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The effect of outdoor education and physical education physical activity programmes upon male adolescents

Stephen Jelley

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THE EFFECT OF OUTDOOR EDUCATION AND PHYSICAL EDUCATION PHYSICAL ACTIVITY PROGRAMMES UPON MALE ADOLESCENTS

A thesis submitted in partial fulfilment of the requirements for the award of the degree

DOCTOR OF EDUCATION

FROM

UNIVERSITY OF WOLLONGONG

By

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FACULTY OF EDUCATION
2009
DECLARATION

I, Stephen Jelley, declare that this thesis, submitted in partial fulfilment of the requirements for the award of Doctor of Education, in the Faculty of Education, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for a qualification at any other academic institution.

Signed

____________________________________________________________________________________

Stephen Jelley

Date:______________________________
ACKNOWLEDGEMENTS

This study would not have been possible without the assistance of various talented people and organisations. I therefore would like to thank:

My supervisors for their individual expertise and guidance, who supported my journey during the writing of the thesis: Firstly to Associate Professor Tonia Gray for sharing her passion for outdoor education, and her guidance through the research process; secondly, to Dr Paul Webb whose knowledge in physical education and grammatical skills were most welcome throughout the writing of the thesis. Both supervisors are good facilitators and leaders in their individual fields of outdoor education, physical education and sports coaching, and have been inspirational to many students at the University of Wollongong. In the latter stages of the thesis, I was fortunate to have Professor Brian Ferry to assist in the development of the final thesis. His patience, skill, understanding and belief in me assisted me to complete this thesis.

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control group into The Scots College physical education programme, and to both coordinators for giving permission to utilise the photographs for this thesis.

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ABSTRACT

The promotion of physical activity (PA) and the prevention of low levels of adolescent health-related fitness (HRF) and self-esteem (SE) associated with physical inactivity, are issues central to current and future global health priorities. Previous research has shown that obese adolescents tend to track into being obese adults (Booth, Chey, Wake, Norton, Hesketh & Dollman, 2003). Recent reports have indicated that the prevalence of obesity in childhood and adolescence has been increasing at an alarming rate (Angelopoulos, Milionis, Grammatiki, Monschonis & Manios, 2009). Therefore such issues warrant further investigation and continued research efforts. The types of physical activities being offered to adolescents need to be evaluated, if future problems associated with obesity are to be prevented (Doak, Visscher, Renders, & Seidell, 2006).

The purpose of this study was to investigate the effect of two different 18-week PA programmes upon Year 9 adolescent males’ HRF and SE. The participants (N = 136) aged 13-14 years, were recruited from one independent Sydney boys’ school. All the boys were enrolled in Year 9; the Year 9 cohorts were randomly allocated to one or other of the two PA programmes. The two PA programmes were conducted simultaneously at two different locations in New South Wales (NSW), Australia. One of the PA programmes was completed at the schools Extended Stay Outdoor Education School Programme (ESOESP) residential campus in Kangaroo Valley, on the South Coast of NSW. The second PA programme, a Year 9 physical education (PE) programme, was completed at the school’s main campus in the Eastern Suburbs of Sydney.

An ESOESP HRF feasibility study was completed in terms one and two, in 2002. This feasibility study involved Year 9 boys from the same boys’ school (N = 69), who completed pre and post-test HRF tests (Schell, & Leelarthaepin, 1994). The HRF test battery included tests for blood pressure, body composition, muscular endurance, muscular strength and flexibility. Prior to starting the OE physical activities programme, the participants’ parents/guardians completed a modified
Preliminary Health Screening and Pre-Participation Fitness Examination Questionnaire (Kibler, 1990) about their sons.

In order to determine whether the PA programme had an effect on the HRF components, statistical analyses were conducted using the SPSS version 14 utilising a dependent *t*-test and Cohen’s effect size. The results indicated that there were significant differences in each of the five HRF variables between the pre and post-tests (at the *p*<.05 level). The HRF tests were evaluated for effectiveness and suitability for the OE and PE RCT study. The conclusion was to remove the measurement of blood pressure, hip circumference.

The OE and PE RCT study was a two-site, random-control trial research design, delivered over an 18-week PA intervention period in terms one and two of 2003. The school’s ESOESP was utilized for the experimental group (*N* = 73); the school’s PE physical activities were utilized for the control group (*N* = 63). Outcome assessments for HRF and SE were made using the modified HRF test battery and the Self-Perception Profile for Adolescents (SPPA) (Harter, 1988).

The modified Preliminary Health Screening and Pre-Participation Fitness Examination Questionnaire (Kibler, 1990) were also completed by the OE and PE RCT study parents/guardians prior to pre-testing. Pre-test baseline measurements for HRF and SE were completed in week one of the PA programmes, and post-test measurements were completed in week 18. In order to determine if the components of HRF (Body composition, muscular endurance, muscular strength, cardiorespiratory fitness, and flexibility) the sub-domains of the SPPA (athletic competence, behavioral conduct, close friendship, global self-worth, physical appearance, scholastic competence, and social acceptance) were significant, individual independent *t*-tests were conducted for each of the stated variables.

In order to determine if the components of the HRF and the sub-domains of the SPPA were significant, individual *t*-tests were conducted, and Cohen’s *d* effect size. The results indicated that there were significant differences in the HRF pre-test post-test results on completion of the 18-week OE physical activities programme (at the *p*<.05 level), but there were not significant differences in all of the six of the
SPPA sub-scales (physical appearance was the only significant difference recorded, at the p<.05 level). The effect sizes for the OE participants were as follows, the body composition variables of weight, BMI, BMI $z$ score and waist circumference effect size was small, the muscular endurance variable, sit-ups effect size was small, but the press-ups variable was medium, the muscular endurance right and left hand variable effect size were medium, the cardiorespiratory variable of lung capacity effect size was small, but the multistage fitness effect size results were large, the flexibility effect size was small. The SPPA sub-domains of athletic competence, behavioral conduct, close friendship, global self-worth, scholastic competence, and social acceptance effect sizes were all small; the physical appearance effect size was medium.

The PE physical activities programme outcomes were not so promising. The HRF results between pre and post-tests produced mixed results, with only the muscular endurance sit-ups and the multistage fitness test results producing significant changes (at the p<.05 level). The HRF body composition variable weight, BMI, BMI $z$ score and waist circumference effect sizes were all small, the muscular endurance variable of sit-ups and press-ups were small, the muscular endurance effect sizes were small, the cardiorespiratory endurance lung capacity and multistage fitness results effect sizes were small, and the flexibility effect size was small. The PE physical activities programme also did not produce significant differences in all of the seven SPPA sub-domains (the close friendship and physical appearance were significant at the p<.05 level). The SPPA sub-domains of athletic competence, behavioral conduct, global self-worth, physical appearance, scholastic competence, social acceptance effect sizes ere all small, the close friendship sub-domain effect size was medium.

Additionally, the OE and PE RCT study investigated whether there was a significant difference between the pre and post-test HRF and SE results of the 18-week OE and PE physical activities programmes. The HRF results indicated that there were significant differences between the OE and PE programmes’ outcomes. The HRF body composition variables of weight, BMI effect sizes were medium, the waist circumference effect size was small, the muscular endurance variable of sit-ups effect size was medium, but the press-ups effect size was large, the muscular strength variable for both right and left hand were medium, the cardiorespiratory fitness
variable for lung capacity was small, the multistage fitness results effect size was medium. The SE SPPA sub-domain results for athletic competence, behavioral conduct, close friendship, global self-worth, physical appearance, scholastic competence, social acceptance effect sizes were all small. The $t$-test score indicated that there were no significant differences between the two different PA programmes, and the Cohen’s $d$ effect sizes were small.
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CHAPTER ONE

INTRODUCTION

An introduction to the study

Childhood obesity is an epidemic of global proportions (Mellecker, McManus, Lanningham-Foster & Levine, 2009). Contemporary society is suffering from increasing levels of poor health-related fitness (HRF), in particular the interrelated comorbidities of high body composition and low cardiovascular fitness. This is becoming a pandemic health problem for adults, adolescents and children. The increasing prevalence of childhood and adolescent obesity in particular, indicates that children and adolescents are not impervious to this modern pandemic (Booth, Dobbins, Okely, Denney-Wilson, & Hardy, 2007). The obesity trend in Australia has increased over decades so that 6-8% of school children are now affected (Gill, Baur, Bauman, Steinbeck, Storlein, Fiatarone Singh, et al., 2009). The graph in Figure 1.1 by (Huang, Stanley & Beilin 2009) shows the percentage of overweight and obesity in Australian children aged 7-15 years, 1985-2007 increasing.

Figure 1.1 Prevalence of overweight and obesity in Australian children aged 7-15 years, 1985-2007. (Huang, Stanley & Beilin, 2009).
The rising childhood obesity rate is paralleled with increasing rates of various metabolic disorders such as Type 2 diabetes (Kelishadi, 2007). The increasing strain on the Australian health care systems caused by childhood obesity is not well established, but the cost of obesity in Australia appears to be substantial (Access Economics, 2006). The psychosocial impact of obesity including low levels of self-esteem (SE) may result in the most immediate and debilitating consequences, especially for children and adolescents (Dietz, 1998a). Research has shown that systematic bias and discrimination against obese children and adolescents is common (Latner & Stunkard, 2003).

Internationally, concern has also been expressed about the tracking of obesity and associated comorbidities (Baker, Olsen, & Sorensen, 2007; Erikson, Forsen, Osmond, & Barker, 2003; Psarra, Nassis, & Siddossis, 2006), showing that obese adolescents tend to become obese adults with related health consequences of poor cardiorespiratory fitness (CRF), cardiovascular disease (CVD) and Type 2 diabetes (T2D). There has been a significant decline in CRF of children and adolescents, over the same period of time of increase in obesity (Stigman, Rintala, Kukkonen-Harjula, Kujala, Rinne & Fogelholm, 2009). Low levels of CRF have been associated with risk factors for CVD and T2D in childhood and adolescence (Allen, Nemeth, Clark, Peterson, Eickhoff, & Carrell, 2007; Ruiz, Ortega, Rizzo, Villa, Hurtig-Wennlof, Oja et al., 2007).

Physical inactivity is implicated in the aetiology of low levels of HRF, obesity, and T2D. Increasing physical activity (PA) has become a basis for the reduction of obesity in and increasing HRF in children and adolescents because of the associated physical and social benefits to their health (Summerbell, Ashton, Campbell, Edmunds, Kelly & Waters 2003). The need to increase physical activity levels, HRF and SE of adolescents, and to investigate the effects of PA programmes for adolescents is therefore paramount.

The aim of this chapter is to introduce the key concepts of this study which investigated the effects of two different 18-week PA programmes for Year 9 adolescent males’ HRF and SE outcomes. The PA programmes were administered at two different locations in New South Wales (NSW), Australia. The first programme was at a residential extended stay outdoor education school programme (ESOESP) campus. The
second was administered at a Sydney city-based physical education campus. Both cohorts were from the same independent Sydney boys’ school. This introductory chapter is a prelude to more extensive discussion in subsequent chapters of the thesis. Specifically, this chapter:

- Introduces the OE and PE RCT study.
- Outlines the problem statement.
- Establishes the aims, purpose of the study, research questions and hypotheses.
- Establishes the research design model and plan of the physical education and outdoor education programme, and locations of the PA programmes.
- Introduces the need for the study.
- Highlights the benefits of adolescent physical activity.
- Provides a synopsis of physical activity interventions in schools.
- Explains the role of outdoor education in high schools.
- Places physical education in NSW high schools.
- Positions the significance of the study.
- Stresses the limitations of the study.
- Portrays the delimitations of the study.
- Gives an overview of the thesis.
- Presents a summary of chapter one.

**Problem statement**

Concern has been repeatedly expressed about children and adolescents well-being and the contributing factors of Australian adolescents’ poor health profiles. Research has shown that children and adolescents are becoming less physically active, less skilled and less fit (Dollman, Olds, Norton & Stewart, 1999). With an increasing prevalence of obesity and low HRF in adolescents, the adverse problems of health outcomes such as CVD, pre-diabetes and T2D, may continue into adulthood (Strong, Malina, Blimkie, Daniels, Dishman, & Gutin, et al., 2005). Given the contribution that physical inactivity makes to the prevalence of disease, particularly in developed nations, there is a need to identify different types of PA programmes suitable for adolescents to increase HRF and SE. Most importantly this thesis focuses on the outdoor education
and physical education physical activity programmes at one independent boys school which may alleviate this health-risk factor and sedentary lifestyle.

**The aims of the study**

The outdoor education and physical education random control trial (OE and PE RCT) study examined the effects of two different PA programmes which may have benefits for adolescent males’ HRF and SE. Additionally, primary PA interventions may aid in the prevention of adolescent obesity, CVD, and T2D which has become a major health problem due to the increases in adolescent obesity. In the 21st Century we need to know which types of PA have a positive health effect (King, 2006). The second aim was to contribute to the body of knowledge in exercise science, outdoor education (OE) and physical education (PE) in relation to primary prevention of adolescent physical inactivity, and the subsequent problems of obesity and associated chronic illnesses (Mutrie, 2008).

To achieve these aims, the research investigated HRF and SE outcomes of 136 Year 9 adolescent males, involved in two different 18-week PA programmes. Each group completed only one physical activity programme for 18 weeks, one group completed the OE physical activity programme, and the second group completed the PE physical activity programme. The PA programmes were administered at two different locations, firstly an experimental intervention group (OE) at an ESOESP campus, at which the participants (N = 73) completed an OE physical activities programme. The second was a control group (PE) of N = 63 participants allocated at a city-based PE programme campus, where the participants completed the PE physical activities programme.

Both the OE and the PE cohorts completed pre and post-tests for HRF, (cardiorespiratory fitness, muscular endurance, strength, flexibility and body composition), and SE using Harter’s (1988) Self-Perception Profile for Adolescents (SPPA), (athletic competence, behavioural conduct, close friendship, global self-worth, physical appearance, scholastic competence, social acceptance) used to evaluate any SE changes. The data was analysed using SPSS software version 14, using independent t-tests and Cohen’s d effect size.
An outcome of this research maybe that existing types of physical activities developed for Year 9 male adolescents, may need to be re-evaluated in relation to increasing PA and increasing health benefits. It was hypothesised that the OE physical activities programme may enhance beneficial HRF, and SE outcomes.

The research questions

There are six main research questions:

1. Does an 18-week OE physical activities programme at the ESOESP campus make a significant difference in the Year 9 males’ HRF results?
2. Does an 18-week PE physical activities programme at the city based campus make a significant difference in the Year 9 males’ HRF results?
3. Is there a significant difference in the HRF results of the OE and PE physical activity programmes?
4. Does an 18-week OE physical activities programme at the ESOESP campus make a significant difference in the Year 9 males’ SE results?
5. Does an 18-week PE physical activities programme at the city based campus make a significant difference in the SE results?
6. Is there a significant difference in the SE results of the OE and PE physical activities programmes?

The research hypotheses

Data gathered from the experimental (OE) and control group (PE) were used to provide answers to the stated research questions, for the purpose of testing the following six research hypotheses:

1. There will be significant positive differences in HRF results between pre and post-tests on completion of the 18-week OE physical activities group programme at the ESOESP campus.
2. There will be significant positive differences in HRF results between pre and post-tests on completion of the 18-week PE physical activities group programme at the city-based campus.
3. There will be significant positive differences in the HRF results between the OE and PE physical activities programmes.
4. There will be significant differences in the SE results between pre and post-tests on completion of the 18-week OE physical activities programme at the ESOESP campus.
5. There will be significant positive differences in the SE results between pre and post-tests on completion of the 18-week PE physical activities programme at the city-based campus.
6. There will be significant differences in the SE results between the OE and PE participants.

The research design

The OE and PE RCT study was a two-site randomized controlled trial (RCT) (Moher, Schulz, & Altman, 2001) which was utilised to examine the effects of two different PA interventions on multiple dependent variables (Murray, 1998). The study included the following two different treatment groups:

1. An OE physical activities programme, conducted at the schools residential ESOESP campus (completed by one group only).
2. A PE physical activities programme conducted at the school’s main city campus (completed by one group only).

This RCT research design, with the two different intervention PA treatment programmes OE and PE was used to compare the outcomes of the PA programmes. As such, the synergistic effects of the PA programmes could be determined in order to understand which PA programme was more efficacious. The primary outcomes for the study were five HRF variables: body composition (height, weight, Body Mass Index, waist circumference); muscular endurance (sit-ups, press-ups); muscular strength (handgrip strength, right and left hands); cardiorespiratory endurance (lung capacity, multistage fitness test); and flexibility (sit and reach). Additionally, seven SE sub-domains of Harter (1988) Self-Perception Profile for Adolescents (athletic competence, behavioural conduct, close friendship, global self-worth, physical appearance, social acceptance and scholastic competence) were measured.
The two cohorts of Year 9 male adolescents participants completed the OE and PE RCT study, all measures being taken for each cohort at baseline (week one) and at follow-up (week 18). The research model for the 18-week PA intervention study is shown in Figure 1.2 (p.9). The research design is an RCT and is explained in detail in Chapter 5. A map of the PE and OE physical activities strands is shown in Table 1.1 and shows the pre-test in week 2, term one, and the post-test in week 8, term two.

The Independent boys’ school physical activity programme locations

The Independent Sydney boy’s school utilised in this study was The Scots College located in the Eastern Suburbs of Sydney, NSW. The Scots College main campus at Bellevue Hill is where the 18-week PE physical activity programme was conducted. The Scots College ESOESP Glengarry campus in Kangaroo Valley is located halfway between Bowral in the Southern Highlands and Nowra on the South Coast; the campus occupies 450 hectares nestled between Morton National Park and Lake Yurrunga, and campus enjoys a sense of wilderness and isolation, creating a unique educational and adventure setting. The 18-week OE physical activities programme was conducted at Glengarry as part of the school’s ESOESP programme.

The rationale for selecting this particular school was that The Scots College has a unique OE physical activities programme at the ESOESP Glengarry campus conducted in terms one and two. A traditional PE physical activities programme was conducted at the schools city-based campus at the same time. This allowed random sampling of the Year 9 boys into either an OE physical activities group, or to be placed in a PE physical activities group at the school’s city-based campus.

The Glengarry ESOESP had a specific application of aims and objectives for the students, for parents and for teachers (The Scots College, Glengarry, 2003). The seven applications of aims and objectives for the ESOESP students included:

1. Developing academic potentials and overcoming weaknesses.
2. Promoting ownership and self-direction in approaches to study.
4. Stimulating social interaction and functionality.
5. Promoting health and physical development.
6. Stimulating spiritual development.
7. Promoting independence and inter-dependence.

It should be noted that the SE and promoting health and physical development aims and objectives are directly related to the aims of this thesis. It is also noteworthy that the Glengarry ESOESP application of aims and objectives included three for parents. These included:

1. Maintaining awareness.
2. Encouraging participation.
3. Promoting their involvement in the support network.

Current childhood and obesity intervention programmes include parental involvement (Heinberg, Katchman, Lawhun, Berger, Seabrook & Cutler, 2009). The aims and objectives for the Glengarry outdoor education teachers have applications which have been regarded as essential to the success of adolescent obesity reduction programmes. The Glengarry ESOESP application of three aims and objectives for teachers included:

1. Providing and facilitating ongoing professional development
2. Promoting team approaches to organisational and educational practices
3. Facilitating clear and effective communication.

The diagram, Figure 1.2 portrays the two-site RCT parallel-group research design that incorporated 136 students from the same Independent boys’ school. The OE experimental group consisted of 73 participants; the PE control group consisted of 63 participants. Table 1.1 shows a map of the physical education and outdoor education physical activities programmes for the two-site RCT.
Figure 1.2 The Effect of Outdoor Education and Physical Education Physical Activity Programmes upon Male Adolescents experimental research design
### 18-WEEK PHYSICAL EDUCATION PHYSICAL ACTIVITY INTERVENTION (2003)

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### Table 1.1 A map of the physical education and outdoor education programme strands

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The need for the study

In 2004, the World Health Organization (WHO) estimated that approximately 22 million children under the age of five years were overweight or obese (WHO, 2004). According to a report from the International Obesity Task Force (IOTF), (Lobstein, Baur & Uauy, 2004), at least 10% of school-aged children between 5-17 years are overweight or obese, representing a total of 155 million children. Approximately 30-45 million within that figure are classified as being obese, accounting for 2-3% of the world’s children aged 5-17 years.

The metabolic syndrome in children and adolescents whose causation is obesity and overweight, leading to T2D, was discussed in the metabolic syndrome in children and adolescents workshop Zimmet, Alberti, Kaufman, Tajima, Silink, Arslan, et al., (2007). The consensus reached was that unless action is taken, diabetes experts agree that this is the first generation in which children may die before their parents, (Zimmet, et al., 2007). Obesity and physical inactivity have been linked to a host of chronic diseases including CVD, hypertension, stroke, T2D and osteoporosis. With one in five children in Australia now overweight or obese (Margarey, Daniels, & Boulton, 2001), it has been argued that children and adolescents are important people in terms of obesity and physical inactivity prevention strategies (Robinson & Sirard, 2005).

Physical inactivity is a global issue, with more than half of the world’s population not achieving basic PA recommendations (WHO, 2005). It has been estimated that globally, physical inactivity is the causation of two million deaths annually, and nineteen million years of potential life is lost due to premature mortality and years of productive life lost due to disability (WHO, 2002). Data from a national survey of adolescents in England revealed that by the age of fifteen, 69% of boys and only 50% of girls met the PA recommendations of at least sixty minutes of moderate activity each day of the week (Sproston & Primatesta, 2003). Despite the benefits of PA, only 32% of adults and 66% of children and adolescents in the United States of America based on Healthy People 2010 guidelines, engage in regular leisure-time PA (Marcus, Williams, Dubbert, Sallis, King, Yancey, et al., 2006).
Year 9 may be the best opportunity to establish HRF and healthy lifestyle behaviours by introducing different types of physical activities, providing a further rationale for this study. This can be seen from the recent investigation in Australia in the New South Wales (NSW) Schools Physical Activity and Nutrition Survey (SPANS) investigated by Booth, Okely, Denney-Wilson, Hardy, Yang, & Dobbins, (2006). This study determined the proportion of young people who recently met the released PA guidelines from the Department of Health and Ageing. The SPANS research determined that three-quarters of boys and girls met the MVPA recommendations (Booth et al., 2006). The concerning factor from SPANS was that although 80% of Year 8 students were meeting the MVPA recommendations, by Year 10, this had declined to 67%. This is support for this thesis which advocates a PA intervention in Year 9; As PA and obesity is known to track from childhood to adolescence (Janz, Dawson, & Mahoney, 2000; Fuentes, Nortkola, Shemeikka, Tuomilehto & Nissinen, 2003) and to a lesser degree into adulthood (Telama, Yang, Vikari, Valimai, Wanne & Raitakari, 2005).

The benefits of physical activity

PA during adolescence has provided important health benefits in areas of skeletal health, aerobic fitness, muscular strength and endurance, adiposity and triglycerides and mental health (Strong, et al., 2005). The problem is the current level of adolescent physical inactivity, which has been described by the World Health Organization (WHO), that in many developed and developing countries, less than one-third of young people are sufficiently active to benefit their present and future health (WHO, 1999).

A theoretical model of PA and fitness (Bouchard, Blair & Haskell, 2007) that allowed for the contributions of inherited factors and of other lifestyle behaviours, personal attributes, and social and physical environment factors was developed. The model highlights that PA is related to fitness, and positive health gains. It additionally specifies that HRF is related to health in a reciprocal manner, stating that fitness influences health, and health status also influences both habitual PA levels and fitness levels (Bouchard, et al., 2007). It has been stated that habitual PA levels established in youth tend to track into adulthood (Carlin, Stevenson, Roberts, Bennett, Gelman, &
PA can be seen as being a health enhancing behaviour (Ferreira, Van der Horst, Wendel-Vos, Kremers, Van Lenthe, & Brug, 2007). It has been advocated that when practised regularly, PA reduces the risk for a range of chronic diseases (Aarnio, Kujala & Kaprio, 1997; Aarnio, Winter, Kujala, & Kaprio, 2002). Importantly among the young, current and future health benefits can be obtained through engaging in physically active lifestyles (Adkins, Sherwood, Story & Davis, 2004). PA is also considered to prevent today’s major public health concern, obesity (Anthsel & Anderman, 2000).

Longitudinal research studies have shown that a steep decrease in PA levels occurs during adolescence (Bogaert, Steinbeck, Baur, Brock, & Beringham, 2003; Beech, Kumanyika, Davis, Robinson, Sherwood, Taylor, et al., 2004). This is of major concern as the health benefits previously described will not be gained, as many adolescents and children are neglecting to engage in the recommended levels of PA (Barnett, O’Loughlin & Paradis, 2002; Baxter-Jones, & Maffulli, 2003).

In May 1997, the American College of Sports Medicine discussed elements of a new ‘Position Statement’ on fitness training which included a new component of HRF called ‘metabolic’ fitness (Buckley, Holmes & Mapp, 2002). It is important for future research that as in the Bouchard et al., (2007) theoretical model, the components of HRF has been expanded to include metabolic fitness. In medical terms, metabolic fitness can be defined in terms of how the human body responds to the hormone insulin (Bernard & Wen, 1994). Insulin sensitive human bodies tend to have excellent glucose tolerance, normal blood pressures, and healthy blood lipid profiles. This is an important factor, which is correlated to Anthsel & Anderman’s (2000) stated problem of obesity, which can have associated problems with metabolic fitness. This also provides a rationale for this thesis to include the measurements of adolescent blood pressure, and waist measurement which are correlated to associated health problems due to obesity, and poor metabolic fitness.

Physical activity has a beneficial effect on various aspects of mental health including anxiety, depression symptoms, self-concept, sport competence and academic
performance (McGuigan, Murray, Gallagher, Davey-Smith, Neville, Vanthof, et al., 2002; Strong et al, 2005); positive changes in skeletal health, aerobic fitness, muscular strength and endurance in youth, (Strong et al., 2005).

A review by Trost (2003), suggested that health benefits can be tracked from adolescence into young adulthood. A follow-up to the Cardiovascular Risk in the Young Finns study, (Telama, Yang, Laakso & Viikari 1997) found that follow-up studies showed the maintenance of PA after nine and twelve years was only a low to moderate degree. This implies that if healthy PA patterns can be established in adolescence, they may carry over into young adulthood. To prevent future adult health problems, primary PA interventions should be promoted. PA promotion in youth is thought to facilitate a carryover of healthful habits into adulthood, and a lifelong protection from other associated health risk factors. Inarguably adolescent PA should be a priority in current health policies.

It should be taken into consideration that some researchers have come to more guarded conclusions, stating that despite the evidence of the benefits of PA among adults, the relationship between PA and health in young people is less clear (Cavill, Biddle, & Sallis, 2001). Some authors state that documenting the positive consequences of regular PA in young people is difficult, if not challenging, as chronic diseases generally manifest themselves in adulthood, not childhood (Welk, Corbin & Dale, 2000; Cavill, et al., 2001). Their argument is that while there are numerous benefits of PA, participation in PA can increase the chance of musculo-skeletal injuries. It appears that most injuries occur as a result of over-exercise, particularly during puberty (Cavill, et al., 2001). To overcome some of the uncertainty by Cavill’s findings, this thesis has included the preliminary health screening and the modified pre-participation fitness examination questionnaire as designed by Kibler, (1990).

Physical activity has been described as being ‘bodily movement that is produced by the contraction of skeletal muscle and that substantially increases energy expenditure’ (US Department of Health & Human Services [USDHHS], 1996, p.21). This particular popular definition makes PA a broad term including not only organised and non-organised sport, but also activities such as walking, cycling and playground games (Booth et. al., 2006). This definition additionally includes exercise, which is
planned, structured, and repetitive PA aimed at improving or maintaining physical fitness; organised sports or games (football, cricket, netball); transport (walking, cycling); occupational PA (manual labour, household chores); and non-organised, recreational physical activities (skateboarding, dancing, walking) Okely, Patterson and Booth, (1998). These definitions are relevant to this thesis as it is the effect of various types of PA that is examined. The participation in a variety of activities as described in Booth et al., (2006) is shown to bring with it many health-related benefits.

When it is considered that adult PA guidelines suggest that adults need only to accumulate 30 minutes or more of moderate PA five times a week or more to increase health-related benefits (USDHHS, 1996; Department of Health, [DOH] 2004), this should be achievable. But these guidelines are not being followed, and it has been estimated that globally, physical inactivity causes almost two million deaths annually, with nineteen million years of potential life lost due to premature mortality, and productive life lost due to disability (WHO, 2002).

Sallis and Patrick (1994) recommended that the minimal level of PA for adolescents was also 30 minutes per day of moderate-to-vigorous PA (MVPA). Australia has changed these MVPA recommendations for children and adolescents to be consistent with the MVPA recommendations in the United Kingdom (UK), and the United States of America (USA), to 60 minutes per day MVPA (Strong et al., 2005). Estimates of total PA in children and adolescents show a strong decline. A large subject cohort was followed from the ages of 9 or 10 to the ages of 18 or 19 years (Kimm, Glynn, Kriska, Barton, Kronsberg, Daniels, et al., 2002). The results showed a remarkable median PA decline of 64% in white girls, and 100% in black girls.

The overall level of PA is recognised as one of the most important factors for reducing the burden of chronic disease and health care costs in Australia, and therefore is an important behaviour to modify and monitor (Stephenson, Bauman & Armstrong, 2000). Low PA and sedentary lifestyles, and poor diet behaviours are associated with morbidity and mortality. Improving these behaviours in all populations, including adolescents, is a national health priority (Sanchez, Norman, Sallis, Cafas, Cella, & Patrick, 2007). Linked to this, is the factor that the incidence of childhood obesity has increased substantially. It has been argued that decreasing PA levels, coinciding with an
increase in sedentary behaviours, are responsible for the rise in childhood obesity. With this knowledge in mind, it is not surprising that there has been a strong call for an increase in PA in schools, to combat the rapid rise in the prevalence of childhood overweight and obesity (Booth & Okely, 2005).

The consequence of adolescents’ sedentary lifestyles, overweight and obesity has been the increased susceptibility to CVD and T2D risk factors. Research has shown risk factors for CVD, and T2D which included obesity, hypertension and high cholesterol, which have their precursors shaped in childhood and adolescence (Bass, Moore & Stewart, 1999). The prevalence of overweight children aged 7 to 15 years, has increased almost two-fold in Australia, (Margarey, et al., 2001) also revealed the prevalence of overweight children aged 7 to 15 years, had increased almost two-fold in Australia (Margarey et al., 2001).

Previously, physical inactivity held a less prominent position as a recognisable health risk factor, behind high blood cholesterol levels, hypertension, smoking and obesity. However, in 1996, the United States Surgeon General’s Report on PA and Health (USDHHS, 1996), promoted public interest and awareness in physical inactivity by outlining an exercise science basis of the health benefits from MVPA. In the same year, the publication and dissemination of PA and health: a special communication from the Chief Health Officer in Australia, alerted public awareness of PA benefits in New South Wales.

The positive influence of PA on reducing all-cause mortality is evident across studies and populations, (Villeneuve, Morrison, Craig, & Schavel, 1998; Lee & Skerrett, 2001). Epidemiological studies have estimated that all-cause mortality rates are at least two to three times greater for sedentary persons, than for those who are active, (Centers for Disease Control and Prevention [CDCP], 1997). Evidence from meta-analyses suggests that physical inactivity appears to be responsible for a two-fold increase in the risk of CVD (Kohl, 2001). Researchers such as Armstrong, Bauman, and Davies (2000) described the associations of physical inactivity as strong and independent of the definition of activity or fitness used. Research data collected from studies utilising different research measurement techniques, examples such as fitness assessment, motion sensors, and written self-reports, show similar relationships between
PA and health-risk factors (Bauman & Owen, 1999). It has been noted that PA acts as a preventative factor in five of the six National Health Priority Areas in Australia: CVD, diabetes mellitus, cancer control, mental health and injury prevention and control (Armstrong, et al., 2000).

Physical fitness is primarily determined by PA habit, and operationally is defined as performance-attained on tests of the following: cardio-respiratory, strength, muscular endurance, body composition, flexibility (health-related fitness), balance, power, speed, agility, co-ordination (skill-related fitness), (Schell & Leelarthaepin 1994). Health-related physical fitness is defined as a demonstration of traits and capacities that are associated with low risk of premature development of hypokinetic diseases, such as those associated with physical inactivity (MacDonncha & Sohun, 2000).

Importantly PA has also been shown to have favourable effects on mental health, with research indicating enhancement of SE, confidence, and enhancement of mood (Armstrong & Welsman, 1997). In a corroborative statement, (Sallis & Patrick, 1994) suggested a rationale for adolescent PA promotion in that: a) PA enhances physical and psychological health; and b) regular participation in PA during childhood and adolescence increases the chances of being active as adults.

**Physical activity interventions in schools**

Given the amount of time that children and adolescents spend in school and the captive audience they provide, schools are clearly a very important place for PA promotion (Brown, Salmon, & Burton, 2006). PA interventions have been evaluated by researchers in a variety of settings, over a range of time periods with most age groups. According to Biddle, Gorely & Stensel, (2004), the efficacy of PA interventions can be measured at four levels: physiological (e.g. health-related component of fitness), cognitive (e.g. knowledge), affective (e.g. SE, self efficacy, attitudes), and behavioural (e.g. participation in activity as assessed by PA questionnaires, pedometers, and motion sensors). This thesis is a primary intervention study involving two of those levels: a) physiological (HRF), and b) affective (SE) which have been shown to be related to adolescent inactivity, obesity, T2D, and CVD risk factors.
The majority of school-based PA interventions have been in primary schools (USDHHS, 1996; Biddle & Mutrie, 2008). However, there is a growing recognition of the need to intervene at the high school level, (Department for Culture, Media and Sport [DCMS], 2000; Department for Education & Skills, [DFES] 2004). School-based PA interventions have targeted a number of outcomes: increases in moderate and vigorous PA in PE programmes (McKenzie, Nader, Strikmiller, Yang, Stone, Perry, et al., 1996; Fairclough & Stratton, 2005); encouraging active transport to school (Rowland, DiGuiseppi, Gross, Afolabi & Roberts, 2003); reducing body weight (Harrell, McMurray, Gansky, Bangdiwala & Bradley, 1999); and increasing physical fitness. More recently, interventions have demonstrated that enhancing the school physical environment, and social resources can have a positive effect on the PA behaviour of students, (Stratton, 2000; Sallis, McKenzie, Conway, Elder, Prochaska, Brown, et al., 2003). The gap in the literature is that there have been no intervention studies that involved determining the effect of different types of PA on adolescents, and in particular there are no comparisons of the effect of OE and PE intervention studies in schools.

This thesis will explore the proposition that schools are in a unique position to influence the behaviour of adolescents, and to prepare them for active lifestyles for their future (Gortmaker, Peterson, Wiecha, Sobol, Dixit, & Fox, et al., 1999). The importance of this function is based upon the assumption that adolescents who are physically active will become active adults. Adolescence is thought to be a time when adult behaviours such as PA patterns, begin to develop. Consequently there is an interest in tracking PA behaviours in both children and adolescents into adulthood. Flynn, McNeil, Maloff, Muasingawa, Wu, Ford et al., (2006) support the notion of utilising the school setting to positively impact on factors such as body composition and fitness.

Schools have been identified as being important in adolescent PA promotion, but they have tended to be in the PE domain (Flynn et al., 2006). Of critical importance to school policy for the promotion of PA for adolescents are; a) the types of activities that can produce health benefits; b) the free living and formalised settings in which they might take place (Fox & Harris, 2003). Both of these concepts are addressed in the research design of this thesis. The thesis incorporates the types and settings of PA in a broader aspect, to include OE physical activities as an alternative method of reducing adolescent physical inactivity to assist in improving adolescent HRF and SE.
Outdoor education in high schools

In NSW high schools, Year 9 outdoor education is a non-compulsory part of the Personal Development, Health and Physical Education (PDHPE) Stages 4 and 5 syllabus (Board of Studies, NSW, 2003), and the Physical Activity and Sports Studies Content Endorsed Course (Board of Studies, NSW, 2004). In neither of these syllabuses is there an individual section for OE. However, there are stated outcomes in the PDHPE syllabus that encompass traditional OE tenets: a) self and relationships: a sense of self; adolescence and change; connectedness; b) movement skill and performance: demonstration of movement skills in increasingly challenging activities, e.g. OE; c) individual and community health: influences on health decision making and risk behaviours; d) lifelong PA: initiative/challenge activities, planning for regular PA; and the stated skills that enhance learning in PDHPE and are especially important for safe and effective OE: 1) communicating, 2) decision-making, 3) interacting, 4) planning and e) problem-solving.

The incorporation of OE into the school curriculum has allowed researchers to investigate the possible effects of OE on children, and to provide a rationale for OE inclusion in a school curriculum. An example of a rationale for inclusion of OE for adolescents can be seen in Neill’s (2001) Adolescent Development and OE in schools article. Neill (2001) states that adolescents of today are ill-prepared for tomorrow, and that OE offers an innovative approach to helping develop students develop their self-concepts. The goals are to prepare students for tomorrow with healthy lifestyle behaviours for future health-related PA choices. The better PA choices may prevent future adolescent obesity and co-related problems.

In New Zealand, Boyes (2000) comments on the integration of OE as part of the New Zealand PE curriculum and their relationship to PA. Boyes (2000) outlines how the new PE curriculum aims to promote the learning of new skills through PA (the experimental group in this study learnt new PA skills in the ESOESP). Additionally he indicates how critical OE can provide a PA context, and how the social and environmental factors that affect health and well-being can be examined. This type of education may also assist the experimental group OE to make future healthy lifestyle choices which may include incorporating some of the ESOESP activities.
Neill, an Australian OE researcher, provided a summary of the effects of OE programmes in schools, which have applications to this study. From this study, Neill stated that “research evidence indicates that the effectiveness of OE programming on average is positive and roughly equivalent to other innovative psychosocial interventions” (Neill, 2004, p.1). In the same article, he wrote that OE programmes have been found to be moderately effective in influencing typically measured outcomes such as SE, which is one of the variables in this study.

Allen-Craig and McLeod (2005) evaluated the implementation of a life effectiveness skills programme on 104 Year 9 males whose average age was 14 years. The boys were from one of the three campuses of an Independent boys’ school in the south-eastern suburbs of Melbourne, Australia. Allen-Craig and McLeod additionally investigated the impact of the OE programme component on these life-effectiveness skills. The Pre-Senior Life Effectiveness Program (PSLE) was designed to assist and support boys to achieve positive self-concept, increased physical self-satisfaction, and improved communication skills.

The PSLE programme consisted of two components: 1) the core programme, a challenging academic programme of approximately thirty hours during the school week in traditional key learning areas and; 2) the option programme consisted of three weeks each term which included a 9-10 day out-of-school experience (OE or experiential education). Both components are part of the Year 9 curriculum as they include the academic and out-of-school experiences. The results of this study showed that the PSLE programme was found to be effective at assisting the participants in increasing overall life-effectiveness skills. The researchers found that there was a significant difference between the OE and non-OE group in life effectiveness skills, suggesting that OE can play a vital part in better facilitating a boy’s development (Allen-Craig & McLeod, 2005).

The limitations of this study was that due to the school charter, curriculum structure, ethical reasons and parental expectations it was not possible for this study to have a control group who participated in none of the option components, or purely just the OE or non OE options. Additionally, this research considers only the male
participants from one school, the programme which may not have similar effects on boys from other school, countries and socio-economic backgrounds.

Harris (2000) investigated the development of self-concept of two groups of Year 9 co-educational students from a state run high school in England, their ages ranging from 13-14 years. The experimental group consisted of 30 participants (15 boys and 15 girls) who completed a 5-day, 4-night residential OE experience at a local authority multi-activity OE centre. The control group consisted of 30 participants (15 boys and 15 girls) selected from the same year group at the same school as the experimental group, where they followed a normal Year 9 school timetable. The participant allocations to their research groups were completed by the schools head of year, on the basis that each group’s participants would mirror the other groups (Harris, 2000).

Both the experimental and control groups completed the Rosenburg Personal Opinion Scale to measure changes in their self-concept on three occasions: 1) four days before the OE residential course, both groups were tested together; 2) the participants were retested on the last day of the course at the appropriate locations e.g. experimental group at the OE residential centre; the control group at the school; 3) the final test was completed three months after the course with both groups being tested together at their school. The results from this study showed that the participants who completed the OE residential 5-day, 4-night course had significant increases in self-concept whist at the OE residential centre, and post-test after three months. The control group had no significant changes at either the end of their school course, or after three months. The author concluded that the short term residential OE course experiences proved to be significant in improving an individual’s self-concept (Harris, 2000).

The limitations of this study include the small number of participants $N = 60$, with only $n = 30$ participants for the experimental and $n = 30$ for the control groups. The small numbers of participants would make it difficult to generalise the results to a larger school population, and students from a different socio-economic background. The data was also collected on the last day of the course, which may have had an effect on the participants’ perceptions. Additionally, the length of the course being only five days
(four being residential in the outdoor group) may have been too short to produce reliable effects on the participants’ perceptions.

An investigation of the perceptions of an ESOESP using a case study research methodology was conducted by Jimenez (1996). A grounded theory and hermeneutic/dialectic approach was used to collect and analyse the data. Interviews, surveys, observations, and participation complemented the process of data collection. The analysis of this data resulted in five categories that were considered to be the essential components to the process leading to an outcome at a particular ESOESP: 1) student role; 2) teacher role; 3) school climate; 4) interpersonal/personal skill development; and 5) the learning process. Based on these five categories and their related sub-categories a process model was developed. The relationship of the five categories to the experiential learning process was investigated (Jimenez, 1996).

The limitations of this study included a) the nature of the study, b) timing of the study, and c) nature of analysis. The nature of the study limitations was that the study was conducted at one site only, and as such the results may not be generalisable to all outdoor and experiential centres and schools. The studies time frame to conduct the research was relatively short (seven days). The limited time frame contributed to the modification of the research design. It also restricted the development of relationships between the researcher and participants, which may have limited the responses the participants made. The timing of the data collection was a limitation as the data was collected in the third term of the scholastic year. This term at Timbertop where most of the time is spent within the school, whereas in terms one, two and three the students spend approximately two days per week out of school and out of their units. This may have affected the students and Timbertop’s’ staff perceptions in relation to the school and the ESOESP.

To test the effects of the impact of an ESOESP upon adolescent participants, Gray (1997) conducted a study on 201 Year 9 co-education students \( n = 73 \) girls, \( n = 128 \) boys. The ESOESP campus is in the Victorian High Country, Mansfield, Australia. The students involved in this unique ESOESP, completed their entire Year 9 academic programme at the ESOESP campus. The students resided for seven days a
week on campus, engaging in a variety of outdoor activities whilst maintaining the normal academic curriculum for Year 9 students in Victorian schools.

The participants completed two quantitative instruments: 1) the Real Me Questionnaire (RMQ), and 2) the School Life Questionnaire (SLQ). Their parents completed the parent questionnaire (PQ). These questionnaires were conducted to evaluate the ESOESP effectiveness. The questionnaires evaluated perceived changes in participants’ attitudes, values and behaviours during and after exposure to an ESOESP, along with differential gender outcomes. The students were administered pre-tests and tracked at regular intervals for up to two academic years using RMQ and SLQ in order to ascertain self-perceived changes in selected variable (Gray, 1997). In order to ascertain the impact of the ESOESP over a full Year 9 academic year, an A x B x (C x S) two way repeated measures mixed-model analysis of variance (MANOVA) was carried out on the self-report data contained in the RMQ and SLQ, where A represented time, B represented gender and C represented the participants with time (Gray, 1997).

OE has long suffered from a credibility crisis (Gray, 1997). To address this anomaly this extensive study by Gray evaluated the impact of an ESOESP. This study included two pilot studies at two different ESOESP campuses, where qualitative and quantitative data was collected. This study found supportive data for the inclusion of ESOESPs into the school curriculum (Gray, 1997). The seminal research by Gray (1997) at the two different ESOESP campuses involved qualitative and quantitative data evaluating the ESOESP effectiveness in regards to participants’ perception of attitudes, values and behaviours and gender outcomes. This study was an examination of the effect of two different PA programmes on HRF and SE, utilising an experimental OE group. The Gray (1997) study design did not use a control group as it was examining the effect of the ESOESP; therefore it was not applicable to use Gray’s (1997) research design.

To test the effects of an ESOESP on adolescent males’ aerobic fitness, (Okely, Gray & Cotton 1997) conducted a quasi-experimental design project on 51 Year 9 males aged 14-15 years, at an ESOESP campus in NSW. The participants were pre and post tested between their first and 16th week at the ESOESP campus, using the multistage fitness test (Brewer, Ramsbottom & Williams, 1988a). The effects of the ESOESP upon
the Year 9 males can be seen in results: a dependent t-test was used to analyse the change between the pre and post-test. A significant increase was observed, 
\[ t(50) = 12.093, p < .05. \] This seminal study has helped empirically confirm what many in OE have anecdotally known, that ESOESP will have a positive effect on aerobic fitness of its participants (Okely et al., 1997).

In order to develop a conceptual model for an ESOESP (Hobbs, 2007) employed an organisational action research approach. The study drew upon the background, interests and values of key stakeholders at Prince Alfred College (PAC), an Independent boy’s school, located in Adelaide South Australia. The background to this study was in 2001 when the senior administrators and teachers at PAC were considering ways in which adolescent boys could be better prepared for the transition from boyhood to manhood (Hobbs, 2007). It was stated that a new Middle Years Programme (MYP) needed to have a distinctive approach to pedagogy based upon special programmes designed to challenge boys and to assist in the development in their sense of identity.

An ESOESP was therefore considered to be one approach in the construction of a new MYP for PAC. An interesting conclusion from this study was that the researcher felt that the true value of the ESOESP lies in how learning experienced at the ESOESP will serve the student in the future.

**Physical Education in New South Wales high schools**

PE in NSW is part of the PDHPE Key Learning Area (KLA), which is one of the NSW mandatory academic syllabi. Table 1.2 outlines the NSW Board of Studies mandatory KLA courses. Each individual school has the ability to personalise the PDHPE programme delivery to suit the resources and suitability of the school students, and their PE staff. The majority of schools would deliver the 300 hours PDHPE mandatory programme evenly across the Years 7-10. The Independent boys’ school in this study divides the 300 mandatory hours by incorporating a PE practical programme for 2 x 50 minutes lessons per week, further complemented by a PDH programme of a 1 x 50 minute lesson per week in Years 7-10.
Table 1.2 New South Wales Board of Studies Mandatory Courses in Years 7-10

<table>
<thead>
<tr>
<th>NEW SOUTH WALES BOARD OF STUDIES MANDATORY COURSES</th>
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<tbody>
<tr>
<td>KEY LEARNING AREAS YEARS 7–10</td>
<td>HOURS</td>
</tr>
<tr>
<td>1) English</td>
<td>400</td>
</tr>
<tr>
<td>2) Mathematics</td>
<td>400</td>
</tr>
<tr>
<td>3) Science</td>
<td>400</td>
</tr>
<tr>
<td>4) Human Society and its Environment</td>
<td>400</td>
</tr>
<tr>
<td>5) Personal Development, Health &amp; Physical Education</td>
<td>300</td>
</tr>
<tr>
<td>6) Creative Arts</td>
<td>200</td>
</tr>
<tr>
<td>7) Technological &amp; Applied Studies</td>
<td>200</td>
</tr>
<tr>
<td>8) Languages</td>
<td>100</td>
</tr>
</tbody>
</table>

Rationale for PDHPE in NSW high schools

The development of a PA lifestyle has been considered a key aim of PDHPE programmes in NSW schools (Okely, 1999). From 1991-1997 the NSW Board of Studies consistently repeated the same aims (Board of Studies, 1991; 1992; 1994; & 1997). In 2003 the Board of Studies aim for the PDHPE years 7-10 Syllabus is to develop students’ capacity to enhance health and wellbeing, enjoy an active lifestyle, maximise movement potential and advocate lifelong health and PA (Board of Studies, 2003). The aims are congruous with the aims of: a) the Independent boys’ school PE programme and their ESOESP programme and b) the aim of this study.

PDHPE contributes significantly to the cognitive, social, emotional, physical and spiritual development of students (Board of Studies, NSW, 2003). PE has also been described as being part of the total educational programme that contributes, primarily through movement experiences, to the total growth of all children (Pangrazi, 2007). The importance of childrens and adolescents’ health is now an important role that PE plays in the growth of children’s and adolescents PA habits throughout their lifetime.

The significance of the study

This research investigated two PA programmes results for HRF and SE for Year 9 males in 2003. The two programmes were of equal length in time (18 weeks).
The OE physical activities at the ESOESP campus included kayaking, rock climbing, abseiling, orienteering, hiking and snorkelling; the PE physical activities programme at the city campus, included swimming and life-saving, basketball, cricket, athletics, and rugby. As indicated by the PE and OE teachers, the actual participants’ hours of PA at the OE and PE campuses were the same. The results from this research may have implications for high school PDHPE curriculums, regarding the types of PA that may be offered to Year 9 male students. Furthermore, their PA outcomes may be tracked continually to observe any impact on preventing hypokinetic diseases in adulthood.

PE is recognised as one of the most important vehicles for teaching children and adolescents to lead active lifestyles. The PE programmes in schools have been proven to have beneficial effects on HRF and SE, but this key learning area has been restricted by its low recognition, low status, and reduced time in the school curriculum (Hardman & Marshall, 2001). Both nationally and internationally, PE has been considered a relatively unimportant component of the school curriculum, and is under threat as a school subject in many regions of the world (Hardman, 2000; Hardman & Marshall 2001).

Paradoxically, OE school programmes have become increasingly popular for recreational, developmental, and therapeutic uses in a multitude of settings (Sibthorp, 2003). Problematically, some OE programmes are being restricted due to cost and time taken away from other KLA’s. Often linked with OE programmes, are claims that participants will experience many beneficial effects as with PE, not only in the immediate quality of the experiences, but also OE aims to have these immediate experiences impact on later experiences (Hattie, Marsh, Neill & Richards, 1997). One of the most common of these claims is the valuable contribution to a person’s sense of self, or self-constructs (Neill & Richards, 1998). However, to date the main evidence to support this is based mainly on anecdotal success, personal experience and belief that such experiences are inherently beneficial (Stenger, 2001).
Limitations of the study

The investigation in this study contributed to understanding the effects of two different types of PA programmes upon HRF and SE of Year 9 males. There were uncontrollable circumstances that may have affected the results of the study:

- Not assessing the physical maturation of the subjects. This is often completed in research studies utilising a Tanner maturation scale (Tanner, 1962). This can be completed by determining skeletal, sexual or somatic maturation (Brooks, Fahey & White, 1996). At the schools request this part of the research was deleted. The height of the participants was assessed from the stature-for-age and weight-for age percentiles table from the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

- Written permission from the parents/guardians was required prior to student participation in the study, and the students were allowed to decline participation in any of the tests, or to withdraw from any test at any time.

- It is difficult, if not impossible to control extraneous factors such as the participants’ family background, ethnic origin, socioeconomic factors, maturation and personality type.

- Evidence supports the fact that perceptions of SE are both influenced by major life stressors, such as parental death and divorce. Anxiety, perceptions of social support and motivational orientation are also influenced by such factors. Although the use of domain-specific measures of most of the constructs controls many of the extraneous factors, such control can never be complete. Results from the SE questionnaires must be interpreted with this in mind.

- Problems of overestimation of competence and intervening socio-environmental factors have been reported (Harter, 1985a; Horn & Weiss, 1991). There is an agreement that by middle childhood and adolescence, self-perceptions of competence are closer to reality.

- The ESOESP experience will have varying effects on different participants.
The ESOESP experience might have varying effects on different participants as they were taken away from their homes or boarding school environments.

The PE physical activities will have varying effects on different participants.

The HRF tests and SE questionnaires were not administered to Year 9 males other than those attending the study’s ESOESP campus and the city-based campus on the nominated pre-test and post-test days. To increase external validity to male adolescents in general, results needed to be obtained from adolescents aged 11-18 years who do not attend this school. An example of this may also include those adolescents who have left school and started full-time employment.

Means, standard deviations, paired t-tests and bivariate correlations represented the major statistical procedures used in this study. The use of such analytical procedures with data reaching only an ordinal level of measurement, although commonly used, is sometimes questioned.

