limited scenario within PE, and further research is needed with different PE activities. In contrast to Lonsdale et al.'s (2009) findings, Ward et al. (2008) reported no significant differences in pedometer step counts between choice and no choice PE groups undertaking a 7-day cardiovascular fitness unit, including jogging, kickboxing, aerobics, and rope jumping. Providing an autonomy-supportive/choice environment has also been found to lead to greater self-determination and intrinsic motivation in PE (Prusak et al., 2004; Ward et al., 2008). Furthermore, Goudas et al. (1995) investigated the motivational effects of manipulating PE teaching styles as either direct or differentiated. Higher intrinsic motivation and task involvement was reported in those in differentiated lessons who were given choices throughout their lesson (Goudas et al., 1995). The effect of providing a task involving motivational climate in PE has also been described by Barkoukis et al. (2008) and Solmon (1996). The Task Authority

Recognition Grouping Evaluation and Time (TARGET) intervention programme resulted in Greek high school students having reduced levels of worry and the intervention was associated with enhancement of teachers' and students' learning orientation, students' task orientation, students' enjoyment and students' perceived competence (Barkoukis et al., 2008).

2.10: Summary

It has been documented that PE is a key medium for health promotion and an influential mechanism to engage young people in physical activity (Biddle et al., 1998; Fairclough and Stratton, 2005; USDHHS, 1996). Furthermore, Sallis and McKenzie (1991) suggest that school PE is the most important institution to address the health-related physical activity needs of almost all children. However, PE research and interventions suggest that PE can only do so much in supplementing young people's daily volume of physical activity (McKenzie et al., 1995), because of the limited time allocated to it (Fox et al., 2004). In addition, PE has various aims including developing physically educated and active individuals, in addition to providing motor, cognitive, social, spiritual, cultural and moral development. There is little evidence to support the claim that PE actually does produce physically educated and active individuals, who engage in recommended levels of habitual physical activity, and who have competent levels of physical activity skill, knowledge, and understanding (Department for Education and Skills/Qualifications and Curriculum Authority [DfES/QCA], 1999; NASPE, 2004). Therefore, there is a need for empirical research to establish how PE influences outcomes representing the 'PE product.'

2.11: Overall Aim of the Thesis;

- To establish how PE influences outcomes representing physically educated and physical active young people.

Study 1 objectives.

- To develop and test a scale to assess students' Perceived PE Worth and Perceived PE Ability
- To explore how these two constructs are related
- To investigate age and sex differences

Study 2 objectives.

- To investigate which secondary school PE factors most strongly correlate with outcomes representing the 'PE product'

Study 3 objectives.

- To qualitatively explore the views of PE students on the effectiveness of PE in developing the 'PE product'
- To elucidate results from Study 2

Thesis study map

A thesis study map appears at the beginning of each study chapter to demonstrate the objectives and key findings of the studies, and demonstrate where each study fits in to the overall thesis.

Study	Objectives
Study 1: The Physical Education Predisposition Scale: Preliminary Development and Factorial Validation	**Objectives:** • To develop and test a scale to assess students' Perceived PE Worth and Perceived PE Ability • To explore how these two constructs are related • To investigate age and sex differences
Study 2: Exploring the contribution of school-based correlates to the 'PE product': Adolescents' physical activity, knowledge and understanding of health-related exercise, and ability levels	
Study 3: A qualitative approach to students' views on the effectiveness of PE in developing the 'PE product'	

Chapter 3

Study 1: The Physical Education Predisposition Scale:

Preliminary Development and Factorial Validation

Chapter 3: Study 1

This study has been published in the Journal of Sports Sciences and can be found in Appendix 3.

Hilland, T. A., Stratton, G., Ridgers, N. D., and Fairclough, S. J. (2009): The Physical Education Predisposition Scale: Preliminary development and validation. *Journal of Sports Sciences* **27**, 1555-1563.

3.1: Introduction

The most commonly identified PE correlates of physical activity involve predisposing factors of perceived competence, self-efficacy, enjoyment, and attitude (Barr-Anderson et al., 2008; Carroll and Loumidis, 2001; Craig et al., 1996; Dzewaltowski et al., 2007; Graber et al., 2007; Portman, 1995; Scanlan and Lewthwaite, 1986; Welk, 1999). Welk (1999) suggests that PE can play a primary role in influencing students' cost/benefit assessment of participating in physical activity (i.e., attitude affective, attitude cognitive and enjoyment), and self-perceptions (i.e., perceived competence and self-efficacy). Students who believe that PE is worthwhile are more likely to participate in physical activity outside of school (Sallis et al., 1999; Trost et al., 1997; USDHHS, 1996), whereas those who show unfavourable feelings toward PE may refrain from indulging in physical activity (Carlson, 1995; Ennis, 1996). Welk (1999) suggests that because children usually value what they are good at doing and pursue things that they value, strong links should be expected between the students' cost/benefit assessment and self-perceptions (Welk, 1999).

In addition, significant age differences have been reported in attitudes towards and enjoyment of PE with studies concluding that as students get older their scores on these variables tend to decline (Butcher and Hall, 1983; Portman, 1995; Subramaniam and Silverman, 2007). Furthermore, sex differences have been observed, with male students typically possessing more positive attitudes, higher levels of PE enjoyment and higher perceived competence than females (Carroll and Loumidis, 2001; Chung and Phillips, 2002; Stelzer et al., 2004; Trost et al., 1997). Though measures of students' PE attitudes, enjoyment and perceived competence are available there is a paucity of research evidence analysing students' PE-specific self-efficacy. For this reason there is a need to investigate this important correlate within the PE context.

The main aim of this study was to develop and test psychometrically a scale to assess secondary school students' self-perceptions and cost/benefit assessment of participating in PE. As these correlates represent the predisposing factors described in Welk's (1999) YPAPM, the scale was entitled the Physical Education Predisposition Scale (PEPS). The second aim was to explore how the students' cost/benefit assessment factors and self-perceptions were related, while the third aim was to investigate age and sex differences with respect to the variables measured.

3.2: Methods

Participants and settings.

Four hundred Year 8 and 9 students (aged 12-14 years) from four suburban state schools in the North West of England were randomly stratified by sex and

Year group and invited to participate in this study. Year 8 and 9 students were selected as they are at the stage of early adolescence when physical activity levels and interests are known to decrease. Three hundred and fifteen completed PEPS questionnaires were returned (78.5% response rate). Completion of the questionnaire was voluntary and whilst 100 students per school were initially invited to participate, a proportion of them declined. Moreover, a number of questionnaires were omitted from analysis as they were incorrectly filled out or were incomplete. The schools were all coeducational community secondary schools of similar size (number of enrolled students ranging from 850-1093), with 14-28% of students eligible for free school meals, which is slightly above the 13% national average (Department for Children Schools and Families [DCSF], 2007). Each school followed the English PE National Curriculum which typically includes a combination of games, dance, gymnastics, aquatics, athletics, and outdoor and adventurous activities (Department for Education and Employment/Qualifications and Curriculum Authority [DFEE/QCA], 1999). Games, gymnastics and dance activities were most prevalent at the time of the research.

In the four schools, named PE teachers received verbal and written information about the aims and objectives of the study and were told that it was a preliminary phase of an on-going project. Written parental consent and student assent were received from all participating students who were briefed about the aims of the study and told that the questionnaire was asking how they feel/think about PE classes. This study aimed to develop and test a scale to measure students' self-perceptions and cost/benefit assessment of participating in PE, which would be utilised in Study 2. The project received institutional ethics

committee approval and focused on how aspects of PE influence outcomes representing physically educated and physically active youth.

Instruments – The Physical Education Predisposition Scale.

Four domains representing predisposing correlates were incorporated into the PEPS in relation to PE. These were perceptions of competence, self-efficacy, enjoyment, and attitude. The identification of these items was based on (a) an examination of published scales in the psychological correlates literature, (Carlson, 1995; Cuddihy et al., 2002; Goudas et al., 1995; McAuley et al., 1989; Saunders et al., 1997; Subramaniam and Silverman, 2000), (b) satisfactory reliability and validity evidence available for children and adolescents, (c) items selected from PE scales or slightly modified from physical activity scales (d) scales with a common response format, and (e) scales that were reasonably brief so as to minimise participant burden. Feedback on the items was sought from an expert panel of University tutors who are experienced in school and PE-based research, teaching and coaching. The experts scrutinised the wording and construction of the PEPS to check that the items were appropriate for the target population. Five items were revised by editing language and grammar and subsequently 22 items were generated to measure perceived predisposing factors of students' cost/benefit assessment and self-perceptions in PE. Example items are presented in Table 3.1. A 5-point Likert scale was used anchored by *Strongly disagree* (1) and *Strongly agree* (5).

Item	Domain	Source adapted from
I love PE lessons	Enjoyment	Carlson (1995)
The things I learn in PE are useful to me	Attitude	Subramaniam and Silverman (2000)
I think I am pretty good at PE	Perceived competence	McAuley et al. (1989)
I think I have the skills I need to take part in PE	Self-efficacy	Saunders et al. (1997)

Table 3.1. Examples of domain-specific PEPS items

Procedures.

The PEPS was administered before PE classes commenced in each of the four schools during the same week in January 2008. The students were told to answer all questions as honestly as possible and not to confer with others, but to ask if they were unsure about any aspects of the questionnaire. To reduce the risk of socially desirable responses and to ensure confidentiality, students were also given envelopes in which to place their completed questionnaires. Once the questionnaires were completed and placed in the sealed envelopes, the PE teachers posted them back to the researcher. To assess test-retest reliability this process was repeated 14 days later with a sub-sample of the students from one of the schools (n = 137).

Data analysis.

Prior to data analysis the PEPS responses were checked and collated, and all negatively worded items were reverse coded. To address study aim 1 principal components analysis was conducted to provide factorial validity evidence for the newly created measure. Direct oblimin rotation was utilised as it was hypothesised that the factor structures of the instrument were conceptually

related. Analysis of eigenvalues in the scree plot was used to determine the number of factors to retain in the instrument. Subsequently, Cronbach's α was employed to assess inter-item reliability, where reliability coefficients were calculated for each item and the full instrument. Test-retest reliability was assessed using the method recommended by Nevill et al. (2001). Briefly, the frequency distributions of the test-retest differences for each item were computed, and individual item stability was claimed if ≥ 90% of the students recorded differences within ± 1.0. A scatter plot of the data was generated to check for violation of the assumptions of linearity and homoscedasticity, and demonstrated that the relationship between the variables was roughly linear and spread out. Pearson's product-moment coefficients were therefore employed to assess study aim 2; the correlation between the resultant factors. Furthermore, the data did not violate ($p > 0.05$) Levene's test for homogeneity of variance, however scores were not normally distributed, yet Pallant (2001) suggests ANOVAs are reasonably robust or tolerant of the violation of normality. As a result, study aim 3 was addressed using a 2 x 2 ANOVA to explore differences in the PEPS responses between age and sex groups. Statistical significance was set at $p < 0.05$. All analyses were conducted using the Statistical Package for the Social Sciences (SPSS) v. 14.0.

3.3: Results

Three hundred and fifteen completed the PEPS questionnaires were received from the 400 students selected to participate in the study (response rate = 78.75%). On 80 of the questionnaires the students' sex was not indicated. While this did not impact on the principal components analysis, these questionnaires

were subsequently omitted from the factorial ANOVAs as the effect of sex was a key element of these analyses.

Study objective 1.

A principal components analysis was conducted to establish initial factorial validity of the PEPS. Prior to performing the principal components analysis the suitability of the data for factor analysis was assessed. Inspection of the correlation matrix highlighted that five items had correlation coefficients greater than 0.7. These items were subsequently eliminated to achieve a determinant number greater than the criterion of 0.00001. The factorability of the correlation matrix was confirmed through the Kaiser-Meyer-Olkin value (0.95) and Bartlett's Test of Sphericity (Field, 2005) which reached statistical significance ($p < 0.001$).

Principal components analysis of the 17 remaining items revealed the presence of two components with eigenvalues exceeding 1. Kaiser's (1960) recommendation of retaining all components with eigenvalues greater than 1 was applied to the data as the sample size exceeded 250 and the average communality was equal to .6. The two components explained 60.7% of variance, and inspection of the screeplot revealed a clear break after the second component. Therefore it was decided to retain two components for further investigation. After the number of factors had been established, direct oblimin rotation was used to simplify interpretation of the factors, with the minimum factor loading criterion for display of scores set at 0.4 (Field, 2005). The final rotated solution revealed the presence of a simple two-factor structure (Table 3.2). Factor 1, labelled Perceived PE Worth was composed of items representing the cost/benefit assessment of participating in PE, reflecting

attitude affective and attitude cognitive (Welk, 1999). Items within factor 2, labelled Perceived PE Ability were indicative of perceptions of PE competence and self-efficacy. However, three items (*I think I can take part in PE no matter how tired I feel* [Self-efficacy], *I don't like PE because other students laugh at me or give me a hard time* [Enjoyment], and *I don't feel part of PE* [Enjoyment] were removed as they loaded on the Perceived PE Ability factor yet were originally intended for the Perceived PE Worth factor. The six items on the Perceived PE Worth factor with the highest loadings were retained, with three of the items negatively worded to limit socially desirable responses. Therefore, the final solution was a two-factor structure including 11 of the original items; six Perceived PE Worth items and five Perceived PE Ability items. Both factors demonstrated an acceptable level of internal consistency (Perceived PE Worth: α = 0.91; Perceived PE Ability: α = 0.89). The proportion of students recording individual item test-retest differences within ±1.0 ranged from 92.7% to 99.3% ($M \pm SD$ = 96.2 ± 2.3%). More than the recommended 90% of students recorded acceptable test-retest differences therefore demonstrating acceptable test-retest reliability.

Item	Factor 1- Perceived PE Worth	Factor 2- Perceived PE Ability
Attitude cognitive-The things I learn in PE are useful to me	**0.88**	
Attitude cognitive-The things I learn in PE are not important to me	**0.87**	
Attitude cognitive-The things I learn in PE are useless to me	**0.85**	
Attitude affective-The things I learn in PE lessons get me excited about PE	**0.84**	
Attitude affective-The things I learn in PE make lessons interesting for me	**0.81**	
Attitude affective-The things I learn in PE make lessons boring for me	**0.79**	
Self-efficacy-I think I can take part no matter how tired I feel	0.70	
Enjoyment-I love PE lessons	0.67	
Enjoyment-I like PE because I like working with others	0.59	
Attitude affective-The things I learn in PE lessons make learning unpleasant for me	0.49	
Enjoyment-I don't like PE because other students laugh at me or give me a hard time		0.84
Perceived Competence- I am pretty skilled in PE		**0.63**
Self-efficacy-I have the confidence to take part in PE		**0.61**
Enjoyment-I don't feel part of PE lessons		0.58
Perceived Competence-I feel pretty able in PE		**0.58**
Perceived Competence-I am satisfied with my performance in PE		**0.55**
Self-efficacy-I think I have the skills I need to take part in PE		**0.47**
Eigenvalues	**8.5**	**6.2**

Table 3.2. Direct Oblimin rotation of two factor solution for Perceived PE Worth and Perceived PE Ability predisposing factors. Retained items highlighted in bold.

Study objective 2.

The associations between Perceived PE Worth and PE Ability were investigated using data from 235 questionnaires. Results demonstrated that there was a strong positive correlation between the two variables ($r = 0.69$, $p < 0.001$), with high levels of Perceived PE Worth associated with high levels of Perceived PE Ability. Further correlations by sex and age were performed and as

demonstrated in Table 3.3, similar positive associations existed between the two dependent variables.

	n	*r*	Sig.(2-tailed)
Male	105	0.68	<0.001
Female	130	0.71	<0.001
Year 8	123	0.69	<0.001
Year 9	112	0.67	<0.001

Table 3.3. Pearson product-moment correlations between measures of Perceived PE Worth and Perceived PE Ability.

Study objective 3.

Data from 235 questionnaires were analysed to address study aim 3. Students' Perceived PE Worth and PE Ability scores are presented in Table 3.4. Boys reported significantly higher values on both aspects of the PEPS than girls (Perceived PE Worth, $F(1, 231) = 17.9$, $p < 0.001$; Perceived PE Ability, $F(1, 231) = 5.8$, $p = 0.02$). Year 8 students scored significantly higher than Year 9 counterparts on Perceived PE Worth ($F(1, 231) = 8.2$, $p = 0.005$) and Perceived PE Ability ($F(1, 231) = 12.3$, $p = 0.001$). There were no significant interactions between sex and age.

	n	Perceived PE Worth	Perceived PE Ability
Sex group			
Boys	105	3.99 (0.75)	3.98 (0.86)
Girls	130	3.48 (0.95)	3.67 (0.73)
Year group			
8	123	3.89 (0.88)	3.99 (0.78)
9	112	3.50 (0.89)	3.62 (0.79)

Table 3.4. Means (SD) for study variables by sex and age

3.4: Discussion

The aims of this study were to: (1) develop and assess the factorial validity and reliability of the PEPS; (2) investigate the relationship between Perceived PE Worth and PE Ability factors; and (3) use the PEPS to explore age and sex differences with respect to the two factors. The development of an instrument to assess PE predisposing factors is warranted as research suggests that students' perceptions of competence, self-efficacy, enjoyment and attitudes towards PE influences their participation in physical activities outside of school (Carroll and Loumidis, 2001; Chase, 1998; USDHHS, 1996). Existing tools have focused separately upon students' attitudes toward PE (Subramaniam and Silverman, 2000), their enjoyment (Carlson, 1995) and perceptions of competence (McAuley et al., 1989). The present study established the factorial validity, internal consistency, and test-retest stability of the PEPS, with the final solution a simple two-factor structure including 11 of the original items.

With regard to the second aim of this study, Perceived PE Worth and PE Ability were significantly and strongly correlated (r = .7) (Pallant, 2001). Therefore, Perceived PE Ability is strongly related to Perceived PE Worth and vice versa, which is in line with the YPAPM (Welk, 1999). Brustad (1993) demonstrated a similar relationship when he found that perceived competence in PE is positively associated with PE enjoyment. Thus, if PE is fun and enjoyable then children are likely to gain also in perceived competence and self-efficacy. Similarly if PE provides opportunities for enhanced perceptions of competence and confidence, children are more likely to enjoy their experiences and maintain their motivation.

The final aim of the study was to explore age and sex differences. The results confirmed past research where Perceived PE Worth and PE Ability variable scores are greatest among boys compared to girls, and among younger students compared to older ones (Cardon et al., 2005; Carroll and Loumidis, 2001; Chung and Phillips, 2002; Stelzer et al., 2004; Trost et al., 1997). Such sex differences could relate to boys and girls having different perceptions of enjoyment, competence and success when in PE (Subramaniam and Silverman, 2007). Also, it is possible that the traditional male bias and focus on traditional team sports in PE (Carroll and Loumidis, 2001) may cause girls to perceive PE as less enjoyable. Moreover, it is well founded that boys are more physically active than girls in free living and PE contexts (Klasson-Heggebo and Anderssen, 2003; McKenzie et al., 1995; Riddoch et al., 2004), which may have an effect on perceptions of PE Worth and Ability.

The observed sex differences may also have been attributed to differences in teacher feedback during PE, as generally male students receive more attention in class from teachers than female students (Duffy et al., 2001). Specifically it has been found that boys receive more feedback, particularly praise, criticism, and technical information, than girls (Dunbar and O'Sullivan, 1986; Griffin, 1981). This enhanced feedback may lead to the advanced development of motor skill performance and cognitive learning in boys, which has been found to heighten students' perceptions of competence, effort and enjoyment in PE (Horn et al., 1993; Nicaise et al., 2007a). However, it has also been reported how girls perceive a higher frequency of encouragement and technical information while boys received more criticism from their teachers, who were also more likely to ignore boys' technical errors (Nicaise et al., 2007a; Nicaise et al., 2006; Nicaise et al., 2007b). These contrasting results may be attributed to the limitations and characteristics of the methods adopted, as the early studies utilised observational methods, whereas Nicaise et al.'s (2007a; 2006; 2007b) studies employed a questionnaire to measure students' perceptions of teacher feedback.

Evidence relating to habitual physical activity also suggests that boys receive more parental encouragement and support to be physically active and this has been linked to greater perceived competence in physical activity (Brustad, 1993; Gustafson and Rhodes, 2006). Furthermore, Fredricks and Eccles (2005) found both mothers and fathers of sons reported they bought more athletic equipment, encouraged sport participation and spent more time on sport activities, than did parents of daughters. These parental stereotypes support the traditional notion that males should be more able at physical activity, which favours boys'

perceived competence and self-efficacy beliefs (Fredricks and Eccles, 2005). Therefore, this greater parental encouragement and support towards boys' habitual physical activity may augment their self-perceptions in PE (Perceived PE Worth and PE Ability). However, in contrast, Ornelas et al. (2007) reported more similarities than differences between mothers' and fathers' parenting styles and their influences on male and female adolescents' physical activity behaviours. This lack of consistency between studies may be influenced by the fact that a number of diverse self-report questionnaires have been utilised to measure parental support (Raudsepp, 2006) and also the use of self-reports for measuring physical activity.

Puberty is a major event in adolescence and could influence changes in activity over time (Bradley et al., 2000). On average girls mature two years earlier than boys (Malina et al., 2004) and it is possible that the girls' lower Perceived PE Worth and Ability scores were related to this earlier age of maturation (Thompson et al., 2003). During biological maturation the increase in adiposity among girls from approximately 15% to 22% body fat (Malina et al., 2004), leads to changes in body shape and size that are generally opposed to competence in athletic events and physical activities (Niven et al., 2007). Girls' psychological responses to these physical changes include reductions in self-esteem, self-perceptions and poor body image which can contribute to negative feelings about their physical activity competencies (Davison et al., 2007; Kolody and Sallis, 1995; Murdey et al., 2004). This lowered psychological profile and well-being has unsurprisingly been linked with a reduction in enjoyment of physical activity (Ashford et al., 1993), and thus may have been significant in this study.

The significant age-related differences found in this study concur with previous results (Butcher and Hall, 1983; Portman, 1995; Subramaniam and Silverman, 2007). The older students reported less enjoyment and less positive attitudes towards PE (Perceived PE Worth) compared to the younger students. A possible explanation for this is the often repetitive and prescriptive nature of the PE National Curriculum, which may restrict student initiative and autonomy (Ntoumanis, 2001). Over time this lack of autonomy may lead to some students' interest being diminished as they get older and strive to be more independent in their learning (Carlson, 1995; Subramaniam and Silverman, 2007). These results suggest that physical educators should be more aware of the psychological differences of boys and girls of different ages. For example, older students need to be provided with a greater variety of activities and opportunities to discover and problem solve, as teachers need to sustain their interest (Subramaniam and Silverman, 2007). In addition students need to experience success and receive support from teachers in order to increase their perceptions of competence, self-efficacy and enjoyment (Portman, 1995). These positive experiences may help young people towards lifelong physical activity. From a health perspective, the decline in Perceived PE Ability and Worth as age increases is worrying. Students with low enjoyment and self-perceptions in PE may become physically inactive as they get older. In order to reverse this trend, PE teachers need to foster a motivational climate where enjoyment and perceptions of competence are emphasised.

There were a number of limitations of this cross-sectional pilot study. (1) The participants were taken from four schools in North West of England, therefore

while the findings may be representative of 12-14 year old students in English suburban state schools, it may be problematic to generalise the results beyond this population; (2) confounding variables such as body composition and biological maturation were not assessed, and therefore the effects of these factors on the dependent variables were unknown; (3) a proportion of data could not be analysed as students failed to answer the sex question; therefore the presentation of this question has subsequently been amended; (4) though every effort was made to standardise the questionnaire administration and encourage the students to respond honestly, the possibility of socially desirable and therefore biased responses cannot be ruled out.

3.5: Conclusions

This study successfully developed and tested the PEPS, which demonstrated an acceptable level of factorial validity, internal consistency and test-retest reliability. A strong positive relationship was found between the Perceived PE Worth and Ability factors, and the expected significant age and sex differences were found. These results support the potential of the PEPS as a concise and straightforward measurement tool for teachers and researchers to use in the PE setting. The PEPS can impact upon practice as PE teachers could adapt or amend their teaching styles depending upon students' Perceived PE Worth and Ability scores. Furthermore, teachers could also utilise the scores to identify and group specific students (e.g., those with higher or lower perceptions of ability) and pedagogical strategies could be implemented to enhance students' Perceived PE Worth and Ability. Researchers may employ the PEPS in order to enhance the knowledge base within this field, and reveal inter-relationships

between Perceived PE Worth and Ability and other variables of interest, such as physical activity engagement.

Thesis Study Map

Study	Objectives and Key Findings
Study 1: The Physical Education Predisposition Scale (PEPS): Preliminary Development and Factorial Validation	Objectives: • To develop and test a scale to assess students' Perceived PE Worth and Perceived PE Ability • To explore how these two constructs are related • To investigate age and sex differences Key findings: • Factorial validity, internal consistency, and test-retest stability of the PEPS was established • Perceived PE Worth and PE Ability were significantly and strongly correlated (r = .7) • Perceived PE Worth and Perceived PE Ability scores were greatest among boys compared to girls, and differed as students got older
Study 2: Exploring the contribution of school-based correlates to the 'PE product': Adolescents' physical activity, knowledge and understanding of health-related exercise, and ability levels	**Objectives:** • **To investigate which secondary school PE factors most strongly correlate with outcomes representing the 'PE product'**
Study 3: A qualitative approach to students' views on the effectiveness of PE in developing the 'PE product'	

Chapter 4

Study 2: Exploring the contribution of school-based correlates to the 'PE product': Adolescents' physical activity, knowledge and understanding of health-related exercise and ability levels.

Chapter 4: Study 2

This study has been accepted for publication in Pediatric Exercise Science and can be found in Appendix 3.

Hilland, T. A., Ridgers, N. D., Stratton, G., and Fairclough, S. J. (in press): Association between selected demographic, biological, school environmental and Physical Education based correlates and adolescent physical. *Pediatric Exercise Science.*

4.1: Introduction

PE aims to improve students' physical skilfulness, their conceptual understanding of physical activity, and enhance their positive attitudes towards active and healthy lifestyles (DfES/QCA, 1999). Thus, a key goal of PE is to "develop physically educated individuals who have the knowledge, skills and confidence to enjoy a lifetime of physical activity," (NASPE, 2004, p.1). To achieve this goal PE must strive to produce physically educated and physically active youth. The evidence of this 'PE product' can be conceptualised in terms of young people who engage in recommended levels of habitual physical activity, and who have competent levels of physical activity skill, knowledge, and understanding.

In the context of applying the YPAPM to PE, enabling and predisposing correlates such as the PE environment, perceptions of PE competence, PE self-efficacy, PE enjoyment, and attitudes may impact upon the outcomes representing the 'PE product.' Welk (1999) suggests that school PE can play a

primary role in influencing students' predisposing correlates relating to perceptions of ability and the costs and benefits of participating. It has been frequently reported that self-efficacy and perceived competence are positively associated with physical activity (Barr-Anderson et al., 2007; Biddle et al., 2004; Biddle et al., 2005; Craig et al., 1996; Sallis et al., 2000; Trost et al., 1997). Carroll and Loumidis (2001) found that children who perceived themselves as more competent in PE participated in significantly more physical activity outside school and at a higher intensity, than those who perceived themselves to be less competent. Furthermore, if children experience fun and enjoyment, they are more likely to take part, persevere, and be dedicated to that particular activity (Carroll and Loumidis, 2001; Craig et al., 1996; Scanlan et al., 1993; Scanlan and Lewthwaite, 1986; Scanlan et al., 1989; Stucky-Ropp and DiLorenzo, 1993). Research has found that enjoyment in PE can affect the level of children's physical activity participation outside of school (Barr-Anderson et al., 2007; Carroll and Loumidis, 2001). Students who demonstrate enjoyment and positive attitudes towards PE and perceive themselves as able and competent in PE may be more likely to participate in physical activity outside of school (Sallis et al., 1999; Trost et al., 1997; USDHHS, 1996). Within Welk's (1999) YPAPM, environmental variables are described as enabling factors. The school physical environment may be influential for physical activity (Davison and Lawson, 2006), as the majority of youth spend around 40% of their waking hours there (Fox et al., 2004). Also, Cradock et al. (2007) concluded that larger school campuses, buildings and play areas per enrolled student were associated with increased physical activity. Furthermore, opportunities to exercise, access to facilities, and physical improvements (e.g. tennis courts,

football goals) are positively associated with adolescent physical activity (Sallis et al., 2001; Sallis et al., 2000).

Together, these findings reinforce the influence of multidimensional PE predisposing and enabling factors on physical activity participation. PE claims to promote lifetime physical activity by producing 'physically educated youth' (DfES/QCA, 1999; NASPE, 2004) but there is little evidence (Dale et al., 2000; Fairclough and Stratton, 2005; McKenzie et al., 1995; Myers et al., 1996) available to support this claim. Therefore, the aim of this study was to investigate which secondary school PE factors most strongly correlate with outcomes representing the 'PE product,' namely habitual physical activity, PE ability, and physical activity knowledge and understanding.

4.2: Methods

Participants and settings.

One hundred and forty-six secondary schools from North West England were initially invited to participate in this study. Heads of PE departments in each school were sent a covering letter along with a participant information sheet, consent form and a survey measuring the school PE environment. To maximise response rates those teachers who completed and returned the PE environment survey were entered into a prize draw for one of four £100 sports equipment/kit vouchers for their schools. Initially, 30 schools returned the environment survey (20.5% response rate). Two weeks after sending the first invitation to participate in the study, a follow-up letter was sent out to those schools who had failed to respond, reiterating the significance of the study and

the importance of their participation. A further 10 schools returned the environment survey, giving an overall response rate of 27.4% (40/146). Out of these 40 schools, 17 demonstrated a willingness to participate in the study. The main outcome variables from the PE environment survey were used as the basis of school selection for participation in the study. These variables included total physical activity spatial area per number of students, permanent resources per student, PE budget per student, and curricular PE time per student. A composite PE environment score was calculated for each school, and schools were then stratified into tertiles representing the range of PE environment provision available in the schools (labelled high, average and low). This method was used to select the schools in order to investigate the potential influence of different PE environments on outcomes representing the 'PE product.' This stratification process led to the selection of a school with "high provision" and two schools with "moderate provision." No schools labelled as "low provision" demonstrated a willingness to participate further in the study.

From these three schools all Year 8 (n = 524) and Year 9 (n = 509) students were invited to participate in the research, as they are at the stage of early adolescence when physical activity levels and interests are known to decrease (Caspersen et al., 2000; Sallis et al., 2000; Telama and Yang, 2000; Trost et al., 2002). Each child was given an information letter outlining the project, its assessment methods and attached consent forms for the child and parent/guardian. The children returned the consent forms to form tutors or the PE department, and these were collected by the researcher. The response rate was 28.9%, which consisted of 299 Year 8 and 9 children (90 boys, 209 girls; aged 12-14 years). Two of the three schools were co-educational community secondary schools and the other school was an independent girls' secondary

school. Each school followed the English PE National Curriculum which typically includes a combination of games, dance, gymnastics, aquatics, athletics, and outdoor and adventurous activities (DfES/QCA, 1999). The project received institutional ethics committee approval.

Measures: predictor variables.

Anthropometry.

Measurements of stature, sitting stature and body mass and were taken using standardised procedures. Students were measured without footwear whilst wearing minimal school uniform (trousers/skirt, shirt). Two measurements were taken for each anthropometric variable, with a third being required if the first two measurements differed by more than 0.4 kg for weight and 0.4 cm for stature and sitting stature (Mirwald et al., 2002). The mean of the two measurements was calculated, but if three measurements were taken, the median value was used (Mirwald et al., 2002).

Stature.

Measurements of stature were recorded using a portable stadiometer (Seca Ltd., Birmingham, UK). Students were asked to stand upright against the stadiometer and the vertical distance between the floor and the highest point of the skull was measured and recorded to the nearest 0.1 cm. The researcher ensured the students' head remained level and they were asked to breathe in when measured.

Sitting stature.

Measurements of sitting stature were recorded using a portable stadiometer (Seca Ltd., Birmingham, UK). Students were asked to sit on the floor at the base of the stadiometer, with their legs slightly bent out in front of them, whilst keeping their back straight. Measurements of the vertical distance between the floor and the highest point of the skull was measured and recorded to the nearest 0.1 cm. The researcher ensured the students' head remained level and they were asked to breathe in when measured. Leg length was then calculated by subtracting sitting height from stature.

Body mass.

Measurements of body mass were recorded using calibrated scales (Seca Ltd., Birmingham, UK) to the nearest 0.1 kg.

Body mass index (BMI).

Body mass index (BMI) was calculated as (weight (kg) / height (m) ^{2}). BMI is used as an estimation of overweight and obesity prevalence in child and adult populations (Chinn and Rona, 2001).

Maturity status.

Somatic maturity was estimated according to Mirwald et al.'s (2002) maturity offset sex-specific regression equations. These equations determine years from attainment of peak height velocity (PHV), which is a common technique used in longitudinal studies (Malina et al., 2004). The maturity offset equation for boys is as follows:

Maturity Offset = -9.236 + 0.0002708·Leg Length and Sitting Height interaction – 0.001663·Age and Leg Length interaction + 0.007216·Age and Sitting Height interaction + 0.02292·Weight by Height ratio.

The maturity offset equation for girls is as follows:

Maturity Offset = -9.376 + 0.0001882·Leg Length and Sitting Height interaction + 0.0022·Age and Leg Length interaction + 0.005841·Age and Sitting Height interaction – 0.002658·Age and Weight interaction + 0.07693·Weight by Height ratio.

A negative value indicated the number of years before the age at PHV, and a positive value indicated the number of years a participant was beyond the age at PHV.

Socio-economic status (SES).

SES was calculated using the 2007 Indices of Multiple Deprivation (IMD) which are comprised of seven domains of deprivation. These include income deprivation, employment deprivation, health deprivation and disability, education, skills and training deprivation, barriers to housing and services, crime and the living environment deprivation domains (Department for Communities and Local Government, 2008). IMD data were derived from the students' home postcodes, which were uploaded to the GeoConvert applications (MIMAS, 2008) to locate raw and ranked IMD scores from the National Statistics Postcode Directory database (National Statistics Postcode Directory, 2008).

Chronological age.

Chronological age was calculated by subtracting each participant's date of birth from the measurement date.

Physical education predisposition scale (PEPS).

The PEPS (Hilland et al., 2009) measures Welk's (1999) predisposing correlates of enjoyment, attitudes, perceived competence and self-efficacy within the PE context. The PEPS consists of 11 items, each scored on a 5-point Likert scale anchored by *Strongly disagree* (1) and *Strongly agree* (5). Perceived PE Worth is calculated from the mean of six items representing the cost-benefit assessment of participating in PE, which reflect attitude affective and attitude cognitive (Welk, 1999). Perceived PE Ability is derived from the mean of the remaining 5 items which are indicative of perceptions of competence and self-efficacy in PE. Higher Perceived PE Worth and Perceived Ability scores reflect more positive predispositions to PE, while lower scores indicate less positive predispositions. The PEPS has previously demonstrated acceptable construct validity, internal consistency (Perceived PE Worth: α = 0.91; Perceived PE Ability: α = 0.89), and test-retest reliability with adolescent boys and girls (Hilland et al., 2009).

Out of school physical activity impact and awareness.

Students were asked to indicate how much they personally agreed with two statements; (1) *What we learn in PE can have an impact on the types of physical activities, exercise and sports we take part in outside of school*, and, (2) *PE lessons help make us aware of opportunities and places close to where we live, where we can take part in physical activities, exercise and sports.* The

statements aimed to assess students' perceptions of the role of PE in relation to their physical activity participation outside of school. Each statement was scored on a 5-point Likert scale anchored by *Strongly disagree* (1) and *Strongly agree* (5). Feedback on the items was sought from an expert panel of university tutors who are experienced in school and PE-based research and teaching. The experts scrutinized the wording of the questions to check their content validity. The inter-item reliability of these items was analysed, and a Cronbach alpha coefficient of .73 was calculated suggesting that the two questions had acceptable, yet moderate internal consistency. However, it was decided to keep the scores from the statements separate to investigate the subtle differences of responses to each statement in relation to the other variables.

School environment survey for PE.

Data from the initial PE environment survey, which was used as the basis of school selection for participation in the study, were included as enabling factors of physical activity (Welk, 1999). The survey is organised into four distinct sections including (1) school demographic and context-specific data, (2) number and size of spaces, (3) number of permanent physical resources and PE department's annual budget and, (4) time available for PE. The main outcome variables of interest were number of students on roll, FSM eligible students (%), number of indoor spaces, indoor area per number of students on roll, number of outdoor spaces, outdoor area per number of students on roll, permanent resources per student, budget per student, curricular and extra-curricular time (minutes). This scale has demonstrated acceptable criterion validity (r = .8 - .99), and test-retest reliability with ICCs ranging from .93 through 1.0 (Fairclough et al., personal communication).

Measures: outcome variables.

Self-reported physical activity: The physical activity questionnaire for older children (PAQ-C).

Self-reported physical activity was assessed using the Physical Activity Questionnaire for Older Children (PAQ-C) (Crocker et al., 1997). The PAQ-C is a 7-day recall instrument for children in grades four and higher, approximately ages 8-14 (Kowalski et al., 2004). The questionnaire measures habitual MVPA during the school year and defines physical activity as "sports, games, or dance that make you sweat, make your legs feel tired, or make you breathe hard" (Kowalski et al., 1997a). The PAQ-C consists of ten items, nine of which are used to derive an overall activity score. The other question determines if sickness or any other events prevented the child from doing his/her regular activity. Each statement is scored on a five point Likert scale ranging from low (1) to very high levels of activity (5), with the overall PAQ-C score calculated as the mean of the nine items.

The first question is an activity checklist consisting of common physical activities, sports, leisure activities and games plus two other additional self-reported activities, with a five point frequency response scale ("none" to "seven times or more" in a week). The purpose of this item is to act as a memory cue. Six questions assess activity in PE classes, break and lunch times, right after school, in the evenings, and on the weekend. One question asks which statement "describes you best for the last 7 days" with five statements

describing low to very high activity levels and the other question asks the child how often he/she did physical activity for each day in the previous week.

The PAQ-C has been used extensively and successfully to classify children and adolescents into different activity levels and to investigate the relationship between physical activity and health outcomes (Bailey et al., 1999; Niven et al., 2007; Thompson et al., 2003; Welk et al., 2003). Furthermore it has demonstrated evidence of being a valid and reliable measure of general physical activity during the school week (Crocker et al., 1997; Kowalski et al., 1997a; Kowalski et al., 1997b). Test-retest reliability using intraclass correlation coefficient was $r = 0.75$ for boys and $r = 0.82$ for girls (Crocker et al., 1997). In addition Kowalski et al. (1997a) concluded that the PAQ-C was moderately and significantly related to other physical activity measures including the Caltrac motion sensor ($r = .39$), a seven day physical activity recall interview ($r = .46$), a self-administered activity rating ($r = .63$) and teachers' ratings of children's physical activity levels ($r = .45$).

Self-reports are the most commonly utilised form of assessment for measuring physical activity levels in children and adolescents (Kowalski et al., 2004). The PAQ-C is relatively quick to complete (<20 minutes), cost effective, has low staff burden, is easily understood and administered and produces a large amount of physical activity data in a short time period (Crocker et al., 1997; Kowalski et al., 1997a; Kowalski et al., 1997b). Also, the PAQ-C utilises memory cues which enhances memory recall ability of children and adolescents (Crocker et al., 1997). There are however a number of limitations with the PAQ-C. It cannot be used to calculate estimates of caloric expenditures, it does not provide

frequency, intensity and time information about physical activity and is unable to assess physical activity during summer and holiday periods, therefore only assesses activities for individuals in the school system (Crocker et al., 1997; Kowalski et al., 2004; Kowalski et al., 1997a; Kowalski et al., 1997b).

Objective physical activity: accelerometry.

Physical activity was objectively assessed in a sub-sample of students (n = 140) for seven consecutive days using ActiGraph accelerometers (Model GT1M, ActiGraph LLC, Pensacola, FL). The GT1M ActiGraph is small and lightweight (3.8 x 3.7 x 1.8cm, 27g), and is the most commonly objective tool with which to assess physical activity (Corder et al., 2008). It has previously been validated in children to estimate physical activity and energy expenditure (Trost et al., 2000; Trost et al., 1998). In addition Dale et al. (2000) suggests that the Actigraph has good potential for documenting the natural physical activity patterns of children. The ActiGraph is a uni-axial accelerometer that measures vertical acceleration and deceleration between the magnitudes of 0.05-2g. The accelerometer enables the monitoring of human motion (frequency and intensity), to be filtered and converted to a numerical value (counts) and these counts are subsequently summed over a specified time interval (epoch), which is specified prior to the commencement of data collection (Baquet et al., 2007; Tryon and Williams, 1996). The recorded counts for each epoch represent the intensity of the activity undertaken during that time period. At the end of each epoch, the summed value is stored in the memory and the ActiGraph is automatically reset to zero (Tryon and Williams, 1996). In this study, a 5 second epoch was used to collect the raw data to account for the sporadic nature of children's physical activity, which includes very short bursts of intense physical activity interspersed with

varying intervals of low and moderate intensity activity (Bailey et al., 1995; Rowlands et al., 2008a). Nilsson et al. (2002) suggests shorter epochs can provide a more detailed picture of children's physical activity patterns.

Accelerometers are motion sensors that capture information regarding the intensity, frequency and duration of physical activity (Rowlands et al., 2006; Welk, 1999). Acceleration is defined as the change in velocity over time; therefore accelerometers assess physical activity through the body's acceleration (Corder et al., 2008; Freedson et al., 2005). Accelerometers are relatively unobtrusive, practical and have the ability to store large amounts of data (Freedson et al., 2005; Nilsson et al., 2002). However, they are limited by their capacity to assess static physical activities, non weight-bearing activities that require little body movement like cycling and do not accurately capture certain terrain changes such as gradient (Corbin et al., 2004; Trost et al., 2002). Therefore, these instruments may not be sensitive to many of the complex movement patterns of children.

The students wore the ActiGraph accelerometer over their right hip (anterior to the iliac crest) which was secured with an elastic belt. To maximise the quality of the data, strategies were employed to encourage compliance. Students were given simple written and verbal instructions to wear the monitor over their right hip, making sure the belt was tight enough to stop the monitor from flapping about but not so tight that it is uncomfortable, to wear it all day from waking up to bedtime only removing the monitor for sleeping, bathing, showering, swimming, and any contact sports (i.e., rugby and wrestling). They were directed to go about their normal activities whilst wearing the monitor, and if

possible forgetting that they were wearing it and finally were told that it was ok to wear the belt on the inside or the outside of their clothes. The researcher also demonstrated how to wear the device properly and reminded the students of the importance not to forget. In addition to distinguish between wear time and sleep time, students were given an Acti-log sheet and were asked to record the time when the ActiGraph was put on in the morning and removed at night before bed. They were also asked to record any other times when the monitor was removed and the reason for the monitor being removed (e.g., during showering, contact sports, etc). This log was to be signed by a parent/guardian each day to promote the children's compliance.

At the end of the data collection period data were downloaded using Actilife software (ActiGraph LLC, Pensacola, FL). This produced individual files, linked according to participant, containing movement counts recorded at each 5 second interval. Downloaded files were initially checked for compliance to the monitoring protocol using customised software (MAHUffe; www.mrc-epid.cam.ac.uk). Using information from the log sheets students' wear times were manually adjusted upwards, increasing the number of students meeting the wear time criteria, if ActiGraphs had been legitimately removed during physical activity (e.g., swimming, rugby, etc). Sustained 20 minute periods of zero counts were deemed to indicate that the ActiGraph had been removed, and total "missing" counts for those periods represented the duration that monitors were not worn (Catellier et al., 2005). For inclusion in the analyses each child was required to have produced counts for ≥ 670 minutes and ≥ 555 minutes on each weekday and weekend, respectively. These figures represent "non-missing" counts for at least 80% of a standard measurement day, which

was defined as the length of time that at least 70% of the sample wore the monitor (Catellier et al., 2005). Data from students with at least 3 valid measurement days (including at least 1 weekend day) were retained for further analysis as this was deemed a reliable minimum wear time (Mattocks et al., 2008). Forty-eight students (27 boys) did not meet the minimum wear time criteria and so were excluded from the data set, leaving a final sub-sample size of 113.

Minute by minute activity counts were uploaded to MAHUFFE data reduction programme. The number of minutes of light (LPA), moderate (MPA), vigorous (VPA) and very vigorous (VVPA) were calculated using Freedson et al.'s (1997) cut-points (see Table 4.1). These cut-points are age specific (6-16 year olds) and were derived from Freedson et al.'s (1997) energy expenditure equations:

METs = 2.757 + (0.0015 • counts/min $^{-1}$) - (0.08957 • age [yr]) - (0.000038 · counts/min $^{-1}$ • age [yr]).

These cut-points have been commonly used in previous large-scale studies in North America and Europe (Ruiz et al., 2006; Trost et al., 2002), and are age and sex-specific.

	MET range	12 years	13 years	14 years
Light	< 3.0	1 - 1261	1 - 1398	1 – 1546
Moderate	3.0 – 5.99	1262 - 4135	1399 - 4380	1547 - 4645
Vigorous	6.0 – 8.99	4136 - 7008	4381 - 7362	4646 - 7744
Very vigorous	> 8.99	> 7008	> 7362	> 7744

Table 4.1. Freedson's (1997) age-specific cut-points (counts • min^{-1})

Knowledge and understanding.

Knowledge and understanding of health-related exercise (HRE) was assessed using five multi-choice items (Fairclough and Ridley, 2001) based on the knowledge and understanding requirements of the English PE National Curriculum (DFEE/QCA, 1999). Assessment of knowledge and understanding of HRE is essential as PE aims to improve students' conceptual understanding of physical activity (DfES/QCA, 1999) and is a key element of producing physically educated students. Selection of these questions was approved from an expert panel of university tutors who are experienced in school and PE-based research and teaching. Each question has 4 possible responses, only one of which correctly related to the elements of knowledge and understanding described in the PE National Curriculum. To minimise the likelihood of guessing the correct answers, each question contained a response of 'not sure.' Students were given a total score out of five.

Teachers' ratings of ability.

Based on their professional knowledge and assessment of the students, PE teachers were asked to rate all of their participating students on overall ability in PE. Students were rated on a 3-point scale anchored by 1 (below average) to 3 (above average).

Data analysis.

Preliminary checks for normality and homogeneity of variance were conducted on the descriptive data. Inspection of the histograms and Normal Q-Q Plots for both boys and girls revealed that some variables were normally distributed while others were skewed. Parametric statistics are known to have more power to

detect differences, and they are argued to be sufficiently robust to withstand violations of the assumption of normality (Field, 2005; Vincent, 2005). Therefore, it was decided to employ parametric techniques of t-tests and analysis of covariance (ANCOVA), although it is acknowledged that ANCOVAs are more robust to violations than t-tests.

Independent – samples t-test.

Initially the descriptive characteristics of boys and girls were analysed using independent t-tests. Boys' and girls' mean age, body mass, stature, BMI, maturity offset and deprivation scores were compared to test whether there were any statistically significant sex differences.

One-way analysis of covariance (ANCOVA).

ANCOVA was used in the study to assess the sex differences on predictor and outcome variables, whilst controlling for any of the descriptive characteristics that were significantly different between boy and girls. To assess the meaningfulness of the findings the effect size (Cohen's *d*) was calculated.

Multilevel modelling (MLM).

In the social world, many data have an inherent hierarchical structure that can affect them (Kreft and De Leeuw, 1998). For example, a person's behaviour can be explained by taking into account the context, such as class, school, or organisation. MLM is a data analytic technique in which variability at one level of analysis can be modelled as a function of variability at another, higher order level (Barkoukis et al., 2008). The hierarchy in this study involved a two-level data structure, where children were defined as the first level unit and school as

the second level unit (Twisk, 2006). The data were analysed using MLwiN 1.10 software (Institute of Education, University of London, UK). School was included as a second level unit to control for the effect that this particular context could have on the children's physical activity behaviours and self-perceptions (Twisk, 2006). Welk's (1999) YPAPM highlights the importance of considering how a person's environment (enabling factors) can influence behaviour both directly and indirectly. Students' physical activity, PE ability, and physical activity knowledge and understanding can be a result of a combination of individual and environmental characteristics.

MLM is considered to be the most appropriate data analysis technique for nested data (Goldstein, 1995), and builds upon single level regression analyses. Two analyses were conducted for each outcome variable; the first analyses determined the effect of sex (Model 1), whist the second (Model 2) determined the effect of all other student and school level predictor variables. The effect of the predictor variables on each outcome variable was assessed for significance by comparing the – 2 log likelihood for each model on the Chi-square distribution with 1 degree of freedom (Twisk, 2006) and using the Wald statistic (Twisk, 2006). The Wald statistic is calculated using the following equation: Wald statistic = (Regression Coefficient/Standard Error)^2.

4.3: Results

Descriptive analyses: predictor variables.

Descriptive (± SD) anthropometric, maturity status and SES characteristics of the students are presented in Table 4.2. Girls were younger, heavier, and had

higher BMI scores than boys. However, t-tests demonstrated that the only significant difference between the sexes was maturity offset (t (293) = -22.48, p < 0.01), where girls were 0.92 years beyond the age at PHV, compared to boys who were 1.17 years before the age at PHV.

	Boys	Girls	*P*
Age (years)	13.16 ± 0.58	13.06 ± 0.59	0.20
Body Mass (Kg)	52.43 ± 12.46	53.28 ± 13.17	0.61
Stature (m)	1.59 ± 0.09	1.59 ± 0.07	0.77
BMI (Kg • m²)	20.60 ± 3.78	20.88 ± 4.35	0.60
Maturity offset (years)	-1.17 ± 0.88	0.92 ± 0.66	<0.01
Deprivation score	34.42 ± 21.76	37.39 ± 21.49	0.28

Table 4.2. Descriptive characteristics of the sample (n = 295; mean ± SD)

School level characteristics are shown in Table 4.3. The schools ranged in size, from 512-1650 enrolled students. In one of the schools the percentage of students eligible for free school meals was above the 13% national average (DCSF, 2007), at 26%. Schools had around 4-9 spaces for PE, measuring between 7,589 and 185,158.74 meters^2. In relation to equipment and facilities, 42-71 permanent resources were reported and the annual budget for PE equipment and resources ranged from £2,180 - £17,200. Students at the three schools were timetabled for similar amounts of time for curricular PE (90 – 120 minutes); however weekly extra-curricular PE time was 1,200 minutes in one school compared to 600 and 660 in the other two schools.

	School A (No. students = 137)	School B (No. students = 62)	School C (No. students = 100)
NOR	512	912	1650
% FSM	11	26	12
Indoor spaces	2	6	5
Indoor spaces / student (m^2)	1.51	2.39	1.03
Outdoor spaces	2	3	4
Outdoor spaces / student (m^2)	13.31	18.79	111.18
No. permanent resources	42	71	70
No. permanent resources / student	0.08	0.08	0.04
Budget (£)	17,200	2,180	11,000
Budget / student (£)	33.59	2.39	6.67
Curricular time (mins)	90	120	120
Extra-curricular time (mins)	660	600	1200

Table 4.3. School level characteristics

Exploratory analyses: predictor variables.

Students' mean scores of their responses to the statements of PE's influence on out of school physical activity impact and awareness are presented in Table 4.4. As a result of the significant difference between boys' and girls' maturity offset, this variable was co-varied to assess sex differences on all the predictor and outcome variables. Boys reported higher values on both study variables compared to the girls. However, ANCOVAs displayed no significant sex differences between PE's impact on out of school physical activity ($F_{1, 285}$ = 0.80, p = 0.37, d = 0.21), or out of school physical activity awareness ($F_{1, 285}$ = 0.24, p = 0.63, d = 0.23).

	Boys	Girls	*p*	*d*
PE's impact upon out of school physical activity	4.03 (0.80)	3.88 (0.63)	0.37	0.21
PE's influence of awareness of physical activity opportunities out of school	3.87 (0.82)	3.69 (0.75)	0.63	0.23

Table 4.4. Mean (± SD) scores of PE predictor study variables by sex.

Boys and girls scored 3.94 (± 0.77) and 3.67 (± 0.59) respectively, on Perceived PE Worth and 4.14 (± 0.60) and 3.78 (± 0.58), on Perceived PE Ability (Figures 4.1 and 4.2). ANCOVAs demonstrated that boys reported significantly higher values on Perceived PE Ability than girls, after adjusting for maturity offset (F 1, 285 = 5.00, p = 0.03, d = 0.61), but results were not significantly different between the sexes for Perceived PE Worth (F 1, 285 = 1.91, p = 0.17, d = 0.39).