**Delimitations of the study**

The study was delimited in the following manner:

- All the participants were enrolled in Year 9 in 2003 in the same Independent Sydney boys’ high school
- Measures of HRF included: a) resting blood pressure, b) body composition, c) muscular endurance, d) muscular strength, e) CRF; f) flexibility. These measures were identified as dependent (response) variables.
- Measures of SE from the SPPA (Harter, 1988) included: a) athletic competence; b) behavioural conduct; c) close friendship; d) global self-worth; e) physical appearance; f) scholastic competence; g) social acceptance. These measures were identified as dependent (response) variables.
- The research environment (PA location) and the participants’ self-reported age were identified as the independent (predictor) variables.
Overview of the thesis

To achieve the stated aims of this study, chapter one introduced the global problem associated with the lack of PA in adolescents, the health-related illness consequences created by physical inactivity including adolescent obesity, CVD, and T2D, and causing low levels of adolescent HRF and SE. The aim of this research was to investigate HRF and SE outcomes of Year 9 males involved in two different PA programmes (OE and PE). The obesity issue is confounded by the two different living arrangements (one being residential, the second not) but some of the boys in the PE physical activity programme were boarders at the main school campus. The next two chapters will examine the literature on the problem of adolescent physical inactivity. Chapter two is a literature review of the considerations for research involving adolescents, including exercise testing for HRF, physical inactivity as health-risk behaviour, obesity, and SE. Chapter three is a literature review of the previously-implemented PA intervention studies for adolescents and children, and the theoretical background of OE and PE.

Chapter four described the ESOESP HRF feasibility study and its results. The feasibility study was a case study at the ESOESP Glengarry campus. Chapter five has the description of the research methods used to achieve the OE and PE RCT study’s research aim. This chapter points out the methods used for the pre and post-tests for the five HRF variables, and the seven SE sub-domains; additionally it describes the methods for collecting the pre-participation fitness questionnaire. Chapter six provides the results from the research method as it relates the research questions and hypotheses; the pre and post-test data was analysed using independent \( t \) tests. Chapter seven discusses the results from the pre and post-tests for the HRF variables, the SE questionnaire and the pre-participation questionnaire; the results in Chapter seven are discussed in relation to the stated six hypotheses, Chapter eight is the final chapter in which the conclusions are related to the aim of the thesis, and were drawn from the discussion chapter.
Chapter one summary

This chapter has stated the aims of the study that investigated the effects of two different 18-week PA programmes for Year 9 adolescent males’ HRF and SE outcomes. The research design model and plan to meet the aims of the study was outlined. A synopsis of PA interventions in schools and an introduction to the roles of two different pedagogies OE and PE were given. The limitations and delimitations of the study were stressed. The problem of adolescent physical inactivity leading to low levels of health needed to be addressed, as do the types of physical activities taught in PE programmes.

Epidemiological evidence supports the views that physical inactivity is a global problem, and that appropriate levels of PA can have significant health-related benefits for adolescents. Regular PA helps adolescents develop health benefits of skeletal health, cardiovascular fitness, muscular strength, lower adiposity and triglycerides, and mental health. Adolescent current and future health benefits can be obtained through engaging in physically active lifestyles. When adolescent PA is practised on a consistent basis it reduces the risk for a range of chronic diseases including cardiovascular disease, and the major public health concern the increasing levels of adolescent obesity and T2D. Despite the many health-related benefits of regular PA many adolescents are not engaging in the recommended levels of PA. Therefore this thesis investigated the types of physical activities that adolescents may participate in, and could assist in alleviating some of the stated physical inactivity problems.
CHAPTER TWO

ADOLESCENT PHYSICAL ACTIVITY LEVELS

Introduction

This chapter will present a literature review related to the thesis research problem and provides a rationale for exploring ethical considerations for adolescents, and the promotion of physical activity (PA), physical fitness and self-esteem (SE) in adolescents. Specifically, this chapter:

- Highlights considerations for exercise science research involving adolescents.
- Emphasizes that adolescence is a period of transition.
- Demonstrates the physiological health-related outcomes of PA.
- Expresses the psychological benefits of PA.
- States the problems of adolescent obesity and physical inactivity.
- Introduces the evidence linking adolescent physical inactivity and causes of mortality and morbidity: adolescent health-related behaviours.
- Establishes the determinants of adolescent PA.
- Presents a summary of Chapter Two.
- Provides an introduction to Chapter Three.

Considerations for exercise science research involving adolescents

Exercise science research involving adolescents and children is increasingly and justifiably subject to both ethical and legal restrictions. When utilising adolescents as research participants, the researcher must consider not only their rights to choose to
participate in research (and to withdraw), but also be aware of issues such as power differentials, and coercion in the recruitment process (Oliver, 2007). The National Statement on Ethical Conduct in Research Involving Humans NSECRIH (2007a; 2007c) additionally raises ethical concerns in the area of possible coercion to participants by parents, peer, researchers or others, (to participate in research). Considerable care was given by the investigator in this thesis in the recruitment of participants for this not to happen. It should be noted at this point that in accordance with the NSECRIH guidelines, the Year 9 male students involved in this research are stated as being ‘participants’ rather than ‘subjects’ (NSECRIH, 2007b).

The Medical Research Council (2004) supports the use of adolescents in research as long as the benefits and risks are carefully assessed. The risk assessment procedure for this research followed the Health and Safety Executive (HSE, 1999), five step approach to risk assessment:

Step 1: identify the potential hazards;
Step 2: decide if any subjects might be harmed and how;
Step 3: evaluate the risk and decide whether the existing precautions are adequate, or whether more should be done;
Step 4: record significant findings; and
Step 5: review assessment and revise if necessary.

Ethical considerations are of primary importance in any research that involves adolescents and children. Both are a special population, characterised by vulnerability, because they are less likely than adults to fully comprehend why they are participating in research (Cardinal, 2000). Legally children of all ages are not able to consent to their participation in research without permission from a parent, or guardian (Armstrong & Welsman, 1994; Jago & Bailey, 2001). In addition, strict guidelines have been developed to protect adolescents and children, who participate in research studies. These guidelines have substantial implications for the types of research investigations, and the specific research procedures, that can be used for research involving adolescents and children (Oliver, 2007).
Importantly, there should be negligible risk of harm in the research procedures used for non-clinical research involving healthy adolescents (NSECRIH, 2007a). To assist in reducing the risk of the subjects injuring themselves, and to be ethical, the modified Preliminary Health Screening and Pre-participation Fitness Examination Questionnaire (Kibler, 1990) was conducted with the participants, prior to commencement of the health-related fitness (HRF) tests.

The obligations of the ethical research investigator of adolescents and children participating in research go even further than legal and methodological issues. They include acting in a kind and charitable manner, treating the adolescents with respect, ensuring their well-being, and making all efforts to avoid harm (NSECRIH 2007a). Each individual investigation with an adolescent or child typically takes time and patience, and considerable effort was made to make participation a positive experience.

Thus, ethical considerations have a substantial impact on the design of the research presented in this thesis, particularly in the methodology used. Specific references to the influence of these considerations are made in Chapter Four, and again in chapter five which describes the methodology used in this research.

Adolescence is a period of transition

Adolescence is typically viewed as the transitional period between childhood and adulthood. It is a time when young people continue to develop their social and intellectual skills, preparing them for adult roles and responsibilities (Harris, Duncan & Boisjoly, 2002). The age of adolescence has been fixed between the ages of 10 and 24 years by the World Health Organization (WHO, 1993). According to the WHO definition, adolescence has been designated between the ages of 10 and 19 years, and youth between the ages of 15 and 24 years. In many developed countries, three age groups are considered within this age range of 10 and 24 years: a) 10 to 14 years, b) 15 to 19 years, and c) 20 to 24 years. This thesis defines adolescence as ranging from 10 to 19 years of age. This adolescent period can be arbitrarily segmented into early (10 to 14 years); middle (14 to 17 years); and late
adolescence (17 to 19 years). This definition of the period of adolescence therefore, covers
the onset of puberty through to the end of adolescence.

Adolescence is a period of transition from childhood to adulthood, and is
characterised by the developmental marker of puberty (Crockett & Petersen, 1993). The
events that signal the onset of puberty are similar across cultures. Pubescence involves
physical and biological changes occurring throughout the body, and is the beginning of
reproductive maturity. Appearance of the secondary sex characteristics during the
adolescent growth spurt is a function of maturation (Haywood & Getchell, 2005). In boys,
physical changes include pubic hair growth, facial hair growth, genital development, and
voice change. In girls, physical changes include pubic hair growth, breast development and
menarche. Rapid increase in height and weight occurs in both sexes, but boys tend to
experience a greater increase in height and weight than girls (Armstrong, Welsman & Chia,
2001; Lewis, 2003).

There are substantial gender differences in the rate and timing of pubescent
changes, (Haywood & Getchell, 2005). Among boys, puberty may begin as early as 9.5
years of age, or as late as 13.5 years of age; among girls, puberty may occur as early as 8
years of age, or as late as 13 years of age. On average, changes in puberty begin at
approximately 12.5 years of age for most boys, and 10.5 years of age for most girls.
Furthermore, these changes can take place over 1.5 to 6 years, with the average time being
about four years. The individual variation in the time of pubertal changes means that
adolescents of the same age will show substantial differences in physical maturity (Tanner,
1962; Armstrong et al., 2001).

Physical developmental changes have different effects for boys and girls. For the
majority of boys, physical growth leads to more satisfaction with their physical appearance,
because of increased size and muscular development leading to improved body image. For
girls, pubertal development leads to greater dissatisfaction with their physical appearance,
most probably due to an increase in weight and body fat (Felts, Parrillo, Chernier, & Dunn,
1996).
Changes in adolescent body size, body composition and body proportions associated with growth and development

Human body size exerts a powerful influence on aspects of human physiological performance. As adolescents develop and mature, there are substantial changes in their body size, body composition (muscle mass versus fat) and body proportions (Haywood & Getchell, 2005). Having recognition of these changes does not, however, diminish the associated problems inherent with adjusting procedures and performance results for individual differences. This is particularly important with body size, when comparing physiological function in adolescents during maturation. Size adjustment becomes necessary in order to determine whether there are influences on physiological function in childhood and adolescence that are not exclusively due to growth (Rowland, Maresh, Charkoudian, Vanderburgh, Castellani, & Armstrong, 1996).

Traditionally, some form of ratio scaling (e.g. dividing by body mass, and height or body surface area) has been used to try to normalise, or remove the influence of body size on adolescent and children’s physiological variables. One example is oxygen consumption data expressed in relation to body mass, volume of oxygen consumed per minute (relative VO2), and cardiac output (Q) which have been expressed relative to body surface area (cardiac index). Body mass and height can be effectively measured and is conceptually easy to understand, but may not relate to adolescent physiological function in a linear or uniform manner during growth and development. Allometry is the study of the relationship between size and shape (Small, 1996), allometric scaling (scaling relationship relating metabolic rate to body mass) has been widely used in interspecies biological investigations during human development (Batterham & Tolfrey, 1996; Welsman, Armstrong, Nevill, Winter & Kirby, 1996). At this point in time, however, allometric approaches have provided little additional advantage or insight over simple reference variables. It was suggested that weight is the best index for controlling the effects of maturation on VO2 max. in both children and adolescents (Krahenbuhl, Skinner & Kohrt, 1985). It is for this reason that weight will be used for controlling the effect of maturation in this research.
Studies examining physiological performance and differences in body composition may confound the effectiveness of standardisation data for body mass. Normalising for body mass is most effective when body composition is uniform. Therefore determination of body composition may aid interpretation or allow normalisation to lean body mass (LBM), which is often considered to be more reflective of active physiological tissue (Astrand & Rodahl, 1986).

In addition to changes in body size and the proportions of body tissues with biological maturation, there are changes in the regulatory processes that govern physiological function (Haywood & Getchell, 2005). This means that in research studies examining any aspect of physiological function in adolescents and children, the stage of maturation of the subjects should be considered (if possible), as this may influence the interpretation of the research data obtained (Armstrong et al., 2001). Unfortunately, an adolescent’s chronological age is not a reliable indicator of biological maturity (Brooks, Fahey & White, 1996). At any particular chronological age, the stage of biological maturity of the adolescent will also vary (Brooks, et al., 1996; Haywood & Getchell, 2005). Failure to consider the difference between chronological age and maturational stages has resulted in extremely heterogenous groups of subjects in most early studies of adolescents and children with cardiovascular function during exercise.

Maturational status was not given much consideration in early research studies of the physiological capacity of adolescents and children during exercise. Consequently, in an analysis of the impact of endurance training status on the aerobic capacity of children, Rowland (1985) found that the paediatric populations examined in the various studies were extremely heterogeneous in terms of physical development and stage of maturation. For the purposes of this research, a take-home Tanner pubertal maturation scale (Tanner, 1962; Armstrong et al., 2001) was proposed. The Tanner scale uses a series of line drawings and gives a short description representing five distinct stages of male pubertal development. The combination of the line drawings and written description would enable the adolescent to indicate their current physical maturation status. Reliability studies have previously demonstrated that adolescents are able to report their stage of pubertal development with
reasonable accuracy (Armstrong & Welsman 1995). Unfortunately, after consultation with the participants’ school, the school did not consider it appropriate to utilise the Tanner Scale (1962) as they felt that some of the participants/parents/guardians may be uncomfortable completing the form.

As well as physical growth, adolescence is a period of cognitive development (Piaget, 1976; Silverthorn, 1999). Significant adolescent cognitive development is apparent when young people become increasingly capable of applying logic, abstract thought, and thinking hypothetically (Central DuPage Hospital, 2005). The work of developmental theorists such as Piaget, represents a starting point in understanding the cognitive development of adolescents (Keating, 1991; Silverthorn, 1999). The fundamental tenets of Piaget’s Theory of Formal Operations (Piaget, 1976) states that children and adolescents precede through four stages of cognitive development: (1) sensorimotor functioning of infancy; (2) preoperational thought processes of early childhood; (3) the concrete operational thought of early and middle adolescence; and (4) the formal operational thought of adolescence and adulthood (Gruber & Voneche, 1982; Silverthorn, 1999). Piaget (1976) argued that children are only capable of concrete operational thoughts, but by the early years of adolescence, the development of formal operational thought allows young people to think abstractly, and to engage in moral reflections and hypothetical reasoning. For the majority of young people, this stage of cognitive development usually takes place between the ages of 11 and 14 years, but the completion of this development may not occur until late adolescence (Piaget, 1976). The influential theory of Piaget provides an explanation for cognitive changes and how individuals think in terms of their reasoning. This is an important factor in relation to health-related behaviours.

Another significant contribution to the understanding of cognitive development which emphasises social cognition is Elkind’s Egocentrism Theory (Lapsley, 1991). This theory focuses on how adolescents reason about themselves, and how they interact with other people. Elkind argued that adolescent egocentrism is characterized by two complementary processes: (1) the imaginary audience and (2) the personal fable. This egocentrism emerges as a direct consequence of formal operational thought, that is,
adolescents can now cognise about the thoughts of others. The imaginary audience is the basis for the belief of adolescents that other individuals are as preoccupied as they themselves with their appearance and behaviour. The personal fable reflects the adolescents’ sense of personal uniqueness, omnipotence and indestructibility. Thus these beliefs can manifest themselves in a variety of behaviours, including heightened self-consciousness and self-awareness, idealism and risk-taking behaviours.

The intuitive theorists’ (Bartch, 1993) perspective on adolescent cognitive development may provide a summary and framework for adolescent educators involved in PA. Intuitive theorists believe that children, adolescents and adults make sense of their social environment by constructing theories about it and then revising those theories as new evidence emerges. Unlike Piaget’s theory, where adolescents move from concrete to abstract thoughts, an intuitive theorist’s framework perceives young people as already possessing abstract thoughts throughout childhood and pubescence. As young people progress through adolescence, their concepts undergo restructuring and modification. This process of cognitive development is a continuous one. Although no extensive empirical evidence has emerged to support this framework, such a view has potential implications for understanding how young people develop their cognitive ability, and how researchers and physical educators present health information to adolescents.

**Developmental stages of adolescence and health**

Recognising the various stages of adolescence is important for this thesis because health needs, problems and issues will vary considerably along with the stages of adolescent development (Heaven, 1996; Haywood & Getchell, 2005). In regards to PA it is important for educators to consider that within the 11–15 year age group, there are many individual differences in psychological, behavioural and emotional factors. At 11 years of age, the focus is on learning, socialising with family members and having fun with peers of the same sex. However, for the majority of adolescents, this is also the age of entry into the secondary high school system and the beginning of social and environmental change. At 15
years of age the focus is usually on having fun, rebellious feelings towards parents, teachers and school, and they may develop an increased interest in sexual relationships.

Furthermore the different stages of adolescent development correspond closely to the experimentation initiation, adoption and habitualisation process of health compromising practices (Heaven, 1996). For example, the development of cigarette smoking and alcohol use are approximately related to developmental phases of adolescence, with experimentation occurring during early adolescence, adoption during middle adolescence, and habitualisation during late adolescence (Ferguson & Horwood, 1995).

Summary

The numerous biological, physical and cognitive developmental changes of adolescents can have a significant impact upon health-related behaviours, and psychological well-being. In many cultures, puberty marks the beginning of new experiences of engaging in health-enhancing practices, such as regular PA or health-compromising behaviours such as substance use, or precocious sexual activity. Thus, understanding adolescents’ levels of cognitive development has important implications for how adolescents can be educated about health and health-related behaviours.

Health-related outcomes of physical activity

The concept that PA and exercise has health benefits was advocated in Greece by Hippocrates in the 5th Century B.C. (Armstrong, Bauman & Davies, 2000; Pate, 2007). In China and India concepts of health and prevention of illnesses were developed as early as 3000 BC. In more recent times, research has shown that the health-related outcomes of PA and exercise include reduced risk of coronary heart disease, stroke, diabetes, hypertension, obesity and increased life expectancy (Sesso, Paffenbarger & Lee, 2000). PA has been described also as having a beneficial effect on mental health variables (Biddle, 1995), and to be important for the health of muscles, bones and joints (McGuigan, Murray, Gallagher, Davey-Smith, Neville, Vanthof, et al., 2002). SE has emerged as one of the major
psychological variables that is enhanced by participation in regular PA, and is often identified as the factor most likely to reflect psychological benefit (Sonstroem & Morgan, 1989). It is for this reason that SE is included in the literature review and in the methodology in this study.

Despite the overwhelming evidence of the benefits of PA among adults, the relationship between PA and health in adolescents is less clear (Booth, Okely, Chey & Bauman, 2002; Bo Andersen & van Mechelen, 2005). This section of Chapter Two outlines the evidence for the physiological benefits of PA for adolescents.

**Physical activity and cardiorespiratory fitness benefits**

Previous physiological research has established a strong association between low cardiorespiratory fitness (CRF) and mortality among adult populations (LaMonte, Eisman, Adams, Schultz, Ainsworth & Yanowitz, 2000), and young adults (Carnethon, Gidding, Nehgme, Sidney, Jacobs, & Liu, 2003). But for adolescents this relationship is less clear (Boreham & Riddoch, 2001). While there appears to be a strong relationship between CRF and coronary heart disease (CHD) risk factors in adolescents, that relationship can be altered by fatness (Kim, Must, Fitzmaurice, Gillman, Chomitz, Kramer, et al., 2005).

It has been assumed that active adolescents will have higher levels of CRF. Cardiorespiratory fitness however, has a strong genetic component (Bouchard, Lesage, Lortie, Simoneau, Hamel, Boulay, Perusse, et al., 1986) and very few adolescents achieve the intensity or volume necessary for the improvement of peak VO₂, which is internationally recognised as the best measure of CRF (Armstrong & Welsman, 1997). Despite confounding factors, longitudinal and cross-sectional studies have demonstrated a positive association between habitual PA and CRF (Twisk, Kemper, van Mechelen & Prost, 1997; Gutin, Yin, Humphries & Barbeau, 2005). It is worth noting that researchers make a distinction between cross-sectional studies and controlled intervention studies of exercise training (Baranoweski, Bouchard, Bar-Or, Bricker, Heath, Kimm, et al., 1992).
Adolescent PA intervention studies have demonstrated the benefits of increased PA on cardiovascular risk factors (Fardy, White, Haltiwanger-Schmitz, Magel, McDermott, Clark, et al., 1996; McMurray, Harrell, Bangdiwala, Bradley, Deng & Leviele, 2002). These studies provide exercise scientists with an understanding of the PA characteristics which affect CHD risk factors, because the intensity, duration and frequency of PA are controlled, whereas cross-sectional studies provide researchers with specific information regarding usual levels of adolescent PA (Baranowski et al., 1992).

The relationship between PA and CF of 1015 Northern Irish adolescents was examined (Boreham, Twisk, Savage, Cran & Strain, 1997). Activity patterns were assessed using a time-based PA questionnaire, and cardiorespiratory fitness was assessed by the Multistage Fitness Test (Brewer, Ramsbottom & Williams 1988b). It has been found that self-reported PA was beneficially related to CRF in 15-year-old boys, but not in girls (Boreham & Riddoch, 2001).

Twisk, et al., (1997) completed a longitudinal study in which adolescent PA was assessed by self-report and CF using a maximal treadmill test. Participants who were physically active and/or became physically active were at a lower risk of being unfit compared to individuals who reported little PA. In a recent similar study (Gutin, et. al., 2005) involving 421 adolescents, the participants were examined looking at the association between their CRF using a multi-stage treadmill test, and their moderate and vigorous PA (MVPA) measured over five days of accelerometry recordings. The authors of this research found that CRF was associated with higher amounts of MVPA, with more variance as a result of more vigorous PA.

**Cardiovascular fitness effects on chronic health conditions**

As stated by Rowland (2007), improving and maintaining PA and physical fitness in children may provide immediate and long-term health benefits. Health-related concepts that sedentary lifestyles leads to an increase in the clinical manifestations of coronary heart disease (CHD), especially myocardial infarction and sudden death has been generally
accepted by the general public and health care professionals (Marshall, Biddle, Sallis, McKenzie & Conway, 2002).

**Physical activity and coronary heart disease (CHD) prevention**

The European Youth Heart Study (EYHS) (Andersen, Harro, Sardinha, Froberg, Ekelund, Brage, et al 2006), was a cross-sectional study of 1732 randomly selected 9 year old and 15 year old school children from Denmark, Estonia, and Portugal. The risk factors included the composite score (mean of Z scores) comprised of systolic blood pressure, triglyceride, total cholesterol/HDL ratio, insulin resistance, sum of four skinfolds, and aerobic (cardiovascular) fitness, the PA was assessed by accelerometry. The conclusions from the EYHS study were that PA levels should be higher than the current international guidelines for at least one hour per day of PA of at least moderate intensity to prevent clustering of CVD risk factors in children and adolescents (Andersen et al., 2006).

Physical inactivity and consequent low levels of CRF have been identified as major independent predictors of CVD (Surgeon General, 1996; Booth, Gordon, Carlson & Hamilton, 2000). The development of CVD in adults represents the endpoint of a process originating in childhood (Nutrition and PA for Australian Children, 2000). Low levels of PA and CRF in childhood appear to accelerate the development of CVD in adulthood whereas high levels of PA and CRF in childhood may be an important primary prevention strategy.

A three-year study examined the prevalence of 14 modifiable CHD risk factors in 210 Greek adolescents (Bouzitas & Koutedakis, 2003) as they progressed from the age of 12 to 14 years. It was found that a) 46.2% of boys and 49.5% of girls exhibited three or more risk factors at their 12th year; b) 42% for boys and 51.1% for girls in their 13th year; and c) 29.4% for boys and 55% for girls in their 14th year. The risk factors observed were that the highest prevalence in both sexes included low vigorous PA, low cardiovascular fitness, and elevated body fatness (Bouzitas & Koutedakis, 2003). This data supports the notion that preventative strategies for combating CHD should begin early in life.
A one year study examined the stability of biological risk factors for CVD: blood pressure (BP), percentage of fat mass (%FM), total cholesterol (TC) and one behavioural lifestyle risk factor, PA in 325 Portuguese adolescents and children aged 8-15 years (Guerra, Ribeiro, Oliveira, Teixeiro-Pinto, Twisk, Duarte et al., 2003). The results of this study were that 46% of the participants who had two or three biological risk factors at the first measurement remained with the same number of biological risk factors in the second measurement (Guerra, et. al., 2003). This research also gives further support for the need to develop intervention programmes for adolescents and children early in life.

**Physical activity and Type 2 diabetes prevention in adolescents**

The primary factor in the pathogenesis of T2D still remains unknown although it is clear that the development of this disease depends upon both genetic and environmental factors (Walker, Piers, Putt, Jones & O’Dea, 1999). Type 2 diabetes in young people is largely due to lifestyle habits (e.g. lack of PA, and being overweight). Additionally, T2D is strongly associated with high blood pressure, high cholesterol and the classic apple shape body where there is extra weight around the waist (Diabetes Australia, 2006). Children and adolescents most at risk of developing T2D in Australia are those who are overweight or obese, and have any two of the following:

1) Blood relatives with T2D.

2) An Aboriginal, Torres Straight Islander, Melanesian, Polynesian background or other high-risk ethnic groups, (Chinese or people from the Indian sub-continent), (Diabetes Australia, 2008).

3) Signs of insulin resistance diagnosed by a doctor (Diabetes Australia, 2006).

Type 2 diabetes has escalated dramatically in the paediatric age group in parallel with the increase in childhood obesity (Pinhas-Hamiel, Dolan, Daniels, Standiford, Khoury & Zeitler, 1996; Ehtisham, Barrett & Shaw, 2000). International examples of this can be seen in a) the United States of America (USA) where it has been estimated that T2D represents between 8 and 45% of new-onset diabetes cases in children depending on geographic location; b) over a 20-year period in Japan, T2D has doubled in children; c) in
Aboriginal children in Australia, the prevalence rate of T2D ranges from 1.3 to 5.3% (Diabetes Australia, 2008).

Doctors in Sydney, Australia stated that they have seen the rate of T2D amongst overweight adolescents jump 16-fold in the last decade, with most of the diagnoses coming when children hit puberty (Australian Broadcasting Corporation, 2004). In an investigation of Western Australian children and adolescents by McMahon, Haynes, Ratnam, Grant, Carne, Jones et al., (2004), in which 43 participants (15 males and 28 females) were diagnosed with T2D; their average age of onset was 13.6 years. The rate of diagnosis was stated as being progressively increasing (the average annual increase in the adjusted overall rates of T2D was 27%). Alarmingly large percentages of the participants had the following comorbidities: 72% of the participants had acanthosis nigricans, 59% had hypertension, and 24% had hyperlipidaemia (McMahon et al., 2004).

Intervention studies with obese youth with T2D may favourably alter insulin resistance. Kahle, Zipfe, Lamb, Horswill and Ward’s (1996) study found that a 15-week exercise programme in seven obese children resulted in a 15% decrease in fasting glucose and 51% decline in peak insulin response to a meal (Rowland, 2007). This is because the original problem of obesity and lack of PA results in metabolic disturbances that restrict liver uptake of insulin (Herd, 1990).

Type 2 diabetes familial links with obesity and physical inactivity

Incorporation of an exercise programme into the diabetes management of adolescents has been strongly advocated. With the addition of diet, and a reduction of abdominal adipose tissue, the triad (medication, PA and diet) underpins the management of T2D. Childhood obesity and the incidence of children who are overweight are currently escalating (Roberts, 2000). Further, children today are more likely to be obese in comparison with the children from any other preceding generation (Brown & Brown, 1996). Mota, Santos, Guerra, Ribeiro & Suarte (2002) indicated that juvenile obesity warrants urgent attention, as it is associated with both immediate health consequences and
adverse metabolic complications in later life. Such complications are physiological conditions and diseases correlated with adult Western societies, examples being: CVD, T2D, arthritis, some forms of cancer, hypertension and osteoporosis (Owens, Cutin, Allison, Ferguson, Litaker & Thompson, 1999). The T2D markers in this study are the waist circumference measurements, and the familial information from the parents and siblings medical information in Appendix B1-B3 (ESOESP HRF feasibility study) and Appendix E1- E6 in the (OE and PE RCT study).

Globally to this point, the literature has indicated the effects of physical inactivity on adolescent morbidly, this thesis is not a true longitudinal study, but data was collected in 2002 for the ESOESP HRF feasibility study, in 2003 in the OE and PE RCT study, and in 2004 a 12 month follow-up study of the OE and PE RCT study participants (not reported in this thesis as it was beyond the scope of the thesis).

**Summary**

Unfortunately there is evidence both in Australia and overseas that many adolescents are becoming increasingly physically inactive. Of particular concern is the apparent loss of incidental PA in the lifestyle of increasing numbers of children. Bar-Or (1997) cites low spontaneous activity levels as an indicator when predicting an epidemic of overweight children and a decline in CF. It has been proposed that many children and adolescents do not appear to be engaged in sustained physical play which was once assumed to ensure almost all children and adolescent engaged in sufficient PA for health (Sleap & Warburton, 1996). The recreational activities of children are increasingly oriented around computers and television, and the remote control device is now considered an acceptable alternative to incidental PA (American Academy of Paediatrics, 1995). Children are driven or take public transport to and from school because parents consider walking unsafe (Dietz & Gortmaker, 1985). Thus, the current PA and CF levels of children and adolescents are causing growing concern for the future CVD health of the Australian population.
During the last decade there has been a developing awareness of the necessity of promoting PA for adolescents’ health and well-being. Additionally, there is a need to establish a PA habit in children and adolescents which can be continued into adult life where the negative implications of an inactive lifestyle are considered indisputable (Janz, Dawson & Mahoney, 2000).

**Adolescent physical inactivity and obesity**

Obesity has reached epidemic proportions globally, with more than 1 billion adults overweight, 300 million of whom are clinically obese (WHO, 2008). Obesity and being overweight pose a major risks for chronic diseases, including T2D, CVD, hypertension and stroke, and certain forms of cancer (colorectal) (WHO, 2008). The key causes are increased consumption of energy-dense foods high in saturated fats and sugars, and reduced PA.

In 1997 the World Health Organization (WHO) described obesity as a rapidly emerging global epidemic among children, adolescents and adults in both developed and developing countries (WHO Consultation on Obesity, 1997). New terminology for this epidemic globesity was coined to describe the escalating epidemic that can affect all ages, races and socio-economic groups (Eggar & Swinburn, 1997). The prevalence of being overweight among Australian children and adolescents doubled between 1985 and 1997, and the prevalence of obesity trebled (Margarey, et al., 2001). In the United Kingdom of Great Britain (UK) the total levels of obesity have tripled in the past two decades (Department of Health and Chief Medical Officer, 2003). In studies involving UK adolescents the results show that their levels of obesity are also increasing (Chinn & Rona, 2001; McCarthy, Ellis, & Cole, 2003).

**Definition of overweight and obesity**

The World Health Organization (WHO) definition of overweight is excess weight relative to height, and obesity is defined as a state of excess body fat storage (WHO, 2008). A consistent measure of body fat should be reliable and correlate well with body fat in both
sexes, and across all ages, and ethnic groups (Dietz & Bellizzi, 1999). Furthermore, the cut-off values of a measure which defines overweight and obesity should be linked to both morbidity and mortality associated with different degrees of adiposity. The process of growth, maturation and the limited data on obesity-related morbidity and mortality of adolescents, have provided exercise scientists a difficult task in determining the best anthropometric measures, and consequent definitions of overweight and obesity among adolescents.

Various direct and indirect measurement techniques are currently available to measure human body composition, but each method has its own limitations. Direct measurement techniques utilise sophisticated technologies that are far more accurate than indirect measures, for example: bioelectrical impedance analysis, and dual x-ray absorptiometry. However, these techniques are very expensive, and therefore are not available for this study. For this thesis a less expensive and simple anthropometric measure, usually utilised to assess body composition (adiposity) in population studies and larger-scale research samples, is used. The accuracy of anthropometric measurements is contingent on the skill of the measure. The anthropometric measurements for this research were conducted by the researcher who is a University exercise science lecturer, and is very familiar with this technique.

The most commonly used anthropometric measure of body composition is Body Mass Index (BMI). The most frequently-used definition of overweight and obesity is based on BMI (weight in kilograms divided by height in metres squared). The BMI is used to estimate the prevalence of overweight (when BMI is greater than or equal to 25) and obesity (when BMI is greater than or equal to 30) (Centers for Disease Control and Prevention [CDCP], 2005). Although BMI is significantly correlated with percentage of body fat (Lazarus, Wake, Hesketh & Waters, 2000), it is a poor proxy for central fatness and has systematically underestimated the prevalence of obesity in young people (McCarthy et al., 2003). More recently, waist circumference has been suggested as a useful anthropometric index of central fat distribution and an indicator of certain obesity-related
diseases (Freedman, Serdula, Srinivasan & Berenson, 1999). For this reason, waist circumference measurements have been included in this study.

Many health-related diseases associated with overweight and obesity typically take years to manifest, so there are only limited outcome data on adolescent obesity-related health risks. As a result, there are at present no formally agreed-upon anthropometric definitions based upon physiological outcomes of overweight and obesity among children and adolescents (Dietz, 1998b; Bellizzi & Dietz, 1999). This situation has tended to hinder some obesity researchers as both nationally and internationally, so different definitions have been used. The recent global rise in the prevalence of physical inactivity leading to the increase in overweight and obesity among adolescents indicates an urgent need for the standardisation of international definitions. This would enable a more accurate description of obesity epidemiology, and allow better comparisons between and within countries.

The role of PA in the reduction of adolescent obesity has gained considerable global attention in recent years. Both research studies and reviews have described the effects of poor dietary habits and physical inactivity as factors contributing to the global increases in the prevalence of paediatric obesity (Twisk, et al., 1997; Mellin, Neumark-Sztainer, Story, Ireland & Resnick, 2002; Yin, Hanes, Moore, Humbles, Barbeau & Gutin, 2005). A meta-analysis was conducted by Maziekas, LeMura, Stoddard, Kaercher and Martucci (2003) to examine the effects of exercise training interventions on adolescent and child obesity immediately after training, and at one-year follow-ups. Their conclusion was that exercise is effective in reducing the percentage body fat in obese children and adolescents.

Obesity is considered so serious that public health action to address both overweight and obesity has become a high priority in many countries. Predicted estimates show that one in four Australian children are either overweight or obese (Booth, Wake, Armstrong, Chey, Hesketh & Mather, 2001). This particular research is complemented by Margarey, et al., (2001), and by Booth, Chey, Wake, Norton, Hesketh, & Dollman (2003). This estimate is derived from several datasets that comprised representative samples of school children from cross-sectional surveys conducted in three states in Australia (New South Wales,
South Australia and Victoria) during the 1995 and 1997 National Nutrition Survey. The prevalence range of overweight and obesity among girls was 21–24% and 19–21% for boys aged 7–15 years. The measurements for overweight and obesity were BMI as the index of adiposity, and the BMI cut-off values were used to categorize each participant as nonoverweight, overweight, obese or either overweight or obese. The sample size was $N = 5,518$ students in Years 2, 4, 6, 8, and 10.

It is worth noting that because participation in health surveys is on a voluntary basis, there is a risk of sample bias. People who participate in research tend to differ from those who refuse to participate (Cummings, 1998). It is plausible that both overweight and obese children and adolescents may refuse to participate, which therefore biases the prevalence estimates. It should be taken into consideration that the stated surveys’ average response rate was approximately 80%.

Data from the Framingham Children’s Study (FCS), (Moore, Gao, Bradlee, Cupples, Sundarajan-Ramamurti, Proctor, et al., 2003), was used to examine the association between PA and measures of obesity from childhood to adolescence, among 103 participants. The eight-year longitudinal study (ages 4 to 11 years) involved PA monitoring (Caltrac) and repeated anthropometry measures (BMI, Sum of Skinfolds). Over the period of the study, the most active participants had, consistently, significantly smaller gains in each of the anthropometric measures.

National health surveys conducted in countries such as the United States of America (USA) and Canada also indicate the high prevalence of overweight and obesity among adolescent and child populations. The highest reported prevalence of overweight and obesity are among American adolescents between the ages of 12 and 14 years (Flegal, Ogden, Wei, Kuczmarski & Johnston, 2001) and Canadian children aged 7 to 13 years (Tremblay & Willms, 2000a). These estimates were based on National Health and Nutrition Examination Survey (NHANES) III data (1988–1994) in the United States of America and the National Longitudinal Survey of Children and Youth (NLSCY) (1996–1997) for the
data based in Canada. Results of those surveys indicated that more than one third of young people were either overweight or obese.

In order to establish an understanding of the stated results for each epidemiological survey, the following information was used: (a) the survey results used were based upon the IOTF definitions of Body Mass Index for age-cut-off values; (b) Figure 2.1 shows an International comparison of prevalence of overweight and obesity; comparatively.

![Figure 2.1 Global estimates of the prevalence of overweight and obesity among boys and girls (Hardy, 2003).](image)

**Population distribution of overweight and obese adolescents**

In Australia the highest prevalence of overweight was among Victorian girls (18.5%) and South Australian boys (17.5%). The highest prevalence of obesity was among Victorian girls and boys (5.7% and 5.2% respectively), (Margarey et al., 2001; Booth et al., 2003). No significant association between socio-economic status (SES) and overweight and obesity among boys was found in a survey conducted by Booth, Wake, Armstrong, Chey, Hesketh, & Mather, 2001; but this survey found that girls in the highest quintile of SES were less likely to be overweight or obese than girls in lower SES quintiles. The research did identify that Australian children from European or Middle Eastern ethnic backgrounds...
differed significantly in that they were more likely to be overweight or obese, when compared with their English-speaking and Asian peers. The surveys also portrayed the significant associations between being overweight and the Australian geographic location among boys.

A study assessing seventy-four obese 7-11 year old children (Owens, Cutin, Allison, Ferguson, Litaker & Thompson, 1999) suggested that children with excessive levels of total body fat and visceral adipose tissue were at high risk of suffering from CVD, and T2D as adults. Similarly, Armstrong & Welsman (1997), reporting on the Muscatine Study (involving 4800 children), concluded that children and adolescents with an adverse lipid profile have a high incidence of multiple CVD risk factors, and have an above-average possibility of developing hypertension and excessive lipoprotein levels into their adult years. In support of this study, is the Bull, Marshall & McCarger (2003) review of the proportionate parallel between childhood obesity, and the risk of CVD. Reference is made to research conducted by Tremblay and Willms (2000b) which stated that hyperlipidemia, T2D, hypertension and atherosclerosis were attributable to juvenile obesity. Childhood obesity is implicated further in a study by Bouzitas & Koutedakis (2003) which assessed the increasing prevalence of T2D in indigenous Greek adolescents. This study investigated the CVD and T2D risk factors by measuring the waist circumference, weight and height (BMI) and the familial factors using the medical questionnaires prior to commencing the pre-tests.

**Skeletal health benefits of physical activity**

Human skeletal health is the bone’s ability to withstand forces placed upon it without breaking or damage. It is often measured by bone mineral content (McVeigh, Norris, Cameron & Pettifor, 2004) and bone mineral density (Vuori, 1995) both of which can be influenced by PA (Vuori, 1995; MacKelvie, Khan, Petit, Janssen & McKay, 2003). Participation in regular PA has been found to be essential for bone health (Drinkwater, 1994) and can increase peak bone mass substantially during childhood and adolescence.
(Vuori, 1995). Additionally regular PA in childhood and adolescence can help to protect against osteoporosis in later life (Department of Health, [DOH], 2004).

Research assessing the relationship between bone health and PA has often been cross-sectional. However, evidence from small randomised controlled trials suggests that participation in various impact activities such as plyometrics and gymnastics, resistance training and sports that involve running and jumping are likely to be beneficial (Kohrt, Bloomfield, Little, Nelson, & Yingling, 2004). The authors of this study have stated that these types of activities will augment bone mineral accrual in children and adolescents (Kohrt et. al., 2004 p1985). A randomised controlled trial study by MacKelvie et al., (2003) evaluated the effects of a high impact, circuit based jumping intervention over a 20 month period among a sample of young girls (mean age 9.9 years). The study’s results indicated that although there were no significant differences at baseline, after the intervention participants in the treatment group showed substantially greater gains in lumbar spine and femoral neck bone mineral content. No differences were noted during the 20-month period in body composition, average PA or calcium intake size. Unfortunately results from the study are limited by the high rate of participant attrition, as less than half of the original participants completed the post-test. Furthermore, randomisation took place at the school level which introduced an additional bias and had bearing on the generalisability of the results (MacKelvie et al., 2003, p.451).

Using a longitudinal study design, Vicente-Rodriguez, Ara, Perez-Gomez, Dorado and Calbet (2005) examined the impact of PA on the accumulation of bone mass among 26 physically-active and 16 matched boys. The PA of the active boys included compulsory PE, plus three hours of extracurricular sports participation, and weekend sports competitions, this is similar to the PE control groups PA programme in this thesis, the control group also completed extracurricular activities which involved training for sports which they competed against other GPS schools on Saturdays, the experimental group completed either a run or mountain bike ride during the week. The PA of the comparison group was limited to compulsory PE only. The study results indicated that femoral bone mineral content and bone mineral density increased twice as much in the active group compared to the matched
group over a three-year period. It is worth noting that while these results appear promising, there was a fault in the design of the study in that the boys were not randomly allocated to the conditions, and therefore care must be taken before inferring causation.

Summary

While there is evidence that inadequate levels of PA have contributed to the obesity epidemic, the relative contribution of genetics, diet and PA are not clear. It has been suggested that food intake might play a more important role in the development of overweight and obesity in children and adolescents than the amount of PA (Salbe, Weyer, Harper, Lindsay, Ravussin & Tataranni, 2003). This thesis did not investigate the food intake of the participants this was considered to be beyond the scope of the study, as the investigation evaluated the effects of the two different types of physical activities.

Adolescent psychological benefits of physical activity

In addition to the many physiological health benefits of adolescent PA, participation in supportive PA programmes by adolescents is associated with positive mental health, especially SE and self-concept (USDHHS, 1996; Ekeland, Heian, Hagen, Abbott & Nordheim, 2004). SE is often seen as the single most important measure of psychological well-being (Biddle & Mutrie, 2008). Increased positive SE resulting from participation in PA is often claimed by experts promoting exercise and sport participation, and is a rationale for the teaching of PE to children and adolescents (Biddle & Mutrie, 2008). The short-term psychological health benefits of engaging in PA are particularly important to adolescents as they do not have to wait decades for the benefits to manifest (Sallis, 1996).

The pattern of cause and effect relating to health-related behaviour and SE is complex. Researchers tend to agree that adolescents’ SE can in part explain their participation in sports, health status and participation in substance use (Torres & Fernandez, 1995). The extent to which SE affects adolescent health-related behaviour is
still unclear. Research evidence does not provide a direct, causal link between SE levels and health-related behaviour (Sands, Tricker, Sherman, Armatos & Maschette, 1997).

**Historical development of self-concept and self-esteem models**

In the context of this study it is important to have an understanding of the use of the terms self-esteem (SE) and self-concept (SC) because they are used interchangeably in the literature. Self-esteem refers to the value placed on aspects of the self, such as academic and social domains (Biddle & Mutrie, 2008). Self-esteem as shown in part la Figure 2.2 was originally thought to be a theory with a one-dimensional construct (Fox & Corbin, 1989). Changes in SE were assessed using a variety of inventories. The validity of using this approach to assess SE change was questionable. Rosenberg (1979) argued that it does not take into account the different relationships, and weightings of the complex aspects which contribute to global SE. Harter (1983) additionally stated that it is too simplistic to give an overall SE score from such a diverse content. Given these viewpoints these types of inventories are theoretically limiting (Fox, 1988).

Further advances in SE theory have seen the use of a multidimensional approach as shown in 1b. Figure 2.2. This type of approach has been more accepted, because it allows SE change to be studied in separate domains (Fox & Corbin, 1989) as individuals perceptions of themselves may vary in different parts of their lives (Fox, 1988). A profile approach assessment such as (Harter, 1985a, 1988), the self-perception profile for children, and self-perception profile for adolescents is necessary to assess global SE as a multi-dimensional construct. Such instruments consist of separate subscales and enable assessment of different dimensions (Fox 1988). The advantages of a hierarchical model (Figure 2.4), is that it allows for interaction within different parts of an individual’s life to feed into the global self (Fox & Corbin, 1989). This model demonstrates that changes in self-perception lower down the structure are more open to modification (Sonstroem & Morgan, 1989).
Figure 2.2 Three models of self-esteem structure (Fox & Corbin, 1989, p 409).

Global SE is composed of differentiated perceptions of the self, such as physical, social and academic self-perceptions. Biddle and Mutrie (2008) stated that these perceptions in turn are underpinned by increasingly transient perceptions of worth and competence, such as sport ability or physical appearance for the physical subdomain of global SE (Fox, 1988; Fox & Corbin, 1989).

Developing a positive SC is also seen as desirable in many academic disciplines including exercise science, health, and education. How we see ourselves, how we evaluate our successes and failures; and how we view our chance of success, have a direct impact upon exercise and sport performance. Self-concept is frequently posited as a mediating variable that facilitates the attainment of other desirable outcomes, such as increases in PA, exercise adherence or HRF.

The stated implications need to be examined further for use in possible interventions in both OE and PE. The skill-development (personal) hypothesis (Sonstroem, 55
1997) has applications in SE research, as it proposes that SE can be changed through experience (positive or negative), development in skills, task mastery, and success (Biddle & Mutrie, 2008). It would be likely that in reality, both approaches have useful roles. The development of the individual’s SC is one which affects, and is affected by all other facets of the individual’s functioning. With regard to this thesis an understanding of the development of self-concept and its relationship to performance is of both theoretical and of practical importance.

A possible link between SE and SC is revealed when looking at the division of SC into three components: cognitive (a system of self-attributions); affective (determines how we feel about these self-attributions), and behavioural (involves our tendencies to behave in accordance with self-image) (Aidman & Schofield, 2004). Previous definitions of SE have proposed that SE is an affective evaluation of self (Rosenberg, 1979), and that SE is a very special type of attitude, representing or which represents the attitude towards self (Aidman & Schofield, 2004). In this study the participants completed a SE questionnaire (Harter, 1988).

**Historical development of self theories**

Academic interest in the concept of the human self is of long standing. The study of the self can be traced to the earliest writings in psychology literature, such as William James (1892, 1920). James is generally recognised as the originator of self psychology. His academic theories are still considered to be the standard reference for developmental discussions of self. James perceived a person’s self as being the sum of what that entire person can call his own. He divided the self into three constituent parts, namely, the material, (body), social (psychological), and spiritual (feelings and emotions) self (James, 1892). James’ work in distinguishing between the objective and subjective selves, remains seminal, and points to a continuing issue in this field. Cooley (1902), another early theorist, insisted that the self cannot be seen apart from its social milieu. Cooley believed in the gregarious nature of the self and developed his theory of the looking-glass self; espousing that we are all in one way or another reflection of those that have crossed our path.
George Mead (1934) stressed the symbolic nature of the human self, a self which develops into a unique self through the use of language in the general areas of experience and maturation. Mead’s self is seen as a developmental construct. Freud (1934) saw the self as being constructed from the interrelationship between the id, ego and superego. Both PE and OE have utilised SC theory in research.

Both SC and SE are psychological constructs which have been defined in many different ways. Furthermore, a psychological construct is a hypothesised process, which is inferred from observed behaviours. The nature of SC has been considered and explored by theorists as diverse as Cooley (1902), Mead (1934), Horney (1939), Rogers (1961), Shavelson, et al., (1976), and Harter (1983, 1999). Each theorist’s conclusion is as varied as their approaches; it is therefore not surprising that the field is still characterised by a lack of consensus, which in turn reflects the complexity of the factors involved in the development of SC.

Empirical approaches have not met with any greater success in developing a consensus. A substantial body of research data has been gathered over the last three decades. Harter (1999) viewed this lack of consensus as extending to basic issues including the definition of the construct, and its measurement. The contributions by Fox and Corbin (1989), Marsh (1990) and Hattie (1992) clearly suggest that both SC and SE are multidimensional, hierarchical constructs.

More recently, Garst, Scheider, and Baker (2001) research in outdoor adventure participation in adolescent self-perceptions, used Harter’s (1988) definition of SC as being associated with nine different sub-domains. Those domains were scholastic competence, athletic competence, physical appearance, social acceptance, behavioural conduct, job competence, close friendship, romantic appeal and global self-worth. The Harter (1988) construct seems to be one of the most widely-used and recognized measures of adolescent SC (Flurie, 2008).
Summary

Adolescent physical inactivity is a contributor to adolescent levels of obesity, which is a contributor to chronic diseases including T2D, CVD, hypertension, stroke, and colorectal cancer. Measurements of overweight and obesity have been based around the BMI cut-off values, and more recently the measurement of waist circumference. Large scale national and international evidence is showing that adolescent overweight and obesity is increasing.

Different terminologies have been utilised in the stated literature in connection with notions of the self: (1) SC: and (2) SE. Additionally other terms have also been utilised interchangeably with SC and SE in the literature, self-worth, and self-image. A more consistent approach to distinguish among different aspects of the construction of the self would do much to aid investigating behaviour changes and reduce confusion when applied to current research outcomes. From the recommendations of the literature, this thesis is focusing on SE not SC. The thesis investigated the effects of two different PA programmes on adolescent male HRF and SE, it was considered to be beyond the scope of the thesis to investigate SC as well. There would have been too many variables if SC was included, and difficulty in separating the statistical inferences between SE and SC.

Self-esteem and self-perceptions of competence

An individual SE can be measured holistically, involving an individual’s broad evaluation of themselves, but also in domain-specific contexts, such as scholastic, social and PA domains (Weiss & Ebbeck, 1996). Utilising this domain-specific approach, children’s self-perceptions have been shown to be lower in obese (a measurement of HRF body composition) females compared with their non-overweight peers (Davison & Birch, 2001). Sung, Yu, So, Lam and Hau (2005) completed an investigation of perceptions of competence of Chinese children in the physical domain. The self-perceptions examined included their health, physical appearance, and body fatness, level of PA, sports competence, muscular endurance, co-ordination and flexibility. These children were
assessed in their perceptions of their general SE and self-worth. The author’s findings indicated that both overweight and obese children reported significantly lower self-perceptions in all domains other than their general level of PA (Sung, So, Yu, Lam, & Hau, 2005).

In Australia, an investigation of 2,749 New South Wales school children aged 9-14 years also investigated self-perceptions between obese and non-overweight children (Franklin, Denyer, Steinbeck, Caterson, & Hill, 2006). This research used the Self-Perception Profile for Children (Harter, 1985b), which is similar to the Self-Perception Profile for Adolescents (Harter, 1988) used in this study. The findings of this research were found to have significantly lower perceived athletic competence, physical appearance and global self-worth than their non-overweight peers (Franklin, et al., 2006). The results from these studies are important as they indicate that low self-perceptions in PA contexts may influence PA behaviour in childhood and adolescence (Davison, Downs, & Birch, 2006).

**Self-esteem and physical activity**

The Health Education Authority (HEA) (1998) highlighted the importance of participating in regular PA. In relation to SE, PA and adolescents, the HEA (1998) document stated that young people who are physically active have been found to have improved SC and SE, HEA (1998).

Fox, Corbin & Couldry (1985) utilised the model portrayed in Figure 2.3 for PA participation, and SE. The model infers that participation in PA leads to increased physical ability, which in turn affects an individual’s estimation of physical ability, therefore affecting levels of SE and additionally, attraction to

PA. Young (1985) described a limitation of this model that although it has been found to be generalised for adolescent males there was no support for adolescent females.
Self-esteem, perceptions of competence and physical activity

Establishing a link between participation in PA and the development of SE endorses the value of sport and exercise (Ebbeck & Weiss, 1998). It is therefore necessary to establish the factors that influence the development of SE. One factor that is recognised in the sport psychology literature is perceived competence. Empirical studies conducted with children and adolescents support the proposition that SE can be predicted on the basis of an individual’s belief about his or her competence in particular achievement domains (Marsh, 1994; Ebbeck & Stuart, 1996).