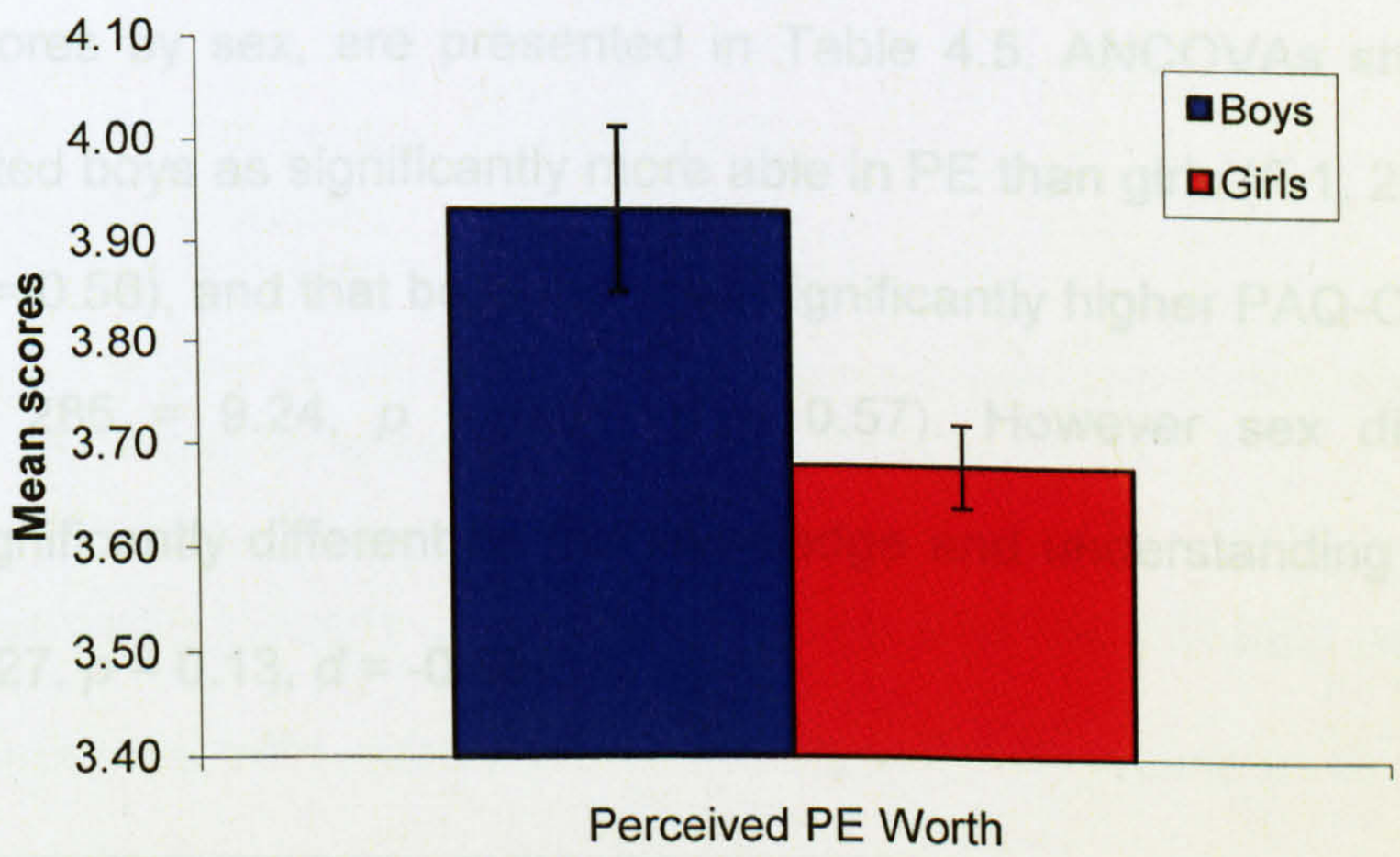

Figure 4.1. Mean values for Perceived PE Worth by sex

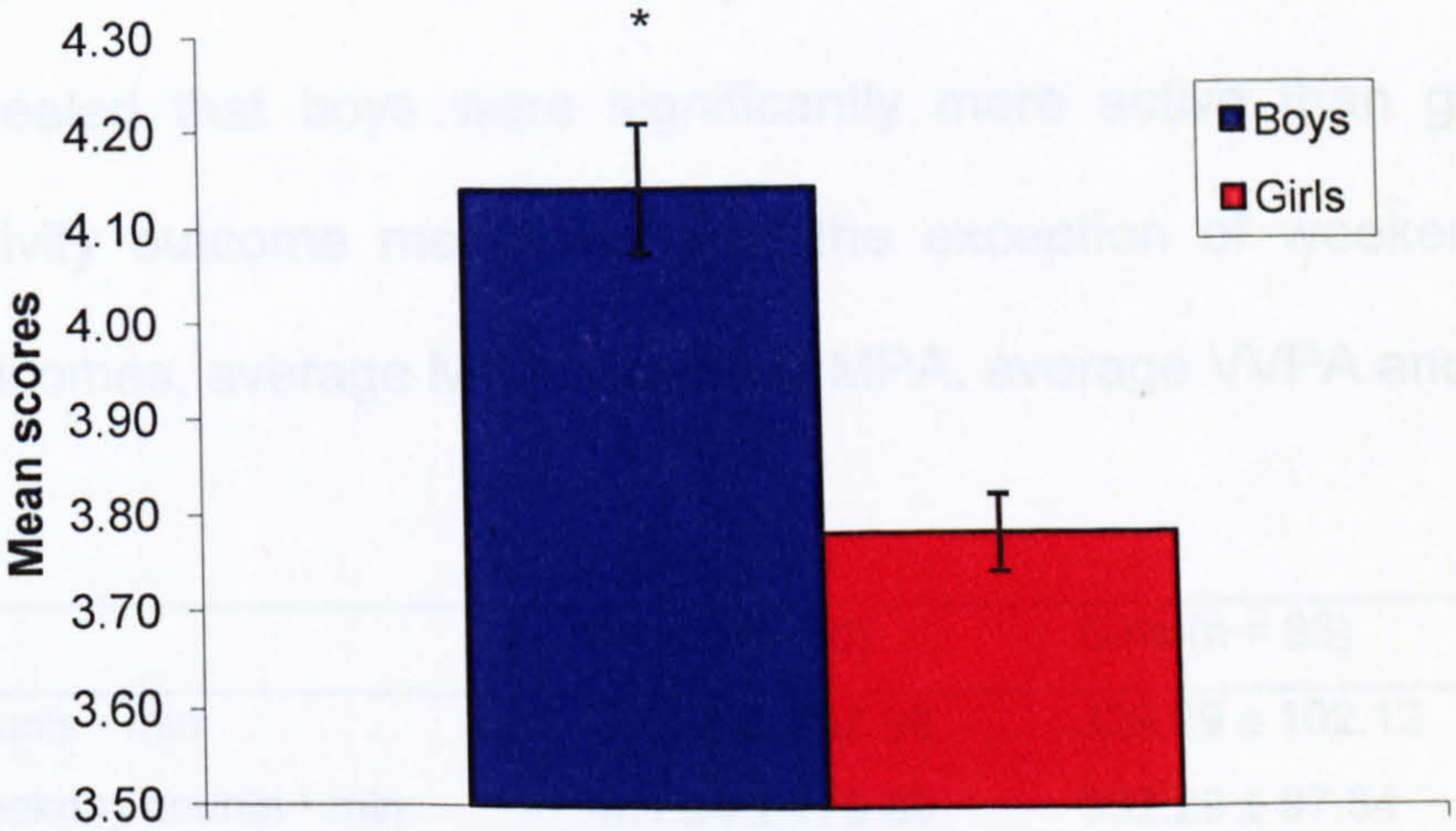

Figure 4.2. Mean values for Perceived PE Ability by sex

* Boys > girls, $p = 0.03$.

Exploratory analyses: outcome variables.

PE teachers' ratings of their students' PE ability, students' mean self-reported scores on the PAQ-C and their knowledge and understanding of HRE total scores by sex, are presented in Table 4.5. ANCOVAs showed that teachers rated boys as significantly more able in PE than girls (F 1, 291 = 35.16, $p < 0.01$, $d = 0.56$), and that boys reported significantly higher PAQ-C scores than girls (F 1, 285 = 9.24, $p < 0.01$, $d = 0.57$). However sex differences were not significantly different on the knowledge and understanding of HRE (F 1, 285 = 2.27, $p = 0.13$, $d = -0.63$).

	Boys	Girls	p	d
Ability rating (teacher)	2.16 ± 0.63	1.76 ± 0.78	<0.01	0.56
PAQ-C	2.81 ± 0.58	2.50 ± 0.51	<0.01	0.57
Knowledge and understanding of HRE	3.01 ± 1.41	3.78 ± 0.99	0.13	-0.63

Table 4.5. Mean (± SD) scores of PE outcome study variables by sex

Analysis of the ActiGraph data are presented in Table 4.6, demonstrating average, weekday average and weekend average physical activity counts • min

and minutes in each of the categories of LPA, MPA, VPA and VVPA. ANCOVAs revealed that boys were significantly more active than girls on all physical activity outcome measures, with the exception of weekend counts, all LPA outcomes, average MPA, weekday MPA, average VVPA and week end VVPA.

	Boys (n = 30)	Girls (n = 83)	*p*	*d*
Counts • min	455.52 ± 157.99	329.29 ± 102.12	<0.01	0.95
Weekday counts • min	481.24 ± 179.09	332.29 ± 97.84	<0.01	1.03
Weekend counts • min	391.20 ± 181.35	320.10 ± 184.98	0.19	0.39
LPA (min)	160.53 ± 39.28	163.21 ± 32.07	0.39	0.07
Weekday LPA (min)	161.08 ± 40.38	170.06 ± 32.22	0.17	0.25
Weekend LPA (min)	159.16 ± 53.83	149.84 ± 46.20	0.97	0.19
MPA (min)	61.62 ± 18.26	51.80 ± 14.94	0.50	0.59
Weekday MPA (min)	60.90 ± 21.53	53.91 ± 15.61	0.73	0.37
Weekend MPA (min)	63.41 ± 23.42	47.89 ± 21.31	0.05	0.69
VPA (min)	12.42 ± 9.83	6.61 ± 4.94	<0.01	0.75
Weekday VPA (min)	12.54 ± 9.64	6.91 ± 5.37	0.01	0.72
Weekend VPA (min)	12.12 ± 12.05	6.05 ± 5.43	0.02	0.65
VVPA (min)	2.52 ± 1.95	1.71 ± 1.86	0.06	0.43
Weekday VVPA (min)	2.62 ± 2.23	1.77 ± 1.87	0.05	0.41
Weekend VVPA (min)	2.27 ± 1.85	1.61 ± 2.16	0.20	0.33

Table 4.6. Mean (± SD) minutes of accelerometry data (counts • min, light, moderate, vigorous and very vigorous) by sex (n = 113)

The study focuses upon MVPA, given that the physical activity guidelines are concerned with children and adolescents engaging in at least 60 minutes of MVPA (NASPE, 2004; DH, 2004). The ActiGraph data showed that boys and girls engaged in MVPA on average for 76.56 (± 27.61) and 54.36 (± 18.12) minutes per day, respectively (Figure 4.3). On weekdays boys and girls accumulated 84.93 (± 31.32) and 57.06 (± 20.02) minutes, and on weekends 55.62 (± 27.69) and 47.59 (± 22.15) minutes, respectively (Figures 4.4 and 4.5). ANCOVAs revealed that boys accumulated significantly more MVPA than girls

on average (F 1, 110 = 5.53, p = 0.02, d = 0.95) and on weekdays (F 1, 110 = 6.44, p = 0.01, d = 1.06).

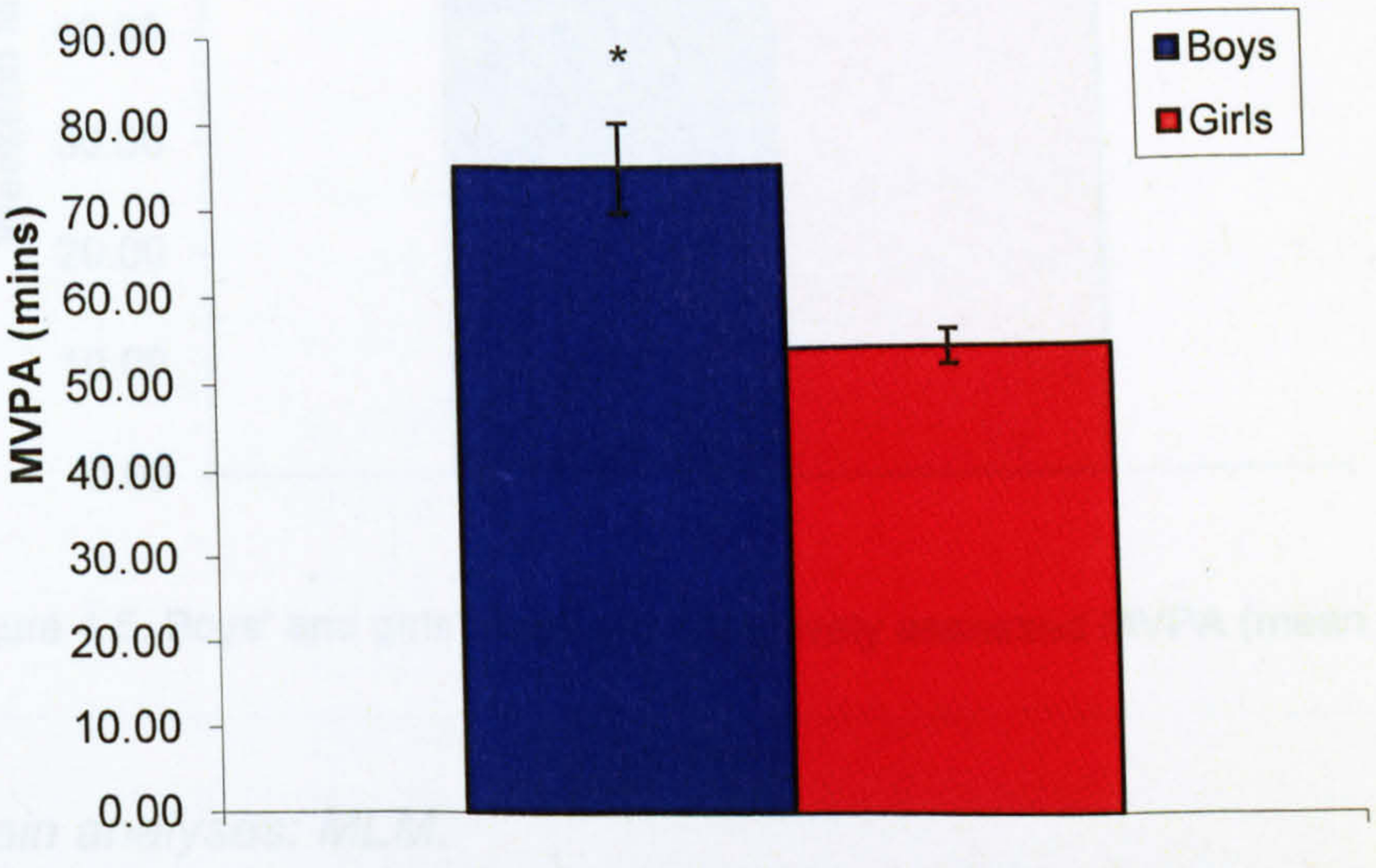

Figure 4.3. Boys' and girls' objectively assessed MVPA (mean ± SD)

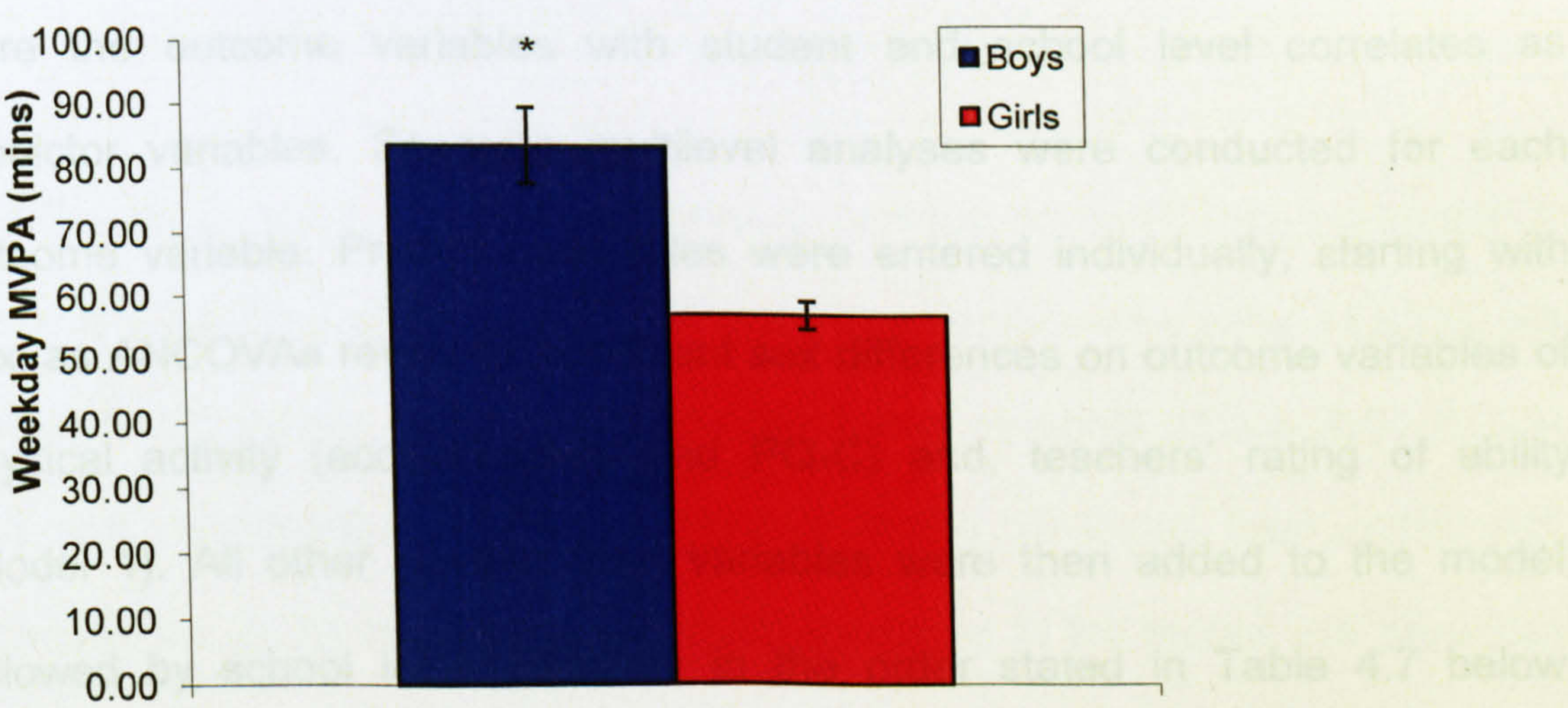

Figure 4.4. Boys' and girls' weekday objectively assessed MVPA (mean ± SD)

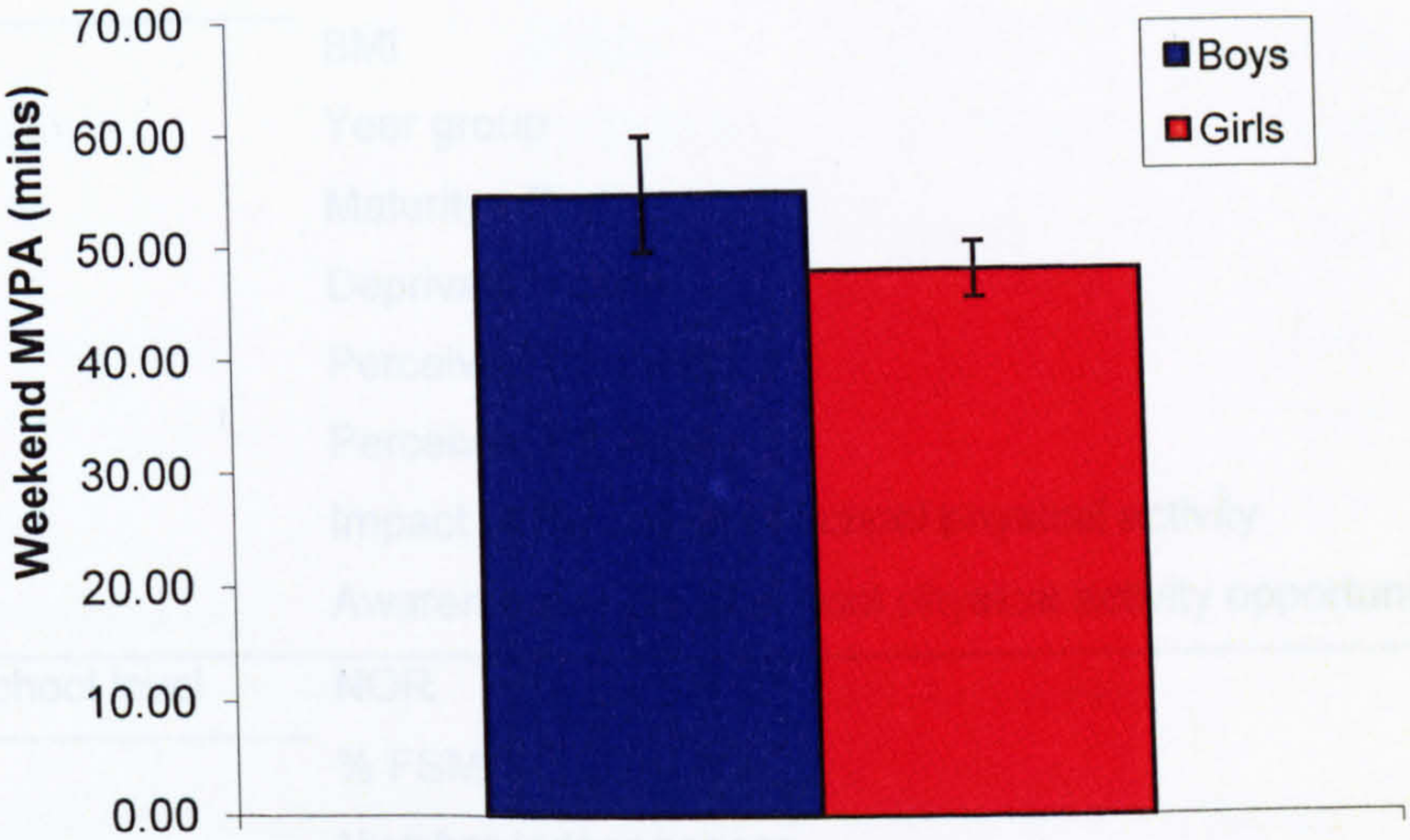

Figure 4.5. Boys' and girls' weekend objectively assessed MVPA (mean ± SD)

Main analyses: MLM.

Minutes of average, weekday and weekend MVPA (accelerometry), PAQ-C, knowledge and understanding of HRE, and teacher's rating of students' ability were the outcome variables with student and school level correlates as predictor variables. Separate multilevel analyses were conducted for each outcome variable. Predictor variables were entered individually, starting with sex, as ANCOVAs revealed significant sex differences on outcome variables of physical activity (accelerometry and PQ-C) and, teachers' rating of ability (Model 1). All other student level variables were then added to the model, followed by school level variables in the order stated in Table 4.7 below. Student level variables were entered first as research has consistently suggested that these correlates affect physical activity and other PE related outcomes (Barr-Anderson et al., 2007; Biddle et al., 2005; Craig et al., 1996; Sallis et al., 2000). Only those predictor variables that were significant and/or significantly improved the fit of the model (2*LL) were retained (Model 2).

Student level	Sex
	BMI
	Year group
	Maturity offset
	Deprivation score
	Perceived PE Worth
	Perceived PE Ability
	Impact of PE on out of school physical activity
	Awareness of out of school physical activity opportunities
School level	NOR
	% FSM
	Number indoor spaces
	Indoor area/student
	Number outdoor spaces
	Outdoor area/student
	Permanent resources/student
	Budget/student
	Curricular time
	Extra-curricular time

Table 4.7. Order that student and school level predictor variables were entered into the model

The results of MLM analysis for average minutes of MVPA are presented in Table 4.8. Average minutes of MVPA were best predicted by sex [-15.82 (4.58)], Perceived PE Ability [9.08 (3.06)] and number of students on roll [0.01 (0.00)]. BMI and deprivation score were retained in the model as they significantly improved the fit. As boys were the reference group in the model, the significant negative outcome for sex reflects that boys engaged in 15.82 minutes more of MVPA, compared to girls and 9.08 minutes of MVPA were accumulated for every 1 unit on the Perceived PE Ability scale on the PEPS. Also, 0.01 minutes of MVPA were accrued for every 1 student on roll at school.

	Model 1		Model 2	
	β (SE)	95% CI	β (SE)	95% CI
Constant	75.08 (3.85)**	67.53 to 82.63	31.89 (18.78)	-4.96 to 68.70
Sex	-20.73 (4.49)**	-29.53 to -11.93	-15.82 (4.58)**	-24.80 to -6.84
Perceived PE Ability			9.08 (3.06)**	3.08 to 15.08
Number of students on roll			0.01 (0.00)*	-0.01 to 0.01
BMI			-0.37 (0.55)	-1.45 to 0.71
Deprivation score			0.08 (0.09)	-0.1 to 0.26

Table 4.8. Results of MLM analysis of predictor variables on average MVPA

Note: The reference category for sex was boys.

* $p < 0.05$

**$p < 0.01$

MLM analysis for minutes of weekday MVPA is presented in Table 4.9. Minutes of weekday MVPA were best predicted by sex [-18.87 (5.00)], Perceived PE Ability [9.71 (3.34)] and number of students on roll [0.02 (0.01)]. BMI and deprivation score were retained in the model as they significantly improved the fit. The significant negative outcome for sex reflects that boys engaged in 18.87 minutes more weekday MVPA, compared to girls, and 9.71 minutes of weekday MVPA was accumulated for every 1 unit on the Perceived PE Ability scale on the PEPS. In addition, 0.02 minutes of weekday MVPA were accrued for every 1 student on roll at school.

	Model 1		Model 2	
	β (SE)	95% CI	β (SE)	95% CI
Constant	83.30 (4.30)**	74.87 to 91.73	35.87 (20.50)	-4.31 to 76.05
Sex	-26.24 (5.02)**	-36.08 to -16.40	-18.87 (5.00)**	-28.67 to -9.07
Perceived PE Ability			9.71 (3.34)**	3.16 to 16.26
Number of students on roll			0.02 (0.01)*	0 to 0.04
BMI			0.55 (0.60)	-0.63 to 1.73
Deprivation score			0.02 (0.10)	-0.18 to 0.22

Table 4.9. Results of MLM analysis of predictor variables on weekday MVPA

Note: The reference category for sex was boys.

* $p < 0.05$

**$p < 0.01$

Table 4.10 shows the results of MLM analysis for minutes of weekend minutes of MVPA. Minutes of weekend MVPA were best predicted by Perceived PE Ability [8.34 (3.47)] and deprivation score [0.23 (0.10)]. BMI was retained in the model as it significantly improved the fit. The significant outcome for Perceived PE Ability reflects that 8.34 minutes of weekend MVPA is accumulated for every 1 unit on the Perceived PE Ability scale on the PEPS. In addition, 0.23 minutes of weekend minutes of MVPA were accrued for every one unit of the deprivation score.

	Model 1		Model 2	
	β (SE)	95% CI	β (SE)	95% CI
Constant	54.54 (4.30)**	46.11 to 62.97	6.49 (19.27)	-31.28 to 44.26
Sex	6.94 (5.02)	-2.90 to 16.78		
Perceived PE Ability			8.34 (3.47)*	1.54 to 15.14
Deprivation score			0.23 (0.10)*	0.03 to 0.43
BMI			0.10 (0.63)	-1.13 to 1.33

Table 4.10. Results of MLM analysis of predictor variables on weekend MVPA

Note: The reference category for sex was boys.

* $p < 0.05$

**$p < 0.01$

Table 4.11 demonstrates MLM analyses for PAQ-C scores. Self-reported physical activity scores (PAQ-C mean) were best predicted by sex [-0.22 (0.07)], BMI [0.01 (0.01)], Perceived PE Ability [0.29 (0.06)], and Perceived PE Worth [0.13 (0.06)]. Deprivation score and number of students on roll were retained as they significantly improved the fit. The significant negative outcome for sex reflects that boys' PAQ-C scores were 4.4% higher, as they scored 0.22 more than girls, and a 0.2% increase in PAQ-C score for every one unit increase in BMI. The findings also suggest that a 5.8% increase in PAQ-C score for every one unit on the Perceived PE Ability scale, and a 2.6% increase in PAQ-C score for every one unit on the Perceived PE Worth scale on the PEPS.

	Model 1		Model 2	
	β (SE)	95% CI	β (SE)	95% CI
Constant	2.77 (0.06)**	2.65 to 2.89	0.99 (0.30)**	0.40 to 1.58
Sex	-0.27 (0.07)**	-0.41 to -0.13	-0.22 (0.07)**	-0.36 to -0.08
BMI			0.01 (0.01)*	-0.01 to 0.03
Perceived PE Ability			0.29 (0.06)**	0.17 to 0.41
Perceived PE Worth			0.13 (0.06)*	0.01 to 0.25
Deprivation score			0.00 (0.00)	0.00 to 0.00
Number of students on roll			0.00 (0.00)	0.00 to 0.00

Table 4.11. Results of MLM analysis of predictor variables on PAQ-C mean scores

Note: The reference category for sex is boys.

* $p < 0.05$

**$p < 0.01$

MLM analysis results for total knowledge and understating of HRE scores are presented in Table 4.12. Knowledge and understanding of HRE was best predicted by sex [0.40 (0.18)], Perceived PE Worth [0.23 (0.10)] and number of indoor spaces [-0.20 (0.05)]. Again BMI and deprivation score were retained in the model as they significantly improved the fit. The significant outcome for sex reflects that girls' knowledge and understanding of HRE scores were 8.0% higher than boys', and that a 4.6% increase in knowledge and understanding of HRE score was associated with a unit increase on the Perceived PE Worth scale on the PEPS. Finally, for every one indoor space this was associated with a 4% decrease in knowledge and understanding of HRE.

	Model 1		Model 2	
	β (SE)	95% CI	β (SE)	95% CI
Constant	3.00 (0.12)**	2.76 to 3.24	3.28 (0.63)**	2.05 to 4.51
Sex	0.77 (0.15)**	0.48 to 1.06	0.40 (0.18)*	0.05 to 0.75
Perceived PE Worth			0.23 (0.10)*	0.03 to 0.43
Number of indoor spaces			-0.20 (0.05)**	-0.30 to -0.10
BMI			-0.00 (0.02)	-0.05 to 0.03
Deprivation score			-0.00 (0.00)	0.00 to 0.00

Table 4.12. Results of MLM analysis of predictor variables on knowledge and understanding of HRE

Note: The reference category for sex is boys.

* $p < 0.05$

**$p < 0.01$

Table 4.13 displays MLM analysis for teacher ratings of their students' ability levels in PE, which were best predicted by year group [0.60 (0.07)], Perceived PE Ability [0.34 (0.06)] and number of indoor spaces [0.10 (0.02)]. In addition, BMI and deprivation score were retained in the model as they significantly improved the fit. The significant outcome for year group reflects that Year 9 students were rated 12% more able by their teachers, compared to Year 8 students, and that there was a 6.8% increase in ability ratings for every one unit on the Perceived PE Ability scale on the PEPS. Also, for every one indoor space this was associated with a 2% increase in teacher ratings of their students' ability in PE.

	Model 1		Model 2	
	β (SE)	95% CI	β (SE)	95% CI
Constant	2.14 (0.08)**	1.98 to 2.30	0.03 (0.34)	-0.64 to 0.70
Sex	-0.39 (0.18)*	-0.57 to -0.21		
Year Group			0.60 (0.07)**	0.46 to 0.74
Perceived PE Ability			0.34 (0.06)**	0.22 to 0.46
Number of indoor spaces			0.10 (0.02)**	0.06 to 0.14
BMI			-0.01 (0.01)	-0.03 to 0.01
Deprivation score			0.00 (0.00)	0.00 to 0.00

Table 4.13. Results of MLM analysis of predictor variables on teachers ratings of their students' abilities in PE

Note: The reference category for sex is boys.

* $p < 0.05$

**$p < 0.01$

4.4: Discussion

The purpose of this study was to investigate which factors of secondary school PE most strongly correlate with the outcomes representing the 'PE product,' namely habitual physical activity, PE ability, and physical activity knowledge and understanding.

Physical activity: accelerometry and PAQ-C.

Results revealed the significant predictive nature of sex on average minutes of MVPA, weekday MVPA and PAQ-C scores. These findings demonstrate that boys are more physically active than girls, irrespective of physical activity assessment method. This concurs with previous studies (Caspersen et al., 2000; Riddoch et al., 2007; Sallis et al., 1996; Trost et al., 2002; Wenthe et al., 2009). The sex difference in PAQ-C scores of 0.31 is similar to those reported previously among Canadian children aged 9 – 18 years (Crocker et al., 1997;

Crocker et al., 2000; Thompson et al., 2003) and American children aged 9 – 11 years, (Joens-Matre et al., 2008) with differences between 0.20 – 0.48.

The sex differences of 126.23 accelerometer counts • min followed a similar pattern to previous studies in Europe (Ekelund et al., 2004b; Riddoch et al., 2004), and the UK (Ness et al., 2007), with differences between 111 – 136 counts • min. In addition, Van Sluijs et al.'s (2008) SPEEDY study with 10-year old British children reported similar sex differences to the present study on weekday, and total week accelerometer counts • min. Accumulated minutes of MVPA and sex differences in minutes of MVPA are problematic to compare against studies using different cut-points. However, the results followed a similar pattern to previous studies that have also utilised Freedson et al.'s (1997) regression equations (Ruiz et al., 2006; Trost et al., 2002). Ruiz et al. (2006) collected physical activity data on 9 – 10 year old children over 4 consecutive days, and found a significant sex difference of 29.4 minutes of MVPA, whilst Trost et al. (2002) concluded that sex differences ranged from 8.4% in grades 10 – 12 to 18.9% in grades 1 – 3.

Despite similarities in sex differences, these studies generally reported higher volumes of activity compared to the present findings. The current data were collected during the months of November and December when reduced daylight hours limit afternoon and evening opportunities for outdoor physical activity. It has been found that children's physical activity is lowest during winter months (Fisher et al., 2005; Levin et al., 1999; Mattocks et al., 2007; Riddoch et al., 2007), and this may be a possible explanation why physical activity levels of the current sample are somewhat lower than those described in other studies. For

example, Riddoch et al.'s (2004) study negated the confounding effects of seasonality by measuring physical activity over the full school year. Moreover, the SPEEDY study (Van Sluijs et al., 2008) assessed physical activity during April – July, when climatic conditions would have been more favourable for physical activity.

These sex differences in physical activity can be attributed to a complex interplay between biological, psychological, social, behavioural and environmental factors (Sallis et al., 2000; Van Der Horst et al., 2007; Welk, 1999). Maturity status is a major factor that may influence children's physical activity participation (Bradley et al., 2000), and it is well known that girls, on average, mature two years before boys (Malina et al., 2004). Therefore, maturational differences are apparent between children of the same chronological age. Sherar et al. (2007) recognised that adolescence is a period of great physical, psychological, cognitive, and emotional change. For girls during biological maturation there is an increase in adiposity from approximately 15% to 22% body fat (Malina et al., 2004), which leads to changes in body shape and size that are generally opposed to competence in athletic events and physical activities (Niven et al., 2007). Girls' psychological responses to these physical changes include reductions in self-esteem, self-perceptions and poor body image which can contribute to negative feelings about their physical activity competencies (Davison et al., 2007; Kolody and Sallis, 1995). These emotional complexities and negative feelings which some girls might experience could fuel self-consciousness, which may deter girls from participating in physical activity. Conversely, during this time for boys there is generally an increase in muscle mass leading to enhanced speed, strength, power and

performance on motor tasks and in physical activity (Malina et al., 2004), which may help explain why boys participate in more physical activity than girls.

Further, differential treatment of boys and girls from their parents, may lead to the sex differences in physical activity. Evidence suggests that boys receive more parental support to be physically active (Brustad, 1993), parental facilitation (Fredricks and Eccles, 2005; Welk et al., 2003), parental encouragement (Fredricks and Eccles, 2005), and parents place more importance on the physical activity of sons rather than daughters (Trost et al., 2003). This enhanced parental encouragement and support to be physically active has been linked to greater perceived competence and attraction towards physical activity for boys (Brustad, 1993; Gustafson and Rhodes, 2006). However, Ornelas et al. (2007) reported more similarities than differences between mothers' and fathers' parenting styles and their influences on boys' and girls' physical activity behaviours. This lack of consistency between studies may be influenced by the fact that a number of diverse self-report questionnaires have been utilised to measure parental support and physical activity (Raudsepp, 2006). The observed sex differences in physical activity could potentially be related to variation in teacher feedback during PE. It has been found that boys tend to receive more attention and feedback in class from teachers than girls (Duffy et al., 2001; Dunbar and O'Sullivan, 1986; Griffin, 1981). This enhanced feedback may lead to the advanced development of motor skill performance which could explain the superior physical activity levels of boys, compared to girls (Carroll and Loumidis, 2001; Dishman et al., 2004). However, in the current study no data were collected on teacher's feedback. It has also been reported that girls perceive a higher frequency of encouragement

and technical information (Nicaise et al., 2007a; Nicaise et al., 2006; Nicaise et al., 2007b). These contrasting results may be attributed to the limitations and differences of the methods adopted (Nicaise et al., 2007a; Nicaise et al., 2006; Nicaise et al., 2007b).

The accelerometry data in the present study also demonstrates that both boys and girls exhibit lower counts • min on weekends, compared to average and weekday counts • min (Table 4.6). This is in agreement with previous research (Riddoch et al., 2007; Rowlands et al., 1999; Rowlands et al., 2008b; Trost et al., 2000). Riddoch et al. (2007) found a difference of 45 counts • min for boys and 19 counts • min for girls between weekdays and weekends, which is similar to the differences found in the present study. A potential reason for this difference in physical activity could be the removal of structured school environment and PE classes at the weekend, which is possibly detrimental to physical activity. Riddoch et al. (2007) suggest that during weekdays, the morning travel to school, lunch breaks and the immediate time after school are the times when children are most active, and weekends are without these peaks of activity. However, Van Sluijs et al. (2008) found overall physical activity and minutes spent in MVPA to be significantly higher on weekends compared with weekdays. These contrasting results may be again explained by the timing of measurements, as Van Sluijs et al.'s (2008) study took place during the school Summer term (April to July). In addition results suggest that sex, unlike average minutes of MVPA, weekday MVPA and PAQ-C scores, is not a significant predictor of weekend MVPA. This is in line with previous research by Gilbey and Gilbey (1995) who monitored children's physical activity over 3 weekdays and 1 weekend. These authors concluded that boys were significantly more active

during weekdays, but no differences were detected between the sexes during the weekend monitoring period. However, Gilbey and Gilbey (1995) study assessed physical activity using heart rate monitors and the study was set in Singapore, therefore comparisons may be limited due to the these methodological and cultural differences.

Perceived PE Ability involving perceptions of PE competence and self-efficacy were significantly associated with all outcome measures of physical activity. This result emphasises the importance of children's judgements about their abilities in PE, which are reflected in their overall physical activity levels. These findings are in line with numerous motivational theories including Harter's (1982) Competence Motivation Theory and Deci and Ryan's (1985) Cognitive Evaluation Theory. These theories contend that an individual's motivation varies according to changes in perceptions of one's competence, autonomy, enjoyment, optimal challenge, and choice, for example. If success is appraised this bolsters perceived competence which leads to increased intrinsic motivation and to an innate desire to persist and exert effort. In addition, the importance of Perceived PE Ability on physical activity levels concurs with Carroll and Loumidis' (2001) findings, who concluded that children with high perceived competence in PE participated in significantly more physical activity outside of school. Additionally, Feltz and Petlichkoff (1983) reported that students who participated in school sport had significantly higher perceived competence scores than peers who discontinued their involvement. These findings re-iterate the important influence of Perceived PE Ability with out of school physical activity participation. The results could be explained through the mechanisms of high perceived competence and self-efficacy positively impacting upon interest

and enjoyment (Brustad, 1993), and Perceived PE Ability having a clear and an effective association with perceived competence and self-efficacy in physical activity outside of school more generally (Carroll and Loumidis, 2001). These findings are consistent with Welk's (1999) YPAPM in that they suggest a dynamic relationship where Perceived PE Ability influences physical activity levels.

Number of students on roll was also significantly associated with both average MVPA and weekday MVPA, suggesting that more physical activity is accumulated in schools with greater student numbers. Carron et al. (1990) concluded in a review of the impact of group size on physical activity that consequences of larger group sizes included greater availability, range and resources to participate in physical activity and sport. In addition, the present finding may be explained by Cradock et al.'s (2007) results, that bigger school environments, campuses, buildings and play areas were related to increased physical activity. Therefore a larger number of students may be related to larger school environments, which as a consequence of their size may also potentially mean increased opportunities to engage in physical activity, for example during break, lunch time, PE and after-school clubs. However, in the current study total area was not significantly associated with any physical activity outcomes, which may suggest a lack of accuracy or sensitivity in the method used to measure the school environment. Further work is needed to more clearly establish the associations between school size and physical activity engagement.

Physical activity: PAQ-C.

Other predictor variables that had a significant influence on self-reported, but not objectively measured physical activity levels included BMI and Perceived PE Worth. In the current study students with higher BMIs reported greater physical activity levels on the PAQ-C. In contrast, research generally suggests that boys and girls with higher BMI and body fatness are less physically active (Ball et al., 2005; Bar-Or and Baranowski, 1994; Trost et al., 2001). It has been suggested that reasons for this physical activity difference between obese and non-obese children may include differences in physical activity self-efficacy and lower self esteem (Ball et al., 2005; Trost et al., 2001). Ball et al. (2005) concluded that the children with BMI ≥ 85th percentile scored lower on social acceptance and self-perception scales. Furthermore, Trost et al. (2001) found that children classified as obese were significantly less confident in their ability to overcome barriers to physical activity, ask parents to provide opportunities for physical activity, and choose physically active pursuits over sedentary ones. However, other studies have failed to show differences in physical activity levels (Romanella et al., 1991), yet in this study physical activity levels were rather low in both lean and obese children. Rowlands et al. (1999) suggest that controversy surrounds the relationship between physical activity and levels of fatness, as this area is plagued with measurement problems. Discrepancies between studies may in part be attributable to small sample sizes, differences in the definition of obesity and include the various methods and approaches used in studies to quantify physical activity (Bar-Or and Baranowski, 1994; Rowlands et al., 1999; Trost et al., 2001). Ball et al.'s (2005) study was the first to use the PAQ-C to compare physical activity levels in groups categorised by weight status. It was found that those with a BMI ≥ 85th percentile, increased their

PAQ-C scores over time, compared to the normal weight group (Ball et al., 2005). This demonstrates the problems of self-report measures, as the children may have learned to provide more socially desirable responses as the study progressed. In addition, McMurray et al. (2008) reported that overweight adolescents tended to over-report activity levels on a questionnaire. These findings are comparable to the current study in which analyses showed that the difference in standardized (z) scores between PAQ-C and MVPA for normal weight children was 0.03, compared to 0.10 for overweight/obese children, suggesting that normal weight children's self-reported physical activity better reflected their objectively measured MVPA. In agreement with previous studies (Ball et al., 2005; McMurray et al., 2008), the results indicate that young people with higher BMIs may over report their physical activity levels, possibly due to socially desirable responses, and perceptions that the physical activity is more intense than it actually is when assessed objectively, compared to peers with lower BMI's. BMI is a simple measure, and is perhaps the only feasible method for use in large scale field work and is currently the best available anthropometric estimate of fatness for public health purposes (Boddy et al., 2007; Hall and Cole, 2006). However, it does have numerous disadvantages in that it does not distinguish between increased mass in the form of fat, lean tissue or bone (McCarthy et al., 2006).

Another factor that had a significant impact upon PAQ-C scores, but not accelerometry outcomes, was Perceived PE Worth, involving positive PE attitudes and PE enjoyment. This result accentuates the positive physical activity consequences of student's perceiving PE to be fun, enjoyable and holding positive attitudes towards the subject, which support the basic tenets of

Deci and Ryan's (1985) Cognitive Evaluation and Self-Determination Theories. This finding is in line with previous research that has consistently concluded that if children experience fun and enjoyment, they are more likely to participate, persist, exert effort and be committed to that particular activity (Carroll and Loumidis, 2001; Craig et al., 1996; Scanlan et al., 1993; Scanlan and Lewthwaite, 1986; Scanlan et al., 1989; Stucky-Ropp and DiLorenzo, 1993). In addition the importance of Perceived PE Worth on physical activity levels concurs with previous research by Barr-Anderson et al. (2007), who concluded that participants with higher enjoyment of PE class were more likely to participate in physical activity. Moreover Carroll and Loumidis (2001), reported enjoyment in PE contributes to the quality (frequency and intensity) of activity participated in outside of school. Results from the LEAP intervention also demonstrated that increased enjoyment of PE partially explained the effect of the intervention on physical activity levels, by direct mediated effects on enjoyment of physical activity and self-efficacy (Dishman et al., 2005). Enjoyment of PE has also been found to be a major indicator of positive student attitudes (Subramaniam and Silverman, 2007). These findings emphasise the role of Perceived PE Worth in maintaining active lifestyles outside school and are consistent with Welk's (1999) YPAPM model.

Knowledge and understanding of HRE.

The outcome variable of students' knowledge and understanding of HRE was significantly predicted by sex, Perceived PE Worth and number of indoor spaces. Results suggest that girls scored higher than boys, which may relate to the fact that female PE staff often place more emphasis on HRE messages than male counterparts (Fairclough et al., 2002). Furthermore, it has been reported

that girls academically outperform boys in language arts, social studies, science and maths (Pomerantz et al., 2002; Serbin et al., 1990). Reasons given for these sex differences in achievement include girls' greater responsiveness to cues, compliance with adult direction and their tendency to be more concerned than boys with pleasing adults, which may heighten their effort to perform well in academic tasks (Pomerantz et al., 2002; Serbin et al., 1990). Therefore, even though HRE is taught within a practical context in PE, HRE theory maybe perceived as an academic and not a practical element of PE, consequently girls are more likely to do better than boys.

Also, those who had more favourable perceptions of PE Worth, including PE enjoyment and positive attitudes, scored higher on the multi-choice questions. Perceived PE Worth reflects attitude cognitive as well as attitude affective (Welk, 1999). Consequently, it is plausible that more positive approaches to learning and engagement in PE, leads to the retention and understanding of exercise and health knowledge. In line with this finding, Ntoumanis (2001) found that levels of effort strongly predicted intrinsic motivation, which is logical as students who find PE exciting and fun are likely to apply high effort to learn. Also, Ryan and Deci (2000a; 2000b) postulate that intrinsic motivation leads to investment, creativity, and high quality learning in activities, while Standage et al. (2005) concluded that enjoyment and intrinsic motivation in PE positively predicted concentration, preference to attempt challenging tasks, and positive affect. Interestingly, knowledge and understanding results were higher in students whose schools had fewer indoor spaces for PE. This negative association is not obviously explained; however it is possible that these particular schools may have placed relatively more emphasis on the cognitive

aspects of PE learning to compensate for having fewer spaces for practical learning.

Teacher's ratings of students' PE ability.

The final 'PE product' outcome involved teachers' ratings of their students' overall PE ability, which was best predicted by school year, Perceived PE Ability and number of students on roll. According to their teachers, Year 9 students were viewed as significantly more able than year 8 students. This difference between year groups may be explained by differences in movement skill capability. Year 9 students are more likely to have passed through the fundamental movement skill 'proficiency barrier' and be moving through the specialised movement skill phase where there is an increased desire for competence (Gallahue and Donnelly, 2003). Teachers' ratings were significantly correlated with Perceived PE Ability. This relationship was investigated using Pearson's product-moment correlation, which found a weak to moderate, positive correlation (r = .307, p <0.01). This result was to be expected, and suggests that the teacher ratings and students' own ratings of themselves were reasonably accurate. Also, teachers' ratings were positively associated with number of students on roll. This may again be related to the greater availability and range of resources to participate in physical activity and sport for students from larger schools (Carron, 1990). Therefore these students may have more opportunities to develop and practice their physical skills and proficiencies.

Study limitations

A number of limitations exist in this study that warrants attention. The recruitment process for this study involved initially contacting 146 Head of PE

departments, which resulted in 40 respondents and only 17 demonstrated a willingness to take part in the research. As the recruitment rate was relatively low and these schools volunteered to take part, the possibility of selection bias is apparent. Three schools were selected to participate in this study, with one an independent girls' secondary school, consequently the sample consisted of more girls than boys (209:90). Therefore, the results pertain to a select group from the North West of England and may not be generalisable beyond the locale where the study took place. Also, the measurement period of objective physical activity took place during the months of November and December when reduced daylight hours limit afternoon and evening opportunities for outdoor physical activity. This may have affected absolute levels of physical activity. In addition, it is important to note that accelerometers are limited in their capacity to assess static physical activities, exercise intensity during non-weight bearing activities (Corbin et al., 2004; Trost et al., 2002). Therefore, these instruments may not be sensitive to many of the complex movement patterns of children, and as a result activity levels may have been underestimated. Finally, although a number of correlates of youth physical activity were measured in this study, other important variables were not considered, for example reinforcing factors of family, peer and coach influence (Welk, 1999).

4.5: Conclusions

This study supports the application of Welk's (1999) YPAPM to the PE context and suggests that a number of factors including; sex, year group, BMI, deprivation score, Perceived PE Ability, Perceived PE Worth, number of students on roll, and number of indoor spaces, most strongly correlated with the

outcomes representing the 'PE product.' Sex and Perceived PE Ability were the key predictive variables for both objectively measured and self-reported physical activity, with boys participating in more physical activity than girls. Other variables of BMI and Perceived PE Worth were associated with only self-reported physical activity levels. These variables were not significantly related to objectively measured physical activity, which may be explained by measurement error associated with accelerometry and self-report measures. In addition, the results may be influenced by over-reporting by the students on the PAQ-C. Knowledge and understanding of HRE was predicted by sex, with girls performing significantly better than boys. Also, those who had more favourable perceptions of PE Worth and students in schools with less indoor spaces for PE scored more favourably. The final PE outcome of teacher's ratings of their students' ability was predicted by school year, Perceived PE Ability and number of students on roll. Thus, the 'PE product' is influenced by a variety of factors, some of which are related, but which consistently include sex, Perceived PE Ability and Perceived PE Worth.

On the basis of these findings it is recommended that PE teachers provide opportunities to enhance students' perceptions of competence by fostering a motivational climate where enjoyment and perceptions of competence are emphasised. This may be achieved by providing appropriate environments and opportunities for children of all abilities to develop and enhance their perceptions of competence (Carroll and Loumidis, 2001). This could be accomplished by finding activities/sports in which children feel competent; in addition providing positive and informative feedback is crucial as PE teachers are a key source of their students' perceived competence. Further, there is a

need for interventions targeting girls' physical activity, as this study confers with previous research (Butcher et al., 2008; Riddoch et al., 2004; Sallis et al., 2000; Trost et al., 2002) which highlights that girls accumulate significantly less physical activity than boys. Lastly, pedagogical strategies are required to enhance boys' knowledge and understanding of HRE, and students' enjoyment and attitudes towards PE, (e.g., PE classes firstly need to be enjoyable educational experiences for cognitive learning to occur). This study has highlighted the numerous key factors that most strongly correlate with outcomes representing the 'PE product.' There is now a need to utilise this information to uncover why these particular correlates affect physical activity levels, PE ability and knowledge and understanding of HRE.

Thesis Study Map

Study	Objectives and Key Findings
Study 1: The Physical Education Predisposition Scale (PEPS): Preliminary Development and Factorial Validation	Objectives: • To develop and test a scale to assess students' Perceived PE Worth and Perceived PE Ability • To explore how these two constructs are related • To investigate age and sex differences Key findings: • Factorial validity, internal consistency, and test-retest stability of the PEPS was established • Perceived PE Worth and Perceived PE Ability were significantly and strongly correlated ($r = .7$) • Perceived PE Worth and Perceived PE Ability scores were greatest among boys compared to girls, and differed as students got older
Study 2: Exploring the contribution of school-based correlates to the 'PE product': Adolescents' physical activity, knowledge and understanding of health-related exercise, and ability levels	Objectives: • To investigate which secondary school PE factors most strongly correlate with outcomes representing the 'PE product' Key findings: • A number of factors including; sex, year group, BMI, deprivation score, Perceived PE Ability, Perceived PE Worth, number of students on roll, and number of indoor spaces, most strongly correlated with outcomes representing the 'PE product'
Study 3: A qualitative approach to students' views on the effectiveness of PE in developing the 'PE product'	**Objectives:** • **To explore and understand the students' views on the effectiveness of PE in developing the 'PE product'** • **To help understand and clarify results from Study 2**

Chapter 5

Study 3: A qualitative approach to students' views on the effectiveness of PE in developing the 'PE product'

Chapter 5: Study 3

5.1: Introduction

Key aims of PE involve facilitating all young people, whatever their circumstances or ability, to take part in, enjoy and succeed in PE, to learn about the value of leading a healthy, active lifestyle, and to improve and achieve in line with their age and potential (DfES, 2004; QCA, 2007). Based on the findings from Study 2 a number of key factors (sex, year group, BMI, deprivation score, Perceived PE Ability, Perceived PE Worth, number of students on roll, and number of indoor spaces) were identified as most strongly correlating with the outcomes representing the 'PE product.' Consequently, there is a need to further elucidate why these factors were particularly important, and to understand and explore students' views about the extent to which school PE provides opportunities for them all to become physically educated and active individuals.

Perceived PE Worth comprising of positive attitudes and enjoyment has been previously identified as critical in impacting continued physical activity participation (DiLorenzo et al., 1998; Subramaniam and Silverman, 2007), compared to those students who dislike PE, who then may avoid participation (Carlson, 1995; Portman, 1995). In addition, previous research has demonstrated that boys report significantly higher levels of PE enjoyment (Cardon et al., 2005; Hilland et al., 2009; Stelzer et al., 2004). Perceived PE Ability encompassing perceived competence and self-efficacy have also been identified as being consistently and positively associated with physical activity

(Sabiston and Crocker, 2008; Sallis et al., 2000). These findings emphasise the important influence of Perceived PE Worth and PE Ability with regard to participation in out of school physical activity. Therefore, it is of great importance to try to identify the sources of information both boys and girls use to determine their PE Ability and Worth. Past research has reported sources determining students' attitude, enjoyment, perceived competence and self-efficacy including feedback, success, winning, skill learning, improvement, fun, choice and spending time with peers (Chase, 1998; Garn and Cothran, 2006; McKiddie and Maynard, 1997; Nicaise et al., 2007a).