Harter’s (1985a) approach to measuring domain-specific perceptions of competence and global self-worth allowed examination of differences among groups on their physical, social and scholastic self-perceptions, in addition to their global self-worth. In this type of self-esteem research, perceived competence was employed to represent aspects of SE. It indicated that in perception by an individual, she/he has the ability to master a task, which results from a history of interactions with the environment (Harter, 1987). Global self-worth is measured directly and independently by a scale which taps the individual’s overall judgement of personal worth.
Perceived competence is a central construct in Harter’s model. And is a central theme in this study. It is made up of several domain-specific aspects which contribute to SE. Perceived competence is viewed as a multidimensional construct initially delineated by Harter (1978), into perceptions of: (a) scholastic competence, (b) physical competence, and (c) social competence. Harter (1982, 1985a), in developing self-perception scales for different developmental stages, has included other domains appropriate to the stage of development of the individual. In middle childhood these competency domains include: (1) scholastic, (2) athletic, (3) social, (4) physical appearance, and (5) behavioural conduct aspects of SE.

Global self-worth is the overall value judgement of the self by an individual and can be contrasted with domain-specific evaluations of one’s competency and adequacy. Harter (1978, 1981) describes it in terms of general or overall worth as a person, and as a feeling carried by the individual all of the time. Harter (1985a) elaborates, describing global self-worth as tapping the degree to which one likes oneself as a person, likes the way one is leading one’s life and feels good about her/himself.

The literature indicates that female adolescents are significantly lower in global SE than males. Physical appearance has been identified as a powerful determinant of what the female adolescent perceives her to be. During this period of changes in body dimensions and size, female adolescents often become fixated on physical appearance and development. Due to the value society places on physical attributes, and its subsequent impact on adolescent SE development, investigation into adolescents’ perceptions of the ideal self may help to contribute to the provision of relevant SE-enhancing interventions, for example engaging in PA versus dieting.

Determining body composition may help ascertain for distortion levels of a distorted body image, commonly found in male adolescents expressing dissatisfaction with their bodies. Perceived appearance, particularly the area of dissatisfaction regarding body weight, has been identified as a motivator for frequency of exercise. Accepting the strong
relationship of physical appearance with SE, exercise behaviour and adherence, by helping with weight control, may also affect SE, and the primary prevention of CVD, and T2D.

Harter (1987) found perception of athletic competence to contribute less to the overall value an individual places on him/herself than some other domain-specific perceptions of competence. Perceptions of physical appearance, social acceptance and scholastic competence were found by Harter to contribute more to global self-worth. Social support by significant others, according to Harter (1987), is also critical in an individual’s perception of global self-worth. This particular viewpoint is supported by Hattie (1992, p.54), who stated that “To have high SE implies both that we consider aspects of our lives as important and that we have the confidence to fulfil our expectations”.

The effect of PA on SE has been investigated by Tiggemann and Williamson (2000) where 252 participants were asked to complete a questionnaire assessing SE, the amount of exercise, reasons for exercise, and body satisfaction. The frequency and duration of exercise was assessed by a questionnaire which listed several physical activities (e.g walking, running, aerobics) and additional space on the questionnaire allowed for further activities to be listed. The SE variable of the study was measured by a 10-item index adapted from Rosenberg’s SE scale (1965). This study demonstrated that females had lower SE and body satisfaction than males, which is a normal result in this type of study (Tiggemann & Williamson, 2000). The study found that the reason that females exercised was more for weight control and tone.

A study of PA involvement, SE and goal perspectives of 234 Mexican American adolescents (n = 117 boys, n = 117 girls) whose average age was 13.4 years, was conducted by Guinn, Vincent, Semper and Jorgensen (2000). The participants were selected from the PE classes of two junior high schools located in the Lower Rio Grande Valley of Texas. The participants were given two self-report questionnaires: 1) The Rosenberg SE Scale (1965); 2) The Task and Ego Goal Orientation in Sport Questionnaire (Duda & Nicholls, 1992). The results showed that the boys tended to be more ego-oriented than task-oriented,
that there were significant relationships with the participants’ PA involvement and SE, and their task orientation and SE, but not with their ego orientation (Guinn, et al., 2000).

The relationship between PA, SE, and academic achievement in 12-year-old children was investigated (Tremblay & Willms, 2000a). Specifically the study examined levels of PA, body mass index, SE, and reading and mathematics scores of 6,923 students in New Brunswick (NB) Canada, as part of the Elementary School Climate Study, and the NB Department of Education’s Grade 6 Assessment. SE was measured using the Self Description Questionnaire 111 (Marsh & O’Neill, 1984). The measure of PA was based on four questions regarding the students’ regular participation in physical activities, both at school and outside of school (Tremblay et al., 2000a).

The authors of this study summarised their results by stating that their study demonstrated that PA had a negative relationship with a participant’s body mass index, a positive relationship with SE, and a trivial negative relationship with academic achievement. The study revealed that both males and females who more physically active had considerably higher levels of SE (Tremblay et al., 2000a).

**Summary**

The importance placed upon some areas of competence, may differ from the importance placed on others. The greater the discrepancy between the importance placed by the individual on a domain and his/her perceptions of competence in that domain, the lower will be the global self-worth for that individual (Harter, 1982; Hattie, 1992). The salience of competence in a particular domain may also be influenced by gender. Females perceive their physical attractiveness lower than males do, but females value it higher (Fox, 1992b). Fox also reported that females are able to discount their low perceptions of athletic competence but are unable to do so for perceptions of low physical appearance.
Cognitive functioning and school academic performance

The positive relationship between participation in PA, school PE programmes and academic performance indicators is one that physical educators have been striving to establish for many years. Academic performance indicators in this instance refer to grade point averages, scores on standardised tests and grades in specific courses (particularly mathematics and English). Indirect estimates come from measures of concentration and classroom behaviour (Strong, Malina, Blimkie, Daniels, Dishman, Gutin, et al., 2005). Explaining the dose-effect of PA on adolescent cognitive functioning has proven elusive. Critics of school-based PE programmes feel that the time spent in PE lessons may detract from time spent on other academic subjects, thus reducing student-learning time. Thomas, Landers, Salazar and Etnier (1994) study did have a more positive conclusion for the critics of PE. They stated that chronic exercise had a small but reliable beneficial effect on cognitive function. However they recognised the lack of longitudinal data to strengthen their claims.

The comprehensive Sports, Play and Active Recreation for Kids (SPARK) research project revealed that spending more time in PE lessons and less time in other academic subjects did not have a harmful effect on the standardised academic achievement in elementary school children (Sallis, McKenzie, Kolody, Lewis, Marshall & Rosengrad, 1999). Additionally, there was some evidence to suggest that a two-year health-related PE programme had a positive effect on academic achievement. This particular study involved a strong experimental design and baseline measures that were controlled at post-test using analysis of covariance.

Summary

For some aspects of cognitive functioning, exercise and PA may be associated with small to beneficial effects (Shephard, 1997). While there is little longitudinal data to support the cognitive benefits of exercise on young people (Thomas, Landers, Salazar & Etnier, 1994), there is evidence that increased PA at school is beneficial to psychomotor
development and not harmful to academic success. The evidence suggests additional PE could enhance academic skills by increased cerebral blood flow, greater arousal, changes in hormone levels, enhanced nutrient intake, changes in body build and increased SE (Shephard, 1997).

**Behavioural benefits of physical activity**

The relationship of the involvement with PA and the adoption of other health behaviours have interested PA researchers for many years (Biddle & Mutrie, 2008). Data from the Cardiovascular Risk in Young Finns Study, a six year longitudinal study examining the health of 961 Finnish youth from the ages of 12 to 18 (Raitakari, Porkka, Taimela, Telema, Rasenen & Viikari, 1994), revealed that habitual PA was associated with less smoking and with consuming a healthier diet. Similarly, the Swiss Multicentric Adolescent Survey on Health (Ferron, Narring, Cauderay & Michaud, 1999) examined the relationship between the frequency of sport behaviour and perceptions of health, self-image, substance abuse and experimental behaviour among a national representative sample of 9,268 adolescents (15-20 years of age). In comparison to non-athletic adolescents, athletic adolescents reported fewer somatic complaints, more confidence in their future health, a better body image, a lesser tendency to attempt suicide, a higher frequency of use of the car seat belt, a lower use of tobacco, wine and marijuana. This study did have some limitations in that it was a measurement of sports participation rather than a more general measure of PA. The participants were classified as being athletic if they belonged to a sports club and had participated two or three times a week, or as being non-athletic if they did sports once a week or never.

Data from the Youth Risk Behaviour Survey (Pate, Heath, Dowda & Trost, 1996) were used to examine the association between PA and other health behaviours in a representative sample of 11,631 US adolescents. Low levels of PA were associated with cigarette smoking, marijuana use, low fruit and vegetable consumption, greater television watching, and failure to wear a seatbelt in a car. This study has important implications due to the large representative sample utilised, and possible links to causes of mortality and
morbidity in adolescents. However, the study results are weakened by a failure to describe the reliability and validity of the PA measures used.

**Summary**

Among adolescents’ participation in PA are factors associated with lower rates of smoking, and consumption of a healthier diet, but not with alcohol consumption (which is a major health concern, especially with binge drinking) (Wankel & Sefton, 1994). A review of the literature by Wankel and Sefton (1994) concluded that moderate increases in PA levels of non-obese individuals have been shown to be associated with corresponding increases in caloric intake; a small positive association exists between PA and some preventive health behaviours, such as seat belt use (In S.J.H. Biddle and N. Mutrie, 2008).

**Determinants of adolescent’s physical activity**

Determinants can have both direct and mediated relationships with health outcomes (Okely, Booth & Chey, 2004). A mediator behaviour can be defined as an intervening psychosocial variable that provides a cause-effect pathway link between intervention and PA (Bauman, Sallis, Dzewaltowski & Owen, 2002, p.13-14). A psychosocial variable may be conceptualised as a mediator if the relationship between the intervention and PA behaviour is attenuated when controlling for the variable (Lewis, Marcus, Pate & Dunn, 2002). Determinants can also be regarded as confounders and moderators. This distinction is important when applied to the analysis of PA research. A confounder is associated with the outcome, but is also associated with exposure to the PA programme and will therefore influence the strength of the association. A moderator is an interaction variable that affects the direction, strength or both of the relationship between the programme and mediator or mediator and outcome (Bauman et al., 2002).

Many determinants of adolescents PA have been identified, some derived from adults’ PA empirical studies, and others from research on children. PA has been described as a voluntary behaviour and is therefore inextricably linked to human decision-making
Psychologists have recognised that the majority of health behaviours are volitional (Godin, 1994). This has been reflected in the methodologies which have been utilised to identify and examine these determinants. The research methods ranged from qualitative interviews and surveys, often involving the application of social psychology theories, for example, Bandura (1986) which provides a theoretical framework for examining interpersonal determinants and their contribution to PA behaviour.

A comprehensive review of PA correlates in adolescents and children, (Sallis, Prochaska, & Taylor, 2000) examining 108 studies and 48 variables. Although some of their findings from the literature often proved to be inconsistent, 15 variables were confirmed to be consistently associated with adolescent PA. The consistent variables included: a) gender (male); b) ethnicity (white); c) age (inverse); d) perceived PA competence; e) intentions to be active; f) depression (inverse); g) previous PA; participation in community sports; h) sensation seeking; sedentary after school and on weekends (inverse); i) support from parents and ‘significant others’; j) sibling PA; direct help from parents; and k) opportunities to exercise.

The National Heart Forum (UK) conducted a similar survey with comparable results (Cavill & Biddle, 2003). The authors highlighted the abundance of research from the US and the need for caution in applying the US findings to UK settings. This thesis is concerned with factors associated with PA during adolescence and therefore the results from this age group will be examined.

Determinants (correlates) of PA are multi-faceted and are not confined to psychological variables. It is important to understand different types of determinants. Biddle and Mutrie (2008) stated that they are: a) personal and demographic; b) psychological, c) social, and d) environmental. PA personal characteristic determinants include a) demographic variables, such as age, gender, ethnic background, socio-economic status, and b) region of abode. Environmental influences are considered to include a) living environment, (terrain, facilities, weather, perceived dangers); b) working environment, (facilities, awareness, peers’ exercise habits); c) education, family support and the nature of
available PA programmes (availability, type, complexity, convenience, costs).
Psychological variables include attitudes and beliefs, knowledge of the behaviour, interest and prior experience of PA, perceived benefits/barriers to exercise, social influences on beliefs, self-esteem, self-efficacy, and SC. A brief review of adolescent PA determinants will now be provided.

**Age**

Cross-sectional research studies (Allison, Dwyer & Makin, 1999; Saxena, Borzekowski & Rickert, 2002; Sproston & Primatesa, 2003; Riddoch, Bo Anderson, Wedderkopp, Harro, Klasson-Heggebo, Sardinha, et al., 2004), and longitudinal studies (Aaron, Storti, Robertson, Kriska & Laporte, 2002; Aarnio, Winter, Peltonen, Kujala & Kaprio, 2002; McKenzie, Sallis, Berry, Brennan, Broyles, Zive, et al., 2003) have revealed a negative association between age and activity among adolescents and children. It appears that students become less active as they move through adolescence into adulthood.

**Gender**

Children are socialised from a very early age that PA is valued more for males than for females (Wold & Hendry, 1998). In almost every PA study that examines gender differences in PA and sport participation rates, boys are found to be more PA (Trost, Owen, Bauman, Sallis, & Brown, 2002; Sproston & Primatesa, 2003; Riddoch, et al., 2004).

**Ethnicity**

Ethnicity has a consistent association with PA among adolescents, with non-Hispanic whites found to be more active than other ethnic groups in the US (Sallis, et al., 2000). Various researchers have identified ethnic differences in PA (McKenzie, Sallis, Broyles, Zive, Nader, Berry et al 2002; Schmitz, Lytle, Phillips, Murray, Birnbaum & Kubik, 2002; Perry, Rosenblatt & Wang, 2004). An example of this can be seen from a longitudinal study by Mckenzie et al., (2002), in which PA patterns were examined along with the
movement skills of 17,766 Anglo-Americans and Mexican-Americans during adolescence. The results showed that Anglo-American students participated in more overall and more vigorous PA and had lower skinfolds than Mexican-American students (McKenzie, et al., 2002). To attempt to overcome the limitations of PA self-report the study used a PA interview. However, the results of the study are limited in applicability as the analysis did not control for parental socio-economic status.

**Socioeconomic status**

A review of literature has found that socioeconomic status, occupational status and educational attainment are consistent determinants of PA behaviour among adults (Trost, et al., 2002). However reviews of child and adolescent studies concluded that the relationship between PA and socio-economic status is indeterminate (Sallis et al., 2000; Cavill & Biddle, 2003). If the relationship exists in adulthood, it is reasonable to hypothesise that socio-economic influences may start to manifest in late adolescence.

Van Lenthe, Boreham, Twisk, Strain, Savage, and Davey-Smith (2001) investigated the existence of socio-economic differences in behavioural and biological risk factors for CHD using data from the Young Hearts Project in Northern Ireland of 509 adolescents at the age of 12 and then reassessed at age 15. For this particular sample the six occupational categories of Standard Occupational Classification of the Office of Population Censuses and Survey Statistics were dichotomised into non-manual (upper three classes), and manual (lower three classes) groups. Interestingly for girls, total PA was slightly lower \( (p = 0.06) \) in the manual group at age 12 and much lower at age 15 \( (p = 0.05) \). There were no statistically significant differences in the PA of boys when comparing socio-economic status. The authors in their discussion suggested that a possible limitation of their study was the use of a dichotomous variable for socio-economic status rather than the original six social class categories.

A study by Santos, Esculcas and Mota, (2004) may shed some light on the uncertainty between socio-economic status and PA among adolescents. The authors
examined the relationship between parental socio-economic status and time spent in organised and non-organised PA among 594 Portuguese adolescents. They found that adolescents from families of higher socio-economic status chose significantly more organised activities; the link to this thesis is that the participants were from a higher socio-economic parental group.

**Chapter Two summary**

PA is very important for adolescent health, but the exact nature of PA is most complex, it is generally considered to be an intricate combination of human biological function and human behaviour. Adolescents who participate in the recommended levels of regular PA are likely to have positive outcomes in weight regulation. Additionally these adolescents are less likely to display risk factors for CVD and T2D. PA may be a centrally-controlled biological process, which in turn modulates physically-active behaviour. Conversely, physically-active behaviour is an observed course of action, fundamentally under biological control, but differentiated through various external influences.

Establishing other links to PA levels and behaviours of adolescents, may have values in HRF. An example of this may be seen when attempting to establish a link in participation levels in PA, and the development of SE which influences the value of sport and exercise. Establishing such a link may demonstrate that an adolescent’s high level of SE leads to increased motivation. This may be an important factor when considering adherence to sport and exercise as an avenue for primary prevention of CVD, T2D and obesity. Due to the unprecedented global increases in the prevalence of adolescent obesity and T2D, there is an urgent need for research in the effectiveness of the type of physical activities that will assist in reducing the incidence of adolescent overweight and obesity. The determinants of adolescent PA are multifaceted and are not confined to either physiological or psychological variables.
Chapter Three introduction

Chapter Three reviews relevant literature examining the impact of adolescent PA interventions implemented in a variety of settings. The literature review also describes the major results of secondary school-based PA interventions. This literature review provides the gap in knowledge in the area of adolescent PA interventions, and the development of a rationale for this thesis, the research questions and hypothesis. This chapter will provide information in relation to research conducted in PE and SE. Chapter Three will additionally provide the theoretical background and applied literature relevant to OE and PE.
CHAPTER THREE

AN INTRODUCTION TO PHYSICAL ACTIVITY INTERVENTIONS FOR ADOLESCENTS, PHYSICAL EDUCATION AND OUTDOOR EDUCATION

Introduction

Chapter two reviewed the literature related to the research problem of adolescent physical inactivity. The aim of chapter three is to review relevant literature to assist in solving the research problem by examining the impact of physical activity (PA) interventions implemented in a variety of environments, focusing primarily on high schools. To achieve this aim, the findings of PA studies, and evidence from school-based surveys, are then applied to the high school setting in order to develop an overview of evidence-based PA promotion. Additionally chapter three will review physical education (PE) and outdoor education (OE) theoretical literature. Specifically this chapter:

- Introduces the relevant school based PA intervention literature.
- Describes the major findings of secondary school-based PA literature.
- Presents literature relating to alternative PA interventions targeting adolescents.
- Reviews PA interventions in non-school settings.
- Initiates PE curriculum literature.
- Establishes the literature relating to self-esteem and PE.
- Depicts the literature about the theories of OE.

Introduction to physical activity interventions

Traditionally PA interventions were developed with reference to individual level psychological theories of behaviour change, an example of which is the Health Belief
Model (Stretcher & Rosenstock, 1997). These interventions can be effective “but they tend to be expensive, require regular reinforcement, and provide little, if any, primary prevention of inactivity” (Powell, Bricken, & Blair, 2002, p.1). Researchers now recognise that individual behavioural patterns are caused not only by individual capacities and experiences but also by social and physical environments, which can be altered. Sallis, Bauman and Pratt (1998) explained how interventions involving environmental and policy changes “hold particular promise for promoting PA because, both are designed to influence large groups, even entire populations” (Sallis et al., 1998, p.379). PA interventions should target multiple mediating factors in the cognitive, social and environmental domains (Wechsler, Devereaux, Davis & Collins, 2000; Biddle, Gorley & Stensel, 2004).

This study is concerned with PA approaches which are used in two different school environments, and will focus on PA interventions conducted in the secondary school settings. Some of the interventions have been large-scale and long-term, providing some enlightening outcomes, while others have been small scale, quasi-experimental and inconclusive. School-based PA interventions have targeted a number of outcomes such as increases in moderate vigorous physical activity (MVPA) in PE programmes (McKenzie et al., 1996; Fairclough & Stratton, 2005).

**Physical activity interventions in secondary schools**

Internationally in comparison to primary school PA interventions, few PA interventions have been examined in high schools, the majority being in Years 7-10, with even less completed studies involving Years 11 and 12 high school students. This may be due to greater competition for specific curriculum time (e.g. maths and science-based subjects), parental or school outcomes pressures for University entrance results, or a lack of student interest. Some PA interventions have been designed to increase PA levels in PE classes, or to reduce levels of obesity. This section includes the description of a number of PA interventions based in secondary schools, with attention paid to methodology, outcomes and limitations.
Systematic literature reviews of the effectiveness of children’s and adolescent PA interventions have focused on a variety of settings, some on school settings only (Dobbins, Lockett, Michel, Boyers, Feldman, & Vohra, 2001); non-curricular intervention approaches (Jago & Baranowski, 2004); cardiovascular disease (CVD) interventions (Resnicow & Robinson, 1997).

It should be noted that not all PA interventions have produced significant changes, and that most of the PA interventions were conducted in the US, with the remainder in countries such as Canada, the UK, Ireland, Greece, Belgium, Finland, France, Spain and Australia. The PA interventions in school settings could be classified as being in one of the following categories (Salmon, Booth, Phongsavan, Murphy & Timperio, 2007):
1) Curriculum only, 2) Curriculum and PE, 3) PE only, 4) PE and the environment, 5) Environment only, 6) Curriculum, PE and Environment, 7) Activity breaks, 8) Special classes/pedometers, 9) Tailored advice and/or brief counselling, 10) After-school programmes, 11) School and family, 12) School and family/community, 13) Family-based interventions, 14) Primary-care interventions, 15) Community-based interventions and 16) Internet-based interventions.

The next section of chapter three describes the major research findings from a number of secondary school-based PA interventions from the years 1996-2006. The key findings are identified along with the study’s limitations. Secondary-school PA interventions have used both experimental and quasi-experimental designs, with more recent studies involving comprehensive interventions targeting multiple opportunities for PA promotion.

A Physical Activity and Teenage Health (PATH) study used a quasi-experimental research design that used a PE curriculum which consisted of 30-minute classes five times a week, for a total of 11 weeks. Each PE class consisted of 20-25 mins of circuit training exercise, and approximately five minutes of health behaviour discussion (Fardy, White, Haltwanger-Schmitz, Magel, McDermott, et al., 1996). The study included an ethnically diverse sample of 346 students from an inner city public school in the USA, who
participated in the intervention, or undertook regular PE volleyball classes. Following the intervention, both boys and girls improved their health knowledge test scores. There were no other statistically significant changes in boys, but the intervention girls improved their dietary habits, reduced their cholesterol, and had higher estimated VO₂ max. From the original pilot study, PE lectures were reduced in time, and improvements in knowledge were still found. The authors suggested that some of the changes observed may have occurred due to “treatment and control subjects exchanging information relevant to the exercise and testing programme” (Fardy et al., 1996, p.252).

The authors proposed that the improvements in female cardiovascular health may have been due to a number of factors including: exercise activity selection: fitness test selection, girls being lower in fitness than boys at baseline; females having less outside PA; and participating in regular PE classes less vigorously than males. The study found no differences in self-reported PA for boys or girls. Very few improvements were found for boys. The PA intervention was not developed with reference to a theory of health behaviour change, and did not involve behaviour modification strategies such as methods to overcome barriers, and time management skills.

Project Heart (Ewart, Rohm-Young & Hagberg 1998) was an experimental research study that evaluated the effects on blood pressure by replacing traditional PE classes with aerobics classes for high risk, predominately African-American adolescent girls (N = 88) from one high school in the USA. Year nine girls with blood pressure above the 67th percentile were randomly allocated to one semester of required standard PE (control), or Project Heart (intervention) aerobics classes. Both classes involved 50-minutes periods throughout the 18-week semester. After the PA intervention period only members of the aerobic exercise group increased their estimated cardiorespiratory fitness (sub-maximal step test), and had a greater decrease in systolic blood pressure compared to the standard PE group. There were no statistically significant group differences in diastolic blood pressure, pulse rate, and BMI.
Project-Active Teens (Dale, Corbin, & Cuddihy, 1998; Dale & Corbin, 2000) involved the evaluation of a conceptual PE programme (CPE) for high school students. The research design was quasi-experimental with 333 participants from one high school. The object of CPE programmes was to promote student competence and positive attitudes toward activity that will encourage students to adopt a physically active way of life (Dale & Corbin, 2000). The CPE curriculum included classroom lessons on fitness and health, laboratories, and PA sessions focusing on personalised fitness programmes, and self-monitoring in a non-competitive environment. Originally designed for College-aged students, the interventions were used with secondary school students. Students in the intervention group received the CPE curriculum one day per week in the classroom, and one day per week in the gym for the full academic year. On the remaining three days students participated in traditional physical education (TPE).

Two to three years after taking Year 9 PE, fewer CPE students reported sedentary behaviours in comparison to students who had participated in traditional PE. CPE boys in Year 12 were significantly more active than TPE boys. However, there were no statistically significant differences within either cohort group or either gender, on moderate activity. For vigorous PA, no statistically significant gender differences were found. After graduation, findings showed that more CPE boys than TPE boys reported being vigorously active. For strength activity, fewer TPE girls were active compared to CPE girls when surveyed at school. The intervention used self-report data from the Youth Risk Behaviour Survey for moderate activity, and the response rate for the post-graduation follow-up was low (34%) due to the mail-out problems. The selection of a comparison group was a considerable limitation of this study. Students who had transferred to the school after Year 9 became the comparison group. In addition to not having a pre-test for these students, there are other areas where they appeared to be different to the CPE group. Furthermore, the students who participated in the CPE programme were already very active before the study started.

In a family-based PA intervention in the USA, 90 families with obese 8-12 year-olds were randomly assigned to groups, and were provided with a comprehensive family-
based behavioural weight control programme (Epstein, Paluck, Gordy & Dorn, 2000). The research was experimental in its research design, one group receiving information on reducing sedentary behaviours, and the other group receiving information on increasing PA. After two years, both groups revealed statistically significant decreases in percent of overweight, body fat, and improvements in aerobic fitness. Self-reported PA minutes increased and targeted sedentary behaviour time decreased during treatment.

The GO GIRLS study involved an intervention designed for inner-city, overweight African-American adolescent girls (Resnicow, Lazarus-Yarock, Davis, Terry-Wang, Carter, Slaughter, et al., 2000). Fifty-seven participants were recruited from public housing developments, and as the study did not involve a comparison or control group, the results were compared for those with high and low attendance. No statistically significant differences were observed between groups for any of the physical measures. Those with high attendance rates \(N=26\), showed more favourable 6-month post-test values for most outcomes, compared with those with low attendance \(N=31\). The study was limited by its lack of a control or comparison group. Furthermore, no follow up post-tests were completed to examine if changes in outcomes were lasting. A concern of this study is the feasibility of the PA intervention. Students were taken on field trips such as hiking, ice skating, and swimming at State parks. The trips were arranged out of school time, and while the authors argued that the benefits exceeded the logistical headaches, it is questionable whether such a programme is sustainable for large groups of sedentary students.

The Patient-Centered Assessment and Counselling for Exercise plus Nutrition (PACE), evaluated a behaviour change programme initiated in primary care settings (Patrick, Sallis, Prochaska, Lydston, Calfas, Zabinski, et al., 2001). One hundred and seventeen adolescents who participated in the initial assessment were then randomly allocated into either a control group or one of three groups with conditions involving different combinations of mail and telephone contact. After four months, there was a statistically significant increase in moderate but not vigorous PA, in the intervention
groups. They also found that adolescents who targeted their behaviour change improved more over time, compared to those individuals who did not target behaviour change.

The Cardiovascular Health in Children and Youth Study (CHICYS I) evaluated the effects of an eight-week intervention in middle schools designed to reduce cardiovascular disease risk factors (CVD) (McMurray, Harrell, Bangdiwala, Bradley, Deng & Leviele, 2002). The research design was experimental, with the research participants consisting of 1140 adolescents from five rural middle schools, aged 11 to 14, who were randomly allocated by the school into four treatment groups: 1) exercise only, 2) education only, 3) exercise and education combined, or 4) control.

The intervention programme utilised lessons in laboratories and PA sessions with a focus on personal fitness. The exercise groups received 30 minutes of aerobic exercise for three days a week for eight weeks. The aerobic exercises consisted of various lifestyle activities or non-competitive activities. The education programme consisted of information on nutrition, smoking, and exercise. Students in the control group participated in their normal health curriculum which did not emphasise CVD risk factors, and engaged in their normal PE programme.

There was a statistically significant increase in systolic and diastolic blood pressures in the control group, compared to the intervention groups. While BMI did not change significantly in any of the groups, the sum of skin fold (SSF) increased less in the exercise intervention groups than the education only or control groups. The exercise intervention group also had small improvements in V0₂. The authors concluded that “the combination of an educational intervention and an exercise programme may have the greatest positive impact on blood pressure and skin folds; however, exercise appears to be the more important determinant” (McMurray et al., 2002, p. 130). The study did not find an intervention effect on aerobic power. However, seasonality may have been a confounding issue as baseline data was obtained in the fall, and post testing was recorded in the winter. While the research design of this study was sound, the 8 week intervention was short as it added only 12 hours of total exercise, which is unlikely to change the physiological
measures assessed. The PA intervention was not developed with reference to a theory of health behaviour, and potential determinants of behaviour were not measured. Despite some promising short-term improvements in the treatment groups, there is little evidence that these will be sustained.

Saelens, Sallis, Wilfley, Patrick, Cella and Butcha (2002) evaluated a four-month Healthy Habits behavioural weight control programme for 44 overweight adolescents initiated in primary care in the USA (Saelens et al., 2002). Adolescents in the Healthy Habits treatment groups received behavioural skills information initiated in a primary care setting, then extended the programme through telephone and mail contact. Those in the control group met once with a paediatrician who discussed issues pertaining to PA and nutrition.

The results of this experimental design study showed that after four months, self-reported PA did not differ between the groups. Promisingly, the treatment group evidenced better changes in body mass index, which was sustained from post-treatment to follow-up. This study involved a strong design, and resulted in positive outcomes for BMI. However, the cost of resources and material may make it unsustainable in the long-term. The costs involved in the Healthy Habits programme could be decreased if it were implemented in the school environment, whereby students are given the material to take home, and then follow-up calls could be made by teaching assistants.

The New Moves study involved a school-based programme for obesity prevention among adolescent girls, (Neumark-Sztainer, Story, Hannan & Rex, 2003; Neumark-Sztainer, Story, Hannan, Tharp, & Rex, 2003). This experimental study involved six schools in the USA which were randomly allocated into intervention and control conditions. Data was collected from 201 adolescent female participants at baseline, post-intervention, and an eight-month follow-up. Girls from Year 9 and 10 in the PA intervention group participated in New Moves five times a week for one semester (16 weeks). Participants in the control schools received a minimal intervention that included written materials on healthy eating and PA at baseline. Girls were recruited for the study
once the schools were allocated to control or intervention groups. The intervention was designed to be implemented as a multi-component, girls-only high school PE class.

Participants in the PA intervention schools knew that they were enrolling in an alternate PE programme, while students at the control schools were recruited to participate in a study about eating and exercise patterns of teens. The New Moves programme was developed with reference to Bandura’s Social Cognitive Theory (Bandura, 1986). The study revealed that girls in the intervention progressed in their stage of behavioural change for PA from baseline to follow-up. This change was statistically significant. While the majority of differences in outcome variables between control and intervention at post-intervention and follow-up were in the hypothesised direction, they were not statistically significant. The authors revealed that the New Moves programme had been sustained in all three intervention schools. Following the completion of the study, the authors confirmed that the New Moves programme had continued in all three intervention schools.

The Middle School Physical Activity and Nutrition (M-SPAN) study involved the random allocation of 24 middle schools (12 intervention and 12 control conditions) in Southern California schools in the USA (Sallis, McKenzie, Conway, Elder, Prochaska, Brown, et al., 2003; McKenzie, Sallis, Prochaska, Conway, Marshall & Rosengrad 2004). This experimental design study evaluated the effects of environmental and policy interventions on the eating habits and PA of 26,616 students at school. A major part of the intervention was a two-year PE programme, which consisted of curricular materials, staff development, and on-site follow-up. The student PA and lesson context were observed in 1849 PE lessons using a validated instrument during baseline and intervention years one and two. The PE intervention component was designed to increase PA in PE classes by changing lesson content, as well as structure and teacher behaviour. Another component of the programme was to increase PA throughout the school day by increasing supervision and equipment and providing organised activities during break times. The control schools continued with their usual programmes.
The System for Observing Fitness Instruction Time (SOFIT) was used to evaluate student PA in a random sample of PE classes, and the System for Observing Play and Leisure Activity (SOPLAY), was used to assess the PA levels of students during leisure time. The intervention had a statistically significant effect on time spent in MVPA in PE. This effect was cumulative so that by the second year, intervention schools increased MVPA by 18%. A greater magnitude of effect (effect size) were found for boys (effect sizes, Cohen’s d = 0.98; large) than girls (Cohen’s d = 0.68; medium). This study has a number of strengths, including the random allocation of a large number of schools to treatment conditions to tighten controls, and the accurate measurement of a number of relevant variables.

The Lifestyle Education for Activity Programme (LEAP) involved a school-based intervention for adolescent girls, emphasising changes in instruction and school environment, on variables derived from Social Cognitive Theory as mediators of change in PA (Dishman, Motl, Saunders, Felton, Wand, Dowda, et al., 2004; Dishman, Motl, Saunders, Felton, Ward, Dowda et al., 2005; Pate, Ward, Saunders, Felton, Dishman & Dowda, 2005). The LEAP was a two year comprehensive school-based intervention. The research design was experimental cohort design using 24 schools (12 control, 12 intervention), who were randomly allocated to either control ($N = 1038$) or intervention conditions ($N = 1049$).

The multi-component intervention emphasised the enhancement of self-efficacy, and development of behavioural skills through PE and health instruction. Tests were administered to Year 9 students in groups of six, and to ten girls in Year 8 and Year 9, before and after the girls had participated in control and intervention conditions. PA was assessed using the 3-Day Physical Activity Recall instrument. The programme was designed to increase PA in high school girls by creating a supportive environment specifically for adolescent girls (Dishman et al., 2004). The results showed that the proportion of adolescent females, who engaged in one or more 30-minute session of vigorous PA, was greater in the intervention schools when compared with the control schools (Pate et al., 2005).
Statistically, latent variable structural equation modelling indicated that self-efficacy and satisfaction, exhibited positive associations with PA. The intervention also had direct effects on self-efficacy, goal-setting and PA. The researchers concluded that self-efficacy partially mediated the effect of the LEAP intervention on PA amongst adolescent girls. The authors argued that self-efficacy can be used as a mediator variable in the promotion of PA among adolescent girls. The study also involved a process of evaluation of the fidelity of each school’s implementation of the LEAP intervention component. The authors concluded that the poor results of many school-based interventions could “be partly explained by inadequate implementation of the intervention components” (Dishman et al., 2004, p.634). Interventions may not be implemented effectively by teachers which in turn may underestimate the efficacy of those interventions. The authors were also interested in the development of behavioural skills, such as goal-setting. While the study revealed a statistically-significant effect of the intervention on goal-setting, it was unrelated to changes in PA. A mixed-model analysis of covariance indicted that, compared to control schools, a greater percentage of girls in high-implementing schools reported engaging in vigorous PA.

Project FAB involved the evaluation of a school-based intervention in the USA, designed to increase PA among adolescent girls, (Schneider-Jamner, Spruijt-Metz, Bassin & Cooper, 2004). The research design was experimental, utilising a recruitment procedure which involved the distribution of information fliers, and class presentations. In response, 68 adolescent girls expressed interest in the study. The 58 adolescents accepted for the study satisfied the following criteria: enrolled in Year 10 or Year 11; and sedentary, low cardiovascular fitness but able to exercise without restrictions. Participants in the intervention school enrolled in a special PE class that met five days a week for an hour each day over a four-month period. The course included a variety of lifetime PA. One day a week was dedicated to a lecture on the health benefits of activity and strategies for becoming physically active. The content of Project FAB was modelled on Project GRAD, an intervention for college-aged students.
After the four month study period the treatment had a statistically-significant effect on CF, lifestyle PA, and light, moderate and hard self-reported PA. The intervention did not have any statistically-significant effects on psychosocial factors related to exercise. Limitations of the study included: the lack of random assignment; small sample size; lack of a standard PE class for comparison; and lack of a follow-up post-test to gauge whether the improvements were lasting.

Fairclough and Stratton (2005) examined the effectiveness of an intervention to increase levels of MVPA in one female high school PE class in England. The experimental research design utilised two Year 7 classes were randomly allocated to either control or intervention conditions. Both classes followed the same six-lesson unit of gymnastics. The intervention class had the additional objective of increasing MVPA, which was assessed in all six lessons using heart rate monitors and systematic observation.

At the end of each lesson, the students’ intrinsic motivation and perceived competence were measured. Students in the experimental group engaged in more MVPA than the control group and had the most opportunities for skill practice. Results showed that both groups were similar in student reported intrinsic motivation, perceived competence, and teacher-reported planned lesson objectives. The findings of this particular study although promising were derived from a small research sample. Additionally the authors acknowledged that baseline data may not have been representative of each class. The authors concluded that PE may make a more important contribution to young people’s regular PA, if PE lessons are planned and delivered with MPVA goals in mind (Fairclough & Stratton, 2005).

The ongoing Intervention Centred on Adolescents’ Physical Activity and Sedentary Behaviour (ICAPS) is aimed at preventing excessive weight gain and cardiovascular risk in adolescents by promoting PA with an emphasis on recreational and daily life PA with a lifelong perspective (Simon, Wagner, Divita, Rauscher, Klein-Platot, Arveiler, et al., 2004). The research design was experimental, utilising a PA intervention which was directed at: 1) changing knowledge and attitudes, through debates and providing access to attractive
activities during breaks and after school hours; 2) encouraging social support; and 3) providing environmental conditions that encourage PA inside and outside school. Eight schools were selected randomly from the Bas Rhin region in Eastern France. Schools were matched on socio-demographics then randomised to either control or intervention groups.

A total of 954 adolescents whose average age was 11.7 years, were involved in the baseline measurements. The ICAPS programme included an educational component focusing on PA and sedentary behaviour, new opportunities for PA during school hours lunchtime and recess, and after school hours. Sporting events were organised, and active transport to school reinforced. Teacher-parent organisations and sport associations were encouraged to become involved in the programme. The control schools followed their usual health curriculum and PE. After six months of interventions, the ICAPS programme was associated with a statistically significant improvement in PA patterns (50% participated in at least one weekly activity).

An impact on the psychosocial predictors of PA, self-efficacy, and intentions to be active was observed in girls. Changes in psychosocial scores in the intervention group were positive, but not statistically significant in boys. The study did describe adherence to the intervention, which is particularly important in large-scale interventions. The measure of sedentary behaviour was not multifaceted, and may be better described as the measurement by small screen devices which have not shown to have an inverse association with PA. The study would have benefited from structured observations of playground behaviour and PE classes, using the System for Observing Play and Leisure activity (SOPLAY) and the System for observing Fitness Instruction time (SOFIT) protocols respectively. An objective measure of PA such as accelerometry data would have added further strength to the study design, and outcomes.

A two-year study by Haerens, Deforche, Maes, Stevens, Cardon and De Bourdeaudhuij (2006) focused on a middle school PA, and health food intervention that involved 15 schools in the West-Flanders region of Belgium, in Europe. The research design was experimental; the objective of the research was to evaluate the effects of a
two-year PA and health food intervention, including an environmental and computer-tailored component on BMI and BMI z-score in boys and girls. Weight and height were measured at the beginning and end of each school year for two years to assess BMI and BMI z-scores. The aim of the intervention was to help children create a physically-active lifestyle, together with a healthy diet (Haerens et. al., 2006). Parental involvement was used in five out of the ten intervention schools to develop a supportive environment for healthy behaviours outside the school environment as well as a PA component which focused on increasing levels of moderate to vigorous PA up to 60 minutes per day; a food component which focused on behavioural changes such as increasing fruit and water consumption, and reducing fat intake.

The results of this study showed no significant positive intervention effects on the boys; however, there was a trend towards a lower increase in BMI for the girls after one year. In the girls final results, BMI and BMI z-score increased significantly less in the intervention with the parental support group compared with the control group (p<0.05), or the intervention-alone group (p = 0.05), Haerens et al., (2006). This outcome emphasised the importance of parental support for interventions focusing on decreasing adiposity in girls.

The Lifestyle Of Our Kids (LOOK) study (Stuckey, 2009) was a study of student attitudes to normal primary PE classes compared to student attitudes after eight months of a specialist PE intervention programme. The study was a longitudinal project over four years (2006-2009) involving primary school children. It was a multidisciplinary project that monitored aspects of health, specifically early symptoms of CVD, TD2, bone health, immuno-competence, psychological health (self-esteem and self-confidence), postural control and balance and coordination. The participants were 1000 ACT children beginning at age seven- eight years. The half the children received a special PA programme, carried out by trained teachers (Bluearth coaches) who visited the schools and took the lessons and provided the equipment.
At the eight month stage the Blueearth coaches appear to be making a significant positive impact on student attitudes toward, and the enjoyment of, their PA classes. There were a considerable lower percentage of students becoming disengaged from the PA experience. There is evidence of higher quality PA experience as a result of a greater emphasis on skill learning rather than fitness activities further results will become available on publication.

The Sports, Play and Active Recreation for Kids (SPARK) four year study in seven San Diego (USA) primary schools (Dowda, Sallis, Mckenzie, Alcaraz, Rosengrad & Kohl, 2005) were the grade four and five primary school participants $N=955$, (mostly European American children) were assigned to one of three conditions, 1) Physical education specialist (PES), 2) trained classroom teacher (TT), and 3) control (CO). In the PES condition, specialist teachers taught PE, in the TT condition, classroom teachers were trained by research staff to implement the SPARK programme, and in the CO classroom teachers taught their usual PE programmes. Specifically, the PE teachers were taught how to design their PE classes with high levels of PA that incorporated enjoyable movement skills for the participants. This involved thirty minute practical sessions that were either a) health-related activities or b) sport skill related. The programme also included classroom sessions which include self-monitoring, goal-setting, reinforcement and related skills. The results showed that the participants in the PES PE classes and the TT PE classes were more active than those in the control classes. The results showed an increase in fitness levels of the participants.

This study had an eighteen month follow-up which showed that the TT teachers continued to use the intervention curriculum and maintained increased student PA levels. But with the withdrawal of the PES teachers there was a significant reduction in both quantity and quality of PE. There was a decline of 88 percent of the intervention level student activity.

The Child and Adolescent Trial for Cardiovascular Health (CATCH) a randomised controlled field trial study Kelder, et al (2003) participants $N=96$ randomly assigned
primary schools (56 intervention and 40 control) for a two year study. The intervention was implemented at four US centres (San Diego, Minneapolis, Houston and New Orleans), the participants included \( N = 5,106 \) 3rd Grade students (mean age at baseline of 8.76 years) with considerable ethnic and global diversity. The CATCH intervention included a focus on food, classroom learning on CVD health, school policy, tobacco and a home/family component. The CATCH PE school programmes were specifically designed to promote children’s enjoyment and PA participation and improve MVPA in existing PE programmes, and to improve physical skills that could be used outside of the classroom. The limitation of this study was that there was only sixty percent participation at the baseline measurement. At the end of the trial the primary PA outcome measures the intervention schools that utilised the teachers who were trained, MVPA increased by 39%. Additionally the intervention participants had higher levels of energy expenditure per PE lesson, and greater overall PA levels than the participants on the control schools.

While this OE and PE RCT study is concerned with the two different types of physical activities interventions in two different school settings, not all PA interventions targeting children and adolescents take place in the main campus of secondary schools. Useful information can be gained from interventions to promote PA and reduce sedentary behaviour that have been implemented in primary care settings, and tertiary institutions. The next section of this chapter includes a detailed description of the main PA interventions in non-school settings. Research study designs, major findings, limitations and implications are discussed.

**Summary of physical activity interventions**

The school environment appears to hold promise for the promotion of PA among adolescent populations. PA promotion in schools should be cumulative, and effective interventions should address both individual and environmental behaviour change principles. As there is no one-size-fits-all solution, programmes should be tailored to the needs of the target groups. PA interventions should be targeted towards certain groups, and
be differentiated on the grounds of gender, age/life-stage and socioeconomic status (Cavill, Biddle & Sallis, 2001).

The majority of school-based PA interventions were conducted in the United States, and evaluated health-related PE programmes. Timperio, Salmon & Ball (2004) examined school-based intervention studies published between 1999 and September 2003. They concluded that studies which incorporated whole-of-school approaches, including curriculum, policy and environmental strategies appeared more effective than curriculum-only interventions. While experimentally-managed PE programmes have consistently improved aspects of PA participation, health education without a PE programme has not been effective (Sallis, Simons-Morton, Stone, Corbin, Epstein, Faucette, et al., 1992). PA interventions that have included contact with families were the most effective, while none of the interventions that included a summer programme, or intensive after-school programme, resulted in statistically significant increases in PA among young people. PA interventions appear to be more successful in changing the behaviour of boys compared to girls.

The Cochrane Review of PA interventions (Hillsdon, Foster & Thorogood, 2005), described a number of issues pertaining to the internal and external validity of PA interventions: allocation concealment at baseline, not stating randomisation methods, any control of baseline results, measurement of PA, and the use of highly-motivated volunteers. These issues are also relevant to school-based interventions. Despite many promising findings, unfortunately very few studies reported sustained increases in PA. Although a number of studies reported increases in PA at the end of the intervention, a few studies incorporating follow-up assessments found that individuals who had received the interventions’ conditions were no longer more physically active. Substantial relapses in behaviour are generally observed in efficacy-type studies “when the intensive intervention ends and external supports are withdrawn” (Dzewaltowski, Estabrooks & Glasgow, 2004, p.62). Alternatively, interventions that require fewer resources, demand less staff expertise, take less time, allow greater flexibility and adaptation should produce higher adoption rates (Dzewaltowski et al., 2004).
Unfortunately, most successful PA interventions in schools have involved “non-standard PE programmes that included additional PE time, the sustainability of which is questionable” (Biddle et al., 2004, p.689). PA interventions have shown little consistency in increasing PA levels among those with low levels of motivation (Baranowski, Anderson & Carmack 1998). Consequently, researchers and educationalists must explore ways to promote lifetime PA through the existing infrastructure, resources, and personnel available in schools. The socio-ecologic model and the disciplines of urban planning and transportation, appear promising sources for PA interventions (Powell, Bricken & Blair 2002) as they can access a large percentage of the population and do not necessarily require the sustained effort of schools and individuals. Multi-component PA interventions that involve innovative curriculum and changes to the school environment may be the best way to initiate long-term changes in PA behaviours.

High school physical education

School PE has been identified as the most accessible medium for promoting PA among young people (Pate et al., 1995, Sallis, McKenzie, Alcaraz, Kolody, Faucette & Hovell, 1997). High school PE should aim to provide opportunities for students to be physically active, which through a sequence of events will lead them to choose active lifestyles as adults (Armstrong, 1993). PE is important because it “ensures a minimum amount of PA and provides a forum to teach PA strategies and activities that can be continued into adulthood” (USDHHS, 2000, p.24)

Aims and objectives of high school physical education

High school PE has the potential to make important contributions to the educational experience of adolescents in a comprehensive range of domains. In Australia, the PE curriculum is not a national curriculum; each individual Australian State develops its own PE curriculum, aims and objectives. In New South Wales, (NSW) PE is part of the PDHPE Key Learning Area (KLA), and is a mandatory KLA for all students. The aim of the PDHPE Years 7-10, Stages 4 and 5 Syllabus is to:1) Develop students’ capacity to enhance
personal health and wellbeing, 2) Enjoy an active lifestyle, 3) Maximise movement potential and 4) Advocate lifelong health and PA.

The objectives of the New South Wales PDHPE Years 7-10 Syllabus are subdivided into two categories, a) Knowledge, Understanding and Skills; and b) Values and Attitudes. In the Knowledge, Understanding and Skills objectives category, the syllabus states that the students will: 1) Enhance their sense of self, 2) Improve their capacity to manage challenging circumstances, 3) Develop caring and respectful relationships, 4) Move with confidence and competence, 5) Contribute to the satisfying and skilled performance of others, 6) Take actions to protect, promote and restore individual and community health, 7) Participate in and promote enjoyable lifelong PA, 8) Develop and apply the skills that enable them to adopt and promote healthy and active lifestyles.

In the Values and Attitudes objectives category, the syllabus states that the students will: 1) Value health-enhancing behaviours that contribute to active, enjoyable and fulfilling lifestyles, 2) Develop a willingness to participate in creating and promoting healthy and supportive communities and environments; 3) Develop a commitment to principles that promote social justice.

The NSW Years 7-10 PDHPE syllabus has the potential to develop healthy PA habits in adolescents, and in relation to this thesis, the opportunity to develop this potential is enhanced for the experimental group as they had the OE physical activity programme at the ESOESP campus in addition to the PDHPE syllabus. This study examines the effects of the PE physical activity programme. In England, the National Association for Sport and Physical Education (2005) described the potential impact of high quality PE by describing the following positive effects: 1) Improved physical fitness, development of motor skills, 2) Provision of regular, healthful PA, 3) Reinforcement of knowledge learned across the curriculum, 4) Development of self discipline and student responsibility for health and fitness, 5) Moral development and leadership skills, 6) Provision of an outlet for reducing tension, anxiety and facilitates emotional stability, 7) Provision of opportunities to learn positive people skills, 8) Provision of opportunities to become confident, assertive,
independent and self-controlled, 9) Provision of opportunities to set and strive for personal, achievable goals.

**Support for the positive effects of physical education interventions**

School-based PA interventions have provided empirical support for the positive effects of PE. Studies completed in primary and secondary schools have demonstrated the benefits of enhanced PE on: risk factors for coronary heart disease (Sallis et al., 1997; Gortmaker et al., 1999; Manios, Moschandreas, Hatzis & Kafatos 1999; Robinson, 1999; McMurray et al., 2002; Schneider-Jamner et al., 2004); psychosocial factors associated with PA (Fardy et al., 1996; Harrell, McMurray, Gansky, Bangdiwala & Bradley 1999; Stevens, Story, Ring, Murray, Cornell, Juhaeri et al., 2003) and academic performance (Shephard, 1997; Sallis et al., 1999a). Physical activity interventions have also demonstrated that the intensity and type of PE provided at school can influence the PA choices made by individuals once they leave school (Dale et al., 1998; Dale & Corbin, 2000; Trudeau, Laurencelle & Shepard 2004).

Although it has been suggested that physical educators should narrow their aims and objectives (Corbin, 2002), the one goal that has been constantly reinforced over the past decade is PE’s role in the promotion of lifelong PA (Green 2000, Daley, 2002; Fairclough, Stratton & Baldwin, 2002). Another important aspect of PE is its role in providing students with opportunities to engage in MVPA. While the traditional images of drill and exercise as punishment can negatively influence PA patterns in later life (Biddle & Mutrie, 2008), PE can provide experiences in MVPA that students find enjoyable and rewarding. Pate, Trost and Williams (1998) argued that the behavioural and physiological objectives of PA programmes are compatible, and suggest that students should be offered activities that provide MVPA and enhance psychosocial factors such as self-efficacy.

Opportunities to participate in MVPA during PE classes vary greatly and depend on two factors: frequency of classes and intensity of activity required during class (Zask, Van Beurden, Barnett, Brooks & Dietrich, 2002). Compared to other European countries, the
U.K. has historically allocated less time to PE (Ross, Dotson & Gilbert, 1985). The amount of time allocated to PE has become a topic of debate for a recent study which examined the trends of schools in the U.K. (DES, 2004).

The study of the Physical Education School Sport Co-ordinator Partnerships (PESSCP) strategy evaluated student opportunities for PA in PESSCP (DES, 2004). Questionnaires were sent to Heads of PE at schools involved in the PESSCL strategy (overall response rate was 81%). Information was gathered by self-report from teachers with no observations or student feedback. They found that 62% of pupils spent at least two hours a week on high quality PE and school sport within and beyond the curriculum, with 80% at Key Stage 3. Pupils (Years 7-9) in longest established partnerships spend the greater amount of time on PE. It is important to note that these schools are not representative of the UK Government school system.