Consequently the aims of this study are to explore and understand the students' thoughts and feelings about school PE, to help understand and clarify results from Study 2.

5.2: Methods

Participants and settings.

Fifty-four students (38 girls, 16 boys; aged 12-14 years) participated in this study, which comprised of a sub-sample of the Year 8 and 9 students from Study 2. Participants from the 3 schools were invited to take part in focus group interviews, and were purposefully selected based on their teacher's normative ratings of their PE Ability. Consequently, focus groups were organised by PE ability, grouping students in their normal PE classes with the presence of their friends, which Sleap and Wormald (2001) suggest can lead to open and confident expressions of opinions. This study aimed to understand the views and opinions from students with varying ability levels. Therefore, four groups

from each school, comprising between 4 – 5 students (see Table 5.1) took part in this qualitative study. The project received institutional ethics committee approval.

School A	School B	School C
Yr 8 girls average ability (n = 5)	Yr 8 boys below average ability (n = 4)	Yr 8 girls below average ability (n = 5)
Yr 8 girls below average ability (n = 5)	Yr 8 girls above average ability (n = 4)	Yr 8 girls above average ability (n = 5)
Yr 9 girls above average ability (n = 5)	Yr 9 boys above average ability (n = 4)	Yr 9 boys below average (n = 4)
Yr 9 girls below average ability (n = 5)	Yr 9 girls average ability (n = 4)	Yr 9 boys average ability (n = 4)

Table 5.1. Breakdown of the focus groups, by school, sex, year group and ability level

Data collection.

The aim of the focus groups was to explore and understand the students' thoughts and feelings about school PE. The focus groups were introduced with the following statement; *"This is now the final phase of my study and thank you all for agreeing to take part in this interview. At the moment I am talking to Year 8 and 9 students from a number of schools about their thoughts and feelings about school PE. The purpose of this study is to get a better understanding of if or how PE influences your physical activity outside of school."* Focus group topics were developed from Welk's (1999) YPAPM and results from Study 2. A semi-structured interview schedule was adopted, providing depth through probe questions; Table 5.2 summarizes the main content and structure of the focus group schedules. Opportunities were given at the end of each session for students to make comments about issues that had not been covered. The focus groups lasted between 30 – 60 minutes, and were conducted during regular

school PE hours in a quiet gym, sports hall or dance studio. All focus group interviews were recorded by Dictaphone and fully transcribed verbatim.

PERCEIVED PE WORTH
Which activities/sports are your favourite and least favourite in PE?
What is it about these particular activities/sports that you like/dislike?
What school PE activities/sports bore or excite you? Why?
PERCEIVED PE ABILITY
Which activities/sports in school PE do you feel confident and not so confident in?
Why do you feel skilled or able in those particular activities/sports?
What information do you use to tell you if you are skilled or able at a particular sport or activit
TEACHER INTERACTIONS
Can you tell me about the relationship you have with your PE teacher(s)?
How does your PE teacher(s) affect your enjoyment/liking of activities/sports?
How does your PE teacher(s) affect your beliefs about your own physical skills and abilities
ACTIVITIES OUTSIDE OF SCHOOL
What activities/sports do you participate in outside of school?
Why do you take part in these particular activities/sports?
What opportunities are you aware of near where you live for activity/sport participation?
PE IMPROVEMENTS
How you would like to change/improve your PE lessons?
If you could try any activities/sports that are currently not offered at school, what would they be?
How would you make PE more enjoyable/fun?

Table 5.2. Main issues explored during the student focus groups

Data analysis.

Data analysis was carried out using the NVIVO software programme, which is specifically designed to organise and analyse qualitative data. A thematic analysis of the data was used to interpret the transcribed focus group interviews, using the process described below (Boyatzis, 1998; Marshall and Rossman, 2006):

1) Transcripts were read several times to get an overall feel for the material, allowing the researcher to become familiar with the data.
2) The data were categorised into themes by identifying recurring, similar and underlying themes.
3) Initially a deductive approach was employed as interviews contained similar material, where findings were interpreted in relation to previous research in PE, physical activity and youth, utilising Welk's (1999) YPAPM.
4) Each transcript was re-read and coded using the categories identified.
5) An inductive approach was then employed, creating and categorising new codes from data that did not fit the pre-determined categories.
6) Data were then organised schematically to assist with interpretation of the higher and lower order themes.

5.3: Results

The focus group data are categorised and presented in a series of figures below (Figures 5.1 – 5.6), with explanatory text linked to each figure. The figures represent themes according to the interview aims and emerging topics. Following this section, the results are then discussed in relation to the key findings from Study 2. Figure 5.1 presents a brief overview of the higher order themes relating to Perceived PE Ability and Worth, whereas figures 5.2 – 5.4 depict this relationship in greater detail. Figure 5.5 portrays issues relating to PE equipment and facilities, PE improvements and sex issues in PE. Finally, figure 5.6 focuses upon the higher and lower order themes raised concerning physical activity outside of school PE. Raw verbatim quotes are included within the

analysis to exemplify themes. Themes that were raised by both boys and girls are presented in black font, whilst those relating to boys or girls only are in blue and red font, respectively.

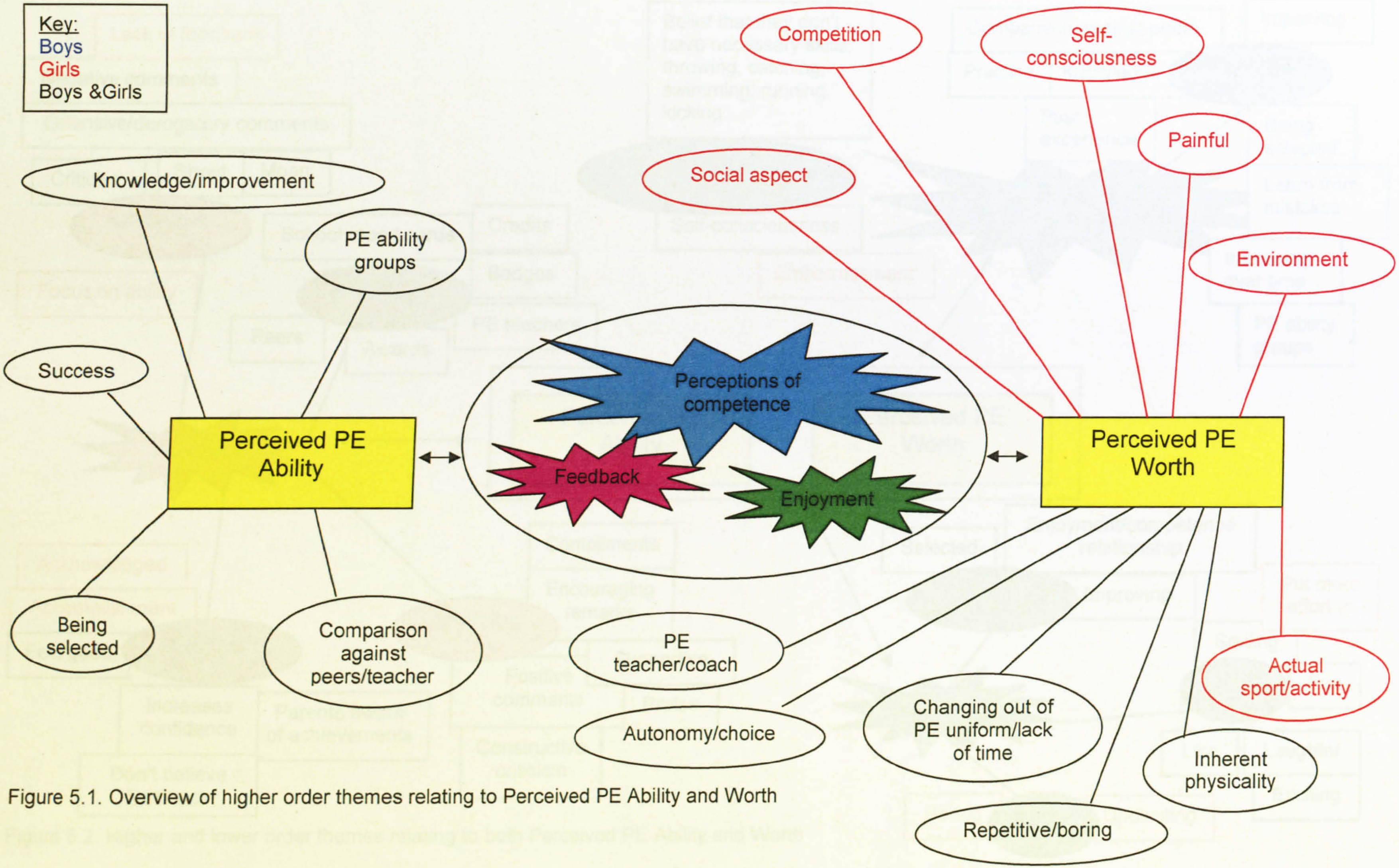

Figure 5.1. Overview of higher order themes relating to Perceived PE Ability and Worth

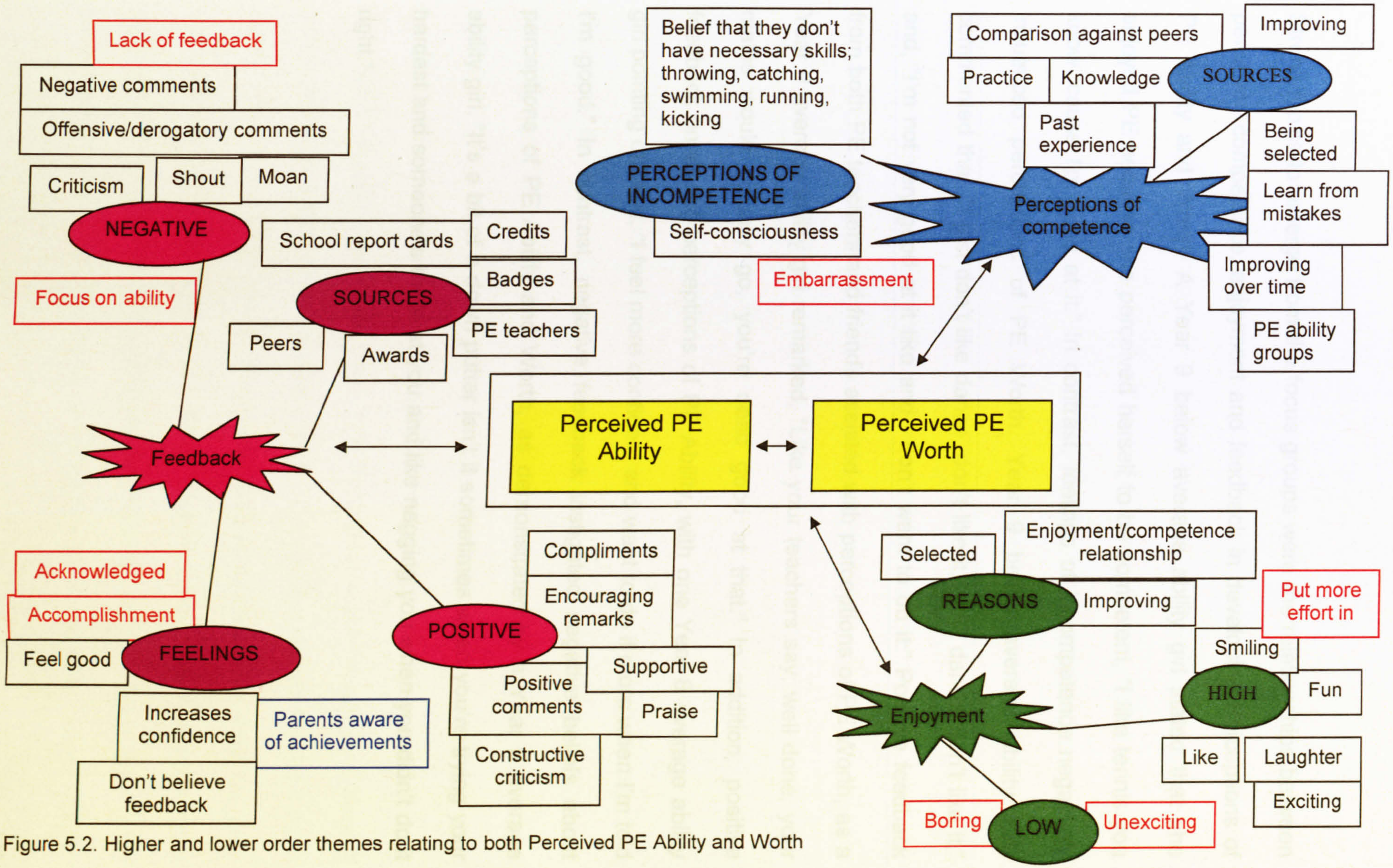

Figure 5.2. Higher and lower order themes relating to both Perceived PE Ability and Worth

Themes relating to Perceived PE Ability and Perceived PE Worth: perceptions of competence, enjoyment and feedback.

Strong topics to emerge from the focus groups were the relationships between perceived competence, enjoyment and feedback in developing Perceptions of PE Ability and Worth. A Year 9 below average ability girl stated that she enjoyed PE because she perceived herself to be competent, "I like tennis you know 'cause I'm good at it." In contrast, feelings of incompetence negatively influenced perceptions of PE Worth. Year 9 below average ability girls commented that, "I just don't like dance, don't like it, can't dance, don't like it," and, "I'm not very good at it like and I don't want to do it." Positive feedback from both PE teachers and friends assisted with perceptions of PE Worth, as a Year 9 average ability girl remarked, "Like your teachers say, well done, your mates would actually go, you're dead good at that." In addition, positive feedback enhanced perceptions of PE Ability, with one Year 8 average ability girl pointing out that, "I feel more confident and want to do it more when I'm told I'm good." In contrast, negative feedback instigated negative beliefs about perceptions of PE Ability and Worth, as demonstrated by a Year 9 average ability girl, "It's a bit of a down putter isn't it sometimes when you're trying your hardest and someone's there at you and like nagging you when you didn't do it right."

Themes relating to perceptions of competence.

Sources.

A wide variety of sources of PE competence were discussed throughout the focus groups. These include improving, learning from mistakes, practice, knowledge, comparison against peers, PE ability groups, being selected and past experience as a Year 8 above average ability girl commented, "If you've done it for ages you know what's right when you do it." Also, a sense of competence is achieved when students perceive themselves to be improving over time, as a Year 9 average ability girl commented, "Like dance when we first came to the school like not many of us could do dance could they...some of us had never tried dance before like and we came to this school and we got to learn more how to do it and stuff like that."

Perceptions of incompetence.

A number of boys and girls mentioned that they believed they don't have the necessary fundamental skills to be competent in PE. For example they stated that they can't throw, catch, swim, run or kick. Year 8 below average ability boys revealed, "I'm just not very good at kicking the ball," and "I haven't got very good hand-eye coordination, I can't really throw that far." Furthermore a Year 8 average ability girl expressed that, "I really cannot catch at all," and Year 9 below average ability girls verbalised that, "I don't like netball 'cause I can't catch," and "I can't run." In addition, students mentioned that they felt self-conscious about their skills in PE as a year 8 below average ability boy commented, "I don't know 'cause I just feel like if I do something then other people will think, 'oh no', like because he can't do it if you know what I mean."

Only girls talked about being embarrassed, for example a Year 9 below average ability student stated, "I couldn't swim to save my life so I just said, 'I can't swim', so I could get in the little pool 'cause I don't want to make a show of myself in the big one."

Themes relating to enjoyment.

High.

High enjoyment of PE was apparent throughout the focus groups, as students mentioned it being exciting and fun, and that they laughed, smiled and liked the subject. For example Year 9 above average ability boys pointed out that PE is, "exciting just running round," and that, "everyone will be like cheering your name and everyone's like smiling no one's sat sitting down upset." Year 9 above average ability girls indicated that, "we'll all have a laugh and run around and go wild don't we, so it's good." Also, Year 8 above average ability girls revealed that when they enjoy PE, they try harder, "I love it and when you actually love something people can tell that you love it and you put all your effort into it."

Low.

In contrast a number of girls commented that they found PE to be boring and unexciting. For example, a Year 9 above average ability girl stated, "It's a bit boring isn't it. And it's just repetitive really isn't it." In addition, a Year 8 below average ability girl voiced that, "we just do that all the time and to be honest it does get a bit boring...we just do the same thing all the time."

Reasons.

Key reasons for enjoying PE involved being selected, improving and being competent. Year 8 and 9 below average ability girls commented that, "I'm improving and I'm enjoying it," and, "I like tennis you know 'cause I'm good at it and they pick 8 people out of each class."

Themes relating to feedback.

Positive.

Types of positive feedback included constructive criticism, compliments, praise, and encouraging, supportive and positive comments. For example, Year 8 above average ability girls announced that their PE teachers, "take you over to one side and just go, 'well I forgot to tell you yesterday but you were great, I'm going to put you in for a team', or, 'you should start a team', or something," and that, "They'll say, 'well done, that was brilliant', in rounders they'll say, 'nice fielding', or, 'nice catch'."

Negative.

In contrast negative feedback in PE was also evident from the focus groups. This involved negative, offensive, derogatory comments, shouting, moaning and criticism. Year 9 average ability girls revealed, "It's like when you're playing rounders they'll shout at you if you drop a ball," and, "if you're out in like the first three she says you're overweight and all stuff like that." In addition, Year 9 below average ability boys stated that their PE teachers, "threaten you...they say, 'you're going to get a 4 if you don't do this' and all this." Furthermore, Year 9 below average ability girls suggested that they don't get any feedback from

their PE teachers, "Well she's not putting me down, she's just not acknowledging it...she just doesn't say anything."

Sources.

Within PE, students discussed a variety of sources of feedback, comprising of their PE teachers and peers, as a Year 9 average ability girl discussed, "Like your teachers say, 'well done', you mates would actually go, 'you're dead good at that'." Also, students receive feedback from their school report cards, credits, badges and awards. Year 8 above average ability boys mentioned, "I got star pupil in PE...I'm going to a reward thing tonight, I think that's about PE."

Feelings.

Both boys and girls commented that feedback in PE makes them feel good and increases their confidence. However, they also discussed that they don't believe their teachers' feedback. A Year 8 below average ability boy stated, "I have a feeling that all teachers before they started to teach had to sign a letter saying, 'even if the child does something terribly bad you have to say it's good', that's what I believe in." Moreover a Year 8 below average ability girl declared, "Yeah they're like programmed, you're not even trying your best or anything, you're not even moving and they go, 'good work', and walk away and you're like eh?!" Furthermore, girls suggested that feedback makes them feel as though they have accomplished something and that they are acknowledged. Year 8 above average ability girls stated, "...like you've accomplished something...You feel like you're a part of something...Feel like you're noticed...in PE it just feels like you're noticed you're not invisible." For boys it seemed more important that their parents would be aware of their achievements. For example, a Year 8 above

average ability boy stated, "Yeah just to say that you've been doing good in sport this year so it's good to know that you have been noticed...and then your parents know about it as well which is better."

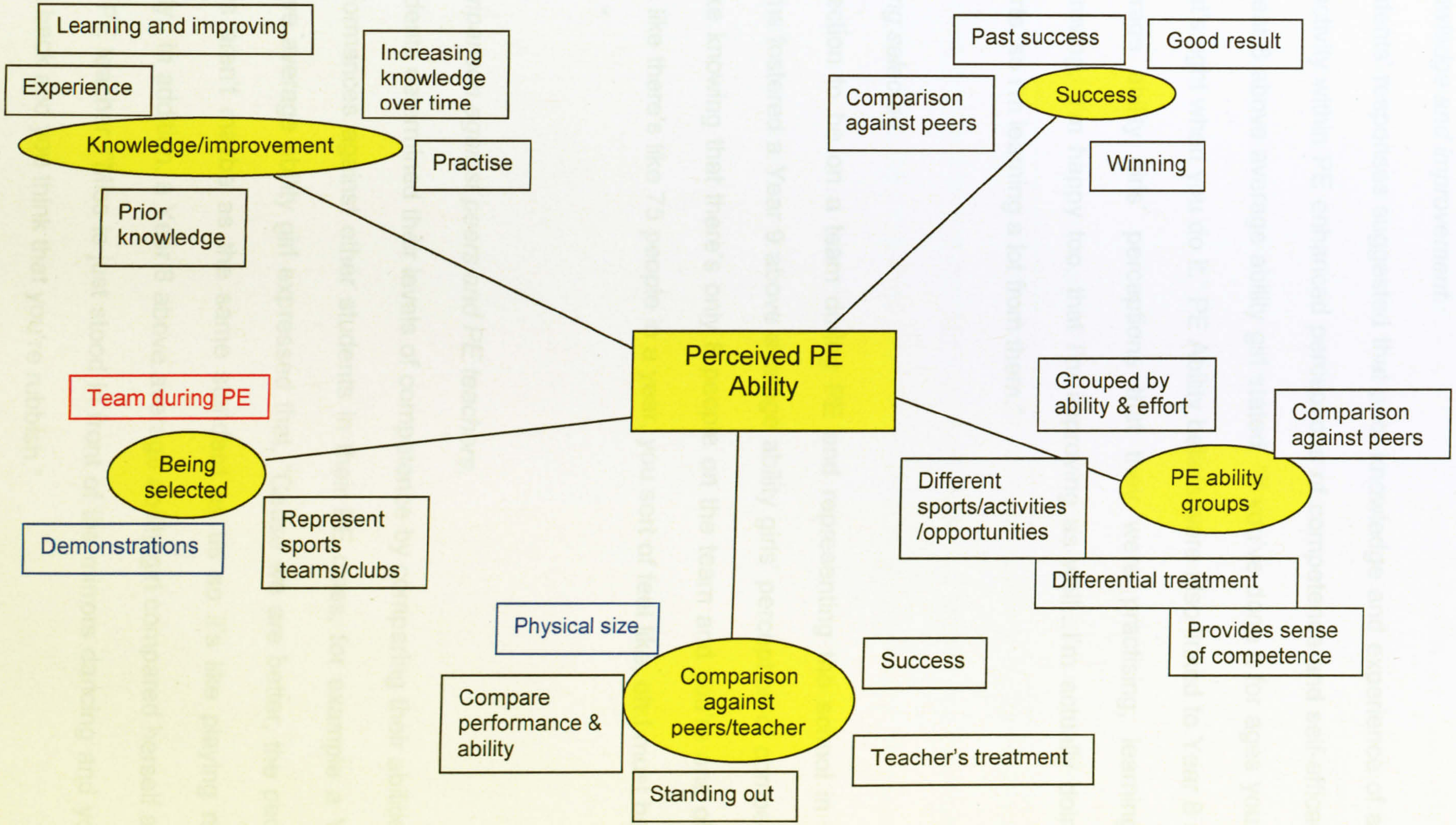

Figure 5.3. Higher and lower order themes relating to Perceived PE Ability

Themes relating to perceptions of PE Ability.

Knowledge and improvement.

Students' responses suggested that prior knowledge and experience of a sport or activity within PE enhanced perceptions of competence and self-efficacy, as a Year 8 above average ability girl stated, "If you've done it for ages you know what's right when you do it." PE Ability beliefs were also linked to Year 8 above average ability girls' perceptions that they were practising, learning and improving, "I'm happy too, that I'm improving as well...I'm actually doing the sports, so I'm learning a lot from them."

Being selected.

Selection to be on a team during PE and representing the school in sports teams fostered a Year 9 above average ability girls' perception of competence, "I like knowing that there's only 8 people on the team and you're one of them and like there's like 75 people in a year, you sort of feel like, oh I must be good at it."

Comparison against peers and PE teachers.

Students determined their levels of competence by comparing their abilities and performances against other students in their PE class, for example a Year 9 above average ability girl expressed that, "Cause we are better, the people in class aren't maybe as the same standard as us so it's like playing nobody really." In addition, a Year 8 above average ability girl compared herself against her PE teacher, "Miss is just stood in front of the mirrors dancing and you just look back and you think that you're rubbish."

PE ability groups.

Students acquired an awareness of their competence as they compare themselves to other PE groups, "the top set are obviously better than me like." Also, a Year 9 above average ability boy described the difference in ability as, "it's like having a six foot boxer against a three foot."

Success.

A key theme emerging from the focus groups was success, with students relating their perceptions of PE ability to past success in the subject. For example, a Year 8 above average ability girl stated, "I know I can bowl and field and I know I can hit the ball dead far so, and I can get a rounder. "Another Year 8 above average ability girl commented that, "We did this big cross-country run at the field down there and I won by far."

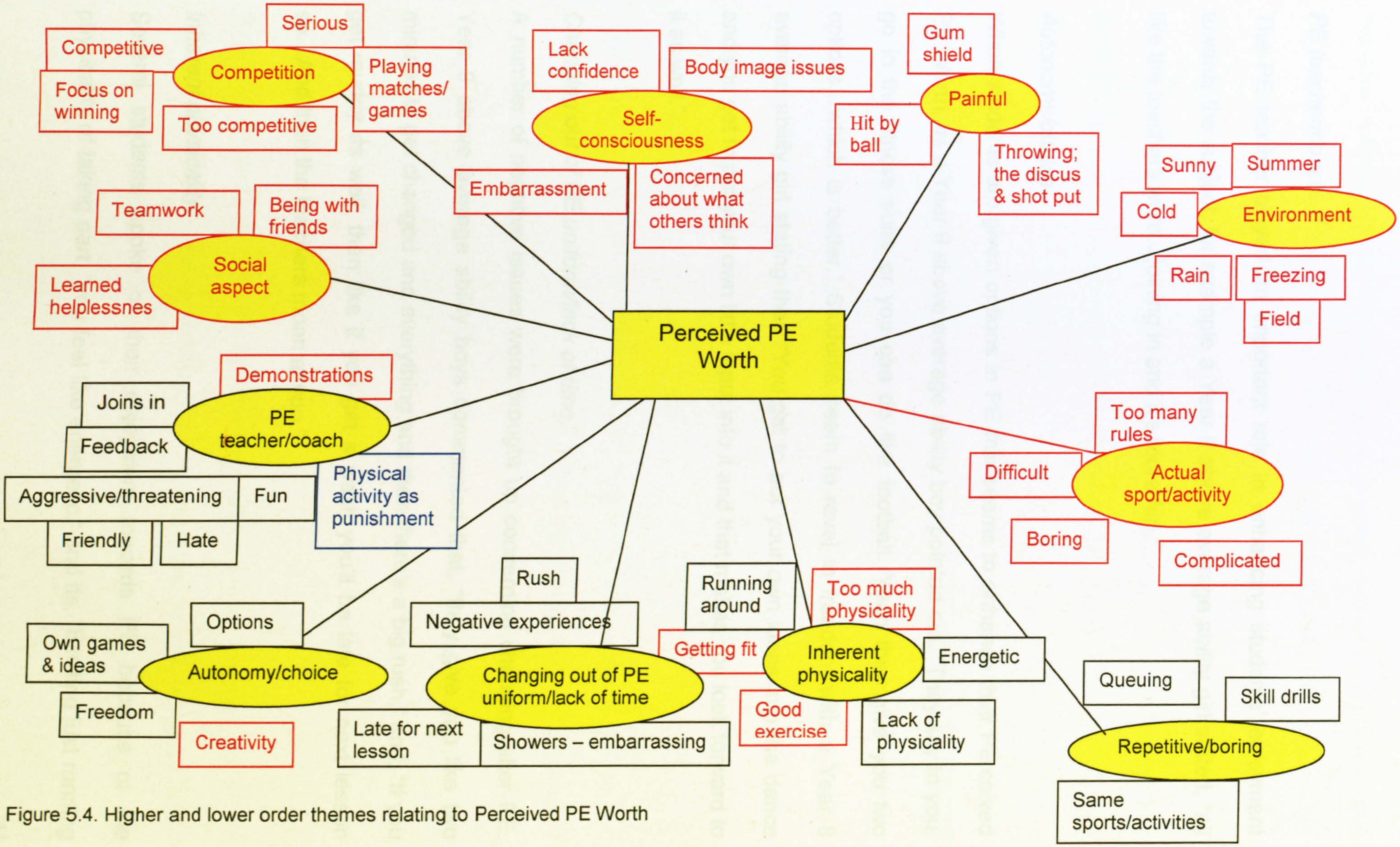

Figure 5.4. Higher and lower order themes relating to Perceived PE Worth

Themes relating to perceptions of PE Worth.