In addition to the number of PE lessons, the amount of actual PA in lessons is another key issue. Studies examining the amount of time students are physically active during PE classes have revealed that students are inactive for the majority of the time. A study conducted in a random sample of 20 elementary schools and seven middle schools in the U.S. compared rates of PA participation in PE lessons (Simons-Morton, Taylor, Snider, Huang & Fulton, 1994). The study found that even in schools with strong PE programmes, students were only active for 30% of the lesson. Determining the amount of PA in PE lessons on a large scale is time consuming. Consequently, most of the evidence comes from small-scale studies. PA interventions evaluated in both primary and secondary schools (McKenzie et al., 1996; Sallis et al., 1997; Fairclough & Stratton, 2005) have revealed that the amount of time spent in MVPA during PE can be increased without compromising the quality of the lessons. A follow-up study to the CATCH intervention found that improvements in MVPA in PE classes could be maintained over time (Kelder, Mitchell, McKenzie, Derby, Strikmiller, Luepker et al., 2003). To increase the amount of MVPA in PE classes, teachers need to plan PE lessons with this objective in mind and avoid situations in which students are sitting around for long periods of time listening to instructions or waiting for a turn.
The problem of physical education motor skill development, games and physical activity

Historically, motor skill development and team sports have been the focus of PE (Simons-Morton, Eitel & Small, 1999) and continue to dominate the secondary school PE curriculum. This form of PE is characterised by relatively short units of activity, a focus on skill development and the almost exclusive use of a directive teaching style (Kirk, 2005). Evidence suggests that this traditional form of PE is not suitable for many young students entering Key Stage 3, particularly girls (Kirk, 2005). Some studies have indicated that adolescents’ interests and participation in PA differ by gender (Booth, Macaskill, McLellan, Phongsavan, Okely, Patterson, et al., 1997a; Booth, Macaskill, Phonsavan, Okely, Patterson, Wright et al., 1997b; Office for National Statistics (ONS), 2002; Sport England, 2002). Findings from the General Household Survey in 2002 (ONS, 2002) revealed that the most popular physical activities in the U.K. were: swimming, keeping fit (yoga), cycling and cue sports [snooker, billiards] (ONS, 2002). Even though team games such as football are very popular with school children (Sport England, 2002) these activities are not reflected in the PA choices made by older students and adults who are more likely to engage in individual lifetime activities (ONS, 2002). Consequently, strategies to increase PA should address these differences (USDHHS, 2000).

Although most high school students have positive feelings about PA, they have even more negative feelings about PE in school (Corbin, 2002). For many pupils the competitive experience is the outstanding feature of PE and those students who become accustomed to losing are unlikely to feel compelled to engage in post-school PA. Unfortunately, for many adolescents, early experiences in PE and games do not translate into a habitual commitment to PA later in life (Green, 2002). It has been suggested that due to the public nature of PE classes “where effort and ability are salient” (Biddle, 2001, p.101) lessons can be a nervous experience for less skilful students in competitive environments. Subsequently, PE has been identified as a source of stress for some children and can be a major reason for truancy (Biddle, 2001).
Although primary school age is the most appropriate time for children to learn and refine their motor skills (Gallahue & Ozmun, 1995) high schools have an important role to play in the further refinement of such skills (Qualifications and Curriculum Authority, [QCA] 2005). Amongst children there appears to be an association between participation in PA and motor skill development (Okely, Booth & Patterson, 2001; Taylor, Sallis, Dowda, Freedson, Eason & Pate, 2002). While genetic factors may be accountable for the potential of motor skill competence, environmental factors such as opportunities to practise and quality of instruction will determine to what degree the potential is achieved (Gallahue & Ozmun, 1995). To encourage lifetime PA choices students should be provided with greater choice and diversity because experiences in PE are likely to have profound implications for subsequent PA choices (Green, 2002; Kirk, 2005).

It has been argued that high school PE programmes are often inappropriate for the needs of adolescents as they tend to benefit the small number of students with sporting ability often resulting in minimal success for many (MacFayden, 1999; Fairclough, Stratton & Baldwin, 2002). Dissatisfaction with the traditional model of PE has resulted in pressure to provide students with lifetime activities that reflect the PA choices made by individuals when they leave the structure of school (Sallis & Patrick, 1994; USDHHS, 1996). Lifetime PA are physical activities that may be readily carried over into adulthood because they generally need only one or two people, for example swimming, cycling, tennis and exercise-based activity. More controversially, it has been suggested that the decrease in time allocated to PE in recent years is a direct result “of student and parent dissatisfaction with inadequate and ineffective programmes that continue to focus on team sports rather than lifetime activities” (Corbin, 2002, p.140).

**Health-related exercise and lifetime physical activity**

In the U.K., health related exercise (HRE) provides a context for the delivery of lifetime physical activities. While HRE is included as part of the PE programme of study at each Key Stage of the National Curriculum (Qualifications & Curriculum Authority (QCA), 2005), there is little reference to lifetime activities in *A Sporting Future for All,*
Game plan or PESSCL (DCMS, 2000; DCMS & Strategy Unit, 2002; DES & DCMS, 2003). Paradoxically in the United States of America, lifetime activities have a much higher profile, and in a number of research interventions (Dale, Corbin & Cuddihy, 1998; Neumark-Sztainer, Story, Hannan, & Rex, 2003; Schneider-Jammer, Spruijt-Metz, Bassin & Cooper, 2004) their research evaluated the benefits of incorporating lifetime PA programmes into the PE curriculum for secondary school students.

Fairclough, Stratton and Baldwin (2002) conducted a survey of fifty-one high school Heads of PE departments regarding their schools’ provision of lifetime PA (the response rate of the survey was fifty percent). Whilst team games were predominant over lifetime activities in Key Stages 3 (Years 7-10) and 4 (Year 10), lifetime activities were more prominent during students’ extra-curricula time. Interestingly the female heads of PE provided more lifetime activities in school curriculum time than the male heads of PE. Fairclough, et al., (2002) suggested that female teachers in this study recognised the importance and relevance of HRE, and valued its place within the NCPE.

The Fairclough et al., (2002) study showed that when student opportunities to participate in lifetime activities increased from Key Stage 3 to Key Stage 4 the number of games reduced. Unfortunately the study only examined one component of the schools’ capacity to promote lifetime activity. The paper did not examine how the activities were specifically delivered, merely if they were offered. The authors argued that the reason for the lack of PE time spent on lifetime activities is due to the restrictive nature of the National Curriculum, the traditional biases as to what activities boys and girls should do and the decreased volume of time allocated to PE in comparison with other school subjects. The authors argued that having a ‘predominantly games based curriculum serves to reinforce the traditional stereotypes of girls’ and boys’ activities’ (Fairclough et. al., 2002).

Summary

Students who develop a routine of participating in PA that can be easily carried into adulthood are more likely to become active adults (Sallis & Patrick, 1994). Therefore
schools need to place greater emphasis on individual recreational activities rather than traditional team sports. Adolescents should be involved in the decision-making process enabling them to choose activities they consider enjoyable (MacFayden 1999; Green, 2002). Different activities must be offered for different populations if individuals are to take full advantage of PA opportunities (Corbin, 2002). Sadly, many high schools may find it difficult to cater for all the different PA interests of high school students due to their budget allocations and lack of resources.

**Self-esteem and physical education**

Fox (1992b) stated two reasons why self-esteem (SE) is of interest to physical educators. Firstly, it is the most often used indicator of mental well-being which may be enhanced through sport and exercise. Secondly, if individuals experience increases in SE then they are more likely to persist in behaviours such as sport and PA. Therefore it could be identified as a prime PE objective.

The National Curriculum for England (Department For Physical Education [DFPE], 2000) states that teachers in all subject areas should set targets that ‘are attainable and yet challenging, and help pupils to develop their self-esteem and confidence in their ability to learn’ (DFPE, 2000, p.31). This could be seen as the perfect opportunity for outdoor educators to utilise their specific skills and pedagogies to enhance students’ SE.

Research in SE within a PE setting is limited (Whitehead & Corbin, 1997). Gruber’s (1986) meta-analysis found support for the benefit of PE on SE and concluded that, ‘participation in direct play and/or PE programs contributes to the development of SE in elementary age school children’ (Gruber, 1986, p43). Anshel, Muller & Owens (1986) found sports related SE benefit in boys’ ages 6-9 years, who participated in a six-week summer camp. However, no general SE benefit was found. There are a number of limitations when assessing the implications for this type of research. As the subjects are voluntary participants, and also have a personal interest in sport, then their results may be similar, whereas subjects in PE lessons are more likely to differ in their interests.
In relation to SE, the Nike/YST girls in sport partnership project (Kirk, 2000) findings showed that 34% of adolescent girls scored below the scales mid-point for physical self-worth; sport competence, body condition, body attractiveness and strength showed, mid-point levels. Kirk (2000, p.2) stated that ‘acquisition of a range of physical competencies in turn can contribute to the development of self-confidence and SE’. Alternatively, if the girls are not actively involved in sport, then they might not gain Kirk’s (2000) stated benefits. The advantage of this particular research project was that it helped PE teachers in the methods of delivery of PE and sport to girls to encourage them to participate in physically-active lifestyles.

This study was carried out in a large sample of schools, using five levels of intervention, which included three stages of data collection. In relation to this research (PE compared to OE) the authors concluded that different teaching strategies and delivery may have an effect on physically-active lifestyles of adolescents, this being additionally-complemented by Kirk’s (2000) statement that the teaching strategies utilised are therefore important in the delivery of PE. Limited research has been conducted within the typical PE programmes but some has been conducted in the adapted PE programmes in schools. The next section of this chapter briefly outlines aspects of adapted PE as it allows the theoretical components of SE to be examined.

Van Rossum and Vermeer (1990) found that children who performed lower on a motor skills test, also performed lower on perceived athletic competence on Harter’s (1985a) scale, validating her notion of perceived competence in the athletic domain. No differences were found between the coordinated and poorly-coordinated children in other domains of perceived competence.

**The benefits of outdoor education**

The term OE has been used in a variety of contexts to describe a range of experiences. In this study the term OE was conducted as part of the schools ESOESP which reflects the use of the outdoors to promote educational and behavioural changes in relation
to Year 9 male PA. During the last century there has been sustained growth in OE. In 1907, Robert Baden-Powell started the Scout movement in the UK which employed non-formal education with an emphasis on practical outdoor activities and camping experiences as part of their OE. The use of camping for children to bring them into the outdoors has deep roots in American culture (Prouty, Panicucci & Collinson, 2007). In the 21st century camping remains as one of the most important activities available for children to experience the outdoors. In the USA, L. B. Sharp (1895–1963) was influential in the development of OE and summer camps (Conrad, 1967) and in 1930 he wrote the first doctoral thesis on the topic (Sharp, 1930). OE is most commonly associated with an out of the classroom curriculum subject for schools (Gair, 1997; Higgins & Humberstone, 1999).

There are more than 12,000 day and residential camps in the USA, with more than 11 million children and adults attending camp each year (Prouty et al., 2007). In England and Wales, 86% of primary schools and 99% of secondary schools offer children at least one residential camping OE opportunity (Scout Association & DES, 2004). For 150 years children have been attending camps in the USA (American Camp Association, 2010), parents, camp staff, and children have reported significant growth in self-esteem, independence, leadership, friendship skills, social contact, peer relationships, when attending the camps (American Camp Association, 2005). The benefits of camping are shown in Table 3.1. The benefits of camping are similar outcomes to outdoor and adventure education programmes. Figure 3.1 shows the interrelationship between camping, outdoor education and adventure education.

Figure 3.1 Camping, outdoor education and adventure education are interrelated (Prouty, et al., 2007, p.21).
Dickenson, Gray and Mann (2008) developed an Australian outdoor adventure activity catalogue; Tables 3.1, 3.2 and 3.3 portray the potential benefits of participation in outdoor adventure activities.

Table 3.1 Benefits of camping (American Camp Association, 2005)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive identity</td>
<td>To the participant: self-esteem, determination, dependability, ambition, independence</td>
</tr>
<tr>
<td>Social skills</td>
<td>Beyond the individual: group bonding, cooperation, conflict resolution, appreciation of Differences, leadership, community, connected to others.</td>
</tr>
<tr>
<td>Physical skills</td>
<td>Activity skills: psychomotor and technical skills, physiological benefits of physical activity.</td>
</tr>
<tr>
<td>thinking skills</td>
<td>Thinking skills: knowledge of safety measures, planning, and problem solving, environmental awareness.</td>
</tr>
<tr>
<td>Positive values</td>
<td>Acquiring and strengthening virtue: selflessness, compassion, keeping commitments, Fulfilling obligations, self discipline, honesty</td>
</tr>
<tr>
<td>spirituality</td>
<td>Connecting to earth, others and even a higher power.</td>
</tr>
</tbody>
</table>

Table 3.2 Goals and benefits of Outdoor adventure (Webb, 1999)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreational</td>
<td>Enjoyment, relaxation, entertainment, excitement, catharsis, self-expression</td>
</tr>
<tr>
<td>Skill</td>
<td>Goal setting, decision making, problem solving, responsibility, physical development, nature awareness, communication, leadership</td>
</tr>
<tr>
<td>Character</td>
<td>Independence, interdependence, self-efficacy, willingness to take risks, tolerance, respect, trust, compassion.</td>
</tr>
</tbody>
</table>

The possible benefits of OE have been categorised by Ewert (1989) as being psychological, sociological, and educational and fitness. These four categories have been further sub-divided into sub-components of each category as shown in Table 3.3.
A meta-analysis of potential benefits of outdoor education programmes for students by Rickinson, et. al., (2004) found that there was research evidence to suggest that outdoor adventure programmes are associated with positive outcomes for young people. The meta-analysis consisted of 150 outdoor learning research studies conducted between 1993-2003. This meta-analysis concluded that the positive outcomes in self-efficacy, self-esteem, locus of control, personal effectiveness, coping strategies, confidence, independence, and attitudes towards the environment. Additionally, the meta-analysis concluded that there were positive benefits in students’ development of interpersonal and social skills, such as social effectiveness, communication skills, group cohesion and teamwork.

There have been seven further meta-analytic studies of outdoor education and closely related literature, such as camping and adventure therapy Neill (2009). The seven meta-analytic studies stated by Neill, (2009) are Bunting & Donley, 2002; Cason & Gillis, 1994; Hans, 2000; Hattie, et al., 1997; Marsh, 1999; Staunton, 2003; Wilson & Lipsey, 2000), these studies and their overall findings are summarised in Table 3.4.

<table>
<thead>
<tr>
<th>Psychological</th>
<th>Sociological</th>
<th>Educational</th>
<th>Physical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-concept</td>
<td>Compassion</td>
<td>Outdoor education</td>
<td>Fitness</td>
</tr>
<tr>
<td>Confidence</td>
<td>Group cooperation</td>
<td>Nature awareness</td>
<td>Skills</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>Respect for others</td>
<td>Conservation Ed.</td>
<td>Strength</td>
</tr>
<tr>
<td>Sensation seeking</td>
<td>Communication</td>
<td>Problem solving</td>
<td>Co-ordination</td>
</tr>
<tr>
<td>Well being</td>
<td>Friendship</td>
<td>Outdoor technique</td>
<td>Catharsis</td>
</tr>
<tr>
<td>Personal testing</td>
<td>Belonging</td>
<td>Improved academics</td>
<td>Balance</td>
</tr>
</tbody>
</table>

Table 3.3 Possible benefits of outdoor activities (Ewert, 1989)
Table 3.4 Overall results from seven meat-analyses related to outdoor education (Neill, 2009)

<table>
<thead>
<tr>
<th>Study</th>
<th>Focus</th>
<th>Cohen’s d</th>
<th>N studies</th>
<th>N effects</th>
<th>N participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bunting &amp; Donley (2002)</td>
<td>Ropes Challenge</td>
<td>.55</td>
<td>15</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td></td>
<td>Courses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cason &amp; Gillis (1994)</td>
<td>Adventure programming for adolescents</td>
<td>.31</td>
<td>43</td>
<td>147</td>
<td>~7,030</td>
</tr>
<tr>
<td>Gillis &amp; Speelman</td>
<td>Ropes challenge</td>
<td>.43</td>
<td>44</td>
<td>390</td>
<td>2,796</td>
</tr>
<tr>
<td>Hattie et. al (1997)</td>
<td>Adventure education &amp; Outward Bound programs</td>
<td>.34</td>
<td>96</td>
<td>1,728</td>
<td>12,057</td>
</tr>
<tr>
<td>Hans (2000)</td>
<td>Adventure programming locus of control outcomes</td>
<td>.38</td>
<td>24</td>
<td>30</td>
<td>1,632</td>
</tr>
<tr>
<td>Marsh (1999)</td>
<td>Camping programs</td>
<td>.20</td>
<td>22</td>
<td>37</td>
<td>Na</td>
</tr>
<tr>
<td>Staunton (2003)</td>
<td>Adventure therapy</td>
<td>.42</td>
<td>17</td>
<td>95</td>
<td>~1,000</td>
</tr>
<tr>
<td>Wilson &amp; Lipsey (2000)</td>
<td>Delinquent youth in Wilderness programs</td>
<td>.18</td>
<td>28</td>
<td>60</td>
<td>~3,000</td>
</tr>
</tbody>
</table>

The American Institutes for Research (2005) investigated the effects of outdoor education for children in California. The research sample included \(N = 255\) school students enrolled in schools serving at-risk populations, attending three resident outdoor science schools. The research design was a delayed treatment design where the children were divided in each individual schools 6th grade classroom as being either in the treatment group (attending the outdoor education residential centre) or being in the control group (remaining at school). The children in the control group attended the outdoor education centre after the data collection period. This is the same method utilised in this studies ESOEPS HRF feasibility study.
The specific research questions addressed in this study included: 1) how does participation in outdoor programmes impact students’ personal and social skills (e.g. self-esteem, cooperation, teamwork)? 2) How does participation in outdoor education programs foster students’ stewardship of the environment and their appreciation of the importance of the wise use of natural resources? 3) How does the science instruction received through the outdoor education program curriculum increase students’ knowledge and understanding of science concepts?

The research data collection included the use of three surveys and site visits between September and December of 2004. The survey participants were the students, parents, and teachers. The results of the data collection showed that participation in the outdoor education school was associated with higher ratings of conflict resolution skills and cooperation, strong evidence of the benefits of outdoor school as seen in the teacher ratings. Students who attended the outdoor school received significantly higher ratings in six of the eight constructs: self-esteem, conflict resolution, relationship with peers, problem solving, motivation to learn, and behaviour in class.

The children who attended the outdoor school significantly raised their science scores by 3 points (27%), and the increase in science knowledge was maintained six to ten weeks following the programme participation. The conclusion was that the positive outcomes associated with students’ participation in the five-day outdoor science school were promising.

A five-day Outward Bound course for 13-16 year old female students $N = 149$ in Singapore by Wang, Liu, & Kahlid, (2006) examined the effectiveness of the course. The participants were required to complete the following questionnaires: the Behaviour Assessment for Children (Reynolds & Kamphaus, 1992) to measure the selected personal qualities of the participants, the Rosenberg’s (1965) self-esteem scale, and Treatment Motivation Questionnaire (Wang, Ang,Teo-Koh,& Kaklid,2004) to measure motivation for participation in the outdoor programme.
The results showed that the Outward Bound course had positive impacts on the participants’ social skills (ES = .44), interpersonal skills (ES = .64), leadership (ES = .43), and self-esteem (ES = .24). The effects sizes ranged from .24 to .64 which was consistent with the moderate change of previous outdoor programmes effect size research (Hattie, Marsh, Neill, & Richards, 1997; Neill, 2009). Additionally, intrinsic motivation positively predicted participants’ satisfaction level after the course. This study showed that outdoor adventure programmes can have a positive impact on adolescent Singaporean girls.

One of the limitations of the study is that the results were based only on immediate programme effects. There is a concern that participants typically experience god feelings at the end of a course, and such ‘post group euphoria’ may affect the effect sizes especially when the measures are self-report (Marsh, et.al., 1986). A second limitation of the study is that the study was only measured quantitatively. A mixed mode approach combining qualitative and quantitative data collection, would help triangulate the data and offer stronger interpretation (Martin & Leberman, 2005).

Okely, Gray and Cotton (1997) investigated the effects of an extended stay outdoor education school program (ESOESP) on aerobic fitness of adolescent males. The participants \( N = 51 \), were year nine boys aged 14-15 years, from one independent boys school in Sydney. The participants completed a pre and post-test multistage fitness tests (MST) (Brewer, Ramsbottom & Williams, 1988), the pre-test was conducted in week one, and the post-test was conducted in week sixteen of their ESOESP programme.

This study’s MST results indicated a significant increase in the predicted VO\(_2\) max scores using a dependent \( t \) test, \( t (50) = 12.09, p <.05 \) between pre and post-test. This represents a 14% increase in VO\(_2\) max in adolescent male scores. The findings are congruent with other MST tests completed over a similar length of time with an adolescent population and support the evidence espousing physical health benefits from an ESOESP (Okely, Gray & Cotton, 1997). The limitations of this study was that only 59.31% of the participants completed both of the pre and posts-tests, where 40.69% did not complete both
tests due to medical or other circumstances. There is a possibility that only the aerobically fittest students completed both the pre and post-tests, possibly skewing the results.

Challenge courses have been utilised in outdoor education, and their benefits have been investigated. One such study investigated the effect of manipulating aspects of challenge course facilitation on participant perceived benefits (Lindenmeir, Long & Robertson, 2004). The purpose of this study was to determine how the existence of certain benefits would be influenced by variation in the surrounding environment. College students $N = 75$ were asked to indicate what benefits their group had received following participation in either a low elements or a high elements challenge course programme.

The high elements participants $N = 30$ (9 men, 21 women), the low elements participants $N = 45$ (19 men, 21 women) results indicated that certain benefits persisted in both high and low element environments (e.g. communication, trust), whereas others were absent from both environments (e.g. honesty, compassion). Furthermore, certain benefits were significantly more common in either low elements environment (e.g. leadership, patience) or the high elements environment (e.g. confidence, excitement). These findings support the need for challenge course facilitators to systematically examine the benefits produced by their programs (Lindenmeir, Long & Robertson, 2004). The results also provide support for previous conceptual descriptions of challenge course benefits (Webb, 1999). The limitations of this study are that the research design is limited in its generalizability. There was no random selection; the participants were volunteers from an existing user-base. Additionally the study focused on the perceived benefits, and did not attempt to verify the existence of any reported benefits. This is a significant limitation due to the role of generalization is assumed to play in adventure therapy or experiential learning (Lindenmeir, Long & Robertson, 2004).

Cross (2002) investigated the effects on alienation and personal control on 17 at-risk adolescents utilising a rock climbing programme. The aim of this investigation was to examine if rock climbing had an effect on sense of alienation and sense of control over the participant’s lives, and compared the results to at-risk peers who did not complete the
programme. Data collection was completed using the Dean Alienation Scale and Connells’ Multidimensional Measure of Children’s Perceptions of Control. The results of this study showed that the experimental group was less alienated then the control group and showed a stronger sense of control. The limitations of this study were the small sample size.

Larson (2007) measured self-concept during a five –day adventure camping programme for adolescent students $N = 61$, aged 9-17 years old with behavioural problems. The data measurement used was the Piers-Harris Children’s Self-Concept Scale, both at the pre-test and post-test given before and after the five day programme. The study’s results showed a significant difference in scores in the treatment group, additionally the results showed more progress being made by the younger adolescents of the research sample. This study included a meta-analysis of other studies that lend evidence to the importance of challenge/initiative adventure-based counselling when working with adolescents in order to get more favourable results.

Bloemhoff (2006) investigated the effects of three high elements ropes course (treatment group) on resiliency in adolescent at-risk boys. A pre and post-test was given in the form of a questionnaire. The results showed a significant difference between the scores which were correlated. The programme allowed the participants to work together which increased self-esteem, enhanced moral development and increased their ability to maintain complex social relations which all directly relate to resilience.

Autry (2001) utilised high and low ropes initiatives, and a four day backpacking trip with at-risk female participants $N = 9$, who were aged 13-18 years. The purpose of this interpretive study was to explore the feelings, attitudes and perceptions of girls at-risk following their participation in outdoor experiential activities in the context of adventure therapy. The girls resided in a same–gender outdoor-based psychiatric rehabilitation facility. The girls were asked a series of specific questions in an in-depth interview before and after the activities and the four day trip. The results of this qualitative study showed that the participant interviews produced four major themes showed that the adventurous activities brought about trust awareness, sense of empowerment, teamwork, and recognition.
of personal values at the end of the four day course. The practical and theoretical implications included concepts of surrounding issues of empowerment and constructivism. The limitation of these studies outcomes was that there was a noted inability to take those values back to everyday life, and the small sample size.

The positive outcomes of the outdoor and adventure programmes for at-risk adolescents are that the programmes 1) show measurable gains in many of the exact behaviours that define many youth at risk, 2) the programmes have shown to be valuable tools in helping reduce recidivism rates of at-risk youth who have committed crimes, and 3) helping at-risk youth with drug rehabilitation. The limitations of these programmes the gains appear to be more practical in nature, showing few statistically significant gains (which may be due to the small sample sizes). There is only a small amount of research that pinpoints exact practices that are effective in impacting positive change in at-risk youth, and only a small amount of research is available that show impact of long-term programming and support of at-risk youth.

The benefits of OE for adolescents continue to be researched by various authors over the years, with some of the results considered to be anecdotal. In recent years the following benefits have been concluded: 1) Increased ability to overcome challenges (Davidson, 2001), 2) Increased personality dimensions such as assertiveness, emotional stability, achievement motivation, internal locus of control, reductions in aggression and neurosis (Hattie, et al., 1997; Davidson, 2001), 3) Increased self-concept, self-efficacy and self-understanding (Hattie et al., 1997; Davidson, 2001). Critical views of OE such as those by Loynes (1998) suggested that OE is increasingly an entertainment park consumption experience. The implicit message is that it is of no benefit. These dialogues indicate a need for those working in OE to examine assumptions to ensure that their work is educational.
The scope of outdoor education

Introduction

This section of chapter three examines definitions of the types of outdoor programmes. Outdoor education is considered as a cultural phenomenon, with personal and social development as the major purpose. Other goals relate to physical, recreational, educational, therapeutic, and environmental outcomes (Neill, 2008).

Definitions

The term outdoor education has been used quite broadly to refer to a range of organised activities which take place in predominately outdoor environments for a variety of purposes. Outdoor education is a broad umbrella term and has various definitions and explanations presented (Hirsh, 1999). Gray (1997) stated that four terms tend to be used interchangeably within the literature. These include: 1) outdoor adventure, 2) Wilderness experience, 3) experiential education and 4) outdoor education.

Priest (1990) provided a different definition and an insight into the complex nature of OE, when he stated that:

It is a place (natural environment), a subject (ecological processes), and a reason (resource stewardship) for learning. It has been called a method (experiential), a process (sensory), and a topic (relationships) of learning. But the learning may occur indoors (trip preparation) and be concerned with more than just ecology (human interactions) (Priest, 1990, p.113).

Priest (1990) indicated that environmental education was also a type of OE with its own distinct objectives: awareness of ecosystem relationships and ekistics relationships, which refer to the key interactions between human society and the natural resources of the environment.
Priest (1986) theorised that adventure education is concerned with both interpersonal and intrapersonal human relationships. Interpersonal relationships refer to those human relationships which are evident between two (or more) people, examples being co-operation, conflict resolution, trust, interdependence, and communication. The intrapersonal relationship refers to how the individual relates to themselves as a person, examples of this construct being SE, self-concept, autonomy, and self-confidence.

Metaphors are utilised in some outdoor education and adventure education programmes, in intrapersonal relationships with an aim to increase SE. Figure 3.2 shows how an ESOESP participant utilised a metaphor whilst caving in this study. The metaphor used by the students was designed by one of the outdoor instructors at Glengarry.

![Figure 3.2 A structured metaphor “inch by inch, life’s a cinch” being practically applied by an ESOESP participant.](image)

Structured metaphors can be used in OE, and are more effective if they have a practical application. Figure 3.2 shows a participant utilising a metaphor designed to be used to assist in the completion of the caving ESOESP experience, inch by inch, life’s a cinch. Structured metaphor transfer uses the adventure experience to purposefully frame the adventure experience prior to participation, and it is “often through a briefing that strengthens the metaphoric message” (Priest & Gass, 1997, p.210). The structured
metaphor is an OE theoretical concept given a practical application which was used to help the thesis participant get through the caving experience.

Theoretically there have been many conceptual models proposed to explain the OE paradigm. From an evolutionary historical perspective, Priest (1990, p.113) stated that historically, two branches of OE have been identified: environmental education and adventure education. Truly functional OE incorporates aspects of both approaches. This trend has been illustrated as a tree metaphor by Priest (1986). In Priest’s illustration the environmental education has two distinct strands: 1) an ecosystemic; and 2) an ekistic strand. The ecosystemic strand is concerned with “the interdependence of living organisms in an ecological microclimate” (Miles & Priest, 1990, p.113); the ekistic strand refers to “key interactions between human society and the natural resources of an environment” (Miles & Priest, 1990, p.113).

Researchers believe that OE is an umbrella term with many sub-categories such as adventure, and environment education (Hirsch, 1999). Priest (1999) defined OE as “an experiential method of learning with the use of all senses … take(ing) place primarily, but not exclusively through exposure to the natural environment … the emphasis for the subject learning is placed on relationships concerning people and natural resources” (p.111). This can be seen in the practical form in Figure 3.2 where the participant is caving.

Outdoor Education has been considered to be a method of guided learning through meaningful experience (Davidson, 2001), and an educational experience “which impels participants into challenging and demanding situations requiring effort, determination, co-operation and self-reliance” (Hattie, Marsh, Neill & Richards, 1997, p.45). Additionally, PA is a human behaviour, OE and in particular a PA programme conducted during an ESOESP may be beneficial because OE programmes operate outside the limitations that govern traditional and formal teaching as well as learning in schools.
Introduction to adventure education

Adventure Education (AE) has included the following philosophy that every adventure experience, lesson, or activity should include three components (Prouty, Panicucci, & Collinson, 2007): 1) Briefing of the experience (framing or introduction), 2) Doing the experience and 3) Debriefing the experience (reflection). A metaphor which illustrates that AE instructors utilise to incorporate the three components is shown in Figure 3.3, the adventure wave.

Priest (1990) argued that AE is about students having the opportunity to experience change by direct and purposeful exposure to Challenge, High Adventure and New Growth Experiences. Creating the acronym CHANGE, Priest (1990) emphasised the important role of environmental education in AE. Hopkins (1985) suggested the following characteristics for AE programmes, which are similar to those for OE: 1) Importance of experiential learning with high impact, problem solving, real experiences, 2) Assessing the needs of participants physically, culturally and socially. 3) Tailor made programmes with an instructor who has understanding of the group’s background, 4) High expectations and focus on individual achievement, 5) Empathetic climate, tolerance sensitivity, leadership and responsibility, 6) The culture of the centre has a profound impact on student outcomes, 7) The power of the group process; social skills, co-operation and effective communication, 8) Environmental awareness; sensory, aesthetic, and creative appreciation, and 9) Regarding adventure as a metaphor for life; reflecting on one’s own learning.

Figure 3.3  The adventure wave (Prouty, et al., 2007, p.44).
When change is a desired outcome both during and after an adventure experience the outdoor education facilitator would need to consider both the development and planning of an appropriate outdoor programme that might enable success for the participant and the potential transference of the outdoor experience. Nadler (1992) summarised this process as follows in figure 3.4.

The Client

experiences a state of

Disequilibrium

by being in a

Novel setting

and

A Cooperative Environment

whilst being presented with

Unique Problem solving situations

that lead to

Feelings of accomplishment

which are augmented by

Processing the experience

which promotes

Generalisation and transfer

To future endeavour

Figure 3.4 The change process (Cited in Gray, 1997) Gass, 1993 p. 60

Under certain conditions, adventure activities result in personal and social development (Richards, 1997). Hopkins and Putnam (1993) defined adventure as “an experience that involves uncertainty of outcome” (p.6) where “adventure liberates as it
disciplines; because of the holistic nature of the experience there is personal growth” (p.227). Hopkins and Putnam (1993) also defined education as “a process of intellectual, moral and social growth that involves the acquisition of knowledge, skills and growth” (p.6).

Wurdinger (1994) identified that AE is not always based on experiential education, as adventure educators use traditional approaches to teach outdoor skills. This is an effective educational pedagogy, as participants must know certain information (AE & OE safety and specific procedures) and can then apply these skills to further aspects of life.

The definitions provided for AE appear to be very similar to that of OE, both including environmental education as part of the objectives (Priest, 1988, 1990; Zook, 1986). In addition throughout the literature the words outdoor, adventure, experiential and environmental are often used interchangeably and paired with the words “education or programme” (Priest, 1988). This suggests that the boundaries of each field of study are unclear.

**Experiential Education**

The Association for Experiential Education states that there are twelve principles of Experiential education (EE), 1) EE learning occurs when carefully chosen experiences are supported by reflection, critical analysis, and synthesis, 2) experiences are structured to require the learner to take initiative, make decisions, and be accountable for the results, 3) throughout the experiential learning process, the learner is actively engaged in posing questions, investigating, experimenting, being curious, solving problems, 4) learners are engaged intellectually, emotionally, and physically, 5) the results of learning are personal form the basis for future experience and learning, 6) relationships are developed and nurtured, 7) the educator and learner may experience success, failure, adventure, risk-taking, and uncertainty, 8) opportunities are nurtured for learners and educators to and examine their own values, 9) the educator’s primary roles include setting suitable experiences, posing problems, 10) the educator recognises and encourages spontaneous
for learning, 11) educators strive to be aware of their biases, judgements, and pre-conceptions, 12) the design of the learning experience includes the possibility to learn from natural consequences, mistakes and success.

The Association for Experiential Education (AEE) (2005, p.1) defines experiential education as:

“Experiential education is a philosophy and methodologies in which educators purposely engage with learners in direct experience and focused reflection in order to increase knowledge, develop skills, and clarify values”.

Figure 3.5 David Kolb’s experiential cycle, and the common questions often used in debriefing experiences (Kolb, 1984)

Galagan (1987) defined experiential education and learning as “to learn by doing” (p.40). This previously commonly-used definition was also intertwined with the statement that “experiential education differs from traditional education in that the student learns material by actually practicing it instead of simply talking or reading about it; (Bacon, 1983, p.1). In every definition of EE there is an experiential cycle involved as shown in
Figure 3.6, and every EE experience engages the students through direct participation in an activity (Bunting, 2006).

David Kolb’s 1984 experiential learning cycle has four distinct phases (as shown in Figure 3.6): 1) Concrete experience; 2) Reflective observation (What?); 3) Abstract conceptualisation (so what?); 4) Active experimentation (now what?). Integral to the cycle is the debriefing that includes the most commonly-asked questions (What; so what; now what?) by OE and AE teachers. These questions assist OE and AE teachers to incorporate all four phases into an effective experience (Prouty, et al., 2007). Boud (1989) theorised that the participant’s experience was a theoretical three-dimensional model which may be used to measure the extent to which an educational programme may be considered experiential (Figure 3.6).

Boud’s three-dimensional model theorises that significant characteristics of any of the three dimensions (degree of learner control; degree of self [learner involvement]; degree of correspondence of the learning environment to the real environment) would legitimise the programme as being called experiential (Boud, 1989).

The environment provides the context for challenges leading to the opportunity for personal learning and growth (AE), with learning about the environment as a specific aim in itself (environmental education) (Hopkins & Putnam, 1993; Priest, 1990). Palmer (1998)
argued that OE and AE should aim to provide experiences that encourage enjoyment, appreciation, understanding, and awareness of the environment. In agreement with Palmer (1998), it may be these factors that encourage higher levels of adolescent PA.

There are a number of other terms that are commonly associated with OE. Outdoor adventure was used by Hunt (1989) and Barrett and Greenaway (1995) to describe the ingredients, challenging opportunities and activities that are used to contribute to young people’s personal and social development (Gair, 1997). This term may be considered to be misleading as the education component is missing, and is more commonly associated with outdoor recreation or outdoor pursuits (Priest, 1990). Outdoor recreation covers any activity done outdoors, with a subset being outdoor pursuits, which describe the individual activities (Priest, 1990). The terms AE and Outward Bound (OB) are often used synonymously, meaning the approach, principles, or the experience (Hopkins & Putnam, 1993). Stetson (1997) believed that this was due to OB being “the oldest adventure based educational organisation in continuous operation in the world” (p.9). Hopkins and Putnam (1993) indicated that the term adventure-based experiential education is commonly used in the marketing of experiential activities.

Throughout the literature the terms outdoor adventure (Barrett & Greenaway, 1995; Hunt, 1989), and OE (Priest, 1990), have been defined with similar characteristics and continue to be used interchangeably, particularly in relation to discussion of OB. Adventure therapy and the synonymous terms of adventure-based counselling (Schoel, Prouty & Radcliffe, 1988), adventure-based therapy, or wilderness therapy, have also derived from the fields of experiential and OE and in particular OB (Gass, 1993). Adventure therapy aims to enhance established practices used such as rehabilitation, prevention or therapeutic treatment (Gass, 1993).

The OE environment in which the participant’s adventure experiences were conducted was designed to make use of Maslow’s notion of peak experience (Kiewa, 1992). The adventure peak experiences are characterised by the notion of a merging of action and participant awareness, which is facilitated by their OE teachers to gain a balance
between the levels of challenge the environment poses and the level of competence of the participant, this is diagrammatically represented in Figure 3.7. This is referred to in psychology as optimum arousal; it is the area in OE where the OE risk and participant competence ratio coincides with peak adventure.

Figure 3.7 The adventure experience paradigm (Martin & Priest, 1986, p.38)

The adventure experience paradigm (Martin & Priest, 1986) shown in Figure 3.7 is an integral part of the planning and experience in adventure education, environmental education and OE. In a practical form this was observed where the participants were kayaking on a river. The kayaking experience provided the participants with a challenging task, with an element of risk and competence required to achieve adventure rather than misadventure. The boys at the ESOESP Glengarry campus were given the opportunity to be challenged with a different problem-solving experience, and in a different environment for example rock climbing. The rock climbing (and subsequent abseiling) adventure activities required different physical and psychological skills to the kayaking experience. The kayaking was a water-based activity, where the participants’ misadventure could be very serious (due to lack of competence/judgement); the rock climbing was a land-based adventure activity which also needed a degree of competence and judgement but the level of risk was different (due to the safety equipment, and being land-based). To evaluate the effectiveness of the ESOESP physical activities an independent validation could be
completed, and example being the student responses and the OE instructors observations. Qualitatively this was beyond the scope of the thesis, but the students, some of their parents, and the OE instructors did portray their responses in a video.

Chapter Three summary

The majority of PA intervention studies have been in primary school settings, which provide a further rationale to conduct PA research in high school environments. School-based PA interventions have been less successful in producing significant changes in long-term adolescent PA behaviours. It would appear that multi-component PA interventions are the most successful in changing PA behaviours in adolescents. Adolescent physical activities can be promoted through a variety of ways in various school settings and environments; the gap in the PA literature provides an opportunity for this thesis to investigate PA programme outcomes at an ESOESP campus in comparison to a traditional PE campus PA.

OE like physical activity is multifaceted in its philosophies and methodologies. Both have the hypothetical potential for improvements in physical and psychological health. OE has important elements of physical skills and psychological growth through the use of metaphors, facilitation, experiential education, and adventure experiences in an outdoor environment. The opportunities for the improvement of both the individual and the OE group in relation to Year 9 adolescent male health-related fitness (HRF) and SE is examined in this thesis.

Introduction to chapter four

Chapter four provides the methodology and results for the pilot study that was a case study conducted at the ESOESP Glengarry campus in semester one and two, 2002, where pre and post-test HRF tests were administered. This chapter describes the HRF tests and their evaluation in preparation for the main study (chapter five). Chapter four also
describes the results of the case study, in relation to the research hypotheses and research questions.
CHAPTER FOUR

THE EXTENDED STAY OUTDOOR EDUCATION

SCHOOL PROGRAMME HEALTH-RELATED FITNESS

FEASIBILITY STUDY

Introduction

Chapters two and three provided the relevant background literature for this study. Chapter two introduced the literature about adolescent physical activity levels, and chapter three presented the literature about physical activity (PA) interventions for adolescents. Additionally, chapter three provided information about two different education methodologies, outdoor education (OE) and physical education (PE).

The aim of the OE and PE RCT study was to investigate the effects of two different 18-week PA programmes, an OE, and a PE. The effects of the two PA programmes upon Year 9 males’ health-related fitness (HRF) and self-esteem (SE) were measured. Prior to conducting the OE and PE RCT study in 2003, an ESOESP health-related fitness feasibility study was conducted in 2002. Chapter four will introduce the research methods used in the ESOESP HRF feasibility study to investigate the effects of the OE physical activity programme on the HRF of Year 9 males. Specifically, this chapter:

- Introduces the ESOESP HRF feasibility study participants
- Introduces the ESOESP HRF feasibility study research design
- States the names of the ESOESP HRF feasibility study research instrumentation
- Identifies the order of the HRF tests used in the feasibility study
- Portrays the OE feasibility study PA programme
- Displays the results of the ESOESP HRF feasibility study
ESOESP HRF feasibility study participants

The research participants were Year 9 boys ($N = 69$), age 13.0-14.0 years, recruited from one independent Sydney boys school, The Scots College in the Eastern suburbs of Sydney. The Scots College has a unique extended stay outdoor education school programme (ESOESP) conducted at their Glengarry campus on the south coast of New South Wales, Australia. The ESOESP was of sufficient length (two consecutive school terms) to have a possible physiological effect on the case study participants HRF. The study and selection of the participants was approved by the University of Wollongong Human Research Ethics Committee. All the participants’ parents/guardians were provided with an informed consent form (Appendix A1 - A4). The informed consent form was written in accordance with language and comprehension level guidelines of Oliver and Oliver, (2001).

Participants were fully informed of the risks, procedures, and potential benefits, and that they were free to end their participation in the pilot study with no penalty whatsoever (Zelaznik, 1993). They were to be given opportunities to freely ask relevant questions throughout the duration of the study, and that they were able to withdraw from the procedures at any time.

The informed consent form followed the following guidelines to provide: 1) an explanation of the purpose of the feasibility study, to investigate the effects of the 18-week OE physical activity programme on the participants HRF results, 2) a description of the research procedures that involved the feasibility study participants, 3) The participant’s time commitment of 2 hours required for both the pre and post HRF tests, 4) identification of any potential risks and or discomforts from the HRF tests that can be reasonably foreseen, 5) describe the arrangements for the participant’s treatment in the case of injury in the HRF tests, which included the available treatment from the on-site school nurse, 6) describe the individual participant potential benefits from the feasibility study HRF testing procedures, which may include an awareness of the HRF benefits from the OE physical activities, 7) statements regarding the participant’s confidentiality, anonymity and privacy, 8) the identification of an appropriate individual whom the pilot study can approach regarding any relevant questions about the feasibility study, and 9) a statement that the ESOESP HRF feasibility study
participation is voluntary, that consent has been freely obtained, and that the participants may withdraw at any time without fear of sanction.

**ESOESP HRF feasibility study research design**

A case study research design (Hyllegard, et al., 1996) was employed to answer the ESOESP HRF feasibility study research questions and hypotheses. The Scots College Year 9 boys have been randomly assigned to either Glengarry ESOESP or to stay at the main school since 1988 for either terms one and two (summer cohort) or terms three and four (winter cohort). This enabled the 2002 Year 9 adolescent males ($N = 69$) to be ethically randomly assigned to participate in the OE physical activities programme for the January to June Glengarry ESOESP in 2002. The boys who did not attend the January to June 2002 Glengarry ESOESP, attended the July to November Glengarry ESOESP. The remaining Year 9 cohort, who did not participate in the ESOESP HRF study at Glengarry, completed the normal Year 9 curriculum at the school’s main campus in Sydney.

The participants completed an 18-week OE physical activities programme as part of their Year 9 semester one and two academic programme. Prior to starting the ESOESP the participants’ parents/guardian completed a modified pre-participation fitness questionnaire (Kibler, 1990), (Appendix A1 – A4). The modified pre-participation fitness questionnaire consisted of questions relating to the participants musculoskeletal, family medical and personal medical information. The aim of the questionnaire was to delineate negative information that may prohibit participation in the HRF tests, and to delineate positive information to decrease participant injury risk in the HRF tests. In week 1 the ESOESP HRF study cohort completed the following HRF pre-tests: resting blood pressure measurement (mmHg); body composition: height (cm), weight (kg), body mass index (BMI) a ratio of weight (kg) to height (cm), BMI z-scores; waist and hip circumferences (cm); muscular endurance; sit-ups (n60s-1), push-ups (n60s-1); muscular strength: handgrip dynamometer (kg) left and right hands, back and leg dynamometer (kg); cardiorespiratory endurance: lung capacity (c.c.), multistage fitness test (predicted VO$_2$ ml.kg.min$^{-1}$); flexibility: bend/ twist/ touch (n20s-1). After completing 18 weeks of the OE physical activity programme, the participants completed a HRF post-test. Figure 4.1 portrays the ESOESP HRF feasibility study research model.
The research design had to encompass the criteria that the HRF pre and post-tests could be collected with minimal disruption to the ESOESP. After completion of the feasibility study data collection the HRF pre and post-tests, the feasibility study was evaluated in relation to the time taken for the data collection, and the participants’ responses to the HRF tests.

**ESOESP HRF feasibility study research questions**

The following five research questions were tested:

1. Does an ESOESP HRF feasibility study group’s 18-week OE physical activities programme make a significant positive difference in Year 9 males’ HRF body composition results?
2. Does an ESOESP HRF feasibility study group’s 18-week OE physical activities programme make a significant positive difference in Year 9 males’ HRF muscular endurance results?
3. Does an ESOESP HRF feasibility study group’s 18-week OE physical activities programme make a significant positive difference in Year 9 males’ HRF muscular strength results?
4. Does an ESOESP HRF feasibility study group’s 18-week OE physical activities programme make a significant positive difference in Year 9 males’ HRF cardiorespiratory endurance results?
5. Does an ESOESP HRF feasibility study group’s 18-week OE physical activities programme make a significant positive difference in Year 9 males’ HRF flexibility results?
ESOESP HRF feasibility study research hypotheses

The following five research hypotheses were tested:

1. There will be significant positive changes in HRF body composition results as the result of completion of the 18-week outdoor education ESOESP physical activities programme.
2. There will be significant positive changes in HRF muscular endurance results as the result of completion of the 18-week outdoor education ESOESP physical activities programme.
3. There will be significant positive changes in HRF muscular strength results as the result of completion of the 18-week outdoor education ESOESP physical activities programme.
4. There will be significant positive changes in HRF cardiorespiratory results as the result of completion of the 18-week outdoor education ESOESP physical activities programme.
5. There will be significant positive changes in HRF flexibility results as the result of completion of the 18-week outdoor education ESOESP physical activities programme.

ESOESP HRF feasibility study research instrumentation

The ESOESP HRF feasibility study used two questionnaires that had to be completed by all participants’ parents/guardians:

2. HRF tests results sheet. (Appendix C1 – C2): researcher and participants.
Prior to participation in the feasibility study, the participant’s parents/guardian was required to complete a modified version of Kibler (1990) Preliminary Health Screening and Pre-participation Fitness Examination Questionnaire on behalf of their child. This questionnaire consisted of three specific sections to assist in predetermining the health of their child in readiness for his participation in the HRF tests: 1) Orthopedic history, 2) Family medical history, and 3) Personal medical history.

The exercise science literature indicates that preliminary health-screening of participants prior to commencing physiological function tests may have many benefits. Primarily it has been recommended as a means to identify those individuals at risk for exercise-related cardiac conditions. However, the risk of cardiovascular complications during exercise is considered to be low (Albert, Mittleman, Chae, Lee, Hennekens & Manson, 2000). While screening will not prevent all such events from occurring, it will help identify those at greatest risk.

In addition, preliminary health screening is an aid to the future design and prescription of exercise intensity, and can also provide strong academic arguments for adherence in those individuals in the highest need of PA. The goals of health screening and pre-participation fitness examinations are stated by Kibler, (1990) as being to: 1) Provide an objective sport-specific musculoskeletal profile of athletic fitness, 2) Delineate negative information that prohibits, modifies, or delays participation, 3) Delineate positive information to decrease injury risk and increase performance, and 4) Provide a reproducible record for subsequent tests (if required).

**ESOESP HRF feasibility study health-related fitness tests**

The American College of Sports Medicine (ACSM) (2000; 2005) guidelines for exercise testing, recommended completing fitness tests in a particular sequence, to minimise the effects of tests on one another (Heyward, 1998). The participants completed the following pre and post-HRF tests after a HRF testing information session conducted by the researcher: 1) Resting blood pressure, 2) Body composition (Body...
Mass Index, waist circumference, hip circumference), 3) Muscular fitness (sit-ups; press-ups), 4) Muscular strength (handgrip strength; leg lift strength), 5) Cardiorespiratory fitness (lung function test, multistage fitness test), 6) Flexibility (Bend/twist/touch test). The total HRF testing time per group was two hours, each HRF section was allocated 20-25 minutes for completion.

**Resting blood pressure**

The researcher demonstrated how the resting blood pressure components were to be measured. Each participant was measured at the end of the Glengarry gymnasium behind a screen to ensure privacy. All participants followed the same protocol. The research protocols as described below:

The participant was rested and comfortably seated, with the sports shirt left arm sleeve raised. The participants arm was raised at the level of the heart, with the cuff wrapped firmly around the subject’s arm with the centre of the cuff in line with the middle anterior surface of the elbow crease, and 3-4 cm above the elbow crease.

The radial pulse was located and monitored; the cuff was then inflated at approximately 10mm Hg per second, until the radial pulse could no longer be detected. The diaphragm of the stethoscope (ausculatory method) was placed over the brachial pulse site. The cuff was rapidly inflated to 20 to 30 mm Hg above the previous radial pulse pressure and then the cuff was slowly deflated at a rate of 2 to 3 mm Hg each second. At the detection point of a sharp tapping sound (Korotkoff phase 1 sound) the reading was noted (systolic blood pressure). The cuff was continued to be deflated at a rate of 2 to 3 mm Hg each pulse beat, noting the change in Korotkoff sounds, until the disappearance of the sounds (diastolic blood pressure).

**Body Composition**

The methods that were used in the measurement of the research participants’ body mass index (BMI) and waist circumferences were the same as those used in the main study. The ESOESP HRF study utilised a hip circumference measurement, described as follows:
The participants were instructed by the researcher on the methodology used for anthropometric waist and hip measurements. All participants were measured using the same protocol. The hip measurement aim was to measure the circumference of the hip area, as a measure of underlying hip structure, musculature and adipose tissue. When combined with the measure of waist measurement in the waist-to-hip-ratio has been shown to be correlated to coronary heart disease (Welborn, Satvinder, Dhaliwal & Stanley, 2003). The hip girth measurement was taken over the participants shorts, at the level of the widest point around the greater trochanter. The participant was instructed to stand erect with his weight evenly distributed on both feet. The measuring tape was lying flat and horizontal. The hip measurement was recorded by the researcher. The waist measurement was taken at the level of the narrowest point between the lower costal (rib) border and the iliac crest (Norton & Olds, 1996). Where no obvious waist narrowing was present, the waist measurement was taken between the mid-point between the iliac crest and the 10th rib (Brooks, et. al., 1996). The waist measurement was recorded by the researcher.

Muscular endurance

Muscular endurance is an important component of HRF. The growing bodies of adolescents need to be engaged in challenging strenuous activities to ensure the healthy development of their muscular and skeletal systems (Schell & Leelarthaepin, 1994). Both muscular endurance tests were demonstrated by the researcher prior to commencement of the research participant’s tests.

Bent-Knee Sit-up (n60s-1)

All the participants were tested in the Glengarry gymnasium in pairs. This allowed the participants to have their sit-ups (n60s-1) counted by two people (for reliability scoring), and to provide encouragement and motivation. The bent knee sit-up was demonstrated by the researcher prior to commencement of the test. All participants completed the same protocol. The participants were instructed to: lie down on a blue gymnastic blue floor mat on their backs, and to place their arms across their chest, with their knees bent, and the soles of their feet on the mat (the participants had their sports shoes on); raise their torsos to 45 degrees; and to lower their torso back to the gymnastic
mat without holding their breath (as this can raise their systolic blood pressure). The participants continued each sit-up for a maximal effort for 60 seconds after the command to start, and stopped after 60 seconds. The researcher used the same Seiko 8023-5000 stopwatch for validity and reliability of the tests. The number of completed sit-ups in 60 seconds was recorded by the researcher.

*Press-up (n60s-1)*

The press-up was demonstrated by the researchers prior to the commencement of the participants’ tests. The following protocol was used by all participants. The participants were instructed to: Lie on the blue gymnastic floor mat in the prone press-up position; raise their bodies, with their backs straight, and in line with their extended legs, arms fully extended; and to lower their torsos (keeping their backs straight and in line with their legs) until their chins almost touched the gymnastic floor mat. The participants were to fully extend their arms pushing their body back to the start position, and to repeat this method of push-ups for 60 seconds after the command to start was given by the researchers, and to cease the push-ups on the command to stop by the researcher. The number of completed push-ups in 60 seconds was recorded by the researcher on the recording sheets. The researcher used the same Seiko 8023-5000 stopwatch for all of the Sit-up tests for validity and reliability of the scores.

**Muscular strength**

Muscular strength is the ability to carry out work against a resistance. The maximum force depends upon the size and number of muscles involved, the proportion of muscle fibres called into action, the co-ordination of the muscle groups, the physical condition of the muscles, and the mechanical advantage of the levers involved. Maximum strength can be defined as the ‘maximum force or torque a muscle or group of muscles can generate at a specified determined velocity’ (Komi, Suominen, Keikkinen, Karlsson, & Tesch, 1992). Therefore there is no single test for strength, each being specific to the action and the muscles being tested.

Test results regarding a participant’s strength may be used to monitor longitudinal adaptations to training and injury rehabilitation, and to determine single
limb or inter-limb strength inadequacies and imbalances (Blazevich & Cannavan, 2007). In this research project the test results were used to measure the effect of the OE physical activity programme. The muscular strength protocols for the handgrip strength measurement were the same as the main study. The leg lift strength test used in the ESOESP HRF feasibility study is described as follows:

**Leg lift strength using a back and leg strength dynamometer**

The leg lift strength test was demonstrated by the researcher, prior to commencement of the subject’s leg lift strength tests. The same test protocol was used for all the participants as follows:

The participant was instructed to hold the back and leg lift dynamometer bar with both hands together in the centre, both palms down, so that they rested at the junction of the subject’s thighs and trunk. The participants were instructed to take care in maintaining this position during the lift.

The boys were then instructed to have their feet in position on the base of the dynamometer. Their knees were to be slightly bent. Maximum lift occurs when the participant’s legs are nearly straight at the end of the lifting effort. Before the participant was instructed to lift, the researcher ensured that their arms and back were straight, their head was erect, and chest was up. The best of three trials was recorded.

**Cardiorespiratory Fitness**

**Lung Function test**

Lung function tests have been utilised as an aid in evaluating pulmonary function in patients with lung diseases (e.g. asthma, or exercise-induced bronchospasm), and gaining insight into normal cardiorespiratory function in healthy subjects (Leelarthaepin, 1992). The objectives for conducting lung function measurements stated by Schell & Leelarthaepin (1992) are:
1. To determine a participant’s current lung function status while in a state of good health.
2. To assess the degree of change in lung function status. For example, a decrease of 20% in a lung function measurement requires further investigation.
3. To assess the effects of exercise on lung function. For example some people suffer from exercise-induced bronchospasms.
4. To determine the effects of a person’s living and/or working environment on their lung function. Comparison of results with previously-measured normal lung function results would indicate the degree of change in function.

The researcher demonstrated the lung function test using a portable dry spirometer, including the disposable hygienic method for the spirometer replaceable mouthpiece. The protocols used in the ESOESP HRF feasibility study were the same as the OE and PE RCT study.

**Multistage Fitness Test**

The multistage fitness test (MFT) is a progressive shuttle run test for the prediction of maximum oxygen uptake (Brewer, Ramsbottom & Williams 1988a). For test validity and reliability the test was conducted in the ESOESP gymnasium using the following protocols:

1. The tests were conducted in the ESOESP Glengarry gymnasium.
2. The 20-metre distance was accurately measured by the researcher, using a Hengstler trundle wheel.
3. The 900mm mega yellow witches hats were used as the 20-metre distance markers.
4. A Sony CFO-S100 CD radio cassette was used.
5. The CD player was mounted on a table, with a rubber base placed underneath the CD player to prevent MFT-CD slippage (caused by gymnasium spring-loaded floors).
6. The tests were conducted at the same time of day in the pre and post-tests.
7. The participants were given oral instructions and physical demonstration by the researcher.
8. The participants completed a specific dynamic warm-up for the test, using the 20 metre shuttle distance and 900mm mega yellow witches hats.

9. The temperature in the gymnasium was recorded.

10. The participants were advised not to eat too large a meal 2 hours prior to the test.

11. The participants were instructed that they would have to wear their sports shoes, and sports socks (to minimise ground reaction force and reduce the risk of injury).

12. The participants were informed prior to the test not to complete any heavy sports training sessions on the day prior to the test.

13. The participants were informed to bring with them a 0.5 litre bottle of water to drink after the test to replace any fluids lost (and to reinforce their OE theory lessons about hydration).

14. Approximately 1 metre of width per participant being tested was allowed for adequate spacing during the MFT.

15. The participants were advised to be well hydrated (with water) prior to the test.

16. All participants were to complete one MFT only (pre-test) and one MFT (post-test).

The participants were instructed to run back and forth between the two marked lines 20 metres apart, within the designated time limit (stated by bleeps on the MFT-CD). The running speed increased on the MFT-CD by 0.5 km/hr-1 each minute. The participants were instructed to run back and forth (i.e. shuttle run) between the 20 metre marked lines, keeping in time with a series of signals (and hence running speed) until participants reached volitional exhaustion (Gabbett, Kelly & Pezet, 2008).

**Flexibility**

Flexibility has been defined as the ‘intrinsic property of the body tissues, which determines the range of motion achievable without injury at a joint or group of joints’ (Holt, Holt & Pelham, 1996). Flexibility is the capacity of a joint to move through its full range of motion. There is no single test that gives you a score for overall flexibility. Each test is specific to a particular movement or joint.
Bend, twist and touch flexibility test

The flexibility test was conducted after the MFT to reduce the risk of hamstring or lower back injuries to the participants. The researcher demonstrated the bend, twist and touch test procedure to the ESOESP HRF feasibility study dormitory groups in the ESOESP gymnasium. The pilot study participants were instructed to stand with their back approximately .5 metre to the vertical gymnasium wall, feet at shoulder-width apart. Their spines were aligned with the marker tapes placed on the gymnasium wall. From a standing position, the participants bent their knees to enable them to touch the floor with both hands, then return to the standing position turning to the right to touch the wall with both hands, one hand on either side of the marker tape. The boys turned and bent their knees to touch the floor again, then straightened to the vertical position again to turn to the left side and touch the wall with both hands, one hand on either side of the marker tape. They then repeated the procedure as many times as possible in twenty seconds.

Before testing, two trials were allowed as practice. The participant stood in the vertical upright position; the stopwatch was started when the floor was touched by the participant’s hands for the first time. The score count is one for each time the participant’s hands touched the gymnasium wall. No score was counted if the turning is not executed properly and/or the hands do not touch the wall. The number of times the participant touched the wall were taken as the score for dynamic flexibility.

Procedures for the ESOESP health-related fitness testing

Table 4.1 portrays the ESOESP HRF feasibility study timetable for HRF pre and post-tests. The table shows the question times for the ESOESP boys to ask questions about the study, or to inform the researcher of their injuries, ill-health or whether they wanted to withdraw from the pilot study. Additionally Table 4.1 shows the ESOESP dormitory order and time for the HRF testing. Figure 4.2 shows the feasibility study HRF station locations and the order of the HRF tests. Table 4.2 lists the feasibility study equipment used for the HRF testing, and the auxiliary equipment brought by the researcher to ensure that efficient first aid could be given immediately by the researcher if needed, and pens for the participants if they forgot to bring them to the gymnasium.
Table 4.1 ESOESP HRF feasibility Study (2002) Timetable for the pre-test and post-test HRF tests at the ESOESP campus

<table>
<thead>
<tr>
<th>TIME</th>
<th>ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.00am</td>
<td>Arrive Glengarry, meet OE staff, and collect gymnasium keys.</td>
</tr>
<tr>
<td>7.15-7.30</td>
<td>Meet ESOESP boys in dining hall (breakfast). Remind them to bring pen(s) to complete their HRF result sheets; to wear sports uniform and sports shoes; and to bring asthma and other medication(s) if required.</td>
</tr>
<tr>
<td>7.30-8.15</td>
<td>Prepare HRF test stations in the gymnasium (figure 4.2) Nos 1-5 (inclusive); prepare location of HRF questionnaires. (Result sheets).</td>
</tr>
<tr>
<td>8.15-8.30</td>
<td>Question time in gymnasium for any boy who may be injured, ill or wishes to withdraw, or has any relevant questions about the pilot study.</td>
</tr>
<tr>
<td>8.30-10.30</td>
<td>Dormitory ‘A’ HRF tests in accordance with ACSM, 2005 guidelines. Collect HRF result sheets; place in sealed envelopes.</td>
</tr>
<tr>
<td>10.30-10.50</td>
<td>Morning tea for all ESOESP boys and OE staff. In dining hall. Reset HRF equipment. Prepare location of HRF questionnaires.</td>
</tr>
<tr>
<td>10.50-12.50</td>
<td>Dormitory ‘B’ HRF tests in accordance with ACSM 2005 guidelines. Collect HRF result sheets; place in sealed envelopes.</td>
</tr>
<tr>
<td>12.50-1.30 pm</td>
<td>Lunch for all ESOESP boys and OE staff. Reset HRF equipment. Prepare location of HRF questionnaires.</td>
</tr>
<tr>
<td>1.30-3.30</td>
<td>Dormitory ‘C’ HRF tests in accordance with ACSM guidelines. Collect HRF results sheets; place in sealed envelopes.</td>
</tr>
<tr>
<td>3.30-3.50</td>
<td>Afternoon tea for all ESOESP boys and OE staff. Reset HRF equipment. Prepare location of HRF questionnaires.</td>
</tr>
<tr>
<td>3.50-5.50</td>
<td>Dormitory “D” HRF tests in accordance with ACSM 2005 guidelines. Collect HRF result sheets; place in sealed envelopes.</td>
</tr>
<tr>
<td>5.50-6.00</td>
<td>Question time for any ESOESP boys and OE staff.</td>
</tr>
<tr>
<td>6.00-6.30</td>
<td>Pack up all HRF equipment and questionnaires in the sealed envelopes. Put into car.</td>
</tr>
<tr>
<td>6.30-7.00</td>
<td>Evening meal with ESOESP boys and OE staff.</td>
</tr>
<tr>
<td>7.00pm</td>
<td>ESOESP Boys and OE staffs go to chapel at the pontoon. Leave Glengarry to return to Sydney.</td>
</tr>
</tbody>
</table>
Figure 4.2 HRF Test Stations at the Glengarry Gymnasium
Table 4.2 Equipment list for the ESOESP HRF feasibility study at the ESOESP campus

<table>
<thead>
<tr>
<th>Component of HRF</th>
<th>Equipment</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body Composition</strong></td>
<td>Portable height stadiometer.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Platform medical scale.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Lufkin flexible steel anthropometric tape.</td>
<td>4</td>
</tr>
<tr>
<td><strong>Muscular Endurance</strong></td>
<td>Seiko 8023-5000 electronic stopwatch.</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Spare batteries for stopwatches.</td>
<td>10</td>
</tr>
<tr>
<td><strong>Muscular Strength</strong></td>
<td>Handgrip dynamometer.</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Back and leg dynamometer.</td>
<td>1</td>
</tr>
<tr>
<td><strong>Cardiorespiratory Fitness</strong></td>
<td>Portable dry spirometer.</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Disposable dry spirometer tubes.</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td>Small yellow bucket (tube disposal).</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Sony CFO-S100 CD Player.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Table and rubber base to place under CD player.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Multistage Fitness Test CD (Brewer, et. al 1988).</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>30m Measuring Tape.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>900mm mega yellow witches hats.</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Hengstler trundle wheel.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Stethoscope.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Sphygmomanometer.</td>
<td>2</td>
</tr>
<tr>
<td><strong>Flexibility</strong></td>
<td>Roll of masking tape (vertical line on gym wall).</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Plumb bob and string (vertical line on gym wall).</td>
<td>1</td>
</tr>
<tr>
<td><strong>Auxiliary</strong></td>
<td>First aid kit / gloves / face shield / asthma spacer.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Clip boards</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Record book (injuries).</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Pens (for ESOESP boys who forgot their pens).</td>
<td>20</td>
</tr>
</tbody>
</table>
Evaluation of the ESOESP feasibility study health-related fitness tests

After completion of the ESOESP feasibility study data collection of the HRF pre and post-tests an evaluation was made using the following protocols: a) Time taken for data collection; b) The feasibility study participant’s responses; and c) Contribution to exercise science knowledge in relation to the goals of the thesis.

The following HRF tests were evaluated and were eventually omitted from the main study. The reasons for this omission were: Resting blood pressure was time-consuming; and normotensive participants have minimal changes in resting blood pressure due to PA.

The researcher had apprehensions in recording the boy’s hip circumference. With the boys measuring their own hip measurement, the problem of validity and reliability is problematic. The hip circumference was replaced by a waist circumference measurement only. Bend/twist/touch flexibility test, there were problems of validity and reliability as the participants did not complete the test protocols consistently. The bend/twist/touch flexibility test was replaced by the sit and reach flexibility test.

The following HRF tests were considered to be the correct ones to be utilized in the OE and PE RCT study: Body composition (Height, Weight, BMI, BMI z-scores, Waist circumference); Muscular endurance (30 second sit-ups, 30 second push-ups); Muscular strength (Handgrip strength); Cardiorespiratory endurance (Lung function test, Multistage fitness test); Flexibility (Sit and reach flexibility test).

The feasibility study outdoor education physical activities programme

The ESOESP HRF feasibility study physical activity OE programme was conducted at the Glengarry ESOESP campus, as part of the ESOESP and the NSW Personal Development, Health and Physical Education (PDHPE) Stages 4 and 5 curricula. Appendix H1 –H3 portray the ESOESP HRF feasibility study orientation week at the ESOESP campus and terms 1 and 2 OE feasibility study PA programmes.
ESOESP HRF feasibility study data analysis

Statistical analysis of the data used in the feasibility study was completed using the Statistical Package for Social Science (SPSS) version fourteen software. The statistical methods used for analysis of the research questions were independent $t$-tests, ad Cohen’s $d$ effect size. The independent variables (predictor) were: the environment and the participants’ ages; the dependent variables (response) were: resting blood pressure, height, weight, waist and hip circumferences, cardiorespiratory fitness (CRF), muscular strength; muscular endurance, and flexibility.

Results from the ESOESP HRF feasibility study

Parents or guardians of the participants were required to complete a modified Sport Pre-participation Fitness Questionnaire (Kibler, 1990) about their child prior to commencement of the HRF tests. Medical contraindications were recorded prior to the pre-test HRF tests. Students who were medically contraindicated were excluded from participation in the HRF tests for ethical reasons. The ESOESP HRF feasibility study group consisted of 74 Year nine adolescent males, who were randomly assigned to participate in the OE physical activity programme at The Scots College ESOESP Glengarry campus.

Three participants were excluded as differential medical diagnosis precluded them from safe and ethical participation in specific HRF tests, and two participants were absent. The final pilot study consisted of 69 subjects who represented a calculated response rate of 93%, which is in excess of the 75% considered acceptable for education research (Gall, Gall, & Borg, 2005). Table 4.3 shows the total number of participants in the ESOESP cohort, who received the ESOESP HRF feasibility study information and consent forms, the number who were absent on the days of testing, and the number of students who participated in the feasibility study.
Table 4.3 Details of the ESOESP HRF feasibility study participant sample.

<table>
<thead>
<tr>
<th>ESOESP HRF feasibility study Research participants Information</th>
<th>Number Participated</th>
<th>Response Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distributed</td>
<td>Absent</td>
<td>Medically Contraindicated</td>
</tr>
<tr>
<td>74</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Preliminary health screening and pre-participation fitness results

Being injury-free is just as much a state of good health as being of healthy weight or not having cardiovascular disease risk factors (Finch, 2008). More than 50% of the PA health benefits are lost due to injury (Eurosafe, 2007). Research that can be adopted in practice (in the PA context) will prevent injuries (Finch & Cassell, 2006). Both the ESOESP HRF feasibility study and the OE and PE RCT study have incorporated these concepts. The following tables provide information which may impact on the HRF results. The trend in Table 4.4 indicated that the pilot study participants’ (N = 69) orthopaedic results, that knee and ankle injuries were the most predominant in the previous 24 months prior to Glengarry. The table shows the descriptive statistics for a specific category of orthopaedic injury, the number of pilot study participants who have had an orthopaedic injury that needed medical treatment within the previous 24 months, prior to going to Glengarry, and the percentage of the ESOESP HRF feasibility study participants who had that orthopaedic injury.
Table 4.4 ESOESP HRF feasibility study participants’ orthopaedic history results

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>OE</th>
<th>OE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck injury</td>
<td>7</td>
<td>10.14</td>
</tr>
<tr>
<td>Back injury</td>
<td>8</td>
<td>11.59</td>
</tr>
<tr>
<td>Shoulder injury</td>
<td>9</td>
<td>13.04</td>
</tr>
<tr>
<td>Elbow injury</td>
<td>5</td>
<td>7.24</td>
</tr>
<tr>
<td>Wrist injury</td>
<td>12</td>
<td>17.39</td>
</tr>
<tr>
<td>Hand injury</td>
<td>9</td>
<td>13.04</td>
</tr>
<tr>
<td>Other Arm injury</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Rib Injury</td>
<td>2</td>
<td>2.89</td>
</tr>
<tr>
<td>Hip or Pelvis injury</td>
<td>4</td>
<td>5.79</td>
</tr>
<tr>
<td>Knee injury</td>
<td>17</td>
<td>24.63</td>
</tr>
<tr>
<td>Ankle injury</td>
<td>19</td>
<td>27.53</td>
</tr>
<tr>
<td>Foot injury</td>
<td>5</td>
<td>7.24</td>
</tr>
<tr>
<td>Other Leg injury</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Participants with no injuries in the last 24 months</td>
<td>17</td>
<td>24.64</td>
</tr>
<tr>
<td>Participants with 1 injury in the last 24 months</td>
<td>37</td>
<td>53.62</td>
</tr>
<tr>
<td>Participants with 2 injuries in the last 24 months</td>
<td>15</td>
<td>21.74</td>
</tr>
<tr>
<td>Total</td>
<td>N=69</td>
<td>100%</td>
</tr>
</tbody>
</table>

The ethical reason for the inclusion of the orthopaedic injuries data was to check that every participant, particularly if he had a knee, ankle, neck or back injury was fully rehabilitated before participating in the HRF tests. In particular, the MFT could aggravate a soft tissue injury in the lower limbs. The boys who had either a full knee reconstruction (n=2) or medial; meniscus injuries (n = 3) discussed their injury with the researcher, and established confidence that their injury was fully rehabilitated prior to participation in the multistage HRF test.

Table 4.5 portrays the ESOESP HRF feasibility study participants’ personal medical history results. This table shows the participants personal medical history categories that needed medical treatment for that category, in the previous 24 months prior to going to
Glengarry. The general tendency in Table 4.8 indicated that participants’ asthma conditions were the predominant medical problem.

Table 4.5 ESOESP HRF feasibility study participants’ personal medical history results

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>ESOESP</th>
<th>ESOESP %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allergies</td>
<td>6</td>
<td>8.69</td>
</tr>
<tr>
<td>Asthma</td>
<td>19</td>
<td>27.53</td>
</tr>
<tr>
<td>Chronic cough</td>
<td>3</td>
<td>4.3</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chest Pains</td>
<td>4</td>
<td>5.79</td>
</tr>
<tr>
<td>Shortness of Breath</td>
<td>4</td>
<td>5.79</td>
</tr>
<tr>
<td>High / low Blood Pressure</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Epilepsy</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fainting Spells</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Diabetes</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Concussions</td>
<td>5</td>
<td>7.24</td>
</tr>
<tr>
<td>Operations</td>
<td>3</td>
<td>4.3</td>
</tr>
<tr>
<td>Heat Intolerance</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Frequent Headaches</td>
<td>2</td>
<td>2.89</td>
</tr>
<tr>
<td>Participants with no symptoms</td>
<td>26</td>
<td>37.68</td>
</tr>
<tr>
<td>Participants with 1 condition</td>
<td>23</td>
<td>33.33</td>
</tr>
<tr>
<td>Participants with 2 conditions</td>
<td>20</td>
<td>28.98</td>
</tr>
<tr>
<td>Total</td>
<td>N=69</td>
<td>100%</td>
</tr>
</tbody>
</table>

Participants who had had chest pains \((n = 4)\) in the 24 months prior to going to Glengarry were advised by the researcher, that if they felt the same symptoms, they should stop the HRF test immediately.

Table 4.6 portrays the ESOESP HRF feasibility study participants \((N = 69)\) family medical history. The table shows the number within the category of the family medical history, and the percentage of the participants. The direction of the data in Table 4.6 shows the familial medical conditions of heart disease, diabetes and high blood pressure.
Table 4.6 ESOESP HRF feasibility study participants’ family medical history results

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>OE</th>
<th>OE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death under age of 40 from Heart Disease</td>
<td>1</td>
<td>1.44</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>15</td>
<td>21.73</td>
</tr>
<tr>
<td>Diabetes Type 1, Type 2, Pre-diabetes</td>
<td>13</td>
<td>18.84</td>
</tr>
<tr>
<td>High Blood Pressure</td>
<td>20</td>
<td>28.98</td>
</tr>
<tr>
<td>Low Blood Pressure</td>
<td>1</td>
<td>1.44</td>
</tr>
<tr>
<td>Asthma</td>
<td>24</td>
<td>34.78</td>
</tr>
<tr>
<td>Participants with no family medical history problems</td>
<td>25</td>
<td>36.23</td>
</tr>
<tr>
<td>Participants with 1 family medical history problem</td>
<td>27</td>
<td>39.13</td>
</tr>
<tr>
<td>Participants with 2 family medical history problems</td>
<td>17</td>
<td>24.64</td>
</tr>
<tr>
<td>Total</td>
<td>N=69</td>
<td>100%</td>
</tr>
</tbody>
</table>

Summary of the ethical considerations for the ESOESP HRF study participants

The need for an informed consent for the ESOESP HRF feasibility study personal medical history arose from the percentage of participants with asthma (34.78%), and the researcher’s concern for their ability to complete the HRF tests (particularly the MFT). The boys who had asthma were invited to consult the researcher if they had any issues about their ability to participate in the HRF tests. Additionally, a buddy system was developed by the researcher to assist any asthmatic participant. An asthma spacer was placed in the researcher’s medical kit as a precaution in case of a possible asthma attack during the HRF tests.

In recognition that there is a genetic component in heart disease and diabetes (McPherson, Pertsemlidis, Kavaslar, Stewart, Roberts, Cox, et al., 2007), the results of the participants HRF tests, in particular the blood pressure, BMI and lung capacity are important familial indicators and cause for concern. The family medical history high blood pressure
percentage (28.98%) and heart disease (21.73%) are possible indicators for at-risk participants with a high BMI and waist circumference.

The ESOESP HRF feasibility study health-related fitness tests

The following HRF tests were conducted pre and post-tests at the beginning and end of week 18 of the OE physical activities programme: Blood pressure, body composition, (height, weight, BMI, waist and hip circumferences), muscular endurance (sit-ups, press-ups), muscular strength (handgrip dynamometer, back and leg dynamometer), cardiorespiratory endurance (lung function test, multistage fitness test), and flexibility (bend/twist/touch).

All 69 participants completed the body composition anthropometric measurements of height and weight. However, not every participant completed both the pre and post HRF tests. Three had either a knee or ankle soft-tissue injury, or the school nurse considered the tests would aggravate the participants’ Osgood-Schlatter disease symptoms. The five students who did not complete the pre and post-tests were not included in the data analysis of the pilot study. One student had a mild asthma attack during the post-test MFT (level three, shuttle 2) and could not continue.

As a result, the number of ESOESP HRF feasibility study participants who completed each component of HRF indices differed as follows: blood pressure, \( n = 69 \); body composition, \( n = 69 \); muscular endurance, \( n = 69 \); muscular strength, \( n = 67 \); cardiorespiratory endurance (lung function, \( n = 69 \); multistage fitness test), \( n = 68 \); flexibility, \( n = 69 \). Therefore analysis was conducted on the participants who had both pre and post-test HRF data, met the inclusion criteria of being ambulatory; not having medically contraindicated symptoms, and were willing to participate \( N = 69 \).

The ESOESP HRF feasibility study major focus

The major focus of the feasibility study was to determine the effect of the OE physical activities at the ESOESP campus upon the HRF of Year 9 adolescent males. The
ESOESP HRF feasibility study sought to examine correlations between participants’ body composition and cardiorespiratory endurance, weight and low back strength, and cardiorespiratory endurance and sit-ups.

**The ESOESP HRF feasibility study health-related fitness results**

The feasibility study HRF data was gathered and analyzed; the HRF results are presented in tables as recommended (Evans & Gruba, 2005). Three types of descriptive statistics, measures of central tendency (mean), measures of variability (standard deviation), and measures of association (correlation) are shown in the feasibility study tables. The ESOESP HRF feasibility study variables were normally distributed and were analyzed using parametric statistics. The parametric dependent *t* test was utilized for testing the hypotheses. The following assumptions were met for the dependent *t*-test procedure, homogeneity of variance, normality, and that the sample was randomly selected. The results are presented and related to the ESOESP HRF feasibility study hypothesis, and research questions.

**Characteristics of the ESOESP HRF feasibility study pre-test health-related fitness results**

The baseline pre-test HRF measurements provided the following information about the ESOESP HRF feasibility study participants’ thirteen HRF variables. Descriptive statistics for the feasibility study participants’ HRF pre-tests are shown in Table 4.7. The variables were assessed for normality using normal distribution methods described in Hyllegard, et al., (1996). The Shapiro-Wilk statistic was used to test the null hypothesis that the sample data were drawn from a normally-distributed population. The variables being normally distributed were analysed using parametric statistics. Mean values for descriptive statistics and *t*-tests were conducted.

The trend in Table 4.7 indicates that the height and weight of the participants were normal for age, but the muscular endurance sit-ups scores were very low (20th percentile). The remaining HRF variables were in the 60th percentile for age.
Table 4.7 Descriptive statistics for the ESOESP pre-and post-test feasibility study participants.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-test N = 68</th>
<th>Post-test N = 68</th>
<th>t-Value</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Blood pressure (mmHg)</td>
<td>121/82</td>
<td>3.29</td>
<td>115/80</td>
<td>2.98</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Body composition</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Height (cm)</td>
<td>1.70</td>
<td>0.08</td>
<td>1.73</td>
<td>0.07</td>
</tr>
<tr>
<td>(b) Weight (kg)</td>
<td>64.3</td>
<td>10.80</td>
<td>61.90</td>
<td>9.31</td>
</tr>
<tr>
<td>(c) Body Mass Index (ratio of weight (kg) to height (m²))</td>
<td>22.08</td>
<td>2.80</td>
<td>20.90</td>
<td>3.27</td>
</tr>
<tr>
<td>(d) BMI z-score</td>
<td>0.67</td>
<td>0.69</td>
<td>0.47</td>
<td>0.62</td>
</tr>
<tr>
<td>(e) Waist circumference (cm)</td>
<td>76.51</td>
<td>7.46</td>
<td>75.34</td>
<td>6.64</td>
</tr>
<tr>
<td>(f) Hip circumference (cm)</td>
<td>86.13</td>
<td>7.84</td>
<td>83.09</td>
<td>7.84</td>
</tr>
<tr>
<td>(g) Waist to hip ratio</td>
<td>0.89</td>
<td>7.55</td>
<td>0.91</td>
<td>7.88</td>
</tr>
<tr>
<td><strong>Muscular endurance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Sit-ups (n60s-1)</td>
<td>33.39</td>
<td>10.36</td>
<td>37.76</td>
<td>8.74</td>
</tr>
<tr>
<td>(a) Press-ups (n60s-1)</td>
<td>33.49</td>
<td>38.83</td>
<td>1.55</td>
<td>11.31</td>
</tr>
<tr>
<td><strong>Muscular strength</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Right hand</td>
<td>34.40</td>
<td>8.69</td>
<td>37.76</td>
<td>7.77</td>
</tr>
<tr>
<td>(b) Left Hand</td>
<td>32.45</td>
<td>7.21</td>
<td>35.25</td>
<td>7.12</td>
</tr>
<tr>
<td>(c) Back and leg (kg)</td>
<td>98.37</td>
<td>3.27</td>
<td>100</td>
<td>2.98</td>
</tr>
<tr>
<td><strong>Cardiorespiratory endurance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Lung capacity (c.c.)</td>
<td>3391.3</td>
<td>580.24</td>
<td>3398.16</td>
<td>583.6</td>
</tr>
<tr>
<td>(b) Mutistage fitness test results converted to laps</td>
<td>83.67</td>
<td>21.4</td>
<td>87.71</td>
<td>22.8</td>
</tr>
<tr>
<td>(c) predicted VO₂ (ml.kg.min-1)</td>
<td>40.26</td>
<td>6.49</td>
<td>47.9</td>
<td>7.44</td>
</tr>
<tr>
<td><strong>Flexibility (n20s-1)</strong></td>
<td>19.66</td>
<td>2.77</td>
<td>19.44</td>
<td>2.51</td>
</tr>
</tbody>
</table>

*p<.05 (one-tail), ** p < .05; (two tail) * p <.01;

NB. ** denotes HRF variables that were found to be statistically significant at the 5% level (one tail) and at the 5% level (two tail). * denotes HRF variable that were found to be statistically significant at the 1% level.

The blood pressure measurements mean of 121/82 is the norm for normotensive adolescent males (US Department of Health and Human Services, 2004). None of the
participants recorded a high blood pressure result, but as could be seen in Table 4.10, 20 participants had parents who have high blood pressure. Body composition measurements of height (mean = 1.7m) and weight (mean = 63.43kg) were within the stature-for-age and weight-for-age percentiles (National Center for Health Statistics, and National Center for Chronic Disease Prevention and Health Promotion, 2000). The feasibility study participants BMI mean of 22.08 showed that the pilot study participants mean scores were classified in the ‘healthy weight range’ for adolescent males. It should be noted however that there were 13 participants whose BMI were classified as being in the 85th percentile for adolescent males (overweight). The BMI scores were converted to z-scores to standardize the BMI scores in relation to growth, as the Tanner scales of puberty could not be utilized. The waist circumferences mean score was 76.7cm, and hips circumference was 85.74cm.

The participants’ muscular endurance sit-up mean score of 33.38 (n60s-1) was calculated in the 20th percentile for the sit-ups; and the press-ups mean score of 33.02 (60s-1) was in the 60th percentile for the push-ups for 14-year-old males. The muscular strength mean score of 34.4kg (right hand) and 32.45kg (left hand) was classified as good; the percentile score was not available. The low back leg lift strength mean score was calculated as being in the 50th percentile (Schell & Leelarthaepin, 1994).

The cardiorespiratory mean score for the MFT of 40.26 ml.kg.m-1 places the feasibility study participants into the 60th percentile for Australian 14-year-old males, (Brewer, Ramsbottom & Williams, 1988b). The participant MFT results were also calculated into laps, with a mean score of 83.67 laps. The mean score for the feasibility study participant’s lung capacity of 3391c.c. which is an average score for 14-year-old males. The participants’ flexibility means score for the bend/twist/touch test was 16.59 (n20s-1). Flexibility is measured as both joint specific, and an individually-based evaluation per participant in relation to improvement.
ESOESP HRF feasibility study research questions and hypotheses discussion

Research question one and hypothesis

Question: Does an 18-week ESOESP HRF feasibility study group’s OE physical activities programme make a significant difference in the Year 9 male’s HRF body composition results?

Hypothesis: There will be significant changes in HRF body composition results following the completion of the 18-week outdoor education physical activities programme.

In order to determine if an effect of the components of HRF were significant, a dependent $t$-test (Thomas, Nelson, & Silverman, 2005), was completed. Table 4.7 shows the descriptive statistics for the post tests and the $t$-test. The trend in Table 4.7 indicated that there were significant differences in each of the five HRF variables between the pre-test baseline results and completion of the 18-week PA intervention post-tests.

Table 4.7 showed that the feasibility study OE physical activity programme at the ESOESP campus had the following outcomes: The blood pressure $t$ test result indicated a statistically significant difference between the pre and post-test results, $t (68) = 2.67$, $p = < .05$. The Cohen’s $d = 0.46$ for the blood pressure variable indicated that the OE physical activities treatment effect was medium. The BMI $t$ test result indicated a significant difference between the pre and post-test results, $t (68) = 1.71$, $p < .05$ (one-tail). The BMI Cohen’s $d = .29$ indicated that the OE physical activities treatment effect was small. The BMI $z$-score $t$ test indicated a statistically significant difference between the pre and post-test results, $t (68) = 2.41$, $p = < .05$ (two tail). The BMI $z$ score Cohen’s $d = .41$ indicated the OE physical activities treatment effect was small. The waist to hip ratio $t (68) = 3.09$, $p = < .05$, the Cohen’s $d = .03$ effect size was small.

Research hypothesis number one investigated whether there were significant changes in HRF body composition scores as a result of the completion of the 18-week OE physical activities programme at the ESOESP campus. There were significant changes in the
participants’ HRF body composition scores as a result of the OE physical activities programme, at the ESOESP campus. The null hypothesis was rejected.

**Research question two and hypothesis**

Question: Does an 18-week ESOESP HRF feasibility study group’s OE physical activities programme make a significant difference in the Year 9 male’s HRF muscular endurance results?

Hypothesis: There will be significant changes in HRF muscular endurance results following the completion of the 18-week outdoor education physical activities programme.

The muscular endurance $t$ test result indicated a significant difference in the pre and post-test results, $t (68) = -3.15, p < .05$ (sit-ups) and -2.05, $p < .05$ (press-ups). The Cohen’s $d = -.54$ treatment effect was medium for the sit-ups variable; and the Cohen’s $d = .35$ OE physical activities treatment effect for the press-ups was small.

Research hypothesis number two investigated whether there were significant changes in HRF muscular endurance scores as a result of the completion of the 18 week OE physical activities programme at the ESOESP campus. There were significant changes in the participants’ HRF muscular endurance scores as a result of the OE physical activities programme, at the ESOESP campus. The null hypothesis was rejected.

**Research question three and hypothesis**

Question: Does an 18-week ESOESP HRF feasibility study group’s OE physical activities programme make a significant difference in the Year 9 male’s HRF muscular strength results?

Hypothesis: There will be significant changes in HRF muscular strength results following the completion of the 18-week outdoor education physical activities programme.

The muscular strength tests using the handgrip dynamometer $t$ tests indicated a significant difference between the pre and post-test results, $t (68) = -2.39, p < .05$ (right
hand), \( t(68) = -2.05, p < .05 \) (left hand). The Muscular strength tests Cohen’s \( d = -.41 \) (right hand), \( d = -.46 \) (left hand) indicated that the treatment effect of the OE physical activities were medium. The back and leg lift strength \( t \) test result indicated a significant difference between the pre and post-test results, \( t(68) = -5.55, p < .05 \). The back and leg lift Cohen’s \( d = .89 \) indicated the treatment effect of the OE physical activities was large.

Research hypothesis number three investigated whether there were significant changes in HRF muscular strength scores as a result of the completion of the 18 week OE physical activities programme at the ESOESP campus. There were significant changes in the participants’ HRF muscular strength scores as a result of the OE physical activities programme, at the ESOESP campus. The null hypothesis was rejected.

**Research question four and hypothesis**

Question: Does an 18-week ESOESP HRF feasibility study group’s OE physical activities programme make a significant difference in the Year 9 male’s HRF cardiorespiratory endurance results?

Hypothesis: There will be significant changes in HRF cardiorespiratory endurance results following the completion of the 18-week outdoor education physical activities programme.

The cardiorespiratory endurance lung function test Cohen’s \( d = -1.53 \) indicated the treatment effect of the OE physical activities was large. The MFT \( t \) tests indicated a significant difference between the pre and post-test results, \( t(67) = -5.17, p < .05 \). The MFT Cohen’s \( d = -.95 \) indicated that the OE physical activities treatment effect was large.

Research hypothesis number four investigated whether there were significant changes in HRF cardiorespiratory endurance scores as a result of the completion of the 18 week OE physical activities programme at the ESOESP campus. There were significant changes in the participants’ HRF cardiorespiratory scores as a result of the OE physical activities programme, at the ESOESP campus. The null hypothesis was rejected.
Research question five and hypothesis

Question: Does an 18-week ESOESP HRF feasibility study group’s OE physical activities programme make a significant difference in the Year 9 male’s HRF flexibilty results?

Hypothesis: There will be significant changes in HRF flexibilty results following the completion of the 18-week outdoor education physical activities programme.

The flexibility test using the bend/twist/touch did not indicate a significant difference between the pre and post-tests, \( t(68) = 0.08, p < .05 \). The flexibility test Cohen’s \( d = .01 \) indicated that the treatment effect of the OE physical activities were very small.

Research hypothesis number five investigated whether there were significant changes in HRF flexibility scores as a result of the completion of the 18 week OE physical activities programme at the ESOESP campus. There were no significant changes in the participants’ HRF flexibility scores as a result of the OE physical activities programme, at the ESOESP campus. The null hypothesis was accepted.

Chapter four summary

Chapter four described an ESOESP HRF feasibility study which was a quasi-experimental study. The feasibility study was conducted to investigate the effects of the OE physical activities programme on the HRF of Year 9 adolescent males. There were 69 randomly-allocated adolescent male participants, who were all members of The Scots College, an Independent boys’ school in Sydney. The 69 boys completed an 18-week OE physical activities programme at the schools Glengarry ESOESP campus in Kangaroo Valley, NSW, Australia. During the ESOESP orientation week in January 2002, the feasibility study participants completed the following HRF pre-tests: resting blood pressure; height and weight; waist and hip circumferences; sit-ups and push-ups; handgrip strength (right and left hands); lung function test, multistage fitness test; and a bend/twist/touch flexibility test. The HRF post-tests were repeated in the same dormitory order (A, B, C, D) as the pre-tests, after completion of the 18-week OE physical activities programme.
A HRF equipment list was given, and a timeline for the pre and post-tests was stated. A diagram of the ESOESP campus gymnasium with the HRF stations was shown. The ESOESP orientation week and the OE physical activities programme for terms one and two were portrayed in a table format. The HRF tests were evaluated in relation to their time to complete, and the feasibility study participant evaluations. Prior to data collection for the OE and PE RCT study, the feasibility study testing was conducted on the HRF tests and pre-participation questionnaires to assess general suitability for the OE and PE RCT study participant sample, and the appropriateness of time allocation for each HRF test. The results of the feasibility study indicated that the OE physical activities ESOESP did have a significant positive effect on each of the HRF variables of the Year 9 males. The effect size of the HRF tests ranged from small (weight, BMI, waist, press-ups), medium (blood pressure, hip circumference, sit-ups) to large (back and leg strength, lung capacity, MFT). The flexibility scores were not statistically significant, and the effect size was small. The bend/twist/touch flexibility HRF test was changed for validity and reliability reasons. Many boys consistently did not complete the test protocol. For the flexibility test, the sit and reach flexibility test replaced the bend/twist/touch test.

The hip measurement was deleted, as the researcher was not comfortable with taking the hip measurements, and if the boys took the measurements the results would not have been valid. Additionally, there are no Australian adolescent male cut-off scores for waist to hip ratios metor.aihw.gov.au/content/index (2008). The sit-ups and press-ups were reduced to 30 seconds, to be economic with the testing time, and to make allowance for some feasibility study participants who seemed to lack motivation when the tests were 60 seconds. The recording of blood pressure measurements was eventually deemed too time-consuming for the time available. The ESOESP HRF feasibility study HRF tests were economized to become more efficient for the OE and PE RCT study.

Each HRF variable was demonstrated and tested by the researcher. Prior to conducting the HRF tests the researcher completed a Master of Sports Science (M.Sp.Sc.) degree at the University of New South Wales. During the M.Sp.Sc degree the researcher completed an exercise testing and fitness evaluation course, where HRF variables were tested and examined by a Level 2 International Society for the Advancement of
Kinathropometry member. This ensured the reliability of the researcher completing the HRF tests in this study.

**Introduction to chapter five**

Chapter five describes the OE and PE RCT study which incorporates a randomized controlled trial (RCT) research design. The OE and PE RCT study utilized a physical education control group, and an outdoor education experimental group. Additionally, the participants completed the modified HRF pre and post-tests, and a SE questionnaire (Harter, 1988a).
CHAPTER FIVE

THE OUTDOOR EDUCATION AND PHYSICAL EDUCATION RANDOM CONTROL RESEARCH STUDY

Introduction

Chapter four introduced the ESOESP health related fitness feasibility study. This was a feasibility case study that investigated the effects of an 18-week outdoor education (OE) physical activity (PA) programme upon Year 9 male adolescents’ health-related fitness (HRF). The aim of the OE and PE random control (RCT) study was to investigate the effects of two different 18-week PA programmes, an OE, and a PE. The effects of the two PA programmes upon Year 9 males’ HRF and self-esteem (SE) were measured. Chapter five introduces the research methods used in the OE and PE RCT study to investigate the effects of the two physical activity programmes. Specifically, this chapter:

- Introduces the OE and PE RCT study participants
- Establishes the OE and PE RCT study research design.
- States the research questions and hypotheses.
- States the names and description of the OE and PE RCT study questionnaires.
- Identifies the order of the HRF tests and the SE questionnaire.
- Shows the data analysis of the OE and PE RCT study.
- Illustrates the PE control group PA programme.
- Portrays the OE experimental group PA programme.
The OE and PE RCT study participants

The OE and PE RCT study participants in 2003 were Year 9 boys (*N* = 136), aged 13-14 years, recruited from the same Independent boys’ school, The Scots College in Bellevue Hill, Sydney. The rationale for recruiting this particular school was twofold; the school was in a unique situation that the boys could be randomly allocated either to participate in the school’s ESOESP at Glengarry, or complete a PE physical activities programme at The Scots College main school in Sydney. This allowed the study to evaluate the effects of the two PA programmes within the same Year 9 cohort.

The OE and PE RCT study participants were informed of the risks, procedures, and potential benefits, and that they were free to end their participation in the study with no penalty (Zelaznik, 1993). The informed consent form followed the guidelines that were used in the ESOESP HRF feasibility study (Appendix D1 – D4).

The OE and PE RCT research design

A two-site random control trial research design (Hyllegard, et al., 1996; Lacy & Hastad, 2003) was utilised for this study to answer the research questions and hypotheses. The research participants (*N* = 136) were randomly divided into two cohort groups in accordance with the research design, and PA programme: (a) The experimental group (*N* = 73) completed the OE physical activities programme only for 18-weeks, at the schools Glengarry ESOESP residential campus in NSW, Australia; (b) The control group (*N* = 63) completed the PE physical activities programme only for 18-weeks, at The Scots College main school campus in Sydney, NSW. Both groups completed the study in terms 1 and 2, 2003 in the same 18-week period. On completion of terms 1 and 2, 2003, both groups completed their Year 9 academic studies at the opposite location in terms 3 and 4, 2003.

Both the OE and the PE groups completed the Preliminary Health Screening and Pre-Participation Fitness Examination (Appendix E1 – E6) prior to commencement of the main study. Both cohort groups completed pre and post-tests for HRF (Appendix F1 – F4), Self-Perception Profile for Adolescents (Appendix G1 – G2).
The OE and PE RCT study research questions

The purpose of the OE and PE RCT study was to investigate the effects of two different 18 week PA programmes: a) OE; and b) PE upon Year 9 males’ HRF and SE. Specifically the six research questions were:

1. Does an 18-week OE physical activities programme at the ESOESP campus make a significant difference in the Year 9 males’ HRF results?
2. Does an 18-week PE physical activities programme at the city-based campus make a significant difference in the Year 9 male’s HRF results?
3. Is there a significant difference in the HRF results of the OE and PE physical activity programmes?
4. Does an 18-week OE physical activities programme at the ESOESP campus make a significant difference in the Year 9 males’ SE results?
5. Does an 18-week PE physical activities programme at the city-based campus make a significant difference in the Year 9 males’ SE results?
6. Is there a significant difference in the SE results of the 18-week OE and PE physical activities programmes?

The OE and PE RCT study research hypotheses

The following six research hypotheses were tested:

1. There will be significant positive differences in HRF results on completion of the 18-week OE physical activities group programme at the ESOESP campus.
2. There will be significant positive differences in HRF results on completion of the 18-week PE physical activities group programme at the city-based campus.
3. There will be significant positive differences in the HRF results between the OE and PE physical activity programmes.
4. There will be significant positive differences in the SE results on completion of the 18-week OE physical activities programme at the ESOESP campus.
5. There will be significant positive differences in the SE results on completion of the 18 week PE physical activities programme at the city-based campus.
6. There will be significant positive differences in the SE results between the OE and PE participants.

Figure 5.1 shows the OE and PE study two-site random control experimental research design that was used to answer the research questions and hypotheses in relation to significant differences between the Year 9 males’ HRF and SE.

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Figure 5.1 The effect of Outdoor Education and Physical Education Physical Activity Programmes upon Male Adolescents experimental research design

#HRF = Health–Related Fitness
#SE = Self-Esteem (Harter, 1988)
The OE and PE RCT study research instrumentation

The instruments that were used to assess preliminary health and fitness, HRF and SE among the adolescent Year 9 male cohorts utilising three questionnaires were:

1. Preliminary Health Screening and Pre-participation Fitness Examination (Appendix E1 – E6)
2. HRF tests result sheet (Appendix F1 – F4)

Preliminary health screening and pre-participation fitness examination

Prior to participation in the main study, the participants’ parents/guardian were required to complete the modified version of Kibler (1990) Preliminary Health Screening and Pre-Participation Fitness Examination Questionnaire (Appendix E1 – E6).

Self-perception profile for adolescents

The Self-Perception Profile for Adolescents (Harter, 1988a), is an upward extension of the Self-Perception Profile for Children (Harter, 1985b). The children’s version was devised to tap domain-specific judgements of competence or adequacy in five separate domains, as well as the global perception of one’s worth as a person. Thus this instrument taps perceptions of scholastic competence, physical appearance, social acceptance, and behavioural conduct, five specific domains, as well as self-worth. Each subscale provides a separate score, thereby allowing one to examine a profile of the adolescents’ evaluative judgements across domains. Additionally the Self-Perception Profile for Adolescents (SPPA) has added three additional domains reflecting the concerns of adolescents: 1) job competence; 2) close friendship; and 3) romantic appeal. For the purpose of this study, the subscale close friendship was retained, but the job competence and romantic appeal was considered inappropriate. The modified SPPA subscales (Harter, 1988b) for this study therefore contained the following seven specific domains:
1. Athletic competence
2. Behavioural conduct
3. Close friendship
4. Global self-worth
5. Physical appearance
6. Scholastic competence
7. Social acceptance

Both the OE and PE groups were instructed to bring a pen to complete the modified SPPA (Harter, 1988b), and the HRF results sheet (Appendix F1 – F4). The researcher read aloud the instructions on how to complete the SPPA questionnaire to each group, and additionally explained that there were was no right or wrong answers to each question (as instructed by the Harter, 1988b manual). To clarify any misunderstanding of the method to complete the questionnaire, the subjects were given the example shown in Appendix G1 –G2 (at the top of the questionnaire) to complete first. All the participants were encouraged to ask the researcher to explain any questions they did not fully understand.

The OE and PE RCT study cohort completed the SPPA, and the HRF result sheet (pre and post-test), which were then placed in sealed envelopes (for privacy and ethical reasons). The envelopes were marked with a code according to the date, group OE or PE, location, dormitory (OE group), or class (PE group), and stored in the researcher’s secure filing cabinet at the University of Newcastle for evaluation.

The OE and PE RCT study health-related fitness tests

The ACSM (2000; 2005) guidelines for exercise testing, recommended completing HRF fitness tests in a particular sequence, to minimise the effects of tests on one another (Heyward, 1998). The order of the HRF tests complies with the ACSM (2000; 2005) recommendations. The participants completed the following pre and post-HRF tests after a HRF testing information session conducted by the researcher:

1. Body composition: height (cm); weight (kg); body mass index (BMI); a ratio of weight (kg) to height (cm); BMI z-scores; waist circumference (cm).
2. Muscular endurance: sit-ups (n30s-1); press-ups (n30s-1).
3. Muscular strength: Handgrip strength (measured in kg), left and right hands.
4. Cardiorespiratory fitness: lung capacity (c.c.); multistage fitness test (predicted VO₂ mL.kg. min-1); level/shuttle converted to laps.
5. Flexibility: sit and reach test.

**Body composition**

In accordance with guidelines for surface anthropometry measurement (Brooks, Fahey & White, 1996; Stewart & Eston, 2007) the following guidelines were used in the measurement of the research participants’ BMI and waist circumference.

All of the OE and PE RCT study cohorts were told in advance the pre and post-test measurement dates, and that their BMI and waist circumference was to be measured; both the participants and their parents/guardians had freely given consent for these measurements to be taken pre and post-test. The anthropometric measurements were taken in the respective gymnasiums which allowed privacy by taking the measurements behind a screen. The anthropometric measurements were taken by the researcher. The participants were informed to be dressed in their school sports uniform. They were additionally instructed to be fully hydrated, and voided. The research protocols for height, weight and waist circumference were the same as the ESOESP HRF feasibility study.

**Body Mass Index (BMI)**

The researcher demonstrated how the height and weight components of BMI were to be measured. All participants followed the same protocol. The research protocols were as follows:

**Height**

The participants were instructed to: remove their sports shoes, but keep their sports socks on, and to wear their school’s PE sports shirt and shorts; and to stand tall, feet together, with both heels flat on the ground, with their arms hanging naturally by their sides (palms facing the sides of their body). Their heels, buttocks, and upper part
of their back were to be in contact with the height stadiometer. The researcher placed the participants head in the Frankfort plane where the orbital and tragion are horizontally aligned (Brooks, et al., 1996; Stewart & Eston, 2007). They were to look straight ahead, take and hold a deep breath and while keeping the head in the Frankfort plane, the researcher applied a gentle upward lift through the mastoid process. The stretch relax method (Norton & Olds, 1996) was completed to allow the height measurement to be recorded at the end of a deep inward breath. The height measurement was recorded twice by the researcher to the nearest 0.5 centimetre.

**Weight**

The time of day was recorded by the researcher, (due to body mass diurnal variation) on the result sheet. The participants were instructed to: have their shoes removed (from the height test) and any other personal items (watches etc.) were to be removed; And to step onto the platform medical scale and to stand still and tall, for three seconds without any support, with their weight evenly distributed over the centre of the scale. The participant’s weight was recorded twice by the researcher to the nearest 0.5 kg.

**Waist circumference**

The participants were instructed by the researcher on the methodology used for anthropometric waist measurements. All participants were measured using the same protocols. Their waist measurement was taken at the level of the narrowest point between the lower costal (rib) border and the iliac crest (Norton & Olds 1996). Where no obvious waist narrowing was present, the waist measurement was taken between the mid-point between the iliac crest and the 10th Rib (Brooks, et al., 1996; Stewart & Eston, 2007).

The participants were instructed to fold their arms across their chest. The researcher stood in front of the participant to correctly locate the narrowing of the waist. The researcher used a cross-handed technique with the tape stub in the left hand, and the case in the right hand. The participant was approached from the right side; the stub was passed around the waist, grasped by the right hand, and then passed to the left hand.
which pulls it to the appropriate tension (Brooks, et al., 1996; Stewart & Eston, 2007). The researcher’s middle fingers of both hands were used for ‘pinning’ the tape and moving it a short distance up or down and maintaining its orientation 90 degrees to the long axis of the participant’s torso. Using a Lufkin flexible steel anthropometric tape, the waist measurement was taken at the end of the participant’s normal expiration with the arms relaxed at the sides. The waist measurement was recorded twice by the researcher. The waist measurement aim was to measure the circumference of the participant’s waist area, as a measure of underlying structure, musculature and adipose tissue. The measure of waist measurement has been shown to be correlated to coronary heart disease.

**Muscular endurance**

Muscular endurance is an important component of HRF. The growing bodies of adolescents need to be engaged in challenging strenuous activities to ensure the healthy development of their muscular and skeletal systems (Schell & Leelarthaepin, 1994). Both muscular endurance tests were demonstrated by the researcher prior to commencement of the participants’ tests.