PE teacher/coach.

The PE teacher played an important role in enhancing students' enjoyment towards the subject, for example a Year 9 above average ability girl stated, "all like the teachers were...joining in and it's more fun."

Autonomy/choice.

When students are given options in PE this seems to enhance their Perceived PE Worth, as a Year 9 above average ability boy pointed out, "They say to you, go in the fitness suite or you can do like football. Yeah they give you two options...which is better." Students seem to revel in freedom with a Year 8 average ability girl stating that, "You get to put your own ideas into the dance and you get to put your own little input into it and that makes you look forward to it as well."

Changing out of PE uniform/lack of time.

A number of negative issues were brought up concerning changing after PE. Year 9 above average ability boys commented that, "they give you like two minutes to get changed and everything and then there's a big rush," and, "If you get muddy as well, then like if you get a wash you'll be late for next lesson so...And then the teachers moan at you."

Inherent physicality.

Several students spoke of their enjoyment towards PE because of the physicality of taking part, "you feel like energetic," and its, "Exciting just running

round." A Year 9 average ability girl associated the physicality of PE with exercise and getting fit, "it's really good exercise because you are proper pouring with sweat, it's so good." However, students vastly differed in their views about the amount of physicality they liked. One Year 9 below average ability girl declared that, "There's no reason to have to run really though is there." This contrasts greatly with another Year 9 above average ability girl's comment that, "it's [tennis] boring, you don't move, it's like a lazy sport."

Repetitive/boring.

Year 9 above average ability boys believed that too much time of PE is focused upon skills drills, "Every lesson it's like pass the ball with the inside of your foot." Other concerns triggering boredom involved doing the same sports and activities, "We do football every single year."

Actual sport/activity.

Girls suggested that some sports and activities within PE were too difficult and complicated. With one Year 8 average ability girl saying that, "The game in general, I think it's harder to grasp like...in lacrosse there's a lot of positions, you've got your stick, the way you've got to hold the ball or otherwise it's going to fall out."

Environment.

Girls commented that the PE environment affected their perceptions of PE Worth, with a Year 9 above average ability girl suggested that, "it's good when it's sunny in the field." In contrast a Year 9 average ability girl stated, "In the

freezing cold they made us go in the field and it's muddy and with football boots...It's so uncomfortable and cold then."

Painful.

Particular sports, activities and experiences within school PE were remarked upon by girls as causing physical pain. For example a Year 8 above average ability girl said, "I don't like throwing heavy things 'cause you just hurt your hands." Whilst another Year 8 average ability girl mentioned that wearing gum shields, "it makes me cry, it does, it goes too far back."

Self-consciousness.

Girls approached their concerns about being self-conscious in PE, which included body image issues. A Year 9 average ability girl remarked upon that, "some people have problems and they feel like too skinny and too fat and they don't want to do certain things."

Competition.

Some Year 8 average ability girls revealed that they enjoyed the "big games" as they, "are all dead competitive." In contrast, other Year 9 average ability girls would prefer to have fun, "we're all just having fun and they have to win."

Social aspect.

A key theme relating to perceived PE Worth for girls involved the social aspect of participating with friends. A Year 8 above average ability girl said that they, "like dance 'cause normally you get to be in a group with all your mates and stuff."

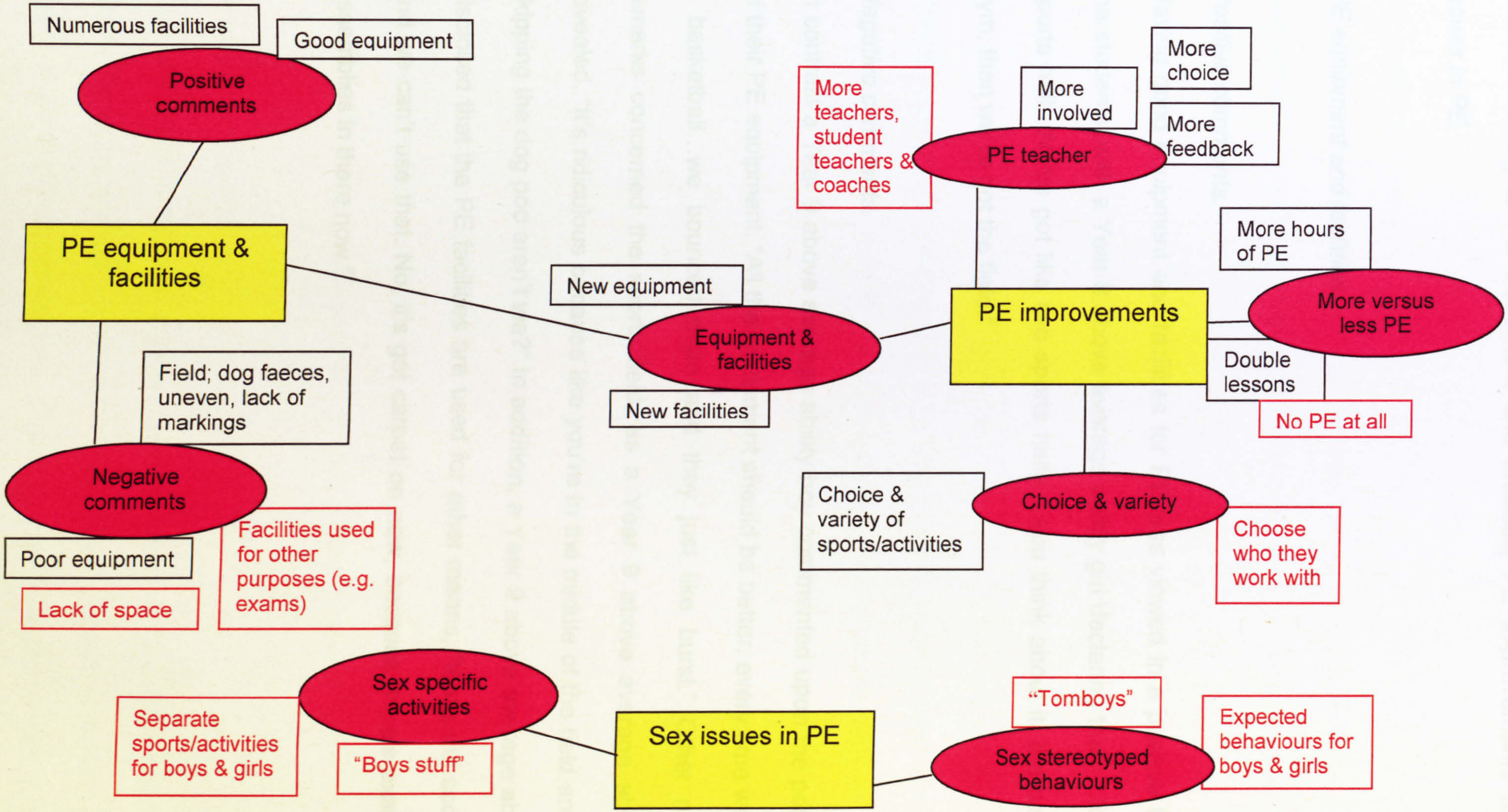

Figure 5.5. Higher and lower order themes relating to PE equipment and facilities, PE improvements and sex issues

Themes relating to PE equipment and facilities, PE improvements and sex issues in PE.

PE equipment and facilities.

Positive comments.

Having good equipment and facilities for PE was viewed in a positive light by the students, with a Year 8 above average ability girl declaring that, "I love the sports hall...We've got like two sports halls if you think about it, the hall, they gym, then we've got the field."

Negative comments.

In contrast a Year 9 above average ability boy commented upon the poor state of their PE equipment, "All the equipment should be better, every time we go for a basketball...we bounced them and they just like burst." Other negative remarks concerned the sports field, as a Year 9 above average ability girl revealed, "It's ridiculous because like you're in the middle of the field and we're skipping the dog poo aren't we?" In addition, a Year 9 above average ability girl disclosed that the PE facilities are used for other means, "that's the sports hall and we can't use that. No, it's got carpet on now, because there's exams and assemblies in there now."

PE improvements.

Equipment and facilities.

Students revealed that they want, "Better equipment," and Year 8 above average ability and 9 below average ability girls want, "a swimming pool."

PE teacher.

Improvements relating to the PE teacher consisted of students desiring more choice and feedback. One Year 9 above average ability boy said, "Rather than just watching us the teachers get more involved in it like and encourage us." Year 9 above average ability girls remarked that they would prefer more student teachers, "Because they're younger and they communicate with us better." Furthermore, a Year 9 above average ability girl commented that, "They are more like in touch with what's going on now and in the world today."

Choice and variety.

Boys and girls discussed that PE would be better if their teachers offered them more choice and variety. Year 9 above average ability girls suggested that PE teachers should, "make it a bit varied 'cause we just we need something different," and that, "we should be allowed to choose whether we do dance or rounders." Moreover, girls would like to choose who they work with in PE.

More versus less PE.

Quite a lot of students, both boys and girls in Year 8 and 9 commented that they would like more hours of PE and double lessons. For example a Year 9 above average ability girl expressed that, "I think it's good, I wouldn't mind doing more

PE like." However, when asked how to improve PE lessons a Year 9 below average ability girl declared, "Not have them at all."

Sex issues in PE.

Sex specific activities.

Both Year 8 and 9 girls described several sports and activities as "boys stuff," (e.g., cricket, football, basketball). A Year 8 above average ability girl believed that, "Girls here are not meant to do basketball." In addition, a Year 9 average ability girl separated sports and activities based on sex, "those are girls' sports and those are boys' sports."

Sex stereotyped behaviours.

Girls had stereotyped expectations of their required behaviour. A Year 8 above average ability girl stated that, "We've had this woman who was like a man and she thinks she...I think she thought of us as boys, made us do like boys stuff, we did like basketball didn't we?" Furthermore, a Year 8 above average ability girl described other girls who like sport and in particular football, as "tomboys... she wanted to get the ball and you're like, 'you're not a boy you're like a girl'."

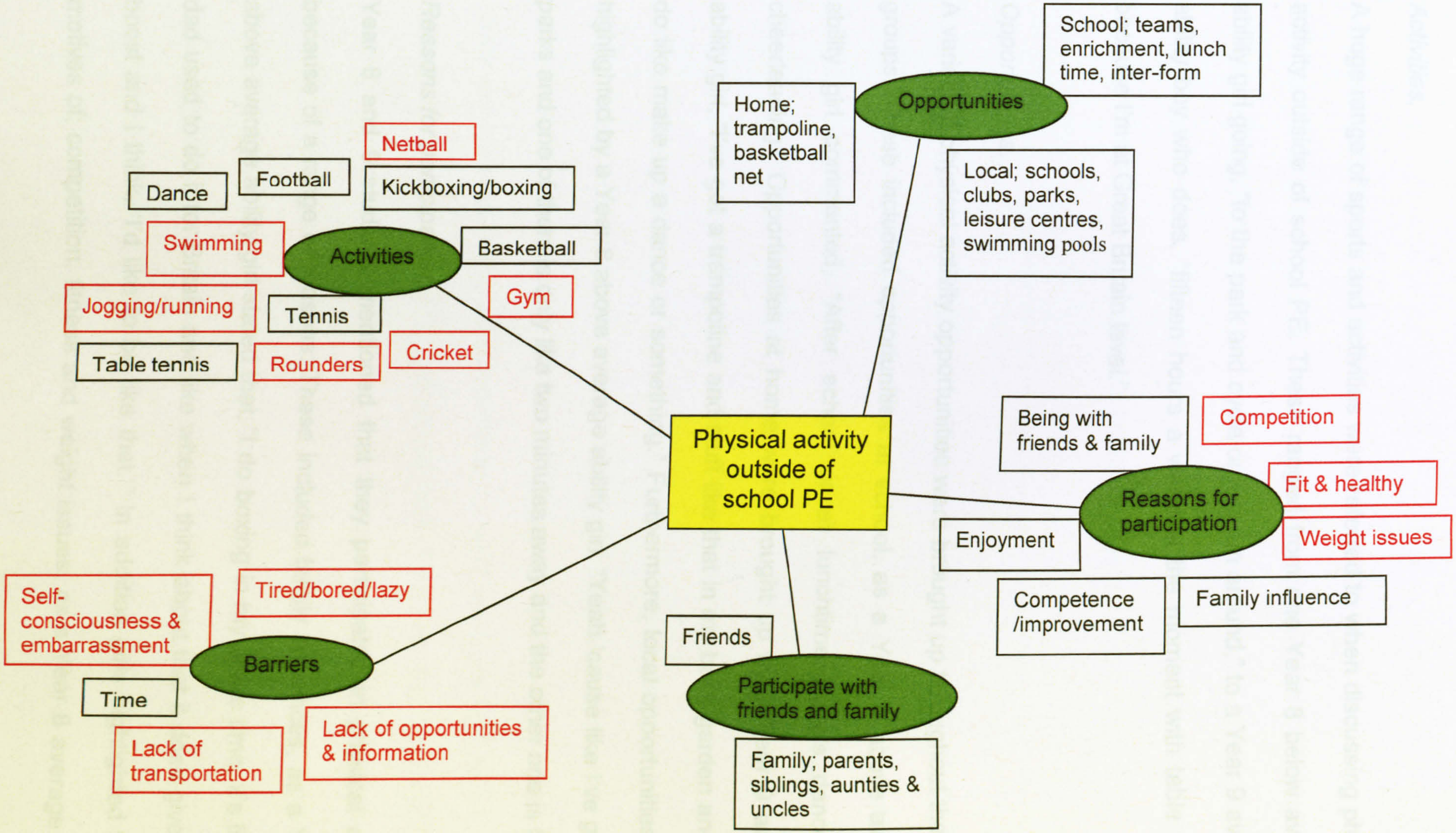

Figure 5.6. Higher and lower order themes relating to physical activity outside of school

Themes relating to physical activity outside of school PE.

Activities.

A huge range of sports and activities were referred to when discussing physical activity outside of school PE. These ranged from one Year 8 below average ability girl going, "to the park and cycle or just run around," to a Year 9 average ability boy who does, "fifteen hours a week at the moment with table tennis because I'm at Great Britain level."

Opportunities.

A variety of physical activity opportunities were brought up throughout the focus groups. These included opportunities at school, as a Year 8 above average ability girl commented, "After school or at lunchtime there's dance and cheerleading." Opportunities at home were brought up by a Year 9 average ability girl, "I've got a trampoline and stuff like that in my back garden and we'll do like make up a dance or something." Furthermore, local opportunities were highlighted by a Year 8 above average ability girl, "Yeah 'cause like I've got two parks and one of them is only like two minutes away and the other one is five."

Reasons for participation.

Year 8 and 9 students mentioned that they participated in physical activity because of a range of reasons. These included family influences, as a Year 8 above average ability girl stated that, "I do boxing in my spare time, it's like my dad used to do it for Britain and like when I think about that it does give me a boost and I think, 'I'd like to be like that.'" In addition girls highlighted further motives of; competition, fitness and weight issues, as a Year 8 average ability

girl commented that, "I want to put on weight 'cause everyone always tells me I'm too skinny."

Participate with friends and family.

Students participate in sport and physical activity outside of school PE with their friends and family. For example Year 9 above average ability girls stated that, "I go running round the park with my friend," and, "Tuesday night I jog four miles with my mum, 'cause my mum likes keeping fit and stuff.

Barriers.

Both boys and girls mentioned a lack of time as being the key barrier to physical activity outside of school. For example, a Year 9 above average ability girl declared that, "I just don't really have the time any more 'cause like, I like to have a social life as well rather than live around sports." Girls stated four other barriers, which included a lack of transportation as a Year 8 average ability girl commented that, "my mum can't get me 'cause she's always like minding the baby or she's too tired minding the other one and stuff like that but I still do stuff when I can." Another barrier which was highlighted by a Year 9 above average ability girl involved being tired/bored/lazy, "I can't be bothered." In addition a Year 9 above average ability girl stated that, "I just wanted to do like street dancing instead and then there was a lack of places to go and so I just stopped altogether," demonstrating a lack of lack of opportunities and information. Finally, a Year 9 average ability girl commented that, "I wouldn't want to go swimming, I'd be well embarrassed," emphasising self-consciousness and embarrassment issues.

5.4: Discussion

The purpose of this study was to qualitatively explore the views of the students on the effectiveness of PE in developing the 'PE product' and to help explain and expand upon the results of Study 2. Study 2 concluded that sex, year group, BMI, deprivation score, Perceived PE Ability, Perceived PE Worth, number of students on roll, and number of indoor spaces, most strongly correlated with the outcomes representing physically active and physically educated young people (i.e., the 'PE product'). Sex was a key predictive variable for both objectively measured and self-reported physical activity, with boys participating in more physical activity than girls. The results of the focus groups revealed that a variety of factors may help explain the sex differences in physical activity levels. These include themes relating to girls' perceptions of PE Ability and Worth (Figures 5.2 and 5.4), (e.g., viewing PE as boring and unexciting, too competitive, lacking feedback and creating learned helplessness beliefs), sex issues in PE (e.g., the belief of sex specific activities and sex stereotyped behaviours in PE) (Figure 5.5), and perceived barriers to physical activity (Figure 5.6).

A number of girls mentioned that they disliked PE, (e.g., "It just bores me") which may negatively affect their physical activity levels. Carlson (1995) and Portman (1995) suggest that students who dislike PE may select to avoid participation in physical activity in their daily life. The experience of enjoyment is a critical factor in determining continued participation in sport, exercise and physical activity (Scanlan and Lewthwaite, 1986; Scanlan et al., 1989; Wankel, 1993). Scanlan et al. (1989) interviewed former elite figure skaters and

concluded that enjoyment enhanced their desire to continue skating, their desire to exert effort, and their actual effort output. Subramaniam and Silverman (2007) reported that enjoyment of PE can play an important role in maintaining an active lifestyle outside of school. McKenzie (2003) suggests that PE can serve as a medium to influence positive attitudes towards physical activity; therefore, enjoyment of PE may have carryover value to adherence participation in lifetime physical activity (Subramaniam and Silverman, 2007). In comparison Bengoechea et al. (2010) found that PE enjoyment in Canadian students was consistently and positively correlated with participation in organised and unorganised physical activity in and outside of school. These findings suggest that higher levels of PE enjoyment may have a protective effect against circumstances and situations that place adolescents at risk of becoming physically inactive (Bengoechea et al., 2010). Only girls brought up their dislike for PE, which is in accordance with previous studies that have reported a significant sex difference in enjoyment in PE, with boys reporting significantly higher levels of PE enjoyment (Cardon et al., 2005; Carroll and Loumidis, 2001; Hilland et al., 2009; Stelzer et al., 2004). Furthermore, in their study exploring African American and Latino adolescents' reasons for participating and not participating in physical activity, Taylor et al. (1999) concluded that almost without exception, the thirty-four girls did not like PE. In addition, their PE experiences discouraged those girls who initially had some interest in activity and sports. This is because the girls felt PE teachers preferred teaching boys, showed boys more attention, and that boys excluded them from sports and physical activities during PE (Taylor et al., 1999). However, Fairclough (2003) reported that both sexes enjoy PE lessons to a similar degree, and Subramaniam and Silverman (2007) reported no significant differences for

enjoyment of PE. These contrasting results are not unexpected and may be a result of a range of factors. For example, it is difficult to compare results from studies with different participants, age groups, PE contexts (i.e., co-educational versus single sex PE), PE activities and instruments to measure enjoyment of PE.

Learned helplessness in PE was a theme identified during the focus groups with girls, which may help explain the sex differences in physical activity. Learned helplessness occurs when an individual perceives that failure will occur whether they try or not, therefore they give up and stop trying (Miller, 1986). Within PE this construct provides a way to understand how students react over time to failure and unsuccessful experiences (Portman, 1995). If students perceive the causes of failure to be internal, uncontrollable and stable, expectancy for future failure is increased (Abramson et al., 1978; Robinson, 1990). This has been found to result in a reduced incentive to participate, feelings of resignation, apathy, low self esteem and depression (Abramson et al., 1978; Robinson, 1990). This construct has been previously identified in school PE (Carlson, 1995; Ntoumanis et al., 2004; Portman, 1995; Robinson, 1990). Ntoumanis et al. (2004) interviewed amotivated children and found that helplessness beliefs of low strategy, low effort and low capacity were the main causes of amotivation in PE. Furthermore, Portman (1995) concluded that all of the girls in their study showed symptoms of learned helplessness, already believing themselves fatalistically destined for failure in PE. Important antecedents of learned helplessness include the knowledge of being low skilled, low teacher expectations, and the competitive achievement structures in PE (Ames, 1984; Portman, 1995; Robinson, 1990). These antecedents are consistent with the

findings from the current study, where learned helplessness beliefs were only identified in girls rated as below average ability by their teacher. Moreover, these beliefs were enhanced by teacher expectations, (e.g., "It's like as soon as they see you they think, 'she's going to be bad and there's no point in wasting any time on them'"). In addition, Ames (1984) identified competitive practices of grouping students by ability, publicly charting student progress, and using comparative information to determine grades as forcing social comparison. These practices were apparent in the focus groups, "I think when she gives the credit notes no one tries anymore, everyone just thinks well it's going to be the same two people every week so what's the point."

Girls' dislike of PE was also associated with perceptions of there being too much competition in PE, (e.g., "The competitiveness of it as well, like how people can be really competitive about it....we're all just having fun and they have to win"). Research has reported that competition results in some students disliking PE (Robinson, 1990). Competition forces social comparison in which students are faced with salient and obtrusive information about their peers' performance, therefore exaggerating the role of ability in perceptions of self-worth and undermining attempts to become mastery or task focused (Ames, 1984; Covington and Beery, 1976). Additionally, the competitive nature of PE has been acknowledged as a deterrent to participation (Carlson, 1995). Van Daalen (2005) concluded that a key factor associated with girls' decision to drop out of PE, once the compulsory credits had been achieved, was the competition that was involved. Therefore, this may help explain differences in physical activity between boys and girls, with some girls disliking the competitive element of PE and therefore being put off participating in physical activity. However, not

all girls disliked competition, (e.g., "I just love doing like, and competing against people and winning," and, "us lot we're really competitive...The class as a whole is competitive"). Girls' views regarding competition in PE may be related to their motivational orientations. For example, ego-oriented students may enjoy competition as they define success and construe competence by out-performing others. In contrast task-orientated students determine success by self-improvement, or mastering of a task, therefore utilise more of a self-referenced perception of competence (Goudas et al., 1994; Wang et al., 2002).

A number of perceived barriers to physical activity participation were identified in the focus groups (Figure 5.6), which represent obstacles individuals face in undertaking, maintaining or increasing physical activity (Allison et al., 2005; Allison et al., 1999). Sallis et al. (2000) concluded that perceived barriers to physical activity are among the most consistent negative correlates of children's actual physical activity. Both boys and girls in the focus groups proposed that time was a key barrier, which concurs with previous research (Allison et al., 2005; Allison et al., 1999; Neumark-Sztainer et al., 2003; O'Dea, 2003; Tergerson and King, 2002). Participants mentioned a lack of time due to homework, part-time jobs, other plans and commitments, and wanting to do other things with their time, (e.g., "I don't know I'm always too tired and stuff and I feel like I've got too much schoolwork to do"). This statement is typical of many of the students and is consistent with findings from other studies (Allison et al., 1999; Dwyer et al., 2006; O'Dea, 2003; Tergerson and King, 2002).

Girls perceived four more barriers than boys which supports previous research in this area (Allison et al., 1999; Tergerson and King, 2002; Zabinski et al.,

2002). Allison et al. (1999) reported a sex difference in perceived barriers, with significant differences apparent in 8 out of 9 instances, which reflected girls perceiving more barriers compared to boys. Therefore, the sex differences in perceived barriers to physical activity may help explain the divergent levels of physical activity between boys and girls (Allison et al., 1999). Girls' additional perceived barriers to physical activity included a lack of transportation, which has been acknowledged by girls in other studies (Dwyer et al., 2006; Sleap and Wormald, 2001). Transportation problems involved girls getting to and from facilities as parents were not always available to drive them. This may be specific to girls as boys may not need transporting as often, as they may be able to get to their physical activity by other means (e.g., foot, bike) or they may rely more on unstructured activities close to home (e.g., playing football in the street). In addition this finding concurs with Hoefer et al.'s (2001) conclusion that boys were transported to activity locations more often than girls, which may reflect boys' greater physical activity levels as they were found to be participating more than girls in both activities that required transportation and those that did not. In addition, there may be more physical activity opportunities for boys that require transportation. However, this study was conducted in southern California which is known to be highly auto-dependent, and relied upon surveys to measure parental provision of transportation and physical activity (Hoefer et al., 2001). Consequently, this study is open to biases because of the subjectivity of parental recall and the higher use of cars in the area; therefore replications are needed in less auto-dependent areas.