**Bent-Knee Sit-up (n30s -1)**

All the participants were tested in the gymnasium in pairs (with their test buddy). This allowed the participant to have the sit-ups (n30s-1) counted by two people (for reliability scores), and to provide encouragement and motivation. The bent-knee sit-up was demonstrated by the researcher prior to commencement of the test. All participants completed the same test protocol. The participants were instructed to: lie down on a blue flat gymnastic floor mat on their backs, and to place their arms across their chests, with their knees bent, and the soles of their feet on the mat (the subjects had their sports shoes on); raise their torsos to 45 degrees; and to lower their torsos back to the gymnastic mat without holding their breath (as this can raise their systolic blood pressure). The participants continued each sit-up for a maximal effort for 30 seconds after the command to start, and stopped after 30 seconds. The researcher used the same Seiko 8023-5000 stopwatch in the OE and PE gymnasiums (for validity and reliability
of the test). The number of completed sit-ups in 30 seconds was recorded by the researcher.

**Press-Up (n30s-1)**

The press-up test was demonstrated by the researcher prior to the commencement of the participants’ test. The following protocol was used by all participants. The participants were instructed to: Lie on the blue gymnastic floor mat in the prone press-up position; raise their bodies, with their back straight, and in line with their extended legs, arms fully extended; and to lower their torsos (keeping their backs straight and in line with their legs) until their chins almost touched the gymnastic floor mat. The participants were to fully extend their arms pushing their body back to the start position, and to repeat this method of push-ups for 30 seconds after the command to start was given by the researcher, and to cease the push-ups on the command to stop by the researcher. The number of completed push-ups in 30 seconds was recorded by the researcher (and the participants buddy) on the recording sheets. The researcher used the same Seiko 8023-5000 stopwatch in the OE and PE gymnasiums.

**Muscular strength**

Muscular strength is the ability to carry out work against a resistance. The maximum force depends upon the size and number of muscles involved, the proportion of muscle fibres called into action, the co-ordination of the muscle groups, the physical condition of the muscles, and the mechanical advantage of the levers involved. Maximum strength can be defined as the ‘maximum force or torque a muscle or group of muscles can generate at a specified determined velocity’ (Komi, Suominen, Keikkinen, Karlsson, & Tesch (1992). Therefore there is no single test for strength, each being specific to the action and the muscles being tested.

Test results regarding a participant’s strength may be used to monitor longitudinal adaptations to training and injury rehabilitation, and to determine single limb or inter-limb strength inadequacies and imbalances (Blazevich & Cannavan, 2007). In this research project the test results were used to measure the effect of the OE
and PE physical activity programmes. The research protocols for the handgrip strength test were the same as the ESOESP HRF feasibility study.

**Handgrip strength test using a handgrip dynamometer**

The handgrip strength test was demonstrated in the left and right hands by the researcher, prior to the commencement of the tests. The same test protocol was used by the entire main study cohort. The participants were instructed to: stand vertically, and away from the gymnasium wall; reset the handgrip dynamometer by moving the needle back to zero, (this was then checked by the researcher); take the handgrip dynamometer comfortably in the right hand, holding it in line with the forearm, and letting it hang down by the thigh. The participants were instructed that the second joint of their fingers should fit snugly under the handle, and take the weight of the handgrip dynamometer. They were instructed to grip it between their fingers and the palm at the base of their thumb. If the spacing of the grip was not correct, the handgrip dynamometer was adjusted for each individual participant by the researcher. When the participant firmly gripped the handgrip dynamometer, it was held away from the body and squeezed vigorously, the subject exerting the maximum force of which he was capable.

The participant recalibrated the handgrip dynamometer back to zero, and after being checked by the researcher, a second attempt was conducted in the same right hand. The process was repeated using the handgrip dynamometer in the participants’ left hands.

**Cardiorespiratory fitness**

The research testing protocols for the lung function test and the Multistage fitness test were the same as the ones for the ESOESP HRF feasibility study.

**Lung function test**

Lung function tests have been utilised as an aid in evaluating pulmonary function in patients with lung diseases (e.g. asthma, or exercise-induced bronchospasm),
and gaining insight into normal cardiorespiratory function in healthy subjects (Leelarthaepin, 1992). The objectives for conducting lung function measurements stated by Schell & Leelarthaepin (1994) are to determine a person’s current lung function status while in a state of good health, and to assess the degree of change in lung function status. For example, a decrease of 20% in a lung function measurement requires further investigation; secondly, to assess the effects of exercise on lung function, for example some people suffer from exercise-induced bronchospasms. Additionally, lung function (capacity) tests are used to determine the effects of a person’s living and/or working environment on their lung function. Comparison of results with previously measured normal lung function results would indicate the degree of change in function.

The researcher demonstrated the lung function test using a portable dry spirometer, including the disposable hygienic method for the spirometer replaceable mouthpiece. The participants were then instructed to individually: place the spirometer replaceable mouth piece onto their portable dry spirometer (six dry spirometers were available). To reset the portable dry spirometer, by moving the dial to zero on each lung function test (this was checked by the researcher); hold the portable dry spirometer between their index finger and thumb, at the base of the portable dry spirometer; and exhale in one breath only into the dry spirometer’s replaceable mouthpiece.

Each participant was given two consecutive lung function tests (with a short break in between tests), with their scores being recorded by the researcher. Each participant placed their own individual spirometer replaceable mouthpiece into the hygienic bucket. These were disposed of by the researcher on completion of the lung function tests of each research group.

**Multistage fitness test**

The multistage fitness test (MFT) is a progressive shuttle run test for the prediction of maximum oxygen uptake (Brewer, Ramsbottom & Williams 1988a). For test validity and reliability the test was conducted in the OE and PE gymnasiums using the following protocols:
The 20-metre distance was accurately measured by the researcher, using a Hengstler trundle wheel in both (OE) and (PE) gymnasiums. The same 900mm mega yellow witches hats were used as the 20-metre distance markers. The same Sony CFO-S100 CD radio cassette was used with both cohorts. The CD player was mounted on a table, with a rubber base placed underneath the CD player to prevent MFT-CD slippage (caused by gymnasium spring-loaded floors). The tests were conducted at the same time of day in the pre and post-tests. The tests were conducted within one 24-hour period. The participants were given the same oral instructions and physical demonstration by the researcher. The participants completed a specific warm-up for the test, using the 20-metre shuttle distance and 900mm mega yellow witches hats. The temperature in the gymnasium was recorded. The participants were advised not to eat too large a meal two hours prior to the test. The participants were instructed that they would have to wear their school sports uniform, sports shoes, and sports socks (to minimise ground reaction force and reduce the risk of injury). The participants were informed prior to the test not to complete any heavy sports training sessions on the day prior to the test.

The participants were informed to bring with them a 0.5 litre bottle of water to drink after the test to replace any fluids lost (and to reinforce their OE and PE theory lessons about hydration). Approximately one metre of width per participant being tested was allowed for adequate spacing during the MFT. The participants were advised to be well hydrated (with water) prior to the test. All participants were to complete one MFT only (pre-test) and one MFT (post-test).

The participants were instructed to run back and forth between the two marked lines 20 metres apart, within the designated time limit (stated by bleeps on the MFT-CD). The running speed increased on the MFT-CD by 0.5 km/hr-1 each minute. Additionally, the participants were informed that: the MFT required maximal effort; the test shuttles increased progressively, and that they were to run until they could no longer keep up with the set speed determined by the MFT-CD cadence; they would not be discouraged if they finish earlier than the other participants; they should not push themselves to the point of exhaustion, but to attempt a maximal effort; they were given the personal choice to quit the test when their individual MFT standard was reached; and their individual MFT was terminated when they could no longer follow the set pace of the MFT-CD, that is make it to the end of the 20-metre distance within the designated
MFT-CD time period on two consecutive shuttles, or when they withdrew from the test voluntarily.

The MFT assessors were the researcher and two qualified PE teachers, (one teacher was placed on each 20-metre distance line to ensure that the test was valid (e.g. the participant reached the line in the set MFT-CD cadence period). When the participant was terminated from the MFT, each participant’s result was recorded by: a) the assessor; and b) the HRF test buddy on his score sheet (each subject was designated a test buddy (reinforcing cooperation and camaraderie, both tenets of OE and PE). The test buddy encouraged the participant to actively warm-down and not to stop and not to immediately sit down (limiting the lactic acid accumulation, and muscle soreness often associated with running).

**Strategies used to assist subjects achieve maximal VO2**

The OE and PE physical activity groups were encouraged by the researcher to set a short-term goal to complete the test to the best of their ability on that particular day. The researcher called out the level and shuttle during the test. On completion of the MFT for both cohort groups, the participants completed a cool-down activity and stretching routine with the researcher. They were individually congratulated on their achievements by the researcher, and encouraged to drink their water, and to eat a snack within 15-20 minutes.

**Flexibility**

Flexibility has been defined as the “intrinsic property of the body tissues, which determines the range of motion achievable without injury at a joint or group of joints” (Holt, Holt & Pelham, 1996, p.23). Flexibility is the capacity of a joint to move through its full range of motion. There is no single test that gives a score for overall flexibility. Each test is specific to a particular movement or joint.
**Sit and reach flexibility test**

The flexibility test was conducted after the MFT to reduce the risk of hamstring or lower back injuries to the participants. The researcher demonstrated the sit and reach flexibility test procedures in both the research groups OE and PE gymnasiums. The participants were instructed to: keep their school sports uniform on, but to remove their sports shoes, and to keep their sports socks on (to reduce the risk of any feet fungal transmissions); sit in front of the sit-and-reach apparatus, and to place the soles of their feet onto the front vertical side of the apparatus; keep their knees fully extended, (a 30cm ruler was placed onto their knees to assist with this); extended their arms with their hands placed downwards and on top of each other; pressed the sit-and-reach indicator with their finger tips horizontally forward as far as possible in a slow, smooth action; and not to use jerky movements at the end of the horizontal movement of this test as this may cause soft tissue damage in their hamstrings or lower back.

Three sit-and-reach flexibility tests were conducted consecutively for each participant, with the researcher recording the individual results. The limitation of this flexibility measurement is that anthropometric differences have a significant effect on sit and reach scores (Shephard, Berridge & Montelpare, 1990). Therefore the sit-and-reach results were used for intra-subject comparisons.

**The OE and PE RCT study data collection procedures**

Utilising the methodology described by Hyllegard, et al., (1996) the following five Figures and Tables portray the main study research procedures for the control PE group at the main school campus, and the OE experimental group at the ESOESP campus:

1. Table 5.1 The timetable for the PE physical activities pre-test and post-test HRF and SE testing. The HRF testing equipment and main study questionnaires had to be transported from the University of Newcastle where the researcher works as an exercise science, and OE lecturer. The University of Newcastle is a two and a half hour drive to The Scots College, Sydney.
2. Figure 5.2 shows the HRF testing stations in The Scots College PE main school campus gymnasium. The HRF stations are placed sequentially in accordance with recommendations for the order of fitness testing (ACSM, 2000; 2005).

3. Table 5.2 shows the timetable for the OE experimental group physical activities pre-test and post-test HRF and SE testing. The Glengarry campus is a further two and a half hour drive from The Scots College in Bellevue Hill, Sydney.

4. Figure 5.4 portrays the HRF testing stations at the ESOESP campus gymnasium are shown. The Glengarry gymnasium is slightly different in that it has an indoor rock climbing wall at one end of the gymnasium. The same ACSM (2000, 2005) sequence for the PRE and post-tests HRF tests was used at The Scots College in Sydney.

5. Table 5.3 shows the equipment list for the OE and PE RCT study HRF and SE pre-test and post-tests. A description of the equipment, including the manufacturer and serial number is given as suggested by Hyllegard, et al., (1996).

The OE and PE RCT study data analysis

Statistical analysis of the data used in this study was completed using the Statistical Package for Social Science (SPSS) version 14 software. The statistical methods used for analysis of the research questions were, independent \( t \)-tests, and Cohen’s \( d \) effect size. The independent variables (predictor) were: the environment and participant’s age. The dependent variables (response) were: height, weight, waist circumference, multistage fitness test, muscular strength, muscular endurance, flexibility, and SE.
Table 5.1  The OE and PE RCT study timetable for the pre-test and post-test HRF tests and SE questionnaires at the main school campus PE control group

<table>
<thead>
<tr>
<th>TIME</th>
<th>ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.30am</td>
<td>Arrive at The Scots College Sydney campus, meet PE staff, open PE gymnasium.</td>
</tr>
<tr>
<td>7.30-8.15</td>
<td>Prepare The Scots College HRF Test stations in the gymnasium (Figure 4.3), Nos1-5 (inclusive). Prepare HRF results sheets and SE questionnaires for the control group.</td>
</tr>
<tr>
<td>8.15-8.30</td>
<td>Question time in the gymnasium for any PE boy who may be injured or ill, or wishes to withdraw or has questions about the main study.</td>
</tr>
<tr>
<td>8.30-10.30</td>
<td>Scots PE group No1 HRF fitness tests and SE questionnaires. Collect HRF result sheets and SE questionnaires, place in sealed envelopes.</td>
</tr>
<tr>
<td>10.30-10.45</td>
<td>Morning tea for all Scots College PE boys and PE staff. Reset HRF equipment. Prepare HRF result sheets and SE questionnaires.</td>
</tr>
<tr>
<td>10.45-12.45pm</td>
<td>Scots PE group No2 HRF Fitness tests and SE questionnaires. Collect HRF results sheets and SE questionnaires; place in sealed envelopes.</td>
</tr>
<tr>
<td>12.45-1.15</td>
<td>All Year 9 PE boys and PE staff lunch. Reset HRF equipment. Prepare HRF result sheets and SE questionnaires.</td>
</tr>
<tr>
<td>1.15-3.15</td>
<td>Scots PE group No 3 HRF Fitness tests and SE questionnaires. Collect HRF result sheets and SE questionnaires; place in sealed envelopes. Reset HRF equipment; prepare HRF result sheets and SE questionnaires.</td>
</tr>
<tr>
<td>3.15-3.30</td>
<td>All Year 9 boys and The Scots College PE staff afternoon tea. Reset HRF equipment. Prepare HRF result sheets and SE questionnaires.</td>
</tr>
<tr>
<td>3.30-5.30</td>
<td>Scots PE group No 4 HRF Fitness tests and SE questionnaires. Collect HRF/SE questionnaires; place in sealed envelopes.</td>
</tr>
<tr>
<td>5.30-5.40</td>
<td>Question time for any of The Scots College PE boys and PE Staff.</td>
</tr>
<tr>
<td>5.40-6.10</td>
<td>Pack up all HRF equipment, HRF result sheets and SE questionnaires.</td>
</tr>
<tr>
<td>6.30pm</td>
<td>Leave The Scots College, Bellevue Hill, Sydney.</td>
</tr>
</tbody>
</table>
Figure 5.2 Health-related fitness test stations at The Scots College gymnasium
Table 5.2 The OE and PE RCT study timetable for the Pre-test/Post-test HRF tests, and SE questionnaires at the ESOESP campus OE experimental group

<table>
<thead>
<tr>
<th>TIME</th>
<th>ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.00am</td>
<td>Arrive Glengarry, meet OE staff, and collect OE gymnasium keys.</td>
</tr>
<tr>
<td>7.15-7.30</td>
<td>Meet Glengarry ESOESP boys in dining hall (breakfast). Remind them to bring pen(s) to complete their HRF result sheets; wear sports uniform and sports shoes; bring asthma and other medications (if required).</td>
</tr>
<tr>
<td>7.30-8.15</td>
<td>Prepare Glengarry HRF test stations in the gymnasium (figure 4.2) Nos 1-5 (inclusive); Prepare HRF result sheets and SE questionnaires.</td>
</tr>
<tr>
<td>8.15-8.30</td>
<td>Question time in gymnasium for any Glengarry boy who may be injured, ill or wishes to withdraw, or ask questions about the main study.</td>
</tr>
<tr>
<td>8.30-10.30</td>
<td>Glengarry Dormitory ‘A’ HRF tests and SE questionnaires. Collect HRF result sheets, and SE questionnaires; place in sealed envelopes.</td>
</tr>
<tr>
<td>10.30-10.50</td>
<td>Morning tea for all Glengarry ESOESP boys and OE staff. Reset HRF equipment. Prepare HRF result sheets and SE questionnaires.</td>
</tr>
<tr>
<td>10.50-12.50pm</td>
<td>Glengarry Dormitory ‘B’ HRF tests and SE questionnaires. Collect HRF result sheets and SE questionnaires; place in sealed envelopes.</td>
</tr>
<tr>
<td>12.50-1.30</td>
<td>Lunch for all Glengarry ESOESP boys and OE staff. Reset HRF equipment. Prepare HRF result sheets and SE questionnaires.</td>
</tr>
<tr>
<td>1.30-3.30</td>
<td>Glengarry Dormitory ‘C’ HRF tests and SE questionnaires. Collect HRF results sheets, and SE questionnaires; place in sealed envelopes.</td>
</tr>
<tr>
<td>3.30-3.50</td>
<td>Afternoon tea, all Glengarry ESOESP boys and OE staff. Reset HRF equipment. Prepare HRF result sheets and SE questionnaires.</td>
</tr>
<tr>
<td>3.50-5.50</td>
<td>Glengarry Dormitory ‘D’ HRF tests and SE questionnaires. Collect HRF result sheets, and SE questionnaires; place in sealed envelopes.</td>
</tr>
<tr>
<td>5.50-6.00</td>
<td>Question time for any Glengarry ESOESP boys and OE staff.</td>
</tr>
<tr>
<td>6.00-6.30</td>
<td>Pack up all HRF equipment, HRF result sheets and SE questionnaires.</td>
</tr>
<tr>
<td>6.30-7.00</td>
<td>Evening meal with the Glengarry ESOESP boys and OE staff.</td>
</tr>
<tr>
<td>7.00pm</td>
<td>Glengarry ESOESP Boys and OE staff goes to chapel at the pontoon. Leave Glengarry to return to Sydney, and then to Newcastle University.</td>
</tr>
</tbody>
</table>
Figure 5.3 Health-related fitness test stations at The Glengarry Gymnasium
Table 5.3 Equipment list for the OE and PE RCT study

<table>
<thead>
<tr>
<th>Component of HRF</th>
<th>Equipment</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body Composition</strong></td>
<td>Portable height stadiometer.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Platform Medical Scale.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Lufkin flexible steel anthropometric tape.</td>
<td>4</td>
</tr>
<tr>
<td><strong>Muscular Endurance</strong></td>
<td>Seiko 8023-5000 Electronic Stopwatch</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Spare batteries for stopwatches.</td>
<td>10</td>
</tr>
<tr>
<td><strong>Muscular Strength</strong></td>
<td>Handgrip Dynamometer.</td>
<td>4</td>
</tr>
<tr>
<td><strong>Cardiorespiratory</strong></td>
<td>Portable dry spirometer.</td>
<td>4</td>
</tr>
<tr>
<td><strong>Fitness</strong></td>
<td>Dry spirometer disposable tubes</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Small yellow bucket (to dispose of tubes).</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Sony CFO-S100 CD Player.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Table and Rubber Base to place under CD player.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Multistage Fitness Test CD (Brewer, et al 1988).</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>30m Measuring Tape.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>900mm mega yellow witches hats</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Hengstler trundle wheel</td>
<td>1</td>
</tr>
<tr>
<td><strong>Flexibility</strong></td>
<td>Sit and reach flexibility box.</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>30cm ruler.</td>
<td>2</td>
</tr>
<tr>
<td><strong>Auxiliary</strong></td>
<td>First aid kit / gloves / face shield / asthma spacer.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Clip boards.</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Record book (injuries).</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Pens (For PE or OE boys who forgot them).</td>
<td>20</td>
</tr>
</tbody>
</table>
The OE and PE RCT study physical education physical activity programme

The PE physical activity programmes for terms one and two 2003 consisted of two 50- minute periods of practical PE, and one 50-minute period of theoretical personal development and health (PDH). Additionally each boy completed two after-school coaching sessions in a sport of their own choice, and competes on Saturday against other Greater Public School (GPS) teams. The Scots College PE physical activity boys additionally have to participate in one of the cadets, the pipe band or, the school orchestra. Tables 5.4 and 5.5 show the PE physical activities programmes for terms one and two 2003.

Table 5.4 PE physical activity programme for Term one 2003

<table>
<thead>
<tr>
<th>Week</th>
<th>Physical Education</th>
<th>2 x 50-minute periods per week</th>
<th>Personal Development and Health</th>
<th>1 x 50-minute period per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>RLSS Bronze Medallion</td>
<td>RLSS Bronze Medallion</td>
<td>RLSS Bronze Medallion</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>RLSS Bronze Medallion + Health-Related Fitness and Self-Esteem testing Mr Jelley (Tuesday)</td>
<td>RLSS Bronze Medallion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>RLSS Bronze Medallion</td>
<td>RLSS Bronze Medallion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>RLSS Bronze Medallion</td>
<td>RLSS Bronze Medallion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>RLSS Bronze Medallion</td>
<td>RLSS Bronze Medallion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>RLSS Bronze Medallion</td>
<td>RLSS Bronze Medallion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Athletics</td>
<td>Moving to Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Athletics</td>
<td>Moving to Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Athletics</td>
<td>Moving to Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Athletics</td>
<td>Moving to Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Athletics</td>
<td>Moving to Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Personal health profile</td>
<td>Personal health profile</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 5.5 PE physical activities programme for Term two.

<table>
<thead>
<tr>
<th>Week</th>
<th>Physical Education 2 x 50-minute periods per week</th>
<th>Personal Development and Health 1 x 50-minute period per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Basketball</td>
<td>How’s your health</td>
</tr>
<tr>
<td>2.</td>
<td>Basketball</td>
<td>How’s your health</td>
</tr>
<tr>
<td>3.</td>
<td>Basketball</td>
<td>How’s your health</td>
</tr>
<tr>
<td>4.</td>
<td>Basketball</td>
<td>How’s your health</td>
</tr>
<tr>
<td>5.</td>
<td>Basketball</td>
<td>How’s your health</td>
</tr>
<tr>
<td>6.</td>
<td>(Year 7-9 exams) Volleyball</td>
<td>Looking for direction</td>
</tr>
<tr>
<td>7.</td>
<td>Volleyball</td>
<td>Looking for direction</td>
</tr>
<tr>
<td>8.</td>
<td>Volleyball + Health-Related Fitness and Self-Esteem testing Mr Jelley (Tuesday)</td>
<td>Looking for direction</td>
</tr>
<tr>
<td>9.</td>
<td>Volleyball</td>
<td>Looking for direction</td>
</tr>
</tbody>
</table>

In addition to the compulsory PDHPE syllabus that all Year 9 students in NSW have to complete, The Scots College boys have to complete extra-curricular physical activities. These activities involve the boys selecting a particular PA and being coached in that PA for two after-schools training sessions, and playing that PA on Saturday. The boys selected their choice from the following physical activities: a) athletics; b) swimming; c) basketball; d) cricket; e) rowing; f) tennis, g) rugby; h) soccer; and i) rifle shooting. The school’s commitment to the boys’ personal development is to provide the boys the opportunity to select from one of the following compulsory extra-curricular categories: a) the cadets; and b) The Scots pipes and drums band. Figure 5.4 shows The Scots College pipes and drums band; figure 5.5 shows The Scots College students playing rugby.
With a Scottish heritage, the school has The Scots College Pipes and Drums Band established in 1900. The Pipes and Drums co-curricular activity offers training in band skills and performance experiences. Originally there were only five boys in the band who joined the cadets as pipers. At present there are 140 boys learning to play or playing the bagpipes or drums in the band (The Scots College, 2008). The Pipes and Drums Band was given permission in 1931 to wear the tartan of the Black Watch (Royal Highland Regiment).

Members of The Scots College Pipes and Drums Band in 1973 were the first Australians and first adolescents to perform at the prestigious Edinburgh Tattoo in Scotland. The band has performed at various Regal and Vice-Regal functions, and has performed in front of capacity crowds at a number of international sporting fixtures in Sydney (The Scots College, 2008). Being a voluntary member of the Pipes and Drums Band has many personal development advantages for the boys. There is a PA component with the marching, a skills component (playing the bagpipes or drums), an academic component (the boys can do piping or drumming as a 2-Unit Music subject in the New South Wales Higher School Certificate), and as a community service component, the boys can be involved in the many acts of community service they perform throughout each year (The Scots College, 2008).
Another extra-curricular activity offered to the PE cohort is rugby. Figure 5.5 shows the boys training for rugby. The PA of playing rugby is tied to this study as it is part of the extracurricular activities and the PE programme, the Scots College Pipes and drum band are also tied to this study in that there are benefits related to changes in their personal perceptions of their abilities and skills, in a similar manner as possible changes gained from the OE programme.

![Image](image.png)

Figure 5.5 The Scots College boys playing rugby, an extra-curricular physical activity whose training starts in term one.

The Scots College has a long history of playing rugby. They have been playing competitive rugby since 1893. The boys play in the Greater Public Schools (GPS) competition on Saturdays and train twice a week as part of the School’s extra-curricular physical activities programme. In 2008 the Scots College has 20 representative teams playing in the GPS competition. To ensure the College is competitive, there are in addition to the twice-weekly training which starts in term one, skill camps and sometimes a rugby tour (overseas or national). The school has won the GPS competition on a couple of occasions, but the GPS competition is usually won by either The King’s School or St Joseph’s College. Some Scots College boys have gone on to play in Interstate (for New South Wales) and International competitions for Australia.
The OE and PE RCT study outdoor education physical activity programme

The OE experimental group physical activities programme was conducted at the Glengarry ESOESP campus. The Glengarry ESOESP campus in Kangaroo Valley, New South Wales was established in 1988. Glengarry combines a rigorous schedule of academic studies, domestic and social responsibilities and OE (The Scots College, 2008). The Year 9 boys at Glengarry are encouraged to develop self-reliance, independence, high levels of self-motivation and leadership skills (The Scots College, 2008). The ESOESP orientation week is an introduction to the Glengarry staff, ESOESP programme, and community residential living. After the completion of the ESOESP orientation week the majority of the Year 9 groups OE physical activities were conducted on Saturdays and Sundays. The OE physical activities were conducted as either dormitory A dormitory, B, dormitory, C, or D dormitory.

The orientation week at Glengarry takes the entire seven days, and is an essential component of the ESOESP programme. The various ESOESP orientation activities are outlined in Table 5.6. Term one 2003 OE physical activities programme at Glengarry is shown in Table 5.7, and term two, 2003 in Table 5.8. The run/bike challenge conducted twice a week at the ESOESP campus is shown in Figure 5.6; the mountain bike challenge at the ESOESP campus is portrayed in Figure 5.7.
<table>
<thead>
<tr>
<th>Session 1</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.30 – 10.30</td>
<td>Staff – get ready Check dorms; allocate beds &amp; pigeon holes. Collect dorm list, post notices &amp; lists on boards in dorms. Obtain afternoon checklist of items that must be covered</td>
<td>A - Equipment Issue, checking, fitting B - Ice Breakers Outside C - Dorm Session, Outside Rules, expectations, Mini Solo, Goals D - River Crossing Lesson</td>
<td>A - Fitness testing Mr Jelley Uni of Wollongong B - Map Making C - Pastoral Care; Letters, mail, journals, medical matters, dorm photos D - Campus Orienteering/Orientation Flag Pole</td>
</tr>
<tr>
<td>Session 2</td>
<td>10.50 – 12.50</td>
<td>12.00pm – 2.00 Arrive Walk down – Intro to dorm staff and dorm mates. Brief sharing circle on way down where each student can introduce himself and share initial feelings about coming to Glengarry. Snack &amp; drink available when get off bus.</td>
<td>A - River Crossing Lesson B - Equipment Issue, checking, fitting C - Ice Breakers D - Dorm Session Rules, expectations, Mini Solo, Goals</td>
</tr>
<tr>
<td>Session 3</td>
<td>1.30 – 3.30</td>
<td>2.00pm – 2.30 Lunch All Staff Hendricks welcome students &amp; introduces staff. Unpack &amp; organization in the dorms. – All Dorm Staff See list of chores to complete:</td>
<td>A - Dorm Session, Rules, Expectations, Mini Solo, Goals B - River Crossing Lesson C - Equipment Issue, checking, fitting D - Ice Breakers</td>
</tr>
<tr>
<td>Session 4</td>
<td>3.50 – 5.50</td>
<td>Unpack etc – Dorm Staff: Guide &amp; facilitate unpacking process Locker allocation: Deposit books in lockers</td>
<td>A - Ice Breakers B - Dorm Session, rules, expectations, mini solo, goals C - River Crossing Lesson D - equipment issue, checking, fitting</td>
</tr>
<tr>
<td>7.00-9.00</td>
<td>6.45 MJIC WELCOME &amp; frame up the semester 7.00pm: Candle circle &amp; foundation talk 7.30pm: Ice breakers. Toss a name game, Have you ever, Balloon trolley, fire in the hole. Brandings stuck in the mud Intake BBQ on lawn outside kitchen. All Students, Staff, and families. Eat, prayer. Introduce staff families to students. Sing-along under the stars. Guitar and camp. Select a series of classic sing-a-longs. Print of word sheets for each dorm.</td>
<td></td>
<td>7.00pm Campfire Chapel at the Pontoon Supper at Pontoon fire 8.30pm Intro to entertainment via the fire Supper, Bed</td>
</tr>
<tr>
<td>Supper</td>
<td>All dorm staff in dorms Overview of day 2, Bed down procedure, Ensure students know AM duties and waking procedures Supper: Sat on staff to dorm to help settle students and answer any questions about program</td>
<td></td>
<td>Supper: Sun on staff to dorm to help settle students and any questions about program</td>
</tr>
<tr>
<td>Staff responsible for organizing resources, lesson preparation for activity</td>
<td>Dorm documentation Checklist of areas to cover during orientation Locker allocation Welcome and short talk Candle circle and activities</td>
<td>Equipment Issue, checking, fitting Ice Breakers Dorm Session River Crossing Lesson BBQ Welcome &amp; Prayer Music and sing-a-long sheets</td>
<td>Fitness Testing Mr Jelley Map Making Pastoral care: letters, mail, journals Medical Matters Dorm Photos Campus Orienteering/Orientation Flag Pole Chapel Service Music at Chapel</td>
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<tr>
<td>Session 1</td>
<td>Thursday</td>
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<td>Saturday</td>
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<tr>
<td>8.45 –</td>
<td>A - Lost in the Bush Lesson Rooms 2-3</td>
<td>A – Leadership in the Wilderness Theatre</td>
<td>7.45 breakfast, Hike staff to attend breakfast</td>
</tr>
<tr>
<td>10.20</td>
<td>B - Wilderness Hazard Lesson Theatre</td>
<td>B - Swim test; Raft Building Challenge Pontoon</td>
<td>First Hike Weekend</td>
</tr>
<tr>
<td></td>
<td>C - Academic Orientation Rm 1</td>
<td>C - Traffic Light Risk Management Room 2-3</td>
<td>All dorms on short away hike to orient students to camp craft, safety, policy and procedures, organization, team building, fun</td>
</tr>
<tr>
<td></td>
<td>D - Intro to climbing wall Hall</td>
<td>D - Hike packing, Pre-trip procedures, weekend hike brief Dorm (Library orientation at start of session for 15 minutes)</td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>A - Intro to climbing wall – Hall</td>
<td>A - Hike packing, pre-trip procedures, weekend hike brief dorm (library orientation at start of session for 15 minutes)</td>
<td>Camp Locations</td>
</tr>
<tr>
<td>10.40 –</td>
<td>B - Lost in the Bush lesson Room 2-3</td>
<td>B - Leadership in the Wilderness Theatre</td>
<td></td>
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<tr>
<td>12.40</td>
<td>C - Wilderness Hazard Lesson Theatre</td>
<td>C - Swim test: Raft Building Challenge Pontoon</td>
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<tr>
<td></td>
<td>D - Academic Orientation Room 1</td>
<td>D - Traffic Light Risk Management Room 2-3</td>
<td></td>
</tr>
<tr>
<td>Session 3</td>
<td>A - Academic Orientation Room 1</td>
<td>A - Traffic Light Risk Management Room 2-3</td>
<td>Saturday Staff: 7.45am-9.00apm Conduct hike as per hike notes</td>
</tr>
<tr>
<td>1.20 –</td>
<td>B - Intro to climbing wall Hall</td>
<td>B - Hike packing, Pre-trip procedures, Weekend hike brief Dorm (Library orientation at start of session for 15 minutes)</td>
<td>Non-highlighted staff on until 9.00pm Highlighted staff camp out &amp; on until hike pack up Sunday PM</td>
</tr>
<tr>
<td>3.20</td>
<td>C - Lost in the Bush Lesson Rooms 2 – 3</td>
<td>C - Leadership in the Wilderness Theatre</td>
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<tr>
<td></td>
<td>D - Wilderness Hazard Lesson Theatre</td>
<td>D - Swim test: Raft Building Challenge Pontoon</td>
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<tr>
<td>Session 4</td>
<td>A - Wilderness Hazard Lesson Theatre</td>
<td>A - Swim test; Raft building challenge Pontoon</td>
<td></td>
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<tr>
<td>3.30 –</td>
<td>B - Academic Orientation Room 1</td>
<td>B - Traffic Light Risk Management Rooms 2-3</td>
<td></td>
</tr>
<tr>
<td>5.30</td>
<td>C - Intro to climbing wall - Hall</td>
<td>C - Hike packing, Pre-trip procedures, weekend hike brief Dorm (Library orientation at start of session for 15 minutes)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D - Lost in the Bush Lesson Rooms 2-3</td>
<td>D - leadership in the Wilderness Theatre</td>
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<tr>
<td>7.00-9.00</td>
<td>Trangia Cooking Demonstration by Catering staff headed by Chef Aunty Mandy</td>
<td>Video in Theatre</td>
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<tr>
<td>Staff</td>
<td>Lost in the Bush Lesson Room 2-3 Wilderness Hazard lesson Theatre</td>
<td>Video in Theatre</td>
<td></td>
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<tr>
<td>responsible for organizing resources, lesson prep</td>
<td>Academic Orientation Room 1 Intro to climbing wall Hall</td>
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<td></td>
<td>Leadership in the Wilderness Theatre</td>
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<td>Swim test; Raft Building Challenge Pontoon</td>
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<td></td>
<td>Traffic Light Risk Management Rooms 2-3</td>
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<td></td>
<td></td>
<td>Hike packing, Pre-trip procedures, weekend hike brief Dorm (Library orientation at start of session for 15 minutes)</td>
<td></td>
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</tbody>
</table>

*Camp Locations:
A - Kings Creek Area
B - Trendally East
C - Trendally West
D - Nogarra*

*Staff responsible for organizing resources, lesson prep:
A - Kings Creek area
B - Trendally East
C - Trendally West
D - Nogarra*
### Table 5.7 The OE physical activities programme for Term one, 2003

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
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</thead>
<tbody>
<tr>
<td><strong>Week 1</strong>&lt;br&gt;January 27&lt;br&gt;Australia Day</td>
<td>Boys at main campus in Bellevue Hill, Sydney</td>
<td>Orientation Week</td>
<td>Orientation Week</td>
<td>Orientation Week</td>
<td>Orientation Week</td>
<td>Orientation Week</td>
</tr>
<tr>
<td><strong>Week 2</strong>&lt;br&gt;February 3&lt;br&gt;Boys arrive</td>
<td>Orientation Week see table 4.9</td>
<td>Orientation Week Heath-related fitness and self-esteem testing</td>
<td>Orientation Week</td>
<td>Orientation Week</td>
<td>Orientation Week</td>
<td>Orientation Week</td>
</tr>
<tr>
<td><strong>Week 3</strong>&lt;br&gt;February 10</td>
<td>Hike packing/hike A=Upper Kings Creek B=Trendally East C=Trendally West D=Lower Kings Creek</td>
<td>Hike A=Upper Kings Creek B=Trendally East C=Trendally West D=Lower Kings Creek</td>
<td>A = Bike maintenance B = bike maintenance C = traffic lights D = physiosize Movie night</td>
<td>A = Physiosize B = Run / ride C = Safety quiz D = River crossing Behaviour &amp; expectations</td>
<td>A = Backrun/Coolendel B = Coolendel/Backrun C = First aid / Orienteering D = Orienteering / First aid Sports night</td>
<td>A = Backrun B = Coolendel C = Climbing/first aid D = First aid /Climbing Movie night</td>
</tr>
<tr>
<td><strong>Week 5</strong>&lt;br&gt;February 24</td>
<td>Run / Ride Orientation Chapel</td>
<td>Run / Ride Challenge</td>
<td>Kangaroo Valley Community service day Sports night</td>
<td>Parent Visiting Day Movie night</td>
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<tr>
<td><strong>Week 6</strong>&lt;br&gt;March 3</td>
<td>Run / Ride Orientation Chapel</td>
<td>Run / Ride Challenge</td>
<td>Run / Ride Challenge</td>
<td>A= Orienteering / Mini Solo B=Mini solo Orienteering C=Landcare, Climbing D= Climbing, Landcare Sports night</td>
<td>A=Landcare/ Climbing B=Climbing/ Landcare C=Orienteering/mini solo D= Mini solo/ Orienteering Movie night</td>
<td></td>
</tr>
</tbody>
</table>
| Week 7 | March 10 | Run / Ride Orientation | Run / Ride Challenge | A= Griffins Farm Parent hike  
B= Apple Tree Flat Parent hike  
C= Canoe hike  
D= Group Solo | A= Griffins Farm Parent  
B= Apple Tree Flat Parent hike  
C= Canoe hike  
D= Group solo Solo Movie night |
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<tr>
<td>Chapel</td>
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</table>

| Week 8 | March 17 | Run / Ride Orientation | Run / Ride Challenge | A= Canoe Hike  
B= Group Solo  
C= Griffins Farm Parent Hike  
D= Apple Tree Flat Parent Hike | A= Canoe Hike  
B= Group Solo  
C= Griffins Farm Parent hike  
D= Apple Tree Flat Parent hike Movie night |
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<tr>
<td>Chapel</td>
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</table>

| Week 9 | March 24 | Run / Ride Orientation | Run / Ride Challenge | A= Upper River Hike  
B= Ben’s Walk Climbing  
C= Group Solo  
D= Canoe Hike  
Sports night | A= Ben’s Walk climbing  
B= Upper River Hike  
C= Group Solo  
D= Canoe Hike Movie night |
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<tr>
<td>Chapel</td>
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</table>

| Week 10 | March 31 | Run / Ride Orientation | Run / Ride Challenge | A= Group Solo  
B= Canoe Hike  
C= Upper River Hike  
D= Ben’s Walk Climbing  
Sports night | A= Group Solo  
B= Canoe Hike  
C= Ben’s Walk climbing  
D= Upper River Hike Movie night |
|---|---|---|---|---|

| Week 11 | April 7 | | | Glengarry 6-hour Rogaine  
Sports night | Glengarry Mountain Bike race  
Glengarry Open day Movie night |

| Week 12 | April 14 | Run / Ride challenge | Boys depart Glengarry | Easter Friday  
Easter Saturday  
Easter Sunday | Easter Friday  
Easter Saturday  
Easter Sunday |
<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
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<td>Week 1</td>
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<tr>
<td>April 28</td>
<td>Staff training day</td>
<td>Staff training day</td>
<td>Boys arrive at Glengarry</td>
<td>A = Night navigation</td>
<td>A= Orienteering</td>
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<tr>
<td></td>
<td>High ropes &amp; night navigation</td>
<td>Caving day at Bungonia</td>
<td></td>
<td>B= Orienteering</td>
<td>B= Self directed Academics</td>
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<td>C= Caving</td>
<td>C= Night Navigation</td>
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<td>D= Self Directed Academics</td>
<td>D= Caving</td>
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<td></td>
<td>Sports night</td>
<td>Movie night</td>
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<td></td>
<td>A= Night navigation</td>
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<td></td>
<td>Staff Training Day</td>
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<td>B= Orienteering</td>
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<td>C= Caving</td>
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<td>D= Self Directed Academics</td>
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<td></td>
<td></td>
<td></td>
<td>Sports night</td>
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<tr>
<td>Week 2</td>
<td>Run / Ride orientation</td>
<td>B= High ropes Training</td>
<td>Run / Ride Challenge</td>
<td>A= Self Directed Academics</td>
<td>A= Caraloo</td>
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<tr>
<td>May 5</td>
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<td></td>
<td>B= Caraloo</td>
<td>B= Self Directed Academics</td>
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<td>C= Orienteering</td>
<td>C= Snorkelling</td>
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<td></td>
<td>D= Snorkelling</td>
<td>D= Night Navigation</td>
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<td>Sports night</td>
<td>Movie night</td>
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<tr>
<td>Week 3</td>
<td>Run / Ride Orientation</td>
<td></td>
<td>Run / Ride Challenge</td>
<td>A= Snorkelling</td>
<td>A= Caving</td>
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<tr>
<td>May 12</td>
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<td></td>
<td></td>
<td>B= Night Navigation</td>
<td>B= Griffins Farm Parent Hike</td>
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<td></td>
<td>C= Apple Tree Flat parent</td>
<td>C= High Ropes Training</td>
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<td></td>
<td>Hike</td>
<td>D = Orienteering</td>
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<td></td>
<td></td>
<td>D = High Ropes Training</td>
<td>Movie night</td>
<td></td>
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<tr>
<td>Week 4</td>
<td>Final Run / Ride Orientation</td>
<td></td>
<td>Final Run / Ride Challenge</td>
<td>A= Apple Tree Flat Parent</td>
<td>A= High Ropes Training</td>
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<td>May 19</td>
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<td>Hike</td>
<td>B= Caving</td>
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<td>B = Snorkelling</td>
<td>C= Self Directed Academics</td>
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<td>C = Caraloo</td>
<td>D = Caraloo</td>
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<td></td>
<td>D = Griffins Farm Parent</td>
<td>Movie night</td>
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<td></td>
<td>Hike</td>
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<tr>
<td>Week 5</td>
<td>3 Day Solo</td>
<td>3 day Solo</td>
<td>3 day Solo</td>
<td>Option hike (A &amp; B dorm)</td>
<td>Option hike</td>
<td></td>
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<tr>
<td>May 26</td>
<td>A= Trendally</td>
<td>A= Trendally</td>
<td>A= Trendally</td>
<td>Mountain biking</td>
<td>Mountain biking</td>
<td></td>
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<tr>
<td></td>
<td>B= Kings Creek</td>
<td>B= Kings Creek</td>
<td>B= Kings Creek</td>
<td>Climbing</td>
<td>Climbing</td>
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</tr>
<tr>
<td></td>
<td>Option hike (C &amp; D dorm)</td>
<td>Option hike (C &amp; D dorm)</td>
<td>Option hike (C &amp; D dorm)</td>
<td>Canoe fishing</td>
<td>Sea kayaking</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mountain biking</td>
<td>Mountain biking</td>
<td>Mountain biking</td>
<td>3 day solo</td>
<td>Canoe fishing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Climbing</td>
<td>Climbing</td>
<td>Climbing</td>
<td></td>
<td>3 day solo</td>
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<tr>
<td></td>
<td>Kayaking</td>
<td>Kayaking</td>
<td>Kayaking</td>
<td></td>
<td>C= Kings Creek</td>
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</tr>
<tr>
<td></td>
<td>Canoe fishing</td>
<td>Canoe fishing</td>
<td>Canoe fishing</td>
<td></td>
<td>D = Trendally</td>
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<td></td>
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<td></td>
<td></td>
<td>Sports night</td>
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<td></td>
<td>Movie night</td>
<td></td>
</tr>
<tr>
<td>Week 6</td>
<td>June 2</td>
<td>Option hike (A and B Dorms)</td>
<td></td>
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<td></td>
<td></td>
<td>Mountain Biking</td>
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<tr>
<td></td>
<td></td>
<td>Climbing</td>
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<td></td>
<td></td>
<td>Sea Kayaking</td>
<td></td>
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<td></td>
<td></td>
<td>Canoe fishing</td>
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<td>Option Hike (A and B Dorms).</td>
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<td></td>
<td></td>
<td>Mountain Biking</td>
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<td></td>
<td>Climbing</td>
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<td></td>
<td></td>
<td>Sea Kayaking</td>
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<tr>
<td></td>
<td></td>
<td>Canoe fishing</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3 day hike briefing</td>
<td>Hike packing</td>
<td>Exeat weekend depart at noon</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Exeat weekend</td>
<td>Exeat Weekend</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Week 7</th>
<th>June 9</th>
<th>Boys return from Exeat weekend</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Option Hike (3 days)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Climbing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mountain biking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sea Kayaking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Canoe fishing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Option hike (3 days)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Climbing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mountain biking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sea kayaking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Canoe fishing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week 8</th>
<th>June 16</th>
<th>Solo</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Health-related fitness and Self-esteem Testing</td>
<td>Hike briefs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Final challenge</td>
</tr>
<tr>
<td></td>
<td>Option hikes (C and D Dorms)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Climbing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mountain biking</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sea Kayaking</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Canoe fishing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bushwalking</td>
<td></td>
</tr>
<tr>
<td>Dorm volleyball championships</td>
<td>24 hour Rogaine briefing</td>
<td>Preparation for Rogaine</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week 9</th>
<th>June 23</th>
<th>24 hour Rogaine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Glengarry Highland Games</td>
<td>Boys depart Glengarry at 10am</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 hour Rogaine briefing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Open Day 10.-4pm</td>
</tr>
</tbody>
</table>
Figure 5.6 The outdoor education physical activities run challenge.

Figure 5.7 The outdoor education physical activities mountain bike challenge.
Chapter five summary

The OE and PE RCT study research design was described as being a two-site random control trial design. The design utilised an OE experimental group \((N = 73)\) who completed an 18-week OE physical activities programme at the same Glengarry ESOESP campus as the pilot study. The research design also utilised a PE control group \((N = 63)\) who completed an 18-week PE physical activities programme at The Scots College main school campus. Both the OE and PE group cohorts were from The Scots College. Prior to starting the OE and PE physical activity programmes and subsequent HRF pre-tests, the participant’s parents or guardians completed the same preliminary health screening and pre-participation questionnaire (Appendix E1 – E6) that was used in the ESOESP HRF feasibility study.

Both the OE and PE groups completed pre-test HRF tests (Appendix F1 – F4) and SE questionnaires (Appendix G1 – G2) in week 2, term one, 2003; post-test HRF tests and SE questionnaires were completed in week 8, term 2, 2003. The HRF testing equipment was listed and diagrams of the OE and PE gymnasiums showing the HRF testing stations were shown. A timeline for the pre and post-test OE and PE HRF and SE testing was stated. Both the OE and PE physical activity programmes were portrayed in a table format. The HRF tests used in the OE and PE RCT study were as follows: height and weight, waist circumference; sit-ups and push-ups; handgrip strength; lung function test, multistage fitness test; and a sit-and-reach flexibility test. Both the OE and PE pre and post-test HRF and SE testing was conducted in the same order (OE: A, B, C and D; and PE: 1, 2, 3 and 4) and the same time of day in the pre and post-test. The OE and PE RCT study data analysis method was stated.

Chapter six will present the HRF and SE results from terms 1 and 2, 2003 main study from the Glengarry ESOESP campus and the PE physical activities at The Scots College Sydney campus. The HRF and SE results will be discussed in relation to the OE and PE RCT study research questions and research hypotheses.
CHAPTER SIX

THE OUTDOOR EDUCATION AND PHYSICAL EDUCATION RANDOM CONTROL TRIAL RESULTS

Introduction

The OE and PE RCT study was undertaken to examine the efficacy of two different 18-week physical activity (PA) programmes within a Year 9 adolescent male population for increasing health-related fitness (HRF) and self-esteem (SE) of Year 9 males. Outcomes were assessed at an 18-week PA intervention follow-up to examine the efficacy of the two PA programmes in the short term.

Chapter four introduced the research methods used in the ESOESP HRF feasibility study and the feasibility study results. Chapter five described the OE and PE RCT study which investigated the effects of an outdoor education (OE) and a physical education (PE) PA programmes. The aim of Chapter six is to present the OE and PE RCT results and observations of the two programmes. To achieve this aim, this chapter presents the OE and PE RCT study results. The OE and PE RCT study was a two-site randomized controlled trial (RCT) investigation of the effect of an OE experimental group physical activities programme, and a PE control group 18-week physical activities programme upon Year 9 males’ HRF, and self-esteem (SE) in term one 2003. Specifically, this chapter provides:

- A description of the OE and PE RCT study participants.
- The results of the OE and PE RCT pre-participation fitness questionnaire.
- The results of the OE and PE RCT study questions.
- The pre-test post-test results of the OE and PE RCT study research aims and hypotheses.
The OE and PE RCT study

The OE and PE RCT study was undertaken to determine the effect of two different PA programmes upon Year 9 adolescent males’ HRF and SE. The OE experimental group physical activities programme was conducted at the Glengarry ESOESP campus of The Scots College in New South Wales. The PE physical activities programme control group was conducted at The Scots College main school campus in Sydney. Both PA programmes were conducted in the 18-week PA period simultaneously.

Both groups completed the following pre and post-tests: a) HRF: body composition (height, weight, BMI, waist circumference); muscular endurance (sit-ups, press-ups); muscular strength (handgrip dynamometer); cardiorespiratory endurance (lung function test, multistage fitness test); and flexibility (sit and reach); and b) Self-Perception Profile for Adolescents (Harter,1988), (Athletic competence, behavioural conduct, close friendship, global self-worth, physical appearance, social acceptance and scholastic competence). Additionally the parents or guardians completed a modified Preliminary Health Screening, and Pre-Participation Fitness Questionnaire (Kibler, 1990), prior to commencement of the pre-tests. Participants who were medically contraindicated were excluded.

The OE and PE RCT study participants

The OE and PE RCT study participants consisted of 136 Year 9 adolescent males who had been randomly assigned to either participate in either the OE experimental PA programme \((N = 73)\) or the PE control group PA programme \((N = 63)\). After excluding participants whose differential diagnosis precluded them from safe and ethical participation in the HRF tests \((n = 10)\), the final main study participant sample consisted of 136 participants. This cohort represents a 93% calculated response rate which is in excess of the 75% considered acceptable for education research (Tuckman, 1994; Gall, Gall, & Borg, 2005). Table 6.1 shows the total number of participants for the research sample who received the information and consent forms, the number who were absent on the days of testing, and the number who participated in the OE and PE RCT study.
Table 6.1 Details of the OE and PE RCT study participants’ cohort

<table>
<thead>
<tr>
<th>Research Sample</th>
<th>Distributed</th>
<th>Absent</th>
<th>Medically Contraindicated</th>
<th>Number Participated</th>
<th>Response Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>146</td>
<td>4</td>
<td>6</td>
<td>136</td>
<td>93%</td>
</tr>
</tbody>
</table>

**Ethical considerations for the OE and PE RCT study participants**

All of the 136 subjects completed the body composition anthropometric measurements of height, weight and waist circumference. However, not the entire cohort completed all of the HRF tests, pre and post-test. Six subjects had knee, ankle, or lower back soft tissue injuries, or the school nurse and/or physiotherapist considered that participation in these tests would aggravate these conditions, or in some instances aggravate symptoms of their Osgood-Schlatter disease. This disease is a common problem in adolescents; it is a painful enlargement of the tibial tubercle at the insertion of the patellar tendon. Running and jumping can aggravate the condition (Neinstein, 2008). Additionally, four participants were absent. The ten participants who were either absent or medically contraindicated, and did not complete all the tests were not included in the analysis of the results.

As a result, the number of the OE and PE RCT study participants who completed the components of HRF indices differed as follows: body composition (height, weight, BMI, waist circumference); muscular endurance (sit-ups, press-ups); muscular strength (handgrip dynamometer, right and left hands); cardiorespiratory endurance (lung function test, multistage fitness test); and flexibility. Analysis was conducted on the participants who had their body composition anthropometric data, and for those of this sample (n=136) who had the pre and post-test data. Analysis was conducted on the OE and PE RCT study participants who met the inclusion criteria of being ambulatory, not having medically contraindicated conditions, and the willingness to be randomly allocated to the ESOESP experimental group, or PE control group PA programmes.

Table 6.2 portrays the OE and PE RCT study orthopaedic history results for the OE group and the PE group. The percentage indicates each group’s participants that had an
orthopaedic injury in the previous 24 months prior to the main study pre-tests. The trend in Table 6.2 indicated that 42.47% of the OE cohort participants, and 42.86% of the PE cohort participants had two injuries that required medical treatment in the 24 months (Years 7 and 8) prior to going to Glengarry.

Table 6.2 OE and PE RCT study participants’ outdoor education and physical education orthopaedic history results

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>OE</th>
<th>OE %</th>
<th>PE</th>
<th>PE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck Injury</td>
<td>6</td>
<td>8.2</td>
<td>3</td>
<td>4.76</td>
</tr>
<tr>
<td>Back Injury</td>
<td>9</td>
<td>12.32</td>
<td>6</td>
<td>8.69</td>
</tr>
<tr>
<td>Shoulder Injury</td>
<td>8</td>
<td>10.95</td>
<td>9</td>
<td>14.28</td>
</tr>
<tr>
<td>Elbow Injury</td>
<td>4</td>
<td>5.47</td>
<td>3</td>
<td>4.76</td>
</tr>
<tr>
<td>Wrist Injury</td>
<td>6</td>
<td>8.21</td>
<td>10</td>
<td>15.87</td>
</tr>
<tr>
<td>Hand Injury</td>
<td>12</td>
<td>16.43</td>
<td>9</td>
<td>14.28</td>
</tr>
<tr>
<td>Other Arm Injury</td>
<td>1</td>
<td>1.36</td>
<td>3</td>
<td>4.76</td>
</tr>
<tr>
<td>Rib Injury</td>
<td>4</td>
<td>5.47</td>
<td>2</td>
<td>3.17</td>
</tr>
<tr>
<td>Hip or Pelvis Injury</td>
<td>3</td>
<td>4.10</td>
<td>2</td>
<td>3.17</td>
</tr>
<tr>
<td>Knee Injury</td>
<td>9</td>
<td>12.32</td>
<td>7</td>
<td>11.11</td>
</tr>
<tr>
<td>Ankle Injury</td>
<td>8</td>
<td>10.95</td>
<td>10</td>
<td>15.87</td>
</tr>
<tr>
<td>Foot Injury</td>
<td>6</td>
<td>8.21</td>
<td>5</td>
<td>7.93</td>
</tr>
<tr>
<td>Other Leg Injury</td>
<td>3</td>
<td>4.10</td>
<td>2</td>
<td>3.17</td>
</tr>
<tr>
<td>Participants with no injuries in the last 24 months.</td>
<td>24</td>
<td>32.88</td>
<td>19</td>
<td>30.16</td>
</tr>
<tr>
<td>Participants with 1 injury in the last 24 months.</td>
<td>18</td>
<td>24.65</td>
<td>17</td>
<td>26.98</td>
</tr>
<tr>
<td>Participants with 2 injuries in the last 24 months.</td>
<td>31</td>
<td>42.47</td>
<td>27</td>
<td>42.86</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>N=73</td>
<td>N=63</td>
</tr>
</tbody>
</table>

The ethical reason for the inclusion of the pre-participation orthopaedic questionnaire was to check whether any of the participants had any injuries that had not been fully rehabilitated before they participated in the HRF tests. In particular the multistage fitness test could aggravate a soft tissue injury in the subjects’ lower limbs (ankles, knees or lower back) due to the repetition of running and turning at the end of each shuttle. Additionally, neck, shoulder, wrist and elbow soft tissue injuries can be
made worse if not fully rehabilitated when completing the press-ups and the muscular strength handgrip dynamometer tests.

Table 6.3 portrays the main study OE group $N = 73$ and the PE group $N = 63$ personal medical, history results for the participants who needed medical treatment for that category in the 24 months prior to the main study pre-tests. The percentage of personal medical history problems of each group is also presented. The tendency in Table 6.3 indicated that both the OE and PE participants had asthma as the medical condition with the highest percentage.

Table 6.3 The OE and PE RCT study participants personal medical history results

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>OE</th>
<th>OE %</th>
<th>PE</th>
<th>PE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allergies</td>
<td>9</td>
<td>12.32</td>
<td>6</td>
<td>9.52</td>
</tr>
<tr>
<td>Asthma</td>
<td>20</td>
<td>27.39</td>
<td>12</td>
<td>19.04</td>
</tr>
<tr>
<td>Chronic Cough</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>3.17</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chest Pains</td>
<td>5</td>
<td>6.84</td>
<td>4</td>
<td>6.34</td>
</tr>
<tr>
<td>Shortness of Breath</td>
<td>5</td>
<td>6.84</td>
<td>3</td>
<td>4.76</td>
</tr>
<tr>
<td>High Blood Pressure</td>
<td>2</td>
<td>2.73</td>
<td>1</td>
<td>1.58</td>
</tr>
<tr>
<td>Low Blood Pressure</td>
<td>1</td>
<td>1.36</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Epilepsy</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fainting Spells</td>
<td>1</td>
<td>1.36</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Diabetes Type 1, Type 2, Pre-Diabetes</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Concussions</td>
<td>7</td>
<td>9.58</td>
<td>3</td>
<td>4.76</td>
</tr>
<tr>
<td>Operations</td>
<td>2</td>
<td>2.73</td>
<td>2</td>
<td>3.17</td>
</tr>
<tr>
<td>Heat Intolerance</td>
<td>1</td>
<td>1.36</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Frequent Headaches</td>
<td>2</td>
<td>2.73</td>
<td>1</td>
<td>1.58</td>
</tr>
<tr>
<td>Participants with no medical symptoms.</td>
<td>25</td>
<td>34.25</td>
<td>23</td>
<td>36.51</td>
</tr>
<tr>
<td>Participants with 1 medical condition.</td>
<td>22</td>
<td>30.14</td>
<td>19</td>
<td>30.16</td>
</tr>
<tr>
<td>Participants with 2 medical conditions.</td>
<td>26</td>
<td>35.61</td>
<td>21</td>
<td>33.33</td>
</tr>
<tr>
<td>Total</td>
<td>N=73</td>
<td>100%</td>
<td>N=63</td>
<td>100%</td>
</tr>
</tbody>
</table>

The ethical reason for the inclusion of the personal medical history questionnaire was to identify prior to HRF testing: a) asthmatics $n = 20$ in the OE group; and asthmatics $n = 12$ in the PE group). The ESOESP HRF feasibility study had one
participant who had an asthmatic attack during the multistage fitness test. The questionnaire helped to identify any other at-risk participant prior to participation in the HRF tests. Table 6.4 portrays the main study family medical history results for the OE (experimental group \( n = 73 \)) and the PE (control group \( n = 63 \)). The percentage of each group’s participants with a specific category of family medical history is shown. The direction in Table 6.4 indicated that high blood pressure and asthma were high levels of familial medical conditions.

Table 6.4 The OE and PE RCT study family medical history results

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>OE</th>
<th>OE %</th>
<th>PE</th>
<th>PE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death under age of 40 from Heart Disease</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>7</td>
<td>9.58</td>
<td>8</td>
<td>12.69</td>
</tr>
<tr>
<td>Diabetes – Type 1, Type 2, Pre-diabetes.</td>
<td>14</td>
<td>19.17</td>
<td>7</td>
<td>11.11</td>
</tr>
<tr>
<td>High Blood Pressure</td>
<td>24</td>
<td>32.87</td>
<td>20</td>
<td>31.74</td>
</tr>
<tr>
<td>Low Blood Pressure</td>
<td>3</td>
<td>4.10</td>
<td>1</td>
<td>1.58</td>
</tr>
<tr>
<td>Asthma</td>
<td>23</td>
<td>31.5</td>
<td>20</td>
<td>31.74</td>
</tr>
<tr>
<td>Participants with no family medical history</td>
<td>30</td>
<td>41.09</td>
<td>28</td>
<td>44.44</td>
</tr>
<tr>
<td>Participants with 1 family medical history problem</td>
<td>27</td>
<td>36.99</td>
<td>21</td>
<td>33.33</td>
</tr>
<tr>
<td>Participant with 2 family medical history problems</td>
<td>16</td>
<td>21.92</td>
<td>14</td>
<td>22.22</td>
</tr>
<tr>
<td>Total</td>
<td>( N=73 )</td>
<td>100%</td>
<td>( N=63 )</td>
<td>100%</td>
</tr>
</tbody>
</table>

The reason for the inclusion of the family medical history questionnaire was to identify participants who might have a high BMI and waist circumference and low cardiorespiratory endurance in conjunction with a family medical history of heart disease and/or diabetes. The PA programme which has the most effect on those measurements and lowering the BMI might have the most benefit as a primary prevention for future-related medical problems (Diabetes Australia, 2006).

**Summary of the ethical considerations for the OE and PE RCT study participants**

The researcher utilised the pre-participation results to allow full participation in the HRF tests, and to minimise possible injuries during the HRF tests. This system complied with the requirements of the Department of Education and Training, New
The major focus of the OE and PE RCT study was to determine the effect of the OE and PE physical activities programmes upon Year 9 adolescent males’ HRF and SE. The components of HRF and SE subscales were examined pre and post-test. Data was gathered and analysed and the results presented in tables (Evans & Gruba, 2005). The OE and PE RCT study used two types of descriptive statistics: measures of central tendency (mean) measures of variability (standard deviation).

The OE and PE RCT study variables for HRF were body composition (height, weight, BMI, BMI- z-scores, waist circumference); muscular endurance (sit-ups, press-ups), muscular strength (handgrip dynamometer, right and left hand); cardiorespiratory endurance (lung function test, multistage fitness test (MFT) predicted VO2 Ml.kg.min-1, and level/shuttle converted to laps); and flexibility (sit and reach).

The variables were assessed for normality using the Shapiro-Wilk statistic to test the null hypothesis that the sample data were drawn from a normally-distributed population. The variables were analysed using parametric statistics; the parametric independent \( t \) test was used to test the hypotheses. The following assumptions were met for the independent \( t \) test procedure: homogeneity of variance; normality; and the participant sample was randomly selected. The random sample was checked after the pre-tests were completed. Using an independent sample test, no significant differences were found on the HRF variables, \( t (136) = -.132, p = < .05 \). This result showed that the random sampling into the ESOESP (experimental) and PE (control) groups were valid.

Additionally, Cohen’s \( d \) was used to measure the magnitude of difference (effect size), omega squared was used to determine the importance of the mean difference, and the amount of improvement from the pre-test to the post-test was calculated. The results are presented and related to the OE and PE RCT study research questions and hypotheses. Descriptive statistics for the OE and PE RCT study participants’ baseline
pre-test HRF results are shown in Table 6.5. The trend in Table 6.5 indicated that the muscular endurance HRF variable had a similar low percentile score (30th percentile) to the pilot study baseline score (20th percentile). The remaining HRF variables were also low (50th percentile) for age.

Table 6.5 Descriptive statistics for the OE and PE RCT study cohort pre-test

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>14.26</td>
<td>0.365</td>
</tr>
<tr>
<td>(a) Height (m)</td>
<td>1.69</td>
<td>0.09</td>
</tr>
<tr>
<td>(b) Weight (kg)</td>
<td>61.17</td>
<td>12.17</td>
</tr>
<tr>
<td>(c) Body Mass Index (ratio of weight (kg) to height (m²))</td>
<td>21.13</td>
<td>3.18</td>
</tr>
<tr>
<td>(d) Waist Circumference (cm)</td>
<td>78.58</td>
<td>8.44</td>
</tr>
<tr>
<td>(e) Sit-ups (n30s-1)</td>
<td>18.95</td>
<td>5.19</td>
</tr>
<tr>
<td>(f) Press-ups (n30s-1)</td>
<td>20.58</td>
<td>8.79</td>
</tr>
<tr>
<td>(g) Strength: Right Hand kg</td>
<td>35.79</td>
<td>8.30</td>
</tr>
<tr>
<td>(h) Strength: Left Hand kg</td>
<td>32.95</td>
<td>7.73</td>
</tr>
<tr>
<td>(i) Lung Capacity (c.c.)</td>
<td>3387.5</td>
<td>632.5</td>
</tr>
<tr>
<td>(j) Predicted VO2 (ml.kg.min-1)</td>
<td>42.15</td>
<td>6.35</td>
</tr>
<tr>
<td>(k) Flexibility (static) sit-and-reach</td>
<td>2.60</td>
<td>8.79</td>
</tr>
</tbody>
</table>

**Characteristics of the pre-test health-related fitness results for the total OE and PE RCT participants**

A major focus of this study was to determine whether OE and PE physical activity programmes had a significant effect on the HRF of Year 9 males. The baseline pre-test measurements scores are shown in Table 6.5, the following variables are noted: Body composition: The participants’ height and weight were within the stature-for-age and weight-for-age percentiles (National Center for Health Statistics, & National Center for Chronic Disease and Health Promotion, 2000). The mean BMI score was 21.13 which is only 1.49 below the BMI score for the overweight 85th percentile (Cole, Bellizzi, Flegal & Dietz, 2000). The muscular endurance mean score of 18.95 (sit-ups) placed them in the 30th percentile, and 20.58 (press-ups) placed them in the 50th percentile for age and gender. The participants’ muscular strength mean score of 35.79
kg (right hand) and 32.95 kg classification were good for both hands (percentile scores not available). The cardiorespiratory endurance lung capacity mean score of 3387.5 placed the participants in the average score for age and gender. The MFT means score result of 42.15 mL.kg.min⁻¹ placed the participants in the 50th percentile for age and gender. The OE and PE pre-test results for the HRF variables were compared and presented in Table 6.6. There were no significant differences in the t test scores in four of the five HRF variables. The Cohen’s d effect size for the HRF variables was very small.

Table 6.6 Descriptive statistics of OE and PE pre-test HRF results, t-values and Cohen’s d

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-Test (OE) N = 73</th>
<th>Pre-Test (PE) N = 63</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td><strong>Body Composition</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Height (m)</td>
<td>1.69</td>
<td>0.93</td>
</tr>
<tr>
<td>(b) Weight (kg)</td>
<td>60.64</td>
<td>12.55</td>
</tr>
<tr>
<td>(c) Body Mass Index (ratio of weight (kg) to height (m²))</td>
<td>20.96</td>
<td>3.21</td>
</tr>
<tr>
<td>(d) Waist Circumference (cm)</td>
<td>78.33</td>
<td>7.87</td>
</tr>
<tr>
<td><strong>Muscular Endurance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Sit-ups (n30s⁻¹)</td>
<td>21.61</td>
<td>4.10</td>
</tr>
<tr>
<td>(b) Press-ups (n30s⁻¹)</td>
<td>22.84</td>
<td>7.84</td>
</tr>
<tr>
<td><strong>Muscular Strength</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Right hand</td>
<td>35.62</td>
<td>8.41</td>
</tr>
<tr>
<td>(b) Left Hand</td>
<td>31.93</td>
<td>7.67</td>
</tr>
<tr>
<td><strong>Cardiorespiratory Endurance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Lung capacity (c.c.)</td>
<td>3438.36</td>
<td>624.86</td>
</tr>
<tr>
<td>(b) Multistage Fitness Test predicted VO₂ max (m1kgmin⁻¹)</td>
<td>41.58</td>
<td>5.94</td>
</tr>
<tr>
<td><strong>Flexibility (static)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sit and reach</td>
<td>3.95</td>
<td>6.01</td>
</tr>
</tbody>
</table>
Characteristic of the OE and PE RCT study self-esteem pre-test scores for the total participants

The OE and PE RCT study participants completed the Self-Perception Profile for Adolescents (SPPA) for the following subscales: athletic competence (AC), behavioural conduct (BC), close friendship (CF), global self-worth (GS), physical appearance (PA), scholastic competence (SC), social acceptance (SA) and total self-esteem, (TS). The mean score for age and gender for the subscales is 2.5 (Harter, 1988), the OE and PE RCT study cohort subscales mean scores were slightly higher. Table 6.7 shows the individual subscales mean and standard deviation. The tendency in Table 6.7 indicated that the self-perception scores were all above the mean for adolescent males.

Table 6.7 The baseline pre-test OE and PE RCT study self-esteem scores for the entire cohort

<table>
<thead>
<tr>
<th>SE Subscale</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Athletic Competence</td>
<td>2.73</td>
<td>0.64</td>
</tr>
<tr>
<td>(b) Behavioural Conduct</td>
<td>2.78</td>
<td>0.51</td>
</tr>
<tr>
<td>(c) Close Friendship</td>
<td>2.98</td>
<td>0.69</td>
</tr>
<tr>
<td>(d) Global Self-Worth</td>
<td>2.97</td>
<td>0.49</td>
</tr>
<tr>
<td>(e) Physical Appearance</td>
<td>2.60</td>
<td>0.58</td>
</tr>
<tr>
<td>(f) Scholastic Competence</td>
<td>2.68</td>
<td>0.59</td>
</tr>
<tr>
<td>(g) Social Acceptance</td>
<td>2.79</td>
<td>0.75</td>
</tr>
<tr>
<td>(h) Total Self-Esteem</td>
<td>2.80</td>
<td>0.33</td>
</tr>
</tbody>
</table>

The individual subscales results for the OE and PE participants showing the participants higher mean score for their age were as follows, athletic competence mean score of 2.73 (+0.23), behavioural conduct man score of 2.78 (+0.28), close friendship mean score of 2.98 (+0.48), global self worth mean score of 2.97(+0.47), Physical appearance mean score of 2.60 (+0.10), scholastic competence mean score of 2.68 (+0.18), Social acceptance mean score of 2.79 (+0.29), and the total self –esteem score mean score of 2.80 (+0.30).

The descriptive statistics for self-esteem pre-test OE and PE RCT study participants are shown in Table 6.8. The t test results for the self-esteem subscale showed that there were no significant differences between the OE and PE participants.

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seven of the eight subscales. The Cohen’s d score showed that there was a very small effect size for all of the self-esteem subscales.

Table 6.8 Descriptive statistics for self-esteem pre-test outdoor education and physical education physical activities groups

<table>
<thead>
<tr>
<th>Self-Perception Profile for Adolescents Subscales (Harter, 1988)</th>
<th>OE N = 73</th>
<th>PE N = 63</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPPA Subscales</td>
<td>Mean</td>
<td>S.D.</td>
</tr>
<tr>
<td>(a) Athletic Competence</td>
<td>2.86</td>
<td>1.58</td>
</tr>
<tr>
<td>(b) Behavioural Conduct</td>
<td>2.80</td>
<td>0.54</td>
</tr>
<tr>
<td>(c) Close Friendship</td>
<td>2.88</td>
<td>0.66</td>
</tr>
<tr>
<td>(d) Global Self-worth</td>
<td>2.95</td>
<td>0.45</td>
</tr>
<tr>
<td>(e) Physical Appearance</td>
<td>2.42</td>
<td>0.58</td>
</tr>
<tr>
<td>(f) Scholastic Competence</td>
<td>2.63</td>
<td>0.58</td>
</tr>
<tr>
<td>(g) Social Acceptance</td>
<td>2.82</td>
<td>0.56</td>
</tr>
<tr>
<td>(h) Total self-esteem</td>
<td>2.81</td>
<td>0.40</td>
</tr>
</tbody>
</table>

Research question one and hypothesis

Question 1: Does an 18-week OE physical activities programme at the ESOESP campus make a significant difference in the Year 9 males’ HRF results? Hypothesis: There will be positive significant differences in HRF results on completion of the 18-week OE physical activities group programme at the ESOESP campus.

Research question one investigated the effect of the participation in the OE physical activities programme. In order to determine the effect on the participants’ HRF an independent samples t-test (Thomas, Nelson & Silverman, 2005) was conducted. Table 6.8 shows the OE health-related fitness results. Table 6.9 indicated significant changes between baseline pre-test results, completion of the 18 week PA intervention and the post-test results.
Table 6.9 Descriptive statistics for the outdoor education participants, t-test value and Cohen’s d for HRF

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-test N = 73</th>
<th>Post-test N = 73</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Age (years)</td>
<td>14.05</td>
<td>1.70</td>
</tr>
<tr>
<td>(a) Height (m)</td>
<td>1.69</td>
<td>0.93</td>
</tr>
<tr>
<td>(b) Weight (kg)</td>
<td>60.64</td>
<td>12.55</td>
</tr>
<tr>
<td>(c) Body Mass Index</td>
<td>20.96</td>
<td>3.21</td>
</tr>
<tr>
<td>(d) Body Mass Index (BMI) z-scores</td>
<td>0.37</td>
<td>0.99</td>
</tr>
<tr>
<td>(e) Waist Circumference (cm)</td>
<td>78.33</td>
<td>7.87</td>
</tr>
<tr>
<td>(a) Sit-ups (n30s-1)</td>
<td>20.61</td>
<td>4.10</td>
</tr>
<tr>
<td>(b) Press-ups (n30s-1)</td>
<td>22.84</td>
<td>7.84</td>
</tr>
<tr>
<td>(a) Right Hand</td>
<td>35.62</td>
<td>8.41</td>
</tr>
<tr>
<td>(b) Left Hand</td>
<td>31.93</td>
<td>7.67</td>
</tr>
<tr>
<td>(a) Lung Capacity (c.c.)</td>
<td>3438.36</td>
<td>624.86</td>
</tr>
<tr>
<td>(b) Multistage fitness Test Results</td>
<td>68.14</td>
<td>20.24</td>
</tr>
<tr>
<td>(c) Predicted VO₂ max (m1 kg min⁻¹)</td>
<td>41.58</td>
<td>5.94</td>
</tr>
<tr>
<td>Flexibility (static) (cm)</td>
<td>3.95</td>
<td>6.01</td>
</tr>
</tbody>
</table>

** <.05 (two-tail) NB. ** Denotes HRF variables that were found to be statistically significant at the 5% level (two-tail).

The OE t test results for the following HRF variables were: The BMI t test result indicated a significant difference between the OE pre and post-test results, \( t(73) = 4.80, p = < .05 \). BMI mean reduced from 20.96 to 19.88. The BMI z-scores t test result indicated a significant difference between the OE pre and post-test results, \( t(73) = 3.85, p = < .05 \). The BMI percentile scores t test result also showed a significant change, \( t(73) = 4.95, p = < .05 \). The waist circumference t test result indicated a significant difference between the OE pre and post-tests, \( t(73) = 2.05, p = < .05 \). The waist circumference mean was reduced from 78.33cm to 75.72cm. The muscular endurance OE press-ups results indicated a significant difference between the pre and post-tests, \( t(73) = 3.64, p = < .05 \). The muscular endurance OE press-ups t test results did not indicate a significant difference between the OE pre and post-tests.
To reduce cardiovascular disease and Type 2 diabetes risks it is necessary to reduce weight, waist circumference and BMI (National Heart Lung and Blood Institute, 2008); Table 6.10 shows the weight, waist circumference and BMI results of four overweight OE participants after completion of the OE physical activities programme.

Table 6.10 Significant positive health benefit gains from weight, waist circumference and BMI loss, four overweight OE participants.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Weight</th>
<th>Waist circumference</th>
<th>Body Mass Index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Loss</td>
</tr>
<tr>
<td>G2</td>
<td>93</td>
<td>81</td>
<td>-12kg</td>
</tr>
<tr>
<td>G19</td>
<td>73</td>
<td>60</td>
<td>-13kg</td>
</tr>
<tr>
<td>G21</td>
<td>93</td>
<td>83</td>
<td>-10kg</td>
</tr>
<tr>
<td>G26</td>
<td>74</td>
<td>65</td>
<td>-9kg</td>
</tr>
</tbody>
</table>

The cardiorespiratory endurance OE lung capacity t test result indicated a significant difference between the pre and post-test results, $t(73) = 48.45, p = < .05$. The lung capacity mean scores increased from 3438 to 3600. Additionally, the OE multistage fitness test $t$ test results indicated a significant difference between the pre and post-test results, $t(73) = 6.52, p = < .05$. The multistage fitness results increased from 41.58 to 48.64ml.kg.min $^{-1}$. The OE muscular strength mean scores increased from 35.85 to 41.06 (right hand) was significant; 32.30 to 37.91 was significant.

Question number one: Does an 18-week OE physical activities programme at the ESOESP campus make a significant difference in the Year 9 males’ HRF result? The results indicated that the OE physical activities did make a significant difference in the participants HRF results. Hypothesis: There are significant differences in HRF results on completion of the 18-week OE physical activities group programme at the ESOESP campus. The null hypothesis was rejected.

**Research question two and hypothesis**

Question 2: Does an 18-week PE physical activities programme at the city-based campus make a significant difference in the Year 9 males’ HRF results?
Hypothesis: There will be positive significant differences in HRF results on completion of the 18-week PE physical activities group programme at the city based campus.

Research question two investigated the effect of participation in the PE physical activities programme at the city-based campus. In order to determine the effect on the participants’ HRF an independent sample $t$ test (Thomas, Nelson, & Silverman, 2005) was conducted. Table 6.8 shows the PE health-related fitness results. The trend in Table 6.11 indicated that only the sit-ups and the multistage fitness test results showed significant improvements from the baseline scores.

Table 6.11 Descriptive statistics for the PE participants, $t$ test value and Cohen’s $d$ for health-related fitness.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-Test $N=63$</th>
<th>Post-Test $N=63$</th>
<th>$t$-Value</th>
<th>Cohen’s $d$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Height (m)</td>
<td>1.69 0.07</td>
<td>1.71 0.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Weight (kg)</td>
<td>61.79 11.80</td>
<td>64.15 10.87</td>
<td>1.20</td>
<td>0.21</td>
</tr>
<tr>
<td>(c) Body Mass Index (BMI)</td>
<td>21.32 3.17</td>
<td>21.80 2.80</td>
<td>0.87</td>
<td>0.16</td>
</tr>
<tr>
<td>(d) BMI $z$-scores</td>
<td>0.65 0.79</td>
<td>0.68 0.73</td>
<td>0.86</td>
<td>0.15</td>
</tr>
<tr>
<td>(e) Waist Circumference (cm)</td>
<td>78.87 9.10</td>
<td>76.60 7.71</td>
<td>1.45</td>
<td>0.26</td>
</tr>
<tr>
<td>(a) Sit-ups (n30s-1)</td>
<td>17.01 5.68</td>
<td>19.21 5.49</td>
<td>2.12*</td>
<td>0.38</td>
</tr>
<tr>
<td>(b) Press-ups (n30s-1)</td>
<td>17.97 7.66</td>
<td>19.49 8.93</td>
<td>0.97</td>
<td>0.17</td>
</tr>
<tr>
<td>(a) Right Hand</td>
<td>35.71 8.38</td>
<td>36.36 8.37</td>
<td>0.42</td>
<td>0.08</td>
</tr>
<tr>
<td>(b) Left Hand</td>
<td>33.70 7.83</td>
<td>33.68 7.77</td>
<td>0.01</td>
<td>0.002</td>
</tr>
<tr>
<td>(a) Lung Capacity (c.c.)</td>
<td>3328.57 641.47</td>
<td>3477.3 676.71</td>
<td>1.21</td>
<td>0.22</td>
</tr>
<tr>
<td>(b) Multistage Fitness Test</td>
<td>42.82 6.79</td>
<td>45.49 7.31</td>
<td>2.00*</td>
<td>0.36</td>
</tr>
<tr>
<td>(c) Multistage Fitness (laps)</td>
<td>70.78 22.27</td>
<td>77.43 21.82</td>
<td>-2.31</td>
<td>-0.41</td>
</tr>
<tr>
<td>Flexibility (static) (cm)</td>
<td>1.03 11.03</td>
<td>1.51 7.63</td>
<td>0.28</td>
<td>0.05</td>
</tr>
</tbody>
</table>

$p < .05$ NB Denotes HRF variables that were found to be statistically significant at the 5% level (two-tail).

The PE physical activities participants’ $t$ test results for the following HRF variables were, Body composition: The PE participants’ $t$ test results did not indicate a significant difference between the pre and post-test results in weight, BMI, BMI $z$-scores, BMI percentile scores or waist circumference. The PE participants’ BMI increased from
21.322 to 21.803 cm, waist circumference reduced from 78.87 to 76.6 cm but the t test result = 1.50, was not significant. The PE participants Cohen’s d for weight was .24 (effect size was small), BMI = .16 (effect size was small), BMI z score = .15 (effect size was small), waist circumference = .26 (effect size was small).

The PE participants’ muscular endurance sit-ups t test results indicated a significant difference between pre and post-tests, \( t = (63), = 2.12, p < .05 \). The sit-ups mean increased from 34.03 to 38.42. The PE participants’ sit-ups Cohen’s d score was .38 (effect size was small). The PE muscular endurance press-ups t test did not indicate a significant difference between pre and post-tests. The press-ups mean increased from 17.97 to 19.49 but was not significant. The PE participants Cohen’s d score was .17 (effect size was small). The PE muscular strength t test results (right and left hands) also did not indicate a significant difference between pre and post-tests. The PE participant’s Cohen’s d score for right hand was .08 (effect size was small), Cohen’s d score for left hand was .002 (effect size was very small).

The PE participants’ cardiorespiratory endurance multistage fitness test t test results indicates a significant difference between pre and post-tests, \( t (63) = 2.00, p < .05 \). The PE participants’ multistage fitness mean scores increased from 42.82 to 45.48. The PE participants’ Cohen’s d score was .36 (effect size = small). Their lung capacity mean increased from 3328.57 to 3477.3 but was not significant. The Cohen’s d score for lung capacity was .22 (effect size was small). The PE participants’ flexibility t test results did not indicate a significant difference between pre and post tests, but it should be noted that flexibility is an individual score. The Cohen’s d score for flexibility was .05 (effect size was very small). The t test results indicated that the PE physical activities do not make a significant difference on all variables. The PE muscular endurance and multistage fitness test results were significant, but the remaining HRF variables were not. The research null hypothesis could not be fully accepted or rejected.

Research question three and hypothesis

Question 3: Is there a significant difference in the HRF results of the OE and PE physical activity programmes? Hypothesis: There will be positive significant differences in the HRF results between the OE and PE physical activities programmes.
Research question three investigated the comparison of the effect of the OE and the PE physical activities programmes. In order to determine if there was a significant difference between the two PA programmes effects upon Year 9 adolescent males, an independent sample \( t \)-test (Thomas, Nelson, & Silverman, 2005), was conducted on the post-test results. Table 6.9 shows the descriptive statistics and \( t \) test values for the OE and PE post-test results and \( t \) values. Table 6.12 indicated that there were significant differences between the OE and PE HRF variables after completion of the 18-week PA intervention.

Table 6.12 Descriptive statistics for the OE and PE post-test results, \( t \)-values and Cohen’s \( d \)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Post-Test (OE) ( N=73 )</th>
<th>Post-Test (PE) ( N=63 )</th>
<th>( t )-Value</th>
<th>Cohen’s ( d )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body Composition</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Height (m)</td>
<td>1.71 (0.0913)</td>
<td>1.71 (0.0802)</td>
<td>0.006</td>
<td>0.46</td>
</tr>
<tr>
<td>(b) Weight (kg)</td>
<td>58.90 (10.744)</td>
<td>64.15 (10.873)</td>
<td>2.66*</td>
<td>0.46</td>
</tr>
<tr>
<td>(c) Body Mass Index</td>
<td>19.88 (2.475)</td>
<td>21.70 (2.802)</td>
<td>3.80*</td>
<td>0.65</td>
</tr>
<tr>
<td>(d) Waist Circumference (cm)</td>
<td>75.72 (7.271)</td>
<td>76.60 (7.712)</td>
<td>0.65</td>
<td>0.11</td>
</tr>
<tr>
<td><strong>Muscular Endurance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Sit-ups (n30s-1)</td>
<td>21.42 (5.02)</td>
<td>19.21 (5.49)</td>
<td>2.31*</td>
<td>0.40</td>
</tr>
<tr>
<td>(b) Press-ups (n30s-1)</td>
<td>27.42 (7.15)</td>
<td>19.49 (8.94)</td>
<td>5.44*</td>
<td>0.94</td>
</tr>
<tr>
<td><strong>Muscular Strength</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Right hand</td>
<td>41.06 (8.39)</td>
<td>36.36 (8.38)</td>
<td>3.07*</td>
<td>0.53</td>
</tr>
<tr>
<td>(b) Left Hand</td>
<td>37.91 (8.65)</td>
<td>33.68 (7.78)</td>
<td>2.80*</td>
<td>0.49</td>
</tr>
<tr>
<td><strong>Cardiorespiratory Endurance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Lung capacity (c.c.)</td>
<td>3.60 (634.31)</td>
<td>3477.36 (676.71)</td>
<td>1.03</td>
<td>0.18</td>
</tr>
<tr>
<td>(b) Multistage Fitness Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>predicted ( \text{VO}_2 ) max (m1kgmin(^{-1}))</td>
<td>48.64 (6.419)</td>
<td>45.49 (7.31)</td>
<td>2.41*</td>
<td>0.41</td>
</tr>
<tr>
<td><strong>Flexibility (static)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sit and reach</td>
<td>3.82 (8.99)</td>
<td>1.51 (7.64)</td>
<td>1.50*</td>
<td>0.26</td>
</tr>
</tbody>
</table>

\* p < .05, \* * p < .01 NB ** denotes HRF variables that were found to be statistically significant at the 5% level, and * denotes HRF variables that were found to be statistically significant at the 1% level.
The differences in the OE and PE health-related fitness \( t \) test results are as follows, Body composition: The \( t \) test results of the participants’ weight indicate a significant difference between the OE and PE post-test results, \( t = 2.66, p = < .05 \). The participants Cohen’s \( d \) score for weight was .46 (effect size was medium). Additionally the \( t \) test result for the OE and PE body mass index (BMI) \( t = 3.80, p = < .05 \). The Cohen’s \( d \) score for BMI was .65 (effect size was medium). The waist circumference \( t \) test did not indicate a significant difference between the pre and post-test. The Cohen’s \( d \) score was .11 (effect size was small). The muscular endurance \( t \) test results for both sit-ups and press-ups indicated a significant difference between the OE and PE post-test results \( t = 2.31 \) (sit-up) and \( t = 5.44 \) (press-ups), \( p = < .05 \). The participants sit-ups Cohen’s \( d \) score was .40 (effect size was small), .94 (effect size was large) for press-ups. The muscular strength \( t \) test results indicated a significant difference between the OE and PE post-test results, \( t = 3.07 \) (right hand) and 2.80 (left hand), \( p = < .05 \). The participants’ Cohen’s \( d \) score for muscular strength (right hand) was .53 (effect size was medium), and for left hand was .48 (effect size was medium).

The cardiorespiratory endurance multistage fitness \( t \) test results indicated a significant difference between the OE and PE post-test results, \( t = 2.41, p = < .05 \). The participants’ Cohen’s \( d \) score for the multistage fitness test was .41 (effect size was medium). The lung capacity \( t \) test did not indicate any significant differences between the OE and PE post-test results. The participants Cohen’s \( d \) score for lung capacity was .18 (effect size was small). The flexibility \( t \) test results show a significant difference between the OE and PE post–test results, \( t = 1.5 \) (one tail), \( p = < .05 \). The participants’ Cohen’s score for flexibility was .26 (effect size was small). The null hypothesis was rejected.

**Research question four and hypothesis**

Question 4: Does an 18-week OE physical activities programme at the ESOESP campus make a significant difference in the Year 9 males’ SE results? Hypothesis: There will be positive significant differences in the SE results on completion of the 18-week OE physical activities programme at the ESOESP campus.
Research question four investigated the effect of participation in the OE physical activities programme. In order to determine the effect of the participants’ SE, an independent sample \( t \) test (Thomas, Nelson, & Silverman, 2005) was conducted. Table 6.10 shows the OE self-esteem results. The direction in table 6.13 indicated that physical appearance was the only sub-domain that significantly improved after the 18 week OE physical activities intervention.

<table>
<thead>
<tr>
<th>Self-Perception Profile for Adolescents Subscales (Harter, 1988)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPPA Subscales</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>(a) Athletic Competence</td>
</tr>
<tr>
<td>(b) Behavioural Conduct</td>
</tr>
<tr>
<td>(c) Close Friendship</td>
</tr>
<tr>
<td>(d) Global Self-worth</td>
</tr>
<tr>
<td>(e) Physical Appearance</td>
</tr>
<tr>
<td>(f) Scholastic Competence</td>
</tr>
<tr>
<td>(g) Social Acceptance</td>
</tr>
</tbody>
</table>

*\( p<.01 \) NB. Denotes a significant correlation at the 1% level

The OE subjects completed the SPPA. The following subscales were completed with no significant difference between the pre and post-tests indicated by the \( t \) tests applied to athletic competence (AC), behavioural conduct (BC), close friendship (CF), global self-worth (GS), scholastic competence (SC) and social acceptance (SA). The \( t \) test result for the physical appearance (PA) subscale did indicate a significant difference between the pre and post-tests results, \( t(73) = 2.80, p = .05 \). Cohen’s d score for PA subscale was .46 (effect size was medium). The Cohen’s d scores for the following subscales were, AC = .05, BC = .06, CF = .08, GS = .16, SC = .01, and SA = .12, the effect size for all of these subscales was very small. The null hypothesis could not be fully accepted or rejected.

**Research question five and hypothesis**

Question 5: Does an 18-week PE physical activities programme at the city based campus make a significant difference in Year 9 males’ SE results? Hypothesis: There
will be positive significant differences in the SE results on completion of the 18 week PE physical activities programme at the city-based campus.

Research question five investigated the effect of participation in the PE physical activities programme. In order to determine the effect of the participants SE an independent sample \( t \) test (Thomas, Nelson, & Silverman, 2005) was conducted. Table 6.11 shows the PE physical activities participants SE results. The trend in Table 6.14 indicated that the close friendship and physical appearance sub-domains were the only SE variables that significantly improved after completion of the 18-week PE physical activities intervention.

Table 6.14 Self-esteem pre and post-test results for the physical education physical activities participants

<table>
<thead>
<tr>
<th>SPPA Subscales</th>
<th>Pre-test ( N = 63 )</th>
<th>Post-test ( N = 63 )</th>
<th>t-Value</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Athletic Competence</td>
<td>2.79 0.72</td>
<td>2.81 0.71</td>
<td>0.16</td>
<td>0.03</td>
</tr>
<tr>
<td>(b) Behavioural Conduct</td>
<td>2.76 0.47</td>
<td>2.87 0.52</td>
<td>1.20</td>
<td>0.21</td>
</tr>
<tr>
<td>(c) Close Friendship</td>
<td>3.05 0.71</td>
<td>2.77 0.51</td>
<td>2.43*</td>
<td>0.43</td>
</tr>
<tr>
<td>(d) Global Self-worth</td>
<td>2.99 0.53</td>
<td>2.93 0.55</td>
<td>0.51</td>
<td>0.10</td>
</tr>
<tr>
<td>(e) Physical Appearance</td>
<td>2.75 0.60</td>
<td>2.61 0.55</td>
<td>1.34**</td>
<td>0.24</td>
</tr>
<tr>
<td>(f) Scholastic Competence</td>
<td>2.72 0.59</td>
<td>2.89 0.48</td>
<td>0.76</td>
<td>0.14</td>
</tr>
<tr>
<td>(g) Social Acceptance</td>
<td>2.85 0.57</td>
<td>2.90 0.54</td>
<td>0.51</td>
<td>0.09</td>
</tr>
<tr>
<td>(h) Total Self-Esteem</td>
<td>2.84 0.38</td>
<td>2.84 0.36</td>
<td>0.76</td>
<td>0.14</td>
</tr>
</tbody>
</table>

* \( p < .05 \), ** \( p < .01 \)

NB.* Denotes a significant correlation at the 5% level; ** at the 1% level

The following PE physical activities participants’ SE subscale \( t \) test results did not indicate a significant difference between pre and post-tests, athletic competence (AC), behavioural conduct (BC), global self-worth (GS), scholastic competence (SC), social acceptance (SA) and total self-esteem (TS). The Cohen’s d scores for those subscales were as follows, AC = .03 (effect size was very small), BC = .21 (effect size was small), CF = .43 (effect size was medium), GS = .10 (effect size was very small), PA = .24 (effect size was small), SC = .14 (effect size was very small), SA = .09 (effect size was very small) and TS = .14 (effect size was very small). The close friendship \( t \) test did indicate a significant difference between pre and post-tests, \( t (63) = 2.43, p < .05 \). The physical appearance \( t \) test results did indicate a significant difference between
the pre and post-test results, $t (63) = 1.34, p = < .01$. The null hypothesis could not be fully accepted or rejected.

**Research question six and hypothesis**

Question 6: Is there a significant difference in the SE results of the 18-week OE and PE physical activities programmes? Hypothesis: There will be positive significant differences in the SE results between the OE and PE participants.

Research question six investigated the difference in the effect of the OE and the PE physical activities programmes. In order to determine if there was a significant difference between the two PA programmes effects upon Year 9 adolescent males’ SE, an independent sample $t$ test (Thomas, Nelson, & Silverman, 2005) was conducted on the post-test results. Table 6.12 shows the descriptive statistics for the OE and the PE post-test results and $t$ value. The trend in Table 6.15 indicated that there were no significant differences in changes of self-perception between the OE and PE participants.

The participants’ Cohen’s d scores for the subscales were as follows, Athletic competence was $AC = .11$ (effect size was very small), Behavioural Conduct $BC = .14$ (effect size was very small), Close friendship $CF = .11$ (effect size was very small), Global Self-Worth $GS = .07$ (effect size was very small), Physical Appearance $PA = .12$ (effect size was very small), Scholastic Competence $SC = .14$ (effect size was very small), Social Acceptance $SA = .14$ (effect size was very small) and Total Self-Esteem $TS = .03$ (effect size was very small).
Table 6.15 Descriptive statistics for self-esteem post-test outdoor education and physical education physical activities groups

<table>
<thead>
<tr>
<th>SPPA Subscales</th>
<th>OE  ( N = 73 )</th>
<th>PE  ( N = 63 )</th>
<th>( t )-Value</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Athletic Competence</td>
<td>2.80 0.51</td>
<td>2.88 0.72</td>
<td>0.67</td>
<td>0.11</td>
</tr>
<tr>
<td>(b) Behavioural Conduct</td>
<td>2.79 0.55</td>
<td>2.87 0.52</td>
<td>0.79</td>
<td>0.14</td>
</tr>
<tr>
<td>(c) Close Friendship</td>
<td>2.93 0.64</td>
<td>2.77 0.51</td>
<td>0.64</td>
<td>0.11</td>
</tr>
<tr>
<td>(d) Global Self-worth</td>
<td>3.03 0.51</td>
<td>2.93 0.55</td>
<td>0.40</td>
<td>0.07</td>
</tr>
<tr>
<td>(e) Physical Appearance</td>
<td>2.68 0.53</td>
<td>2.61 0.55</td>
<td>0.70</td>
<td>0.12</td>
</tr>
<tr>
<td>(f) Scholastic Competence</td>
<td>2.81 0.57</td>
<td>2.89 0.48</td>
<td>0.83</td>
<td>0.14</td>
</tr>
<tr>
<td>(g) Social Acceptance</td>
<td>2.96 0.48</td>
<td>2.90 0.55</td>
<td>0.83</td>
<td>0.14</td>
</tr>
<tr>
<td>(h) Total Self-Esteem</td>
<td>2.86 0.34</td>
<td>2.84 0.36</td>
<td>0.20</td>
<td>0.03</td>
</tr>
</tbody>
</table>

The \( t \) tests indicated that there were no significant differences in the OE and PE post-test SE results, the Cohen’s d scores indicated that there the effect sizes were very small. The null hypothesis was accepted.

The magnitude of the difference (size of effect), percentage change, and omega squared results for the OE and PE RCT study

The magnitude of the difference (size of effect) was used in the OE and PE RCT study as the \( t \) test results are an indicator that there is a significant difference, and that the differences are real (significant at \( p=0.05 \)) and did not occur by chance (Vincent, 1999). However, there is also a practical significance that needs to be considered. The following calculations show the mean difference of: Cohen’s d (effect size) and effect-size correlation using means and standard deviations, and omega squared, to determine the importance, or usefulness of the measure of the mean difference.

The omega squared calculation was used to determine the importance, or usefulness, of the mean difference (Vincent, 1999). The omega squared calculation was the \( t \) score squared minus 1, divided by the \( t \) squared + the number of participants (experimental group) + the participants (control group) – 1. The percent improvement from the pre-test to the post-test was determined by assessing the percent change.
The percent improvement was calculated by subtracting the mean of the control group from the mean of the experimental group, and dividing that score by the mean of the experimental group multiplied by 100. The Cohen’s d (effect size) r and percent change (improvement) for the ESOESP and PE health-related fitness tests are shown in table 6.14. The trend in Table 6.16 indicated that there was a large effect size in BMI, press-ups and the strength HRF variable of the participants’ right hand.

Table 6.16 Cohen’s d, (Effect size) r, and percentile standing, percent of nonoverlap and Cohen’s standard for the outdoor education health-related fitness results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cohen’s d</th>
<th>r</th>
<th>r2</th>
<th>Percentile standing</th>
<th>Percent nonoverlap</th>
<th>Cohen’s standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Weight (kg)</td>
<td>0.49</td>
<td>0.24</td>
<td>.10</td>
<td>69</td>
<td>33.0</td>
<td>medium</td>
</tr>
<tr>
<td>(b) Body Mass Index</td>
<td>0.69</td>
<td>0.33</td>
<td>.11</td>
<td>76</td>
<td>43</td>
<td>large</td>
</tr>
<tr>
<td>(c) Waist Circumference (cm)</td>
<td>0.12</td>
<td>0.50</td>
<td>.002</td>
<td>54</td>
<td>7.7</td>
<td>small</td>
</tr>
<tr>
<td>(d) Sit-ups (n30s-1)</td>
<td>0.4</td>
<td>0.2</td>
<td>0.4</td>
<td>66</td>
<td>2.74</td>
<td>medium</td>
</tr>
<tr>
<td>(e) Press-ups (n30s-1)</td>
<td>1.02</td>
<td>0.45</td>
<td>.89</td>
<td>84</td>
<td>27.4</td>
<td>large</td>
</tr>
<tr>
<td>(f) Right Hand</td>
<td>0.56</td>
<td>0.27</td>
<td>.56</td>
<td>69</td>
<td>33</td>
<td>large</td>
</tr>
<tr>
<td>(g) Left Hand</td>
<td>0.51</td>
<td>0.25</td>
<td>0.54</td>
<td>69</td>
<td>33</td>
<td>medium</td>
</tr>
<tr>
<td>(i) Lung Capacity (c.c.)</td>
<td>0.19</td>
<td>0.10</td>
<td>0.01</td>
<td>58</td>
<td>14.7</td>
<td>small</td>
</tr>
<tr>
<td>(j) Multistage Fitness Test</td>
<td>0.46</td>
<td>0.22</td>
<td>0.4</td>
<td>66</td>
<td>27.4</td>
<td>medium</td>
</tr>
</tbody>
</table>

Cohen’s d is the family of indices that measures the magnitude of a treatment effect (Vincent, 1999). The Percentile standing and percent overlap in the Table 6.16 was determined from Becker (2000). The body composition variable of BMI Cohen’s d = .69 indicated that the OE physical activities treatment effect was large. The muscular endurance sit-ups Cohen’s d =1.02 indicated that the OE physical activities effect was also large, and the muscular strength Cohen’s d for muscular strength indicated that the OE physical activities treatment effect was large. The HRF variables of the participants’ weight: Cohen’s d = 0.49; sit-ups, left hand handgrip strength:
Cohen’s $d = .51$; and multistage fitness: Cohen’s $d = .46$ indicated that the OE treatment effect was medium. The waist circumference Cohen’s $d = .12$, and lung capacity: Cohen’s $d = 0.19$, indicated that the OE treatment effect had only a small effect on the OE participants.

The magnitude of the difference (size of effect) has been recorded by declaring $t$ to be significant at $p = .05$ or a similar level. But this only indicates that the differences are real and that they did not occur by chance (Vincent, 1999). Thomas and Nelson (1990, p.133) suggests the use of omega squared to determine the importance, or usefulness of the mean difference. Omega squared is an estimate of the percentage of the total variance (the difference between the means) that can be explained by the influence of the independent variable (the treatment, OE physical activities). The amount of improvement from the pre-test to the post-test in repeated measures’ designs was determined by assessing the percent change (improvement) between the two measures. Table 6.17 shows the percent change and omega squared results for HRF. The trend in Table 6.17 indicated that there were larger percent changes (improvement) in the OE participants BMI, waist circumference, press-ups, right and left hand strength, lung capacity, multistage fitness predicted VO$_2$ results than the PE cohort participants. The omega squared results for the OE participants indicated that the largest improvement due to the PA intervention treatment was the MFT, muscular strength, press-ups and BMI.

Table 6.17 Percent change, omega squared results for the OE and PE RCT study participants’ HRF

<table>
<thead>
<tr>
<th>Variable</th>
<th>% Change OE</th>
<th>% Change PE</th>
<th>Omega Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Weight (kg)</td>
<td>-2.87</td>
<td>3.81</td>
<td>0.001</td>
</tr>
<tr>
<td>(b) Body Mass Index (ratio of weight (kg) to height ($m^2$)</td>
<td>-5.2</td>
<td>2.25</td>
<td>0.13</td>
</tr>
<tr>
<td>(c) Waist Circumference (cm)</td>
<td>-3.33</td>
<td>-2.88</td>
<td>0.022</td>
</tr>
<tr>
<td>(d) Sit-ups (n30s$^{-1}$)</td>
<td>3.9</td>
<td>12.93</td>
<td>0.01</td>
</tr>
<tr>
<td>(e) Press-ups (n30s$^{-1}$)</td>
<td>20.05</td>
<td>8.45</td>
<td>0.08</td>
</tr>
<tr>
<td>(f) Right Hand</td>
<td>14.53</td>
<td>1.82</td>
<td>0.08</td>
</tr>
<tr>
<td>(g) Left Hand</td>
<td>17.36</td>
<td>-0.06</td>
<td>0.10</td>
</tr>
<tr>
<td>(h) Lung Capacity (c.c.)</td>
<td>4.7</td>
<td>1.3</td>
<td>0.94</td>
</tr>
<tr>
<td>(i) MFT Predicted VO$_2$ max (ml kg min$^{-1}$)</td>
<td>16.98</td>
<td>6.21</td>
<td>0.24</td>
</tr>
</tbody>
</table>
The largest percent improvement in the OE physical programme at the ESOESP was muscular endurance (press-ups = 20.05%), muscular strength (left hand = 17.36%), (right hand = 14.53%), and the multistage fitness predicted VO₂ = 16.98%. In comparison to the PE physical activities group of muscular endurance (press-ups = 8.45%), muscular strength (left hand = -0.06%), and right hand = 1.82%, and the multistage fitness predicted VO₂ = 6.21%. The omega squared results for the OE physical activities effect was the multistage fitness predicted VO₂ omega squared = 24%, muscular strength (left hand = 10%), (right hand = 8%); press-ups = 8%, and BMI = 13%.

To reduce cardiovascular disease and Type 2 diabetes risks it is necessary to reduce weight, waist circumference and BMI (National Heart Lung and Blood Institute, 2008); Table 6.18 shows the weight, waist circumference and BMI results of four overweight PE participants after completion of the PE physical activities programme. The results are positive but not as significant as for the four overweight OE participants.

Table 6.18 Positive health benefit gains from weight, waist circumference and BMI loss of four overweight PE participants.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Weight</th>
<th>Waist circumference</th>
<th>Body Mass Index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Loss</td>
</tr>
<tr>
<td>S19</td>
<td>85.5</td>
<td>80</td>
<td>-5.5kg</td>
</tr>
<tr>
<td>S31</td>
<td>89</td>
<td>87</td>
<td>-2.0kg</td>
</tr>
<tr>
<td>S61</td>
<td>79</td>
<td>77</td>
<td>-2.0kg</td>
</tr>
<tr>
<td>S63</td>
<td>74</td>
<td>73</td>
<td>-1.0kg</td>
</tr>
</tbody>
</table>
Chapter six summary of the OE and PE RCT study results

The 18-week OE physical activities programme was more successful in providing significant HRF results for Year 9 adolescent males, than the PE physical activities programme. Neither programme produced significant changes in positive SE for Year 9 males. There was a significant difference in the HRF results between the OE and PE physical activity programmes. There was no significant difference in the SE results between the OE and PE physical activity programmes. The next chapter will discuss the research outcomes in more detail. Chapter seven will also provide a summation of the aims achieved and recommendations for future research.
CHAPTER SEVEN

DISCUSSION

Introduction

This OE and PE RCT study presents an investigation of two different 18-week physical activity (PA) programmes with an adolescent male population: firstly an outdoor education (OE) programme at The Scots College Glengarry extended stay outdoor education programme (ESOESP) campus; and secondly a physical education (PE) programme at the school’s main campus in Sydney. The aim of this study was to look at the effect of the two PA programmes upon Year 9 males’ health-related fitness (HRF) and self-esteem (SE).