Girls also stated that they were too lazy, tired and could not "be bothered" to participate in physical activity. Similar results have been reported by Robbins et

al. (2003) and Saxena et al. (2002), who highlighted self-reported laziness and a lack of motivation as commonly cited barriers among girls, which may be down to maturational differences and a lack of social support and encouragement to be physically active for girls (Robbins et al., 2003; Taylor et al., 1999). Perceiving a lack of physical activity opportunities and information was another major barrier for girls, which has been reported elsewhere (Dwyer et al., 2006; Taylor et al., 1999). Culp's (1998) qualitative analysis revealed several meaningful sources of constraints to outdoor recreation, including girls' perceiving a lack of opportunities. Moreover, Petlichkoff (1992) stated that a lack of opportunity and accessibility was responsible for the high attrition rate in sports participation. A number of girls discussed issues of self consciousness and embarrassment about their physical appearance as barriers to physical activity participation (e.g., "I wouldn't want to go swimming, I'd be well embarrassed"). This perception concurs with findings from Zabinski et al.'s (2002) study which highlighted how girls reported body-related concerns including body consciousness and anxiety about others seeing their bodies while being active, as the most frequent barriers to physical activity. However, as this study focused upon overweight participants seeking treatment at either a summer fitness camp or a weight loss clinic, the conclusions are limited to this population. Other studies though have focused upon adolescent students in PE and their barriers to physical activity, and have revealed similar results (Dwyer et al., 2006; Leslie et al., 1999; Robbins et al., 2003). Dwyer et al. (2006) conducted 7 focus groups with adolescent Canadian girls, and concluded that a key barrier was body centred issues including girls being self-conscious about their appearance, particularly in front of adolescent boys.

Some girls stereotypically believed that sports and activities within PE were sex-specific (e.g., "those are girls' sports and those are boys' sports"). This differentiation by sex has been highlighted elsewhere, with school PE relying upon traditional notions of sex appropriate sports and activities (Garrett, 2004; Williams et al., 2000). Girls believed that a number of sports and activities were not available to them as they were "boys sports" (e.g., football, cricket and basketball). This lack of availability effectively reduces girls' physical activity opportunities and acts to alienate them from their physical selves (Garrett, 2004). Within the focus groups a number of girls described sporty and competitive girls who participated in predominantly male activities like football, as "tomboys," which is in accordance with previous research (Cockburn and Clarke, 2002; Hills, 2006). Cockburn and Clarke (2002) concluded that a girl in PE can be identified as a masculinised 'doer' (a *tomboy*), or a feminised 'non doer' (a *girlie*) of sport and physical activity. Therefore, those girls who find PE as being incompatible with their versions of appropriate female behaviour forego any real or valuable benefit of physical activity participation (Hills, 2006). Issues that were raised in the focus group interviews which may help explain the sex difference in physical activity participation included girls' lack of PE enjoyment, too much competition in PE, learned helplessness beliefs, girl's enhanced perceptions of barriers to physical activity compared to boys', and girls' views of the gendered nature of PE.

Perceived competence refers to an individual's beliefs about their ability in an achievement domain (Harter, 1982), and is key to the predisposing factors described by Welk (1999), with the question '*am I able?'*. Perceived PE Ability beliefs were key to both measures of physical activity, which concurs with

previous research suggesting that perceived competence is closely related to motivational indicators, such as choosing to participate in physical activity (Asci et al., 2001; Biddle and Armstrong, 1992; Sabiston and Crocker, 2008; Weiss, 2000). Sallis et al. (2000) also reported in their review of correlates that perceived physical activity competence was consistently and positively associated with physical activity. More specifically, Carroll and Loumidis (2001) found that children with higher perceived competence in PE participated in significantly more self-reported physical activity outside of school than those of low perceived competence. These findings emphasise the possible important influence of perceived competence in PE with regard to participation in and out of school physical activity. Within the current study numerous sources of information were used by both boys and girls to evaluate their performance competencies in PE. Criteria included feedback, enjoyment, PE ability groups, being selected on a team during PE and to represent school sports teams, normative comparisons with peers and teachers, success, knowledge and improvement (Figures 5.2 and 5.3). These sources for judging how capable the students are in PE are comparable to those reported by Chase (1998), in a study examining sources of self-efficacy in PE and sport in 24 children aged 8-14 years. Sources included praise and encouragement from significant others, practice, successful performances, comparison with others, improvement and winning (Chase, 1998). Furthermore, similar results have also been reported by McKiddie and Maynard (1997), who identified 8 distinct and meaningful categories that secondary school aged students used to assess their competence. These included peer comparison/evaluation (comparison to classmates/skill level, peer feedback) significant adults' feedback (teacher's evaluation and feedback, praise or criticism), sport attraction (enjoyment, ability

to improve), game outcomes, skill learning (ease/speed of learning), spectators'/others' evaluation, and self-comparison (improvements). Possible limitations of this study include the reliance upon a questionnaire scale to measure sources of competence information, which may have influenced the degree of objectivity in the results. Positive feedback from PE teachers and peers was the most commonly cited criteria used to assess competency within PE, which is in accordance with previous research (Ferrer-Caja and Weiss, 2000; Nicaise et al., 2007a; Silverman et al., 1992). This positive feedback about students' competence serves to maintain or enhance intrinsic motivation toward the activity (Ferrer-Caja and Weiss, 2000). Also, Koka and Hein (2003) reported that one of the most important predictors of intrinsic motivation in PE was perceived positive feedback. Consequently, teachers who provide positive feedback are more likely to be successful in facilitating children's intrinsic motivation because such teachers' behaviours enhance both children's perception of competence and interest in physical activity (Ferrer-Caja and Weiss, 2000; Koka and Hein, 2003).

Within the YPAPM the other predisposing factor involves enjoyment and attitudes summed up by the question, "*is it worth it?*" (Welk, 1999), which in the current study was represented by the construct of Perceived PE Worth. Enjoyment of physical activity has been found to be one of the most important predictors of physical activity (DiLorenzo et al., 1998). In addition, Deci and Ryan (1985) suggest that when people experience interest and enjoyment they are more likely to exert effort and persist in the activity. Therefore enjoyment, satisfaction and/or fun are primary motives for participation. Bengoechea et al. (2010) suggest that PE enjoyment is an important psychological correlate to

consider when exploring links to physical activity, as it has been found to be significantly associated with structured physical activity (Barr-Anderson et al., 2007).

In the focus groups fourteen higher order themes relating to Perceived PE Worth were identified (Figures 5.2 and 5.4). These principles which determine students' Perceived PE Worth are similar to those previously identified (Figley, 1985; Garn and Cothran, 2006; Hassandra et al., 2003; Smith and St. Pierre, 2009). Garn and Cothran (2006) highlighted three key fun themes in PE as: (a) teacher (e.g., teachers creating fun, reducing PE enjoyment and attitudes), (b) task (e.g., importance of personal competency, challenge, success, meaningfulness), and, (c) social (e.g., spending time with peers). Along with the critical incident technique these authors utilised a survey instrument based on the Scanlan and Lewthwaite's (1986) Model of Sport Enjoyment, which may not be the most appropriate tool to use because of the inherent differences between sport and PE. Following 16 in-depth interviews, Hassandra et al. (2003) revealed two higher order themes that were associated with intrinsic motivation for PE; (1) individual differences and, (2) the social environment. Individual differences involved; perceived competence, perceived autonomy, perceived usefulness, goal orientation and physical appearance. The social environment was made up of in-school environmental factors (lesson content, PE teacher, schoolmates and school athletic facilities) and out of school environmental factors (physical activity behaviour of family and encouragement, participation in out of school athletic activities, media, cultural values and social preconceptions). These results demonstrate that a wide variety of factors influence the development of Perceived PE Worth.

Previous studies have also identified the PE teacher (Carlson, 1995; Hassandra et al., 2003; Luke and Sinclair, 1991; Prusak et al., 2004; Ward et al., 2008), providing choice (Carlson, 1995; Dyson, 1995; Hopple and Graham, 1995), competition (Carlson, 1995; Ennis, 1996), the social aspect of PE (Dyson, 1995; Garn and Cothran, 2006) and variety (Ryan et al., 2003) as important influences in determining students' attitude and enjoyment toward PE. In addition, competence was highlighted throughout the focus groups as a key predictor of Perceived PE Worth. Feelings of competence were a source of fun, (e.g., "I like tennis you know 'cause I'm good at it"), and a perceived lack of competence was a barrier to fun (e.g., "I just don't like dance, don't like it, can't dance, don't like it") which concurs with previous research (Goudas et al., 1994; Ntoumanis, 2002). Therefore, children who feel and are physically competent tend to find PE fun and enjoyable and appear more likely to want to continue participating in an active lifestyle. Competition was also evident throughout the students' reflections of PE, with students both liking and disliking the competitive element. These findings are supported by previous studies (Dyson, 1995; Garn and Cothran, 2006). Other highlighted themes were similar to those reported by Coakley and White (1992), in which decisions about sport participation reflected past experiences in school PE classes. Most memories were negative revolving around boredom, lack of choice, feeling stupid and incompetent, and receiving a negative evaluation from peers. These results suggest that negative experiences of PE may "switch off" individuals from participating in sport and physical activity outside of the curriculum. Consequently, as Carroll and Loumidis (2001) stated, if PE programmes are enjoyable for students they may encourage adolescents to become more active.

Within study 2, knowledge and understanding of HRE was significantly higher in girls than boys. This may relate to the fact that only girls in the focus groups talked about their PE teachers' HRE messages (e.g., "Stretches. Like naming the parts of the legs and that, it's necessary"). This quote suggests that female PE teachers stress the importance of knowledge and understanding of HRE, and concurs with the findings of Fairclough et al. (2002) who concluded that female PE staff provided significantly more HRE lessons in PE (permeation approach and discrete or focused HRE lessons) than their male counterparts. In addition, girls mentioned that a key reason for participating in physical activity within PE and outside of school was for health and fitness benefits (e.g., "...we know they're good for us. Yeah and I like keeping fit as well like"; "If you keep on doing sport and things like that you keep healthy"). These views demonstrate that girls clearly recognise that physical activity can provide important health and fitness benefits, which supports previous research (Flintoff and Scraton, 2001; Taylor et al., 1999).

It was evident throughout the focus groups that students behaved differently during PE, depending of their level of enjoyment and interest in PE activities. For example, "On like the courts if its netball or whatever and you would want to be like, with the teachers and trying to improve and things like that...in tennis you get the court furthest away from the teachers." This demonstrates that Perceived PE Worth can affect engagement in PE and positive approaches may lead to the retention and understanding of HRE messages. This is consistent with Deci and Ryan's (1985) self-determination theory, which suggests that when people are intrinsically motivated, they experience interest and enjoyment

and are more likely to exert effort and persist in the activity. Also, Ryan and Deci (2000a; 2000b) postulate that intrinsic motivation leads to investment, creativity, and high quality learning in activities. Moreover, current findings add support to previous work in the PE setting, which has found that levels of effort are strongly predicted by intrinsic motivation, therefore those students who find PE fun and exciting are likely to exert high effort to learn new motor skills and accomplish a certain level of competence (Ferrer-Caja and Weiss, 2000; Ntoumanis, 2001; Standage et al., 2003). More recently, Standage et al. (2005) concluded that enjoyment and intrinsic motivation in PE positively predicted concentration, preference to attempt challenging tasks, and positive affect. This finding suggests that enjoyment and intrinsic motivation in PE may serve to foster physical activity beyond the school years.

Both boys and girls discussed their beliefs that they were learning and improving over time in PE, (e.g., "Year seven was a bit hard because nobody knew anything about it (netball) but then in Year eight when we got back everybody knew the basics so we could build on our skills and stuff," and, "It came natural then compared to Year seven, you had to think about what you were doing and stuff"). This concurs with findings from study 2, that Year 9 students were rated as being more able by their teachers, compared to Year 8 students. This difference between Year groups may be explained by differences in movement skill capability, as it is consistently reported that movement skills improve with age (Barnett et al., 2008; Branta et al., 1984; Gallahue and Donnelly, 2003), as older students are more likely to have passed through the fundamental movement skill 'proficiency barrier' (Gallahue and Donnelly, 2003). To emphasise this point, Okley et al. (2001) found that Grade 10 students

scored significantly higher than Grade 8 students on five of six fundamental movement skills and on the skills index (which gave an overall score based on adding the scores from each skill).

In study 2 PE teachers' ratings of the students' ability was positively predicted by students' Perceived PE Ability. This concurs with previous research in the PE context, that students' self-ratings were significantly and positively correlated to their PE teachers' ratings of their competence (Trouilloud et al., 2006; Trouilloud et al., 2002; Xiang and Lee, 1998). Trouilloud et al. (2002) concluded that PE teachers' expectations of their students' performance and talent in swimming measured on a 7-point scale anchored with 'very bad' and 'very good', strongly predicted student perceived ability. Within the focus groups, students utilised their teacher's feedback to acquire a sense of competence, (e.g., "...when the teacher's like, 'oh that's good that', you know you're doing quite good at it"). Teachers' positive feedback has been consistently found to enhance students' perceptions of competence within PE, sport and physical activity (Ferrer-Caja and Weiss, 2000; Koka and Hein, 2003; Mouratidis et al., 2008; Nicaise et al., 2006; Vallerand, 1983; Vallerand and Reid, 1988).

The in-depth focus groups have highlighted a number of key themes relating to students' Perceived PE Ability and Worth, emphasising the particular importance of enjoyment, feedback and perceptions of competence. Students also brought up issues surrounding PE equipment and facilities, sex issues in PE and suggested improvements for PE. Physical activity outside of school was also discussed, shedding light on the activities, opportunities, barriers, reasons for participation and with who the students participate with. These themes serve

to help explain the quantitative findings from Study 2, which identified key PE and school related correlates associated with physically educated and physically active students.

Strengths and limitations

The strengths of this study were that it was underpinned by the YPAPM (Welk, 1999) and that the results are in alignment with Deci and Ryan's (1985) Self-Determination Theory, highlighting the importance of autonomy, competence and relatedness. The focus groups also assembled students within their normal PE classes so as to create an environment where the students could talk openly and freely in the presence of peers with whom they felt comfortable (Sleap and Wormald, 2001). Also, students identified as high ability, average ability and low ability were interviewed, which allowed thoughts and feelings about PE and physical activity from a range of students to be explored.

The secondary school students attending the three schools and who made up the sample were predominantly white British in origin, therefore care should be exercised in making attempts to generalise findings beyond this group. Also, of the three schools selected to participate in this study one was an all girls' school, which meant that more girls (38) than boys (16) were involved in the focus groups. As only students were involved in the focus groups, the data may have represented a somewhat narrow view of the issues. It would have been insightful to obtain the views of PE teachers, parents, and other significant others but time constraints meant that this was not possible.

5.5: Conclusions

The detailed focus group data suggest that girls' negative perceptions of PE Worth and PE Ability, learned helplessness beliefs, sex issues in PE and perceived barriers to physical activity, may partly explain the observed sex differences in physical activity. Numerous sources of Perceived PE Ability and PE Worth were highlighted by the students that could also potentially clarify the relationship between perceptions of competence, enjoyment and physical activity. The enhanced HRE messages from female PE teachers may account for girls' superior knowledge and understanding of HRE and students who perceive PE to be fun and enjoyable may be positively engaged and more motivated to learn and exert effort. Finally, both students' perceptions of progression in PE over time and PE teachers' positive feedback clarifies why teachers' rating of their students improves with advancing student age groups.

From the focus group findings, it is clear that during PE, students need to experience success and enjoyment and require positive feedback, to ensure that they believe PE to be worthwhile and so that they are able to successfully participate. In addition, PE teachers should provide students with increased choice and variety, which is consistent with students' thoughts and ideas on improving PE and their PE teachers. This study highlighted the need for interventions targeting girls and their perceptions of barriers to physical activity. Also, in comparison to Hassandra et al. (2003), PE teachers would also benefit by acknowledging that some students come to lessons with negative preconceptions about PE, sport and physical activity. In addition, teachers should challenge the traditional, dominant stereotypical views associated with

male and female participation in sport and physical activity (Lee et al., 1999). Finally, a number of physical activity issues and themes were raised in this study, and *reinforcing* variables of parents, family and peers were highlighted as central to the students' physical activity interests and participation (Welk, 1999). Therefore, future work is needed to unravel the complex interrelationships of *reinforcing* factors on students' thoughts and feelings on school PE.

Thesis Study Map

Study	Objectives and Key Findings
Study 1: The Physical Education Predisposition Scale (PEPS): Preliminary Development and Factorial Validation	Objectives: • To develop and test a scale to assess students' Perceived PE Worth and Perceived PE Ability • To explore how these two constructs are related • To investigate age and sex differences Key findings: • Factorial validity, internal consistency, and test-retest stability of the PEPS was established • Perceived PE Worth and Perceived PE Ability were significantly and strongly correlated (r = .7) • Perceived PE Worth and Perceived PE Ability scores were greatest among boys compared to girls, and differed as students got older
Study 2: Exploring the contribution of school-based correlates to the 'PE product': Adolescents' physical activity, knowledge and understanding of health-related exercise, and ability levels	Objectives: • To investigate which secondary school PE factors most strongly correlate with outcomes representing the 'PE product' . Key findings: • A number of factors including; sex, year group, BMI, deprivation score, Perceived PE Ability, Perceived PE Worth, number of students on roll, and number of indoor spaces, most strongly correlated with outcomes representing the 'PE product'
Study 3: A qualitative approach to students' views on the effectiveness of PE in developing the 'PE product'	Objectives: • To explore and understand the students' views on the effectiveness of PE in developing the 'PE product' • To help understand and clarify results from Study 2 Key findings: • Girls' negative perceptions of PE Worth and PE Ability, learned helplessness beliefs, sex issues in PE and perceived barriers to physical activity, may partly explain the observed sex differences in physical activity . • Numerous sources of Perceived PE Ability and PE Worth were highlighted by the students that could also potentially clarify the relationship between perceptions of competence, enjoyment and physical activity • Enhanced HRE messages from female PE teachers may account for girls' superior knowledge and understanding of HRE and students who perceive PE to be fun and enjoyable may be positively engaged and more motivated to learn and exert effort • students' perceptions of progression in PE over time and PE teachers' positive feedback clarifies why teachers' rating of their students improves with increasing year group

Chapter 6

Synthesis

Synthesis

Higher levels of physical activity in children and adolescents are associated with fewer risk factors for disease (Andersen et al., 2006), and decreased morbidity and delayed mortality (Blair et al., 1989; Paffenbarger et al., 1986). However, there is much debate as to whether youth are sufficiently active in order to achieve health benefits (Riddoch et al., 2007). PE has been identified as an influential mechanism to engage young people in physical activity (Biddle et al., 1998; Fairclough and Stratton, 2005; USDHHS, 1996). A key goal of PE is to "develop physically educated individuals who have the knowledge, skills and confidence to enjoy a lifetime of physical activity" (NASPE, p.11). The evidence of this 'PE product' can be described in terms of young people who engage in recommended levels of habitual physical activity, and who have competent levels of physical activity skill, knowledge, and understanding (DfES/QCA, 1999; NASPE, 2004). However, there is little evidence to support the claim that PE is producing physically educated and active individuals. Consequently, there was an identified need to develop and test a scale to assess students' Perceived PE Worth and Perceived PE Ability, to investigate which secondary school PE factors correlated with outcomes representing the 'PE product' (physical activity, knowledge and understanding, PE ability), and qualitatively explore the PE students' views of PE in relation to the significant correlates identified. The studies in the thesis were based upon Welk's (1999) YPAPM, and within this synthesis results from the three studies and their implications will be discussed.

Study 1 developed and tested the PEPS, an 11-item scale to measure Perceived PE Worth (attitude affective and attitude cognitive) and Perceived PE

Ability (perceptions of competence and self-efficacy). The present study established the factorial validity, internal consistency, and test-retest reliability of the PEPS. Results demonstrated that there was a strong positive correlation (Pallant, 2001) between the two variables of Perceived PE Worth and Perceived PE Ability. This is in line with the YPAPM (Welk, 1999) and Brustad's (1993) findings that perceived competence in PE was positively associated with PE enjoyment. In addition, boys reported significantly higher values on both aspects of the PEPS than girls, and Year 8 students scored significantly higher than Year 9 counterparts. These findings concur with past research (Butcher and Hall, 1983; Cardon et al., 2005; Carroll and Loumidis, 2001; Chung and Phillips, 2002; Portman, 1995; Stelzer et al., 2004; Subramaniam and Silverman, 2007; Trost et al., 1997). Sex differences in Perceived PE Worth and Perceived PE Ability may be attributed to different perceptions of enjoyment, competence and success in PE (Subramaniam and Silverman, 2007), puberty and the associated psychological responses to the physical changes (Davison et al., 2007; Kolody and Sallis, 1995; Murdey et al., 2004), teacher feedback and parental encouragement and support to be physically active. Potential explanations for the age-related differences on the PEPS involved the repetitive and prescriptive nature of the PE National Curriculum, which may restrict student initiative and autonomy (Ntoumanis, 2001).

Study 2 investigated which secondary school PE factors most strongly correlated with outcomes representing the 'PE product,' namely habitual physical activity, PE ability, and knowledge and understanding. Minutes of MVPA (accelerometry), self-reported physical activity, knowledge and understanding of HRE scores, and teacher's rating of students' ability were the

outcome variables, with student and school level correlates as predictor variables. This study suggested that a number of factors most strongly correlated with outcomes representing the 'PE product.' Sex and Perceived PE Ability were the key predictive variables for both objectively measured and self-reported physical activity, with boys participating in more physical activity than girls. The finding that boys are more physically active than girls, irrespective of physical activity assessment method is in accordance with previous studies (Caspersen et al., 2000; Riddoch et al., 2007; Sallis et al., 1996; Trost et al., 2002; Wenthe et al., 2009). The sex differences in physical activity may be attributed to maturation (Bradley et al., 2000), differential treatment of boys and girls from their parents (Brustad, 1993; Fredricks and Eccles, 2005; Welk et al., 2003), and teacher feedback during PE (Duffy et al., 2001; Dunbar and O'Sullivan, 1986; Griffin, 1981). Perceived PE Ability was significantly associated with all outcome measures of physical activity which supports numerous motivational theories such as Harter's (1982) Competence Motivation Theory, and Deci and Ryan's (1985) Cognitive Evaluation Theory.

Other variables of BMI and Perceived PE Worth were associated with only self-reported physical activity levels. Students with higher BMI's reported greater physical activity levels, which differs from research which generally suggests those with higher BMI's are less physically active (Ball et al., 2005; Bar-Or and Baranowski, 1994; Trost et al., 2001). However, McMurray et al. (2008) concluded that young people with higher BMIs over reported their physical activity levels. Perceived PE Worth was significantly associated with self-reported physical activity which corresponds with previous studies which have concluded that if children experience fun and enjoyment, they are more likely to

participate, persist, exert effort and be committed to that particular activity (Carroll and Loumidis, 2001; Craig et al., 1996; Scanlan et al., 1993; Scanlan and Lewthwaite, 1986; Scanlan et al., 1989; Stucky-Ropp and DiLorenzo, 1993).

Knowledge and understanding of HRE was predicted by sex, with girls performing significantly better than boys, which is in accordance with Fairclough et al.'s (2002) finding that female PE staff place more emphasis on HRE messages. Also, those who had more favourable perceptions of PE Worth and students in schools with less indoor spaces for PE scored more favourably. It is plausible that more positive approaches to learning and engagement in PE, leads to the retention and understanding of exercise and health knowledge (Standage et al., 2005). The negative association between knowledge and understanding of HRE and indoor spaces could be explained by schools compensating for having fewer spaces, therefore emphasising cognitive aspects of PE learning.

The final PE outcome of teachers' ratings of their students' ability was predicted by school year, Perceived PE Ability and number of students on roll. Year 9 students were rated as significantly more able than year 8 students, which may be explained by differences in movement skill capability. The significant result of Perceived PE Ability was to be expected, and suggests that the teacher ratings and students' own ratings of themselves were reasonably accurate. Finally, teachers' ratings were positively associated with number of students on roll, which may be related to the greater availability and range of resources to participate in physical activity and sport for students from larger schools (Carron, 1990).

Study 3 aimed to explore and understand the students' thoughts and feelings about school PE. Strong topics that emerged from the focus groups involved sources of Perceptions of PE Ability and PE Worth, emphasising the particular importance of enjoyment, feedback and perceptions of competence. Furthermore, themes relating to PE equipment and facilities, PE improvements, sex issues in PE, and physical activity outside of school PE were also discussed. These themes helped to explain the quantitative findings from Study 2, which identified key PE and school related correlates associated with the 'PE product.'

Results of the focus groups revealed that a variety of factors may help explain the sex difference in physical activity levels. These included girls' negative perceptions of PE Ability and Worth, for example, viewing PE as boring and unexciting, too competitive, lacking feedback and creating learned helplessness beliefs. It has previously been found that students who dislike PE may select to avoid participation in physical activity in their daily life (Carlson, 1995; Portman, 1995). Furthermore, learned helplessness beliefs have been identified in school PE and have been found to result in a reduced incentive to participate and feelings of resignation (Carlson, 1995; Ntoumanis et al., 2004; Portman, 1995; Robinson, 1990). Other factors that emerged from the focus groups include sex issues in PE (e.g., the belief of sex specific activities and sex stereotyped behaviours in PE), and perceived barriers to physical activity. Girls perceived four more barriers than boys which is in accordance with previous research and may help explain the divergent levels of physical activity between boys and girls (Allison et al., 1999; Tergerson and King, 2002; Zabinski et al., 2002).

Numerous sources of Perceived PE Ability and PE Worth were highlighted by the students that could also potentially clarify the relationship between perceptions of competence, enjoyment and physical activity. Criteria to determine students' Perceived PE Ability and PE Worth are similar to those previously identified (Chase, 1998; Figley, 1985; Garn and Cothran, 2006; Hassandra et al., 2003; Koka and Hein, 2003; McKiddie and Maynard, 1997; Smith and St. Pierre, 2009). Knowledge and understanding of HRE was significantly higher in girls than boys in study 2, which may relate to the fact that only girls in the focus groups talked about their PE teachers' HRE messages. Also, girls mentioned the health and fitness benefits associated with physical activity, which demonstrates that they know the benefits of participating, which supports previous research (Flintoff and Scraton, 2001; Taylor et al., 1999). Also, students who perceive PE to be fun and enjoyable may be positively engaged and more motivated to learn and exert effort, which is consistent with Deci and Ryan's (1985) self-determination theory. Research in the PE setting has also found that levels of effort are strongly predicted by intrinsic motivation (Ferrer-Caja and Weiss, 2000; Ntoumanis, 2001; Standage et al., 2005). In addition, students' perceptions of progression in PE over time and PE teachers' positive feedback clarifies why teachers' ratings of their students improves with advancing age.

Results from these studies support the potential of the PEPS as a concise and straightforward measurement tool for teachers and researchers to use in the PE setting. Results further suggest that older students need to be provided with a greater variety of activities and opportunities to discover and problem solve, as

teachers need to sustain students' interest (Subramaniam and Silverman, 2007). In addition, it is key that students experience success, positive feedback and support from teachers in order to increase their perceptions of competence, self-efficacy and enjoyment in PE (Portman, 1995). This may be achieved by providing appropriate environments and opportunities, choice and variety. Further, there is a need for interventions targeting girls' physical activity and their perceptions of barriers to physical activity. Pedagogical strategies are required to enhance boys' knowledge and understanding of HRE, and students' enjoyment and attitudes towards PE.

This research was based upon Welk's (1999) YPAPM which utilises a social-ecological framework to conceptualise a broad range of factors including *predisposing*, *enabling, reinforcing*, and *personal demographics* (Welk, 1999). In line with the YPAPM, key themes to emerge from the three studies involved sex and predisposing factors of Perceived PE Worth and Perceived PE Ability. Initially during the construction of the PEPS, it was found that the two variables were related, and that boys scored significantly higher than girls. Study 2 reported factors associated with the 'PE product,' and the most consistent correlates involved sex, Perceived PE Worth and PE Ability. Finally, from the focus group interviews there were diverse responses from girls and boys, especially with regards to sources of Perceived PE Worth and PE Ability. On the basis of these findings it is plausible to suggest that most variation in achievement of the 'PE product' centres on biological, emotional, cultural, and psychosocial differences between girls and boys, as well as students perceptions of their ability within PE, and the cost/benefit of the subject.

Chapter 7

Conclusions

Conclusions

The overall aim of this thesis was to establish how PE influences outcomes representing the 'PE product,' (i.e., physically educated and physically active young people).

Study 1

Study 1 achieved its objectives as it successfully developed and tested the PEPS, which demonstrated an acceptable level of internal consistency and test-retest reliability. In addition, a strong positive relationship was found between the two constructs of Perceived PE Worth and PE Ability (r = .69), which is in line with the YPAPM (Welk, 1999). The final objective of this study involved addressing age and sex differences on the PEPS. Boys reported significantly higher values on both Perceived PE Worth and PE Ability than girls, and Year 8 students scored significantly higher than their Year 9 counterparts.

Study 2

A range of factors including sex, year group, BMI, deprivation score, Perceived PE Ability, Perceived PE Worth, number of students on roll, and number of indoor spaces, most strongly correlated with the outcomes representing the 'PE product.' Sex and Perceived PE Ability were the key predictive variables for both objectively measured and self-reported physical activity, whilst other variables of BMI and Perceived PE Worth were associated with only self-reported physical activity levels. Knowledge and understanding of HRE was predicted by sex, Perceived PE Worth and number of indoor spaces. Teacher's ratings of their students' ability were predicted by school year, Perceived PE

Ability and number of students on roll. Therefore, the 'PE product' is correlated with a variety of factors, some of which are related including sex, Perceived PE Ability and Perceived PE Worth.

Study 3

To help elucidate results from Study 2, the main objective of this study was to explore the students' views of PE's effectiveness in developing the 'PE product.' The detailed focus group data suggest that a range of factors may partly explain the observed sex differences in physical activity (i.e., girls' negative perceptions of PE Worth and PE Ability, learned helplessness beliefs, sex issues in PE and perceived barriers to physical activity). The enhanced HRE messages from female PE teachers may account for girls' superior knowledge and understanding of HRE and students who perceive PE to be fun and enjoyable may be positively engaged and more motivated to learn and exert effort. Finally, both students' perceptions of progression in PE over time and PE teachers' positive feedback clarifies why teachers' rating of their students improves with advancing student age groups.

Chapter 8

Recommendations

Recommendations

There are a number of recommendations from this research, including suggestions both for PE practice and to further this line of research.

8.1: Recommendations for practice

- PE teachers should utilise the PEPS. They could adapt or amend their teaching styles depending upon students' Perceived PE Worth and Ability scores, they could also utilise the scores to identify and group specific students.
- PE teachers should provide opportunities to enhance students' perceptions of competence, and should provide students with enjoyable, successful experiences, positive feedback, choice, and as much variety as is possible.
- A classroom climate is needed that fosters learning and improvement, in addition to competition.
- Pedagogical strategies are required to enhance boys' knowledge and understanding of HRE, and students' enjoyment and attitudes towards PE.

8.2: Recommendations for further research

- To improve understanding this research should be replicated to test the hypotheses among groups more representative of the secondary school population.

- To overcome limitations of this cross-sectional research design (e.g., cause and effect) longitudinal studies are needed to investigate the influence of students' perceptions of PE Worth and PE Ability on their physical activity levels after compulsory school education and into adulthood.
- There is a need for interventions targeting girls' physical activity. From these findings interventions should provide girls with choice, a variety of activities including sports and lifestyle activities, and opportunities to be creative and work with their friends.
- There is also a need for interventions helping girls identify and overcoming barriers to physical activity (e.g., increase self-efficacy, social support).
- Researchers should employ the PEPS in order to enhance the knowledge base within this field, and further reveal inter-relationships between Perceived PE Worth and Ability and other variables of interest (e.g., physical activity participation in PE, outside of school PE, reinforcing factors).
- Future work is needed to unpick the intricate interrelationships of *reinforcing* factors (e.g., parents, family, peers) with the other elements of the YPAPM (Welk, 1999).

Chapter 9

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Appendices

Appendix 1:

Ethical Approval

Liverpool John Moores University,
Room B016,
IM Marsh Campus,
Barkhill Road,
Liverpool,
L17 6BD.

Dear Parent/Guardian,

I am a researcher at Liverpool John Moores University undertaking a project entitled Physically Educated and Physically Active Youth. The purpose of the investigation is to find out which aspects of secondary school physical education (PE) have the strongest influence on developing physically educated and physically active young people.

The information your child can potentially provide may help to further the knowledge base in the area of physical education. I have enclosed an information sheet which provides full details of the project. Also enclosed is a consent form which needs to be signed and returned should you agree to your child's participation.

Thank you in advance for your time. I look forward to hearing back from you soon.

Kind regards,

Miss Toni Hilland,
Email: t.a.hilland@2007.ljmu.ac.uk
Tel: 0151 231549

Participant Information Sheet for Parents

Please read this information sheet carefully before deciding whether or not to allow your child to participate. If you decide to permit them to participate, thank you. If you decide not to there will be no disadvantage to your child of any kind and I thank you for considering this request. Project Physically Educated and Physically Active Youth is being undertaken as part of a PhD research project.

The phases of the project which could involve your child are as follows:

- Observation of PE lessons by a small team of trained researchers to determine pupil activity levels, lesson contexts and teacher behaviours.
- Your child will be asked to complete a questionnaire regarding their attitudes towards PE lessons and knowledge and understanding within PE. The children will also complete a physical activity recall questionnaire.
- In addition, a smaller group of children will be asked to wear an accelerometer on a selected weekday and weekends. This device is very similar in size to a pedometer or step counter, but is more advanced. Essentially it is worn on the waist and measures physical activity.
- Children's height, weight and sitting height will also be measured, as these things may influence activity levels.
- The final phase involves a case study approach, whereby your child may be asked to take part in a short focus group interview with other children. These focus groups will take the form of a group discussion on the views of PE.

The information collected will be analysed and used to form the results of the project. At no point will your child's identity be known to anyone apart from myself and the supervisory team. The results collected will be securely stored in such a way that only those mentioned above will have access to it. Results of this project may be published but any data included will in no way be linked to any specific participant. You are most welcome to request a copy of the results of the project should you wish. At the end of the project any non-vital personal information will be destroyed immediately, though, any raw data on which the results of the project are based on will be retained in secure storage for five years. After this time this information will also be destroyed.

Please be aware that you may withdraw your child's participation from the project at any time, without any disadvantage.

LIVERPOOL JOHN MOORES UNIVERSITY

FORM OF CONSENT (B) (CARER)

The title of the project is Physically Educated and Physically Active Youth.

I have read the information sheet and understand what the project is about. I have had the opportunity to ask for further information and I understand that I am free to do this at any time.

I know that:-

1) My child's participation in the project in entirely voluntary,
2) My child is free to withdraw from the project at any time and without any disadvantage,
3) The data will be destroyed at the conclusion of the project but any raw data on which the results of the project depend will be retained in secure storage for five years, after which they will be destroyed,
4) The results of the project may be published but my child's anonymity will be preserved.

I hereby give consent for.....to take part in the project. (Child's full name) *

Carer/parent/guardian's full name:*.....Date:.....

Carer/parent/guardian's signature:.....Date:.....

Investigator's full name.....Date:.....

* Please print in block capitals

Liverpool John Moores University,
Room B016,
IM Marsh Campus,
Barkhill Road,
Liverpool,
L17 6BD.

Participant Information Sheet for Students

Please read this page carefully before choosing whether or not to take part.
Project Physically Educated and Physically Active Youth aims to find out more about sport and physical activity during school time and out of school. The specific parts of the project that you may be asked to take part in are described below:

- **Your PE lessons may be watched and you will be asked to fill out a questionnaire on your feelings towards PE, what you learn within PE, and what physical activities you do.**
- **You may also be asked to wear an accelerometer, which is a small gadget that is worn on the waist to measure how much movement you do throughout the day (see picture).**

- **Your height, weight and sitting height will be measured as these things may influence your activity levels.**
- **Finally you may be asked to take part in short discussions with other students about your views on PE. These discussions are known as 'focus groups' and will be recorded by a researcher. The recording will then be typed up and used with the other results.**

Important;

- The information you provide will help to form the results of this project.
- People will not know which answers are yours, apart from me and the other researchers.
- Your teacher will not see any individual results.
- You can ask to see the results at any time if you like.
- Your answers will be safely locked away for five years, and then they will be destroyed.
- You may drop out from the project at any time. If you choose to leave the project this will not affect your opportunities for PE and sport in school.

If you decide to take part, thank you, please complete the enclosed consent form and return to school by (DATE) ..... If you decide not to, that's no problem, thank you for reading this.

If you have any questions about the project, now or in the future, get in touch with;

Miss Toni Hilland,

Email: t.a.hilland@2007.ljmu.ac.uk

Tel: 0151 2315493.

LIVERPOOL JOHN MOORES UNIVERSITY

FORM OF CONSENT TO TAKE PART AS A SUBJECT IN A RESEARCH PROJECT (PUPIL)

The title of the project is Physically Educated and Physically Active Youth.

I have read the information page and know what the project is about.
I have had a chance to ask questions, and I know that I can ask for more information at any time.

I know that:-

1) My participation in the project in totally voluntary,
2) I can drop out of the project at any time,
3) My answers will be destroyed at the end of the project,
4) Any answers that the results depend will be safely locked away for five years, and then they will be destroyed,
5) The results of the project may be published but my name will not be used and no-one will know which answers are mine.

I .....agree to take part in the project.
(Pupil's full name)*

Pupil's
signature:.....Date:.....

Investigator's full
name.....Date:.....

* Please print in block capitals

Information Sheet for PE Teachers

Please read this information sheet carefully before deciding whether or not to participate. Project Physically Educated and Physically Active Youth is being undertaken as part of a PhD research project. The purpose of the investigation is to obtain an increased understanding of which aspects of secondary school Physical Education have the strongest influence on developing physically educated and physically active young people.

Phase 2

- A small team of researchers will observe PE lessons in the selected schools to determine pupil activity levels, lesson contexts and teacher behaviours.
- Selected key stage 3 students will be required to complete three questionnaires measuring (1) their attitudes towards PE, (2) their levels of physical activity and (3) their knowledge and understanding within PE.
- A smaller group of children will be asked to wear an accelerometer for seven consecutive days. This device is very similar in size to a pedometer or step counter, but is more accurate. Essentially it is worn on the waist and measures physical activity. In addition measures of children's height, weight and sitting height will be taken.
- PE staff will be asked to rate the participating students' overall ability in PE as 'excellent,' 'good,' 'average,' 'below average,' or 'weak.'

Phase 3

- This phase involves a case study approach where selected PE teachers and students will be asked to participate in interviews. Some of these teachers' lessons may also be observed.

Each aspect of the project has received ethical approval from the University Ethics Committee. Fully informed consent will be obtained from all students and teachers before their involvement in phases 2 and 3 of the project.

In summary, within this project the relationships between habitual physical activity, school environments, delivery of PE, students' attitudes to PE and their knowledge and understanding of PE will be investigated. The main aim is to find out which factors most strongly influence the

development of the 'PE product' (i.e., physically educated and active young people). A secondary aim is to develop a model of good practice with regard to youth physical activity promotion that may inform future pedagogical interventions and continued professional development.

The data collected will be analysed and used to form the results of the project. At no point will the identity of any participants be known to anyone but myself and the supervisory team. The data collected will be securely stored in such a way that only those mentioned above will have access to it. Results of this project may be published but any data included will in no way be linked to any specific participant or school. At regular intervals you will receive an overview of the project's progress to date. At the end of the project any non-vital personal information will be destroyed immediately, though any raw data which the results of the project are based upon will be retained in secure storage for five years. After this time this information will also be destroyed.

Please be aware that you may withdraw your participation from the project at any time and without any disadvantage to yourself or your school.

If you have any questions about the project, either now or in the future, please do not hesitate to contact:

Toni Hilland
Room B016,
Faculty of Education, Community and Leisure,
Liverpool John Moores University,
IM Marsh Campus,
Barkhill Road,
Liverpool,
L17 6BD.
Email: t.a.hilland@2007.ljmu.ac.uk
Tel: 0151 2315493.
Mob: 07854522815

LIVERPOOL JOHN MOORES UNIVERSITY

FORM OF CONSENT TO TAKE PART AS A SUBJECT IN A RESEARCH PROJECT

(PE TEACHER)

The title of the project is Physically Educated and Physically Active Youth.

I have read the information sheet and understand what the project is about. I have had the opportunity to ask for further information and I understand that I am free to do this at any time.

I know that:-

1) My participation in the project in entirely voluntary,
2) I am free to withdraw from the project at any time and without any disadvantage to myself or my school,
3) The data will be destroyed at the conclusion of the project but any raw data on which the results of the project depend will be retained in secure storage for five years, after which they will be destroyed,
4) The results of the project may be published but my anonymity and that of my school will be preserved.

I .....agree to take part in the project.

(Full name)*

Signature:.....Date:.....

Investigator's full

name.....Date:.....

* Please print in block capitals

Dear Toni,

With reference to your application for Ethical approval titled:

Project Physically Educated and Physically Active Youth

Thank you for correspondence responding to the proviso and I am happy to confirm your application is fully approved.

The Ethics Committee approval is given on the understanding that:

(i) any adverse reactions/events which take place during the course of the project will be reported to the Committee immediately;

(ii) any unforeseen ethical issues arising during the course of the project will be reported to the Committee immediately;

(iii) any change in the protocol will be reported to the Committee immediately.

Please note that ethical approval is given for a period of five years from the date granted and therefore the expiry date for this project will be **December 2012**. An application for extension of approval must be submitted if the project continues after this date.

Yours sincerely

Jo McWatt
Research Support Officer
Research Support Office
Liverpool John Moores University
Rodney House
70 Mount Pleasant
Liverpool
L3 5UX
Tel: (0151) 231 3119
Fax: (0151) 231 3724
Email: j.m.mcwatt@ljmu.ac.uk

Appendix 2:

Questionnaires

The Physical Activity and Physical Education

Questionnaire

(Including the Physical Education Predisposition Scale, PEPS)

Physical Activity and Physical Education Questionnaire.

Dear Student,

Thank you for taking the time to complete this questionnaire about your physical activity levels, knowledge, understanding and beliefs towards Physical Education. We have attempted to make the questionnaire as quick and easy to complete as possible, however if you have any questions please just ask.

REMEMBER:

- **There are no right or wrong answers; this is not a test.**
- **Please answer all questions as honestly and accurately as you can.**
- **Please complete each section as fully as possible as each is important to the project.**

SECTION 1. YOUR DETAILS

1) Name: .....

2) Age: .....years.....months

3) Boy O Girl O

4) School: .....

5) Year group: .....

SECTION 2. YOUR PHYSCIAL ACTIVITY LEVELS

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

1. Physical activity in your spare time, outside of school. Have you done any of the following activities in the past 7 days? If yes, how many times? (Mark only one box per activity).

ACTIVITY	NO	1-2 times	3-4 times	5-6 times	7 times or more
Bike riding					
Household chores (e.g., mowing lawn)					
Jogging/Running					
Roller skating/Ice skating					
Skateboarding					
Skipping					
Swimming					
Tag/chase games					
Walking for exercise					
Aerobics					
Athletics					
Badminton					
Basketball					
Boxing/Wrestling					
Cheerleading					
Dance					
Fitness class (e.g., circuits)					
Football					
Golf					
Hiking					
Hockey					
Lacrosse					
Martial arts (e.g., Karate)					
Netball					
Rounders					
Rowing/Canoeing					
Rugby					
Squash/Racquetball					
Table Tennis					
Tennis					
Volleyball					
Weight training					
Other.....					
Other.....					

2. In the last 7 days, during your **Physical Education classes**, how often were you **very active** (playing hard, running, jumping, etc)? (Tick one box only)

I don't do Physical Education	
Hardly ever	
Sometimes	
Quite often	
Always	

3. In the last 7 days, what did you do most of the time during **break** time at school? (Tick one box only)

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

4. In the last 7 days, what did you normally do at **lunch time** (besides eating lunch)? (Tick one box only)

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

5. In the last 7 days, on how many days **right after school**, did you do sports, dance or play games in which you were very active? (Tick one box only)

None	
1 time last week	
2 or 3 times last week	
4 times last week	
5 times last week	

6. In the last 7 days, on how many **evenings** did you do sports, dance, or play games in which you were very active? (Tick one box only)

None	
1 time last week	
2 or 3 times last week	
4 or 5 times last week	
6 or 7 times last week	

7. **Last weekend,** how many times did you do sports, dance, or play games in which you were very active? (Tick one box only)

None	
1 time	
2 - 3 times	
4 - 5 times	
6 or more times	

8. Which **one** of the following describes you best for the last 7 days?

Read **all five** statements before deciding on the **one** answer that describes you. Tick one box only.

a) All or most of my free time was spent doing things that involve little physical effort	
b) I sometimes (1 – 2 times last week) did physical things in my free time	
c) I often (3 – 4 times last week) did physical things in my free time	
d) I quite often (5 – 6 times last week) did physical things in my free time	
e) I very often (7 or more times last week) did physical things in my free time	

9. Mark how often you did physical activity (like playing sports, games, doing dance, etc) for each day last week. Tick one box only for each day.

	None	Little bit	Medium	Often	Very often
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					

10. Were you sick last week, or did anything stop you from doing your normal physical activities? (Tick one box only)

Yes	
No	

If Yes, what stopped you? .....

SECTION 3: YOUR BELIEFS AND ATTITUDES TOWARD PHYSICAL EDUCATION

(The Physical Education Predisposition Scale (PEPS)

INSTRUCTION:

Please read each of the statements listed below and indicate how much you personally agree with each statement by circling **only one** response (see example below).

EXAMPLE:

a) **I love Physical Education lessons**

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

1) **The things I learn in Physical Education make my lessons interesting for me**

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

2) **The things I learn in my Physical Education lessons get me excited about Physical Education**

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

3) **I feel the things I learn in Physical Education make the lessons boring for me**

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

4) **I feel the things I learn in Physical Education are useless to me**

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

5) **The things I learn in Physical Education are not important to me**

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

6) **The things I learn in Physical Education are useful to me**

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

7) **I am pretty skilled in Physical Education**

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

8) **I feel pretty able in Physical Education**

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

9) **I am satisfied with my performance in Physical Education**

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

10) **I have the confidence to take part in Physical Education**

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

11) **I think I have the skills I need to take part in Physical Education**

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

SECTION 4: YOUR KNOWLEDGE AND UNDERSTANDING

INSTRUCTION: Please read each of the questions listed below (1-5) and indicate which **one answer** you believe is true.

1. When you exercise what is the main short term effect on your body?
    a) Your breathing gets faster, you heart beats faster
    b) You get hot and sweaty
    c) You feel tired
    d) Not sure.

2. What should you do just before you begin to exercise or play sport??
    a) Warm-up (e.g., gentle running and stretching)
    b) Eat energy foods (e.g., bananas)
    c) Drink energy drinks (e.g., Lucozade)
    d) Not sure

3. Why should you perform cool down exercises after you have finished exercising?
    a) To prevent injury
    b) To return your body back to its normal state
    c) To help get extra oxygen into your body
    d) Not sure

4. Why does your heart beat faster when you exercise?
    a) To cool you down
    b) To make you exercise harder
    c) To get more oxygen to your muscles
    d) Not sure

5. Why do you sweat when you exercise?
    a) To get rid of extra water in your body
    b) To cool you down
    c) So you know it's time to stop exercising
    d) Not sure

INSTRUCTION: Please read the statements listed below (6 & 7) and indicate how much you personally agree with each statement by circling **only one** response.

6. What we learn in Physical Education lessons can have an impact on the types of physical activities, exercise, and sports we take part in outside of school

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

7. Physical Education lessons help make us aware of opportunities and places close to where we live, where we can take part in physical activities, exercise, and sports.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

Thank you for taking the time to complete this questionnaire.
Your responses are very important to the Physically Educated and Physically Active Project
and are very much appreciated!

The Physical Education and School Sport Inventory

(PESSEI)

Physical Education and School Sport Environment Inventory (PESSEI)

Dear PE professional,

Thank you for taking the time to complete this audit of your school's PE and school sport environment. For the purposes of this audit the term 'environment' is broadly defined to incorporate physical spaces for PE and School Sport, permanent facilities, and the time allocated for both curricular and non-curricular activity.

We understand that your time is valuable and limited and so have attempted to make the audit as quick and user-friendly to complete as possible. Please complete each section of the audit as fully as possible as each is important to the project. Next, please return it in the self-addressed envelope provided.

The deadline for completed returns is .....

Remember that all schools that return fully completed audits will be entered into a prize draw with four chances to win £150 worth of sports equipment/kit vouchers.

Many thanks once again for participating in this research. Your support is truly appreciated.

If you require any further information please contact Toni Hilland on:
0151 231 5494 (email: t.a.hilland@2007.ljmu.ac.uk).

Physical Education and School Sport Environment Inventory

Please complete each section of the inventory as fully as possible.

SECTION 1. YOUR SCHOOL AND STUDENTS

1. What is the name of your school? _____

2. What is the school's post code? _____

3. In what education authority is your school located? _____

4. Please tick the relevant boxes below which best describe what type of school yours is.

All boys		Academy	
All girls		City Technology College	
Mixed sex		Voluntary aided	
Community		Voluntary controlled	
Foundation/Trust		Independent	
Specialist sports college		Grammar	
Other specialist school [not sports]			

5. What is the current number on roll? _____

6. What percentage of children receive free school meals? _____

SECTION 2. YOUR PE SPACES

Using the tables in this section please indicate as accurately as possible how many of the spaces listed are regularly available (i.e., free for curricular and/or non-curricular use when required) in your school during term time for PE and school sport. These spaces could be both on-site and off-site. If off-site spaces are used please include only if the total time involved travelling to and from them comes to less than approximately 25% of the total typical lesson time. Note that for some of the spaces you are asked to indicate their approximate size. For convenience these sizes are described in relation to standard sized badminton courts, as sports halls are often based on these dimensions. Please answer these parts as fully as possible.

INDOOR SPACES

Specialist spaces:	How many?		Admin use only
Dance/exercise studio			
Fitness room/suite			
Squash courts			
Gyms and halls:	How many?	Total size: how many badminton courts is the total space equivalent to (to nearest 0.5 / half courts)?	
Gymnasia (equipped for gymnastics)			
Sports halls/halls (including assembly halls)			
Pools:	How many?	Pool length (m)	Number of lanes
Swimming pools			
Other indoor spaces (please state type of spaces below):	How many?	Approximate room/space dimensions (m)	
Indoor athletics:	Yes/No?		
Indoor athletics facility (specialist facilities typically incorporating sprinting straight and jumps and throws areas)			

OUTDOOR SPACES: Please tick YES or NO to indicate whether the following outdoor spaces are available in your school for use during curricular time and/or non-curricular time			
Synthetic pitches: Astro/synthetic turf pitches (for multi-use surfaces see below)	YES	NO	Admin use only
Grass surfaces: Grass fields/pitches	YES	NO	
Multi-use surfaces: concrete/tarmac/synthetic surface; enclosed or open; including playground areas	YES	NO	
'All-weather' surfaces: cinder/clay/redgra areas	YES	NO	
Other outdoor spaces (please state type of spaces below):			
Athletics: Outdoor synthetic athletics track (specialist facilities typically incorporating minimum of 6 lane 400m track with jumps and throws areas)	YES	NO	

A) Please state below which of these indoor or outdoor facilities you travel off-site to (if any):

_____

_____

_____

B) On the appended aerial photograph of your school grounds, please mark clearly the boundaries of the outdoor spaces which you currently use for curricular and/or non-curricular PE and school sport. Please return this photograph with your completed survey.

C) If off-site facilities included above are not shown on the aerial photograph, please provide the location details (e.g., site name, street name, postcode) below, or alternatively, email the information to Toni Hilland at: T.A.Hilland@2007.ljmu.ac.uk

_____

_____

_____

SECTION 3. RESOURCES FOR PE AND SCHOOL SPORT

1. How many permanent physical resources are available to your students? (i.e., permanent means that the resources are fixed and therefore not portable and are available for use within the PE curriculum and/or out of curriculum time). Please complete the table below.

Permanent physical resource	Number
Badminton court markings	
Basketball hoops	
Basketball court markings	
Climbing wall	
Cricket nets	
Cricket square/wicket	
Cricket wickets [painted on wall]	
Fixed football goals	
Fixed hockey goals	
Fixed rugby posts	
Football goals [painted on wall]	
Gymnasium wall bars	
Netball court markings	
Netball goals	
Playground game markings (e.g., hopscotch)	
Squash/racquetball courts	
Tennis court markings	
Tennis nets	
Volleyball court markings	
CV equipment: treadmills/steppers/cross-training/rowing machines, etc	
Resistance equipment stations	
Others (please state)	

2. How much is the annual PE department budget that is used to facilitate and resource PE and school sport provision (e.g., purchase and maintenance of equipment and facilities, etc)?

   £_____

SECTION 4. PE AND SCHOOL SPORT ACTIVITIES

1. During curriculum PE, approximately how much weekly time per pupil is allocated at Key Stages 3 and 4?

	Weekly time (minutes)
Key Stage 3	
Key Stage 4 (*core/compulsory PE only*)	

2. During extra-curricular time, approximately how much weekly time is allocated for Key Stage 3 and 4 students?

	Weekly time (minutes)
Key Stage 3	
Key Stage 4	

Phase 2 participation: Please tick the appropriate box next to the statements below:

My school **would be** willing to participate in Phase 2 of the project as described in the information sheet. ☐

Your name: _____

Tel: _____ Email: _____

My school **would not be** willing to participate in Phase 2 of the project as described in the information sheet. ☐

Thank you for taking the time to complete this audit. Your responses are important to the PE Project and are very much appreciated! Please return the audit in the SAE by .....!

Appendix 3:

Associated Publications

PAGES NOT SCANNED AT THE REQUEST OF THE UNIVERSITY

SEE ORIGINAL COPY OF THE THESIS FOR THIS MATERIAL