The findings from this study provided evidence of the efficacy of the two PA programmes. The aim of chapter seven is to review the evidence related to each research hypothesis. To achieve this aim the findings are discussed and interpreted in the context of the current body of research in adolescent PA interventions to improve HRF and SE. Specifically, this chapter provides:

- The OE and PE RCT study findings.
- The OE and PE RCT study’s six research hypotheses.
- Key findings including limitations presented for each hypothesis.
- What was found from each hypothesis.
- A comparison with other adolescent research in HRF and SE.
- Potential mechanisms and explanations.
- Research implications for adolescent HRF and SE.
- Clinical exercise science research implications.
- The OE and PE RCT study strengths and limitations of the research.
Discussion of the OE and PE RCT study findings

The six research hypotheses are discussed individually. Each of the research hypotheses is discussed in regards to the individual key findings from the OE and PE RCT study, and what has been learnt from the specific results of each PA programme. Comparisons to other research studies are discussed in relation to each hypothesis. Potential mechanisms and explanations of the research are given for the findings of each PA programme, in relation to each hypothesis.

Research hypothesis one

There are significant differences in HRF results on completion of the 18-week OE physical activities group programme at the ESOESP campus.

Key findings

Research hypothesis one was largely supported by the results from the main study. That is, the Year 9 boys who participated in the ESOESP 18-week OE physical activities programme ($N = 73$) at Glengarry showed significant increases in four of the five HRF variables. Independent $t$ tests were conducted to test the hypothesis.

At the 18-week post-testing of the five HRF variables, the OE participants significantly improved in body composition. Specifically the BMI results were significant and the effect size was small, and the BMI $z$-score results were significant and the effect size was small. Additionally, the OE cohort’s waist circumferences were significantly different from the baseline pre-test scores, and the effect size was small. Therefore, evidence from the main study indicated that the OE physical activities were effective in enhancing Year 9 males’ body composition HRF variables on completion of the 18-week OE physical activities programme.

The HRF variable cardiorespiratory endurance results were also significantly improved in both the lung capacities measure using a portable dry spirometer, and the multistage fitness test (MFT) measure using the 20-metre shuttle run. The lung capacity results were significant and the effect size was small, and the MFT predicted VO$_2$
results were significant and the effect size was large. The MFT results converted to laps results were significant and the effect size was large. This provides evidence that the OE physical activities were effective in increasing cardiorespiratory endurance HRF variables on completion of the 18-week OE physical activities at the ESOESP campus.

The muscular strength HRF variable results improved significantly after the 18-week follow-up testing. Both the right and left hands of the OE participants were tested using a handgrip dynamometer. The right hand results were significant and the effect size was medium and the left hand results were significant, and the effect size was medium, which gives the OE and PE RCT study empirical evidence that the OE physical activities at the ESOESP campus can improve Year 9 boys’ muscular strength (forearm flexor muscles).

On completion of the 18-week post-tests, the muscular endurance HRF variable results were not able to fully support the first research hypothesis. The press-ups results were significantly different from the pre-test results, and the effect size was medium, but the sit-ups results were not significant, the effect size was small.

The findings from the main study were also unable to definitively support the first research hypothesis in relation to the HRF variable flexibility, measured using the sit- and-reach flexibility test. Participation in the OE physical activities may have significantly improved individual flexibility scores, but the OE cohorts results were not significant, and the effect size was small, which does not support the first hypothesis.

**What has been learnt from the key findings of research hypothesis one?**

The OE and PE RCT study investigated the effect of Year 9 males’ participation in an 18-week OE physical activities programme at the Glengarry ESOESP residential campus in New South Wales (NSW) Australia. The full ESOESP programme at Glengarry was conducted over two consecutive school terms (terms one and two, 2003) and lasted for 20 weeks.
The 2003 ESOESP cohort was tested in week one of the OE physical activities programme to provide baseline measures of the following HRF variables: body composition (height, weight, BMI, BMI $z$-scores and waist circumference); muscular endurance (sit-ups, n30s-1, and press-ups, n30s-1); and cardiorespiratory endurance (lung capacity using a portable dry spirometer; and an MFT using the 20-metre shuttle run to provide predicted V$O_2$ scores, and the MFT results of levels and shuttles were converted to laps).

The HRF post-tests were conducted in week 18 of the OE physical activities programme. The reason for conducting the HRF tests after 18 weeks rather than in week 20 was to prevent an end-of-course effect, which may have contaminated the results. Research hypothesis one for the OE and PE RCT study was, in general, supported as the HRF results were significantly increased (in particular the HRF variables that are related to the significant global adolescent problem of obesity). Obesity has long been thought to be the product of a positive energy imbalance, caused by excess energy intake and insufficient energy expenditure (Ebbelling, et al., 2002; Goran & Treuth, 2001). The findings of hypothesis one are related to this study’s aims which was to examine the primary intervention effect of two different PA programmes which may have benefits for adolescent males’ HRF.

Comparisons with other outdoor education HRF studies

The findings for this hypothesis indicated that improvements in the HRF variable cardiorespiratory endurance are consistent with two other known published trials reporting cardiorespiratory endurance improvements following an OE physical activities programme at ESOESP campuses. Okely, et al., (1997) reported that Year 9 male adolescents ($N = 51$) cardiorespiratory endurance increased after participating in OE physical activities at an ESOESP campus in NSW.

The 1997 cohort was tested using the MFT (Brewer, et al. 1998a) in week one of their ESOESP, and re-tested in week 16. Okely et al., (1997) used a dependent $t$ test to analyse the change between the 1st and 16th week’s MFT results. A significant increase was observed, the effect size for the MFT was 0.8 1. No control group was used in this study. This seminal study by Okely, et al., (1997) supports this study in that compliers
of OE physical activities can significantly improve Year 9 males’ cardiorespiratory endurance. The results of the MFT for Okely et al (1997) were the effect size was -0.81 (large), the effect size for the ESOESP HRF feasibility study was -0.95, (large) the effect size for the OE and PE RCT study OE participants was -1.14 (large), the effect size for the PE participants was 0.36 (small).

Gray (1997) conducted pre and post-cardiorespiratory endurance running tests in a Year 9 co-educational ESOESP residential campus in Victoria in 1993 and 1994. The 1993 cohort \( N=149, (n=63 \text{ females, } n=86 \text{ males}) \); the 1994 cohort \( N=153, (n=66 \text{ females, } n=87 \text{ males}) \) completed a consecutive four-term OE physical activities programme. Both cohorts undertook identical tests during their ESOESP. This involved a timed cross-country run around a set course. Pre-test scores were collected during the first week at the ESOESP campus in February; the post-test scores were obtained in the final week of the ESOESP in December of their respective cohort years. No control group was used in this study. Using paired \( t \) tests to compare the mean completion time between the first and final run, it was shown that both the 1993 and 1994 cohorts achieved a significant improvements for 1993. The significant increases in both the Year 9 females and males of the 1993 and 1994 cardiorespiratory fitness (CRF) supports this study’s first hypothesis.

The findings from the evaluation of the HRF variables on completion of the OE physical activities 18-week programme in this study were the result of a rigorous assessment process that consolidated the reported changes in CRF, and improved on the methods reported by Okely et al., (1997) and Gray (1997). The reasons are that this study included all five HRF variables; additionally, a control group was used for comparison of the effects of the types of physical activities.

The present study was a two-site random control trial research design, with HRF variables assessed from standardised tests. HRF variables were assessed by one assessor and had acceptable accuracy and reliability, as illustrated by the inter- and intra-assessor reliability tests. The HRF assessment tests used had been validated in adolescents, and provide scores that appropriately adjusted for age-related improvements in HRF variables to allow comparison within and between individuals over time following treatment interventions. Finally, HRF assessments at the ESOESP campus were
conducted after a ESOESP HRF feasibility study had been conducted in 2002, as well as after a period of 18 weeks follow-up, to better understand the pattern of change in HRF after completion of the OE physical activities intervention.

**Potential mechanisms and explanations for the significant HRF improvements**

The results of the OE cohort group at the ESOESP campus from this evaluation indicated that the utilised PA intervention strategies and the pedagogical approach to the teaching of OE physical activities were successful in developing Year 9 males’ HRF in the short-term. This does not necessarily indicate any fundamental change in Year 9 males’ lifestyles, or that improved performance is likely to continue beyond the 20-week stay at Glengarry. The results suggest a marked improvement in Year 9 males’ HRF.

The OE physical activities at Glengarry first involved the boys completing an orientation week of OE activities. This included the use of OE equipment, river crossings, and ice-breaker games, swimming tests, and hiking. The orientation week also included OE theory lessons followed by opportunities to practise the OE skills in developmentally-appropriate situations.

The OE physical activities programme, through face-to-face dormitory group teaching sessions with qualified OE instructors, who introduced the Year 9 boys to a variety of OE physical activities, and bush/aquatic survival skills. Through specific OE instruction, goal setting, planning, feedback and OE skill practice opportunities, the boys were guided through the stages of OE physical activities skill acquisition. This was combined with a rigorous schedule of Year 9 academic studies, domestic and social responsibilities. The boys had to complete two run/ride challenges per week starting in week 4, and concluding in week 12 (term one). In term two the run/ride challenge started in week 2 and concluded in week 4 (term two) a total of 11 weeks, of twice per week (see section 4.12). Additionally the boys had to complete 9 sports nights during the 18-week programme, and a 24-hour Rogaine. It is therefore considered that the combination of the OE physical activities programme which included land and water-based activities, and the run/ride challenge provided the necessary energy expenditure,
muscular conditioning and organ functioning to significantly effect HRF of Year 9 males.

**Outdoor education research implications**

The empirical evidence from this study in relation to hypothesis one, clearly illustrated the short-term efficacy of an 18-week OE physical activity programme at an ESOESP campus in improving specific Year 9 males’ HRF. Findings were less clear at showing a benefit in muscular endurance push-ups, and flexibility of the hamstrings/lower back. As such the OE physical activities programme, which was comprised of an intensive orientation week, hiking, orienteering, climbing, a mini-solo, a parent hike, canoeing, snorkelling, mountain biking, running, caving, high ropes, kayaking, sea kayaking and canoe fishing, which were consistent amongst all the dormitories.

Despite the improved research design strengths, several limitations are likely to have impacted for HRF in this study. In week 12 (term one) there was a PA session (run/ride challenge) on Monday, April 14. The boys departed Glengarry on Tuesday April 15 and did not complete any another OE physical activities until Saturday May 3, (due to the Easter holiday school vacation). In term two, the boys had another school break (and returned to their homes in Sydney), during the Scots College Exeat (A Scots College religious holiday) weekend. The boys left Glengarry on Thursday June 6, and did not complete any other OE physical activities until June 14. HRF gains may have been impaired by these breaks in training, and changes in nutrition (availability of energy dense foods whilst holidaying with their parents and peers in Sydney).

Taking into account the discussion points, further OE research might consider the following six suggestions to prevent a possible regression in HRF during/after the intervention:

1. Provide similar OE physical activities close to the Sydney main school campus: mountain biking, running (Centennial Park), sea kayaking in Rose Bay, snorkelling in Gordon’s Bay, or at Clovelly beach, indoor rock climbing at
Alexandria. This would allow for further OE skill development and further HRF gains could be made, and become more established.

2. Provide the aforementioned activities as alternatives to the traditional Scots College extra-curricular activities to maintain/increase HRF in Years 9, 10, 11 and 12.

3. Provide a more intensive parent inclusion component after the Glengarry parent hikes, that includes parent attendance at some OE physical activities sessions.

4. Provide a theoretical/practical parent-centred OE physical activities behaviour change programme.

5. Develop formal strategies that assist the Scots College boy’s parents in locating and enrolling their children in parent/child-organised OE physical activities in the Sydney/Eastern suburbs community to encourage lifetime PA.

6. Investigate the amount of incidental PA that occurs during the OE physical activities at Glengarry using pedometers.

Clinical exercise science research implications

The significant changes demonstrated in the HRF results of the OE physical activities cohort may provide future clinical research opportunities for specific overweight or obese Year 9 adolescent males, and Year nine males with low CRF. This is significant, as this study’s OE participants had familial backgrounds of cardiovascular disease (CVD), asthma and diabetes. A waist circumference of over 94 cm carries an increased risk, and over 100 cm indicates a greatly-increased risk of some cancers, heart disease and T2D, (Cancer Council, Australia, 2008). A reduction of ten percent of a person’s weight, and a reduction of waist circumference can reduce the onset of T2D (Diabetes Australia, 2008). The most significant changes in weight, waist circumference, BMI and cardiorespiratory endurance occurred in participants presenting the following situations:

Overweight and obesity implications

Each participant’s parent/guardian completed the Sports Pre-Participation Fitness Questionnaire (Appendix B1-B4) with specific information about their child prior to participation of the HRF pre and post-tests. To ensure anonymity, each
participant’s Pre-Participation, Questionnaire, HRF result sheet and SE questionnaire was given a prefix of G for Glengarry or S for The Scots College, followed by a number.

By reducing overweight and obesity, by as little as 10% of body mass, and reducing waist circumference to < 94cm and BMI to 18.5 – 24.9 units the risks of CVD and T2D can be minimised (National Heart Lung and Blood Institute, 2008; Waist measurement fact sheet, 2008). The following OE participants achieved significant results, which have clinical implications, as the same participants had familial links to heart disease and diabetes: Participant G2: weight loss of 12.9%; waist circumference a loss of 6cm; BMI a reduction of 4.1 units. Participant G19: weight a loss of 17.8%; waist circumference a loss of 13.5 cm; BMI a reduction of 5.7 units. Participant G21: weight a loss of 10.75%; waist circumference a loss of 9 cm; BMI a reduction of 4.9 units. Participant G26: weight, a loss of 12.16%; waist circumference a loss of 10 cm; BMI a reduction of 3.9 units.

Cardiorespiratory endurance (inversely related to CVD) implications:

Participant G40: predicted VO2 at pre-test result was 35 ml.kg.min-1, the 40th percentile for age and gender; post-test the result had improved significantly to 51ml.kg.min-1. Participant G62 predicted V02 pre-test result was 32.5 ml.kg.min-1, the 20th percentile for age and gender, a very poor result; post-test the result had improved significantly to 57.6ml.kg.min-1, an excellent result. Cardiorespiratory endurance is a very important factor in growth and development during childhood and adolescence. A high level of cardiorespiratory endurance during the growing years indicates good development of the muscles, bone, and cardiorespiratory system. It is more important in this respect than body weight. The significant changes in HRF variables in the OE experimental group overweight participants’ warrants further investigation in future OE clinical exercise science research.

Research hypothesis two

There were significant differences in HRF results on completion of the 18-week PE physical activities group programme at the city-based campus.
Key findings

The findings from the OE and PE RCT study were unable to definitively support the second research hypothesis. Participation in the control group’s PE physical activities programme produced some gains in only two of the five HRF variables. The treatment effect of the PE physical activities programme was very small.

At the end of the 18-week follow-up testing of the five HRF variables, the PE participants’ HRF variable body composition $t$ test results did not indicate significant differences in weight, BMI, BMI $z$-scores or waist circumference. Additionally, the effect sizes were all very small. The PE cohort’s BMI mean score actually increased slightly from 21.32 to 21.80. The waist circumference means score did decrease, but the $t$ test result was not significant, the effect size was very small.

The PE cohort’s HRF variable cardiorespiratory endurance produced mixed results. The lung capacity measurements did increase, but not significantly. The effect size was small. The MFT $t$ test result did indicate significant differences between the pre-test and at the intervention 18-week follow-up, and the effect size was small. The PE cohort’s muscular endurance scores also produced mixed results. The n30s-1 press-ups $t$ test did not indicate a significant difference at the 18-week intervention follow-up, the effect size was very small. But the n30s-1 sit-ups $t$ test indicated a significant difference after the 18-week PE physical activities programme at the city-based campus, th Interestingly, the muscular endurance results were the exact opposite of the OE intervention group.

The PE physical activities programme at the main city campus produced no significant increase in the muscular strength tests, which were measured in both hands using a handgrip dynamometer. The HRF flexibility variable also did not provide a significant difference at the 18-week follow-up post tests using a sit-and-reach measure. The PE physical activities treatment effects were inconsistent, and did not conclusively show a benefit from the PE physical activities intervention for Year 9 males.
What has been learnt from the key findings of research hypothesis two?

The OE and PE RCT study investigated the effect of Year 9 boys’ participation in a PE physical activities programme at The Scots College main campus in Sydney, NSW. The full PE physical activities programme was conducted in the same two academic school terms as the OE physical activities programme at Glengarry. The PE cohort was tested in the same weeks as the OE cohort. Therefore the opportunity for the physical activities to have a HRF physiological effect was equal in both programmes. The HRF results of the PE cohort at the city based campus could not support hypothesis two. The Year 9 boys did not gain significant HRF physiological gains from the 18 week PE programme. This provided empirical evidence that in the short-term (20 weeks); the PE physical activities did not provide the Year 9 boys with significant HRF benefits. This relates to this study’s aims to examine the primary intervention effect of two different PA programmes which may have benefits for adolescent males’ HRF. The effect of the PE physical activities did not provide significant HRF benefits on all the HRF variables for Year 9 males, but it did provide a significant benefit in the cardiorespiratory MFT test.

Comparisons with other physical education HRF studies

The findings from this hypothesis indicating the lack of improvement in HRF variables is consistent within the following studies: Physical Activity and Teenagers Health (PATH) (Fardy, et al., 1996) utilised a co-educational PE experimental group using circuit training, and health behaviour discussion for 11 weeks, and a PE control group playing volleyball, also showed no significant improvements in HRF (Fardy, et al., 1996). Interestingly, the girls in the study did improve their predicted VO₂, the same as this study’s PE males.

The Project Heart study by (Ewart et al., 1998) also showed a lack of improvement in a PE control group who participated in traditional PE classes for 50 minutes for 18 weeks (the same allocated PE times as this study’s PE group); the experimental group participated in aerobics classes of 50 minutes duration for 18 weeks. Only the experimental group increased their estimated HRF CRF, and had a greater
decrease in their systolic blood pressure (as measured in this study’s ESOESP HRF feasibility study). The PE control group did not achieve significant increase in CRF.

Potential mechanisms and explanations for the undistinguished HRF results

The results of the PE cohort at the city-based campus from this study’s evaluation indicate that the utilised PA intervention strategies and pedagogical approach to the teaching of PE physical activities were not successful in developing Year 9 males HRF in the short-term. This does not indicate any change in Year 9 lifestyle, or that the lack of improvements of HRF performance was likely to continue into terms three and four of Year 9 and beyond. But as low adolescent HRF may track into adulthood, the potential mechanism and explanations of the undistinguished HRF results therefore need to be discussed.

The PE physical activities programme at the city-based campus in term one (see section 4.11, table 4.4) consisted of participation in the Royal Life Saving Society (RLSS) bronze medallion, (6 weeks), followed by athletics (5 weeks) and personal health profile (1 week); term two consisted of Basketball (5 weeks), followed by volleyball (4 weeks). The PE programme additionally had one PDHPE theory lesson per week for the two terms. The PE cohort participants also had to select an extra curricular PA per term, which consisted of two coaching afternoons per week, and playing their selected sport in a Greater Public Schools (GPS) competition on Saturday. The extra curricular activities included athletics, swimming, basketball, cricket, rowing, tennis, rugby, soccer or rifle-shooting. To complement their personal development, the PE cohort had to participate in either The Scots College Pipes and Drums Band or the cadets.

There are several plausible explanations for the lack of HRF benefits from the PE physical activities programme; one would be that the energy systems being utilised during the PE physical activities were not conducive to improvements in the HRF variables being tested for example, cardiorespiratory endurance. The three energy systems utilised in the PE physical activities were: (1) ATP-PCr system, (2) Glycolytic system, and (3) Oxidative system, (and combinations of numbers 1-3). The adenosine triphosphate (ATP) and creatine phosphate (ATP-PCr) doesn’t rely on the presence of
oxygen. It is anaerobic and lasts for approximately 3-15 seconds. If the PA goes beyond this, the performer moves to another energy system. The Glycolytic system starts approximately after 10 seconds of PA; at 45 seconds of sustained PA the energy system requirements are reliant upon the Oxidative system. The major point in regard to the HRF results is that the oxidative system can produce ATP through either fat (fatty acids), or carbohydrate (glucose). If the PE cohort were to significantly increase their HRF results in relation to body composition, they would need to use more fat for fuel. To do that it must have sufficient oxygen to meet the demands of the PA.

One of the PE physical activities that potentially requires an oxidative aerobic energy system would be the RLSS bronze medallion. This RLSS award incorporates a 13- minute 400-metre timed swim, comprised of 100m freestyle, 100m lifesaving backstroke, 100m sidestroke and 100m breaststroke, followed by lifesaving contact tows. The other PE physical activities such as basketball (60% ATP-PCr & Glycolysis, 20% Glycolytic, 20% oxidative), soccer (50% ATP-PCr, 20% Glycolysis are 20% oxidative) and the remaining physical activities incorporating the use more of ATP-PCr and Glycolysis, and Glycolysis & oxidative energy systems (Foss & Keteyian, 1998). Cricket and volleyball would utilise the ATP-PCr & Glycolysis energy system (Foss & Keteyian, 1998). This may not have been sufficient to improve the HRF variables being tested at the 18-week follow-up.

A second possible explanation could be the nature of the PE physical activities programme, and the pedagogical approach used to teach the PE physical activities. The PE physical activities taught as part of the PDHPE programme was taught by qualified PE teachers. The PE physical activities are traditional Australian sports and games taught in many boys schools (in particular the GPS schools). The nature of the programme can be traced historically to character-building by participating in team sports. The PE pedagogical approach may have therefore been more orientated to either the whole game, or skills-based approach, which leaves little time for improving HRF. Additionally, the extra-curricular physical activities are taught in the main by The Scots College academic staff; only some of the extra-curricula physical activities are taught by the PE staff. A third reason may have been that due to the combined nature of the PE physical activities and the pedagogical approach used in the PE lessons, the 18-week
intervention period may not have been long enough to have a physiological benefit for Year 9 males.

**Physical education research implications**

The empirical evidence from this study in relation to hypothesis two, clearly illustrated that there was no short-term efficacy of an 18-week PE physical activities programme at the city-based campus in improving Year 9 males’ HRF. Despite having the same baseline HRF results as the OE participants the PE cohort achieved significant improvement in parts of only two HRF variables, muscular endurance sit-ups (n30s-1) and the MFT 20 metre shuttle run.

Taking into account the discussion points, further PE research might consider the following four recommendations to increase the HRF results of Year 9 males in a PE programme:

1. Provide increased aerobic training and strength training as part of the PE extra-curricular physical activities.
2. Change the pedagogy from skill-based to the games sense approach to increase the time being physically active.
3. Provide strength and conditioning training for The Scots College’s non-PE staff, the knowledge to be practically-applied into the extra-curricular physical activities.
4. Investigate the amount of incidental PA that occurs during the PE physical activities, and the extra-curricular physical activities using pedometers.

**Research hypothesis three**

There is a significant difference in the HRF results between the OE and PE physical activity programmes.
**Key findings**

Research hypothesis three was largely supported by the results from the main study. That is, Year 9 boys who participated in the 18-week OE physical activities group programme ($N = 73$) showed significant differences in their HRF results in comparison to the Year 9 boys ($N = 63$) who participated in the PE physical activities group programme.

At the 18-week post-tests of the HRF variables, body composition, muscular endurance, muscular strength, cardiorespiratory endurance and flexibility, the two cohort results provide a significant difference between the effects of the OE and PE physical activities programmes upon Year 9 males. The body composition variables and the respective independent $t$ test results were as follows: weight was significant, the effect size was medium; Muscular endurance variables, sit-ups ($n30s-1$), was significant, the effect size was small, press-ups was significant, the effect size was large; muscular strength right and left hand measures using a handgrip dynamometer was significant in both hands and the effect size was medium for both hands; the cardiorespiratory endurance HRF variable measured using an MFT, was significant and the effect size was medium; and the flexibility HRF variable measured using a sit-and-reach flexibility test was significant the effect size was small.

The findings from the main study comparisons of the effects of the OE and PE physical activities for significant differences could not support the third hypothesis in regards to the participants waist circumference, (measured in centimetres), and lung capacity (measured in cubic centimetres) using a portable dry spirometer. The respective independent $t$ test results were as follows waist not significant with a very small effect size, the participants’ lung capacity was not significant and the effect size was very small.

*What has been learnt from the key findings of research hypothesis three?*

The first aim of the OE and PE RCT study was to investigate the primary intervention effects of two different PA programmes which may have benefits for adolescent males’ HRF. Additionally, primary PA interventions may aid in the
prevention of adolescent obesity, CVD, and T2D which has become a major HRF health problem due to the increasing rise in adolescent obesity (see section 1.8). The second aim was to contribute to the body of knowledge in exercise science, OE and PE in relation to primary prevention of physical inactivity, and the subsequent problems of obesity and associated chronic illnesses (Mutrie, 2008).

Research hypothesis three investigations were aimed at finding if there was a significant difference in the HRF results between the OE and PE physical activities programmes. The independent \( t \) tests results largely supported hypothesis three in that there were significant differences in the HRF results between the OE and PE physical activities programmes. There were significant differences in HRF variable results in body composition, muscular endurance, muscular strength, cardiorespiratory endurance and flexibility. In relation to the stated aims of this study, the results provide empirical evidence that the 18-week OE physical activities programme effects provide better HRF benefits to Year 9 male adolescents in the short-term. Further HRF research could investigate the residual effects of the OE verses the PE programmes into Years 10, 11 and 12. Further research into the significant differences in incidental PA between the OE and PE programmes which could also be evaluated using pedometers (10% of each group due to cost, and self-report problems of adolescents).

**Research hypothesis four**

There will be significant positive differences in the SE results on completion of the 18-week OE physical activities programme at the ESOESP campus.

**Key findings**

The findings of this study were unable to definitively support the fourth research hypothesis. That is, the Year nine boys who participated in the experimental group OE physical activities programme at Glengarry did not display significant differences in their SE results on completion of the 18-week physical activities intervention.

The boys who participated in the OE physical activities programme displayed an improvement in perceived self-perception of their physical appearance competence at
the 18-week intervention post-test. The physical appearance t test results at the 18-week intervention follow-up were significant, and the effect size was medium. But there were no other significant differences found in the remaining Harter (1988) Self Perception Profile for Adolescents (SPPA) subscales of athletic competence, behavioural conduct, close friendship, global self-worth, scholastic competence or social acceptance. Therefore the OE physical activities programme appeared to influence the physical appearance domain of perceived competence (SE), but the remaining five Harter (1988) domains of perceived competence did not exhibit any psychological benefit of the 18-week OE programme at Glengarry for Year 9 males in the short-term.

**What has been learnt from the key findings of hypothesis four?**

The OE and PE RCT study investigated the effect of Year 9 males’ participation in an OE physical activities programme at the Glengarry residential ESOESP campus. The full ESOESP at Glengarry was conducted over two consecutive terms (terms one and two, 2003) and lasted for 20 weeks.

The 2003 ESOESP cohort was tested using Harter (1988) SPPA in week one of the OE physical activities programme to provide baseline measures. The participants were tested on the following specific SPPA subscales: athletic competence, behavioural conduct, close friendship, global self-worth, physical appearance, scholastic competence and social acceptance.

The follow-up SE perceptions of competence SPPA post-tests were conducted in week 18 of the OE physical activities programme. The SPPA questionnaire (Appendix H) was given to the OE cohort in their dormitory groups just prior to conducting the HRF tests. The reason for the SPPA questionnaire being given to the OE participants in week 18 was to prevent an end-of-course effect, which may have contaminated the SE results. Research Hypothesis four was not fully supported as the SE results were only significant in the perceptions of physical appearance. It should be noted that there were within-group improvements in perceptions of physical appearance in the overweight (n = 5) and obese (n = 1) participants. This should be noted as this complies with aims of the study.
Comparison with other outdoor education SE studies

The findings for hypothesis four in this study indicating a lack of significant improvements in adolescent SE were inconsistent with published OE literature. Hattie et al., (1997) conducted a meta-analysis of adventure programmes; they found in general that adventure programmes positively impacted SE, with interpersonal relations, with SE change being the most significant. These changes were also shown to be more stable overtime than the changes generated in more traditional educational programmes.

A meta-analysis of effect sizes in 43 studies of outdoor adventure programming with adolescents (Cason and Gillis, 1994) found only a small effect size of 0.31. The effect size was related to programme length and participant age. One psychological variable that they investigated was the effects that adventure programmes have on SE. The meta-analysis results suggest that despite some inconsistencies that adventure programmes lead to an improvement in self-perception (Cason and Gillis, 1994). It should be noted that the participants were adjudicated youth; emotionally or physically challenged at-risk adolescents (defined by school officials), and adolescents perceived as being normal participating in outdoor adventure programmes.

Neill (2004) completed a meta-analytic research on the outcomes of OE. Neill concluded that the five OE meta-analyses reported that OE programmes has small-moderate effects for typically-measured outcomes such as SE. It should also be noted that much of the research was based on Outward Bound expedition-style programmes, thus generalisations of the findings is limited (Neill, 2004).

Other outdoor programmes have also not supported changes in SE, Marsh (1999), and Nichols (2002). SE has been found to have no empirical evidence that SE was strongly related to locus of control, self-efficacy, and general positive attitude but relatively immune to change ((Nichols, 2002). Another study concluded that only camps that have a specific focus on self-enhancement actually contribute to a youth’s development of positive self (Marsh, 1999).
Despite the OE physical activities group exhibiting improvement in perceived physical appearance competence at the 18-week follow-up post-tests, a benefit of the OE intervention treatment for significant improvements in the SE of Year 9 males could not be clearly established.

The potential mechanisms and explanations could be due to the theoretical concepts of social desirability in two categories. Adolescent self-reports such as Harter’s SPAA (1988) may be influenced by social desirability of the respondents’ willingness to report a higher SE at the baseline pre-test in week one of the OE physical activities programme. This has been previously observed in adolescents’ willingness to report engaging in more PA thereby under-reporting sedentary behaviour. The second category of social desirability in regards to the OE participants SE high baseline results, was that they wanted to appear to the researcher as having high self-perceptions of competence (over self-reporting) at the pre-test.

A second possible explanation may have been that Harter’s (1988) SPPA which is an internationally-recognised research instrument for American adolescents was not sensitive enough for Australian male adolescents in 2003. Additionally, would the SPPA questions or the statistical methods used (independent t tests) be sophisticated enough to interpret the OE participant responses, and be able to distinguish Australian male adolescents SE changes in 18 weeks that the OE participants have spent 14 years developing?

The third possible mechanism and explanation for the undistinguished SE results could be related to the OE physical activities programme (see section 4.12, Tables 4.6, 4.7 and 4.8). The OE physical activities programme was comprised of hiking (4 times), orienteering (3 times), run/ride challenge (21 times), climbing (4 times), canoeing (5 times), caving (1 opportunity), rogaine (1 x 6 hour; 1 x 24 hour) snorkelling (1 opportunity), sea kayaking (4 times), and raft-building (one opportunity). To critique the OE programme in relation to increasing Year 9 males’ SE, it may be considered that there are too many types of land-based OE physical activities; therefore the OE participants did not perceive that they had mastered those activities sufficiently to get a
change of perceived competence, and secondly, that there is not enough water-based physical activities for perceptions of competence to be achieved in water-based PA.

The fourth possible explanation might be that as a group OE dormitory PA member; there might not have been enough available individual PA time for perceptions of competence to change sufficiently for significant SE results. Individuals with lower SE may have needed more individual tuition in the OE physical activities they did not perceive themselves being competent in.

The fifth possible explanation may have been that the 18-week OE physical activities were new to the majority of the OE participants, and with the large amount of different types of OE physical activities, the programme may not have been not long enough. The OE participants were at the cognitive stage of skill acquisition; the 18 week OE physical activities programme just may not have had sufficient time for them to move to the associative stage, at which their perceptions of competence might have increased.

Outdoor education research implications

The empirical evidence from this study in relation to hypothesis four, clearly illustrated that the 18-week OE physical activities programme did not significantly improve the OE participants’ SE results. The findings showed that only the physical appearance $t$ test results were significant; the remaining SPPA subscale results did not improve. The limitations of this study were to not investigate the OE physical activities previous experiences of the cohort. There may have been significant differences shown associated with the level of prior OE experience. Additionally, an Australian adolescent SPPA questionnaire may be needed to more accurately investigate the effects of the OE physical activities at the ESOESP campus.

The lack of improvement from the OE physical activities programme in perceptions of athletic competence has pertinent behavioural implications. Weiss, 2000 and Weiss and Ebbeck, 1996, proposed that children who report high perceived competence in the PA domain are more likely to enjoy being physically active and sustain interest in continuing involvement than children with low levels of perceived
competence. This has ramifications for OE programming in the primary school sector. In relation to this study, perceived athletic competence has through cross-sectional studies been related to PA behaviour in adolescents (Crocker, Eklund & Kowalski, 2000; Paxton, Estabrooks, & Dzewaltowski, 2004).

**Clinical exercise science research implications**

The total SE increase demonstrated in the SE results of overweight and obese OE participants, may provide future clinical research opportunities for specific overweight and obese Year 9 adolescent males. With specifically-designed Australian adolescent specific perceptions of competence questionnaire that may be more sensitive to responses of the overweight and obese adolescents a tailored OE physical activities programme could be developed that incorporates both changes in SE and reductions in body composition gained through participation in the specific OE physical activities.

The changes in self-perceptions through the specific OE physical activities programme may lead to a behaviour change that is necessary for longitudinal residual benefits of increased SE and body composition. It is well documented that obese and overweight children and adolescents are subject to social marginalisation and discrimination (Latner & Stunkard, 2003; Puhl & Brownwell, 2001). Evidence of this was reported from a study by Franklin, et al, (2006) in which a large sample of obese 9-14 year-old NSW girls reported lower perceived social acceptance than non-overweight girls. Consequently there are reported implications from social marginalisation and discrimination that has social and economic implications in adulthood (Gortmaker, et al., 1993).

Obese adolescents have also been shown to have lower global self-worth than their peers who were not overweight (Franklin, et al., 2006). A study by Strauss (2000) that obese children and adolescents who had declining rates of global self-worth also had increasing rates of sadness, loneliness, and nervousness, (it should be noted that there is a correlation between depression and heart disease). Furthermore, those obese adolescents who experienced declines in global self-worth were more likely to become involved in health-risk behaviours such as smoking and drinking alcohol compared to their obese peers whose global self-worth did not decline.
Low SE during adolescence has been associated with later physical and psychosocial morbidity, along with lower economic prospects and higher criminal activity involvement in young adulthood compared with adolescents with high SE (Trzesniewski, Donnellan, Moffit, Robins, Poulton & Caspi, 2006). It should therefore be important for OE researchers involved in clinical exercise science, that maintenance or improvement in global self-worth following a specialised OE physical activities programme for obese and overweight adolescents may prove to be valuable in deterring the onset of undesirable HRF and social behaviours both in the short-term and in later life.

**Overweight and obese OE participants**

Several of the OE and PE RCT study boys were either obese or overweight. The following results were obtained for the Glengarry students: participant G21 had a total SE increase of + .29 units; participant G 31 had a total SE increase of + .35 units; participant G43 had a total SE increase of + .28 units; participant G63 total SE increase of +.32 units; the obese participant G21 had a total SE increase of + .29 units. The results of the PE participants showed that only S31 had a total increase of +.26 units, no other PE overweight participants matched the OE participants’ increases in SE. This research evidence is supporting the general hypothesis that PA may increase SE in some overweight and obese adolescents, but not in all cases because some participants BMI decreased but their SE did not change.

**Research hypothesis five**

There will be significant positive differences in the SE results on completion of the 18-week PE physical activities programme at the city-based campus.

**Key findings**

The findings of this study were unable to definitively support the fifth research hypothesis. That is, the participants of the control group PE physical activities programme at the city-based campus in Sydney did not display significant differences in all of their SE results on completion of the 18-week physical activities intervention.
The boys who participated in the PE physical activities programme displayed an improvement in perceived self-perception of their physical appearance competence at the 18-week intervention follow-up. The physical appearance $t$ test results were significant, the effect size was small. This was a similar result to the OE cohort at the 18-week post-test. Additionally, the PE cohorts perceived close friendship competence $t$ test result was significant, the effect size was medium. But there were no other significant differences found in the remaining Harter (1988) SPPA subscales of athletic competence, behavioural conduct, global self-worth, scholastic competence or social acceptance. Therefore the PE physical activities programme appeared to influence both the perceptions of physical appearance and close friendship, but the remaining four Harter (1988) domains of perceived competence did not exhibit any psychological benefit of the 18-week PE programme at the city-based campus in the short-term for Year 9 males.

**What has been learnt from the key findings of research hypothesis five?**

The OE and PE RCT study investigated the effect of Year 9 boys participating in a PE physical activities programme at the city-based main campus. The SE results of the PE cohort could not definitively support hypothesis five, the Year 9 males did not gain significant improvements in SE as a result of the 18-week PE physical activities programme. The PE cohort gained significant changes in perceptions of physical appearance and perceptions of close friendship, which are only two of the seven Harter’s (1988) SPPA subscales used in this study.

The SE results did not evidence of positive psychological SE benefits from participation in the PE physical activities programme. This outcome relates to the aims of this study which examined the effects of the adolescent males’ SE, the results show that this particular PE programme cannot provide significant improvements for Year 9 adolescent males in the short-term.

**Comparison with other physical education SE research**

The findings from this hypothesis indicate a lack of improvement of Year 9 males perceptions of competence (SE) on completion of the 18-week PE physical
activities programme are not consistent with the published literature. Regular PA in childhood and adolescence improves strength and endurance, and increases SE (CDC, 1996). The PE physical activities programme at the city-based campus in Sydney did not significantly improve the HRF variables, and in relation to hypothesis four, it did not improve the SE variable.

Standage and Gillison (2007) investigated 300 British secondary adolescent school students (mean age = 13.51 years) who responded to a multi-section inventory assessing their motivational processes toward school PE. One week later, data pertaining to general SE and health-related quality of life (HRQoL) was collected. The results found autonomous motivation towards PE to positively predict general SE. These results indicate that the PE context can impact on global perceptions of self.

The Growing up today Study (GUTS) a physical activity and perceived competence investigation, evaluated data from 5260 girls and 3410 boys (Stein, Fisher, Berkey & Colditz, 2007). The physical activities included PE activities of swimming, gymnastics, strength training, running, walking and martial arts. PA changes were compared to changes in perceived competence in three domains (social, athletic and scholastic) of the Harter Self-Perception Profile for Children (1985). For both girls and boys increase in PA was positively associated with change in social and athletic perceptions (p<.0001), but not scholastic or global self-perception. Compared with those with little or no change in PA, those with increased PA were more likely to have increased self-perception measures.

Like the results of this study, not all studies have shown a positive association between PA and SE (Sallis, et al., 2000). In a review of literature Sallis et al., (2000) concluded that in adolescents, self-efficacy and perceived competence had an indeterminate relationship with PA, and there was no association seen between PA and SE.

Potential mechanisms and explanations for the undistinguished results

Despite the PE physical activities group exhibiting significant improvement in perceived physical appearance competence, and perceived close friendship competence
at the 18-week post-tests, a benefit of the PE intervention treatment could not be found in relation to Year 9 males SE.

The potential mechanisms and explanations could be similar to the previously-stated OE physical activities explanations of (1) social desirability, (2) Harter SPAA (1988) not being sensitive enough for Australian males adolescents in 2003, (3) the PE physical activities programme might not be structured to the needs of significantly-increasing Year 9 males’ perceptions of competence in 2003 and beyond, and (4) the SE scores were high at pre-test and remained high at post-test data collection. The PE physical activities programme, was comprised of RLSS bronze medallion, athletics, personal health profile, basketball and volleyball. The extra curricular PE physical activities included athletics, swimming, basketball, cricket, rowing, tennis, rugby, soccer and rifle-shooting.

Physical education research implications

The empirical evidence from this study in relation to hypothesis five illustrates that there was no benefit from the 18-week PE physical activities programme in regard to improving SE of Year 9 male adolescents. Taking into account the discussion points, further PE research might consider the following three recommendations to increase the SE results of Year 9 males in PE programmes at city-based campuses:

1. Change the PE programme structure to encourage lifetime physical activities aimed at improving health and PA participation and SE.
2. The team games training to be in the extra-curricular physical activities programme.

Research hypothesis six

There will be significant positive difference in the SE results between the OE and PE participants.
Key findings

The sixth research hypothesis was not supported by the findings from this study. The Year 9 boys who participated in the OE experimental group displayed a significant increase in perceptions of physical appearance only; the PE control group displayed a significant difference in perceptions of physical appearance, and close friendship only. There were no significant differences found at the 18-week intervention follow-up SE results between the OE and PE participants.

What has been learnt from the key findings of research hypothesis six?

The first aim of the OE and PE RCT study was to investigate the primary intervention effects of two different PA programmes, which may have benefits for adolescent males SE. The research hypothesis six investigations was to find if there was a significant difference in the SE results between the OE and PE physical activity programmes. The independent t tests could not support that there were significant differences between the OE and PE physical activity programmes. The results showed that there were no significant differences at the 18-week post-test in relation to the SE variables of the OE and PE cohorts.

OE and PE RCT study strengths

The OE and PE RCT study was a two-site parallel-group randomized control trial designed to evaluate the effects of two different PA programmes upon Year 9 male adolescents’ HRF and SE. The first programme was an OE physical activities programme conducted at an ESOESP campus at the South Coast of NSW; the second programme was a PE physical activities programme conducted at the Sydney city-based campus. Both PA interventions tested in this study were grounded in current theory and were evidence-based. The testing procedures were designed to be completed by future OE and PE teachers with undergraduate degree training to limit the need for exercise science specialists and expensive measurement resources, and therefore be transferable to high schools.
The design and methods used addressed recommendations that highlighted limitations inherent in past experimental studies in the area of PA, including: the use of a parallel control group, random allocation of participants to either experimental (OE) or control (PE) groups, a moderately large \((N = 136)\) and homogeneous sample of Year 9 males that ensured two developmentally-appropriate PA programme interventions. Additionally, this study contributes to the body of literature examining HRF and SE changes and associated factors following PA interventions for male adolescents.

The design of strategies to impact on Year 9 male adolescent PA behaviour and the measurement of change of HRF and SE are part of an evolving field that has been challenged by design and evaluation limitations. In addition, the rigorous objective assessment of the HRF variables at baseline, and at the 18-week follow-up, is the strength of this study that minimises HRF measuring bias; additionally it improves the exercise science understanding of the short-term impact of PA programmes. Finally, assessment of the PA-associated HRF and SE outcomes in the efficacy of this study, using age-related research instrumentation, has allowed exploration into the potential mechanisms associated with Year 9 PA programmes.

**OE and PE RCT study limitations**

Several limitations have been isolated in this study. Firstly, the limitation of the OE cardiorespiratory results is that the OE participants were not asked to distinguish whether they participated in the Glengarry challenge run or the challenge ride. The participants in the challenge run completed a designated distance to run as fast as they could, and the challenge ride was completed on the students’ mountain bikes. If there was a significant difference between the run and ride participants’ CRF results, the design of future HRF training programmes could be changed appropriately. Both of the stated HRF variables, BC and CE are extremely important as they are inversely related to obesity, cardiovascular disease, pre-diabetes and Type 2 diabetes which have their precursors shaped in childhood and adolescence (Bass, et al., 1999).

Secondly, despite the improved research design strengths, several limitations are likely to have impacted the HRF variables of the OE cohort in this study. In week 12 (term one) there was a PA session (run/ride challenge) on Monday, April 14. The boys
departed Glengarry on Tuesday April 15 and did not complete any other OE physical activities until Saturday May 3, (due to the Easter holiday school vacation). In term two, the boys had another school break (and return to their homes in Sydney), during The Scots College Exeat (religious holiday) weekend. The boys left Glengarry on Thursday June 6, and did not complete any other OE physical activities until June 14. HRF gains may have been impaired by these breaks in training, and changes in nutrition (availability of energy-dense foods whilst holidaying with their parents and peers in Sydney). If HRF tests had been completed prior to the Easter holiday, a more significant understanding of the effects of free living with their parents and the effect of nutrition on their HRF results could have been obtained.

Thirdly, the limitation of the HRF variables PE cohort research was the lack of identification of the PE participants’ extra curricular activities. The reason was being that there was a significant increase indicated by an independent t test, at the 18 week follow-up in cardiorespiratory endurance, measured using a multistage fitness test 20 metre shuttle run but the results could not identify as to whether the individual extra curricular physical activities produced more significant increases in cardiorespiratory endurance.

Fourthly, the limitation of the main study was not being able to identify the effect of nutrition on the HRF variables. If a nutrition diary could have been utilised, where the boys of both groups were to complete a weekly comprehensive nutrition record for the 18-week intervention period, an extensive evaluation could have been completed to examine the effect of nutrition on HRF. The boys at Glengarry had regulated meals, with limited access to energy dense foods during their 18 weeks, whereas the Scots College boys (PE group) had unlimited acces during their 18 weeks. The nutrition diary was beyond the scope of this study, but is a suitable future research possibility.

**Discussion of possible recommendations**

As an introduction to a discussion about what the author would do differently, Figure 7.1 (Bouchard, Blair, & Haskell, 2007) shows a recent research model for HRF.
Discussion of recommendations which include this model, and changes to the physical activities programmes are stated.

![Figure 7.1 A model that defines the relationships among physical, health-related fitness, and health status (Bouchard, Blair, & Haskell, 2007).]

1. A recommendation for future adolescent HRF research using the model shown in Figure 7.1 (Bouchard, et al., 2007) should include metabolic testing and PA intervention components. Specifically in relation to PA intervention programmes aimed at reducing obesity and overweight levels of adolescents; the OE physical activities programme was effective in reducing the body composition HRF variables (BMI, BMI z-scores, and waist circumference) of OE obese and overweight participants. Further research that includes a dietary programme, and a PA programme that increases the obese and overweight participants’ metabolic rate by exercise and resistance training in the morning needs to be conducted.

2. A recommendation for future HRF research that involves body composition assessment of adolescents is to use adolescent waist circumference cut-off
points rather than BMI or BMI $z$-scores, as there is a strong relationship with waist circumference, cardiovascular disease and Type 2 diabetes.

3. A recommendation to utilise the pre-participation fitness questionnaire or similar prior to PA research with adolescents is to be continued. This ethical consideration used in this study is now part of the recommendations for safety guidelines for children and young people in sport and recreation (Sports Medicine Australia, 2008).

4. A recommendation to use the Yo Yo intermittent recovery test (Bangsbo, Iaia, & Krustrup, 2008) as part of the HRF test battery, as this evaluates more closely the energy systems used in the OE and PE physical activities.

5. Evaluate and report the educational outcomes related to CVD health from the different physical activities to the participants, which may increase the chance of the reported physiological changes continuing into adulthood with the adoption of a healthy lifestyle.

**Recommendations for the OE physical activities programme**

1. Include more water-based physical activities that are life-time recreation-based, examples being body-surfing, body-boarding, surfing and dingy-sailing. This recommendation although not linked directly to the results, is based on recommendations from the participants, and the authors’ belief that Australia is an ideal location to improve lifetime water-based activities in schools to improve PA levels in adulthood.

2. Reduce the amount of land-based activities to allow more time for skill-acquisition in both land and water-based activities. This recommendation is also based on recommendations from the OE participants.

**Recommendations for the PE physical activities programme**

1. Provide similar OE physical activities close to the Sydney main school campus for the boys returning from Glengarry. Examples are, mountain biking, or running (Centennial Park), sea kayaking, dingy sailing (Rose Bay
or Double Bay) Snorkelling (Gordons Bay or Clovelly Beach), indoor rock climbing (in the school gym or at Alexandria), body-surfing, body-boarding, surfing (Bondi beach). This would allow for further OE skill development and further HRF gains to be made, and become more established.

2. Reduce the amount of traditional games and sports taught in the PE curriculum, and replace with HRF and lifetime physical activities. Teach the traditional sports and games in the extra-curricular activities programme.

3. To provide the PE participants with a PA journal and an accelerometer when participating in extracurricular activities. This would assist with data collection when attempting to identify the effect of the extra curricula activities.

Chapter seven summary

Chapter seven discussed the OE and PE RCT study investigation of two different 18-week PA programmes with an adolescent male population. The findings from the OE and PE RCT study were reviewed in regard to the efficacy of each PA programme. The evidence related to each research hypothesis was reviewed; the findings were discussed and interpreted in the context of the current body of research in adolescent PA interventions to improve HRF and SE.

During the ESOESP orientation week at Glengarry the OE participants completed the following HRF tests: body composition (height, weight, BMI, BMI z-scores, and waist circumference); muscular endurance (sit-ups, n30s-1; press-ups, n30s-1); muscular strength, (measured using a handgrip dynamometer, measuring right and left hands); cardiorespiratory endurance (lung capacity, measured using a portable dry spirometer, a multistage fitness test giving predicted VO\textsubscript{2} scores, and level/shuttles converted to laps); flexibility (measured using a sit-and-reach flexibility test). The PE cohort completed the same tests in the same week. Both cohorts completed follow-up HRF tests after 18 weeks of the OE or PE physical activities programmes.
The two different PA programmes produced different HRF results. The OE physical activities programme HRF results were significantly increased in four of the five HRF variables, and was therefore able to support research hypothesis one. The PE physical activities programme on the other hand, was unable to support research hypothesis two, as there were only significant increases in parts of two HRF variables. Comparisons were made with other OE and PE respective research findings, and both the OE and PE research findings of this study were supported. Research hypothesis three investigated significant differences in HRF results between the two PA programmes. There were significant differences in the HRF results from the two programmes, with the OE physical activity programme producing significantly better HRF results for Year 9 males.

Potential mechanisms and mechanisms for the HRF results were indicated for each hypothesis. The OE physical activities programme involved a variety of land and water-based activities, and was supplemented with a challenge run/ride twice a week. It was considered that the combination of the OE physical activities and the challenge run/ride provided the participants with the energy expenditure, muscular conditioning and organ functioning to have a significant effect on HRF of Year 9 males in the OE experimental intervention group. Paradoxically, the PE physical activities programme which involved traditional sports and games, did not have a significant effect on the HRF of the Year 9 males in the PE cohort. Neither physical group produced significant positive changes in SE.

The future research implications included recommendations for the OE physical activities to be continued on the boys’ return from Glengarry to the main school campus. This would allow researchers to identify if further OE skill development and possible further HRF gains can be made on the return to Sydney. Additional recommendations involved parental inclusion to incorporate a behaviour change, and encouragement to enrol in OE physical activities in Sydney/Eastern Suburbs to encourage lifetime PA. Also, if the Glengarry physical activities programme were to have more water-based activities and more time on repeating certain land-based activities, the participants could gain more skill development, then SE may improve. The PE research recommendations included changing the programme from traditional sports and games to lifetime physical activities, and then both the HRF and SE variables
could be examined for significant changes. The clinical exercise science recommendations were related to designing specific OE and PE physical activity programmes for overweight and obese Year 9 males.

Although this study was designed to improve on previous PA research, and the OEOESP HRF feasibility study, through attempts to overcome specific problems in the evaluation of the effectiveness of HRF and SE physical activity programmes for male adolescents, a number of limitations were considered when making conclusions for the key findings. Several limitations found in this study, specific to each research hypothesis, were discussed. Research hypothesis one, relating to significant changes in HRF of the OE participants was limited by not examining which challenge (run or ride) was completed. Similarly, the individual extra-curricular physical activities of the PE participant’s were not identified. If there was a significant difference of the HRF results of the OE or PE participants, this knowledge may have assisted future PA programming to improve HRF of Year 9 males. The limitation of research hypothesis three was not investigating the amount of incidental PA of each group, therefore indicating if the significant differences were significantly influenced by this. A proposed methodology for this was to use pedometers on approximately 10% of each cohort (due to the cost of pedometers, and the problems relating to self-report record-keeping of adolescent PA).

The limitations of research hypotheses four, five and six were related to the PA programmes efficacy by not having an Australian adolescent SE specific questionnaire. Understanding the mechanisms for the lack of SE-perceived competence following the OE and PE physical activity programmes may be considered to be of paramount importance for the future programming of PA for Year 9 males. The effects of behavioural and physical outcomes in self-perceptions related to physical appearance and PA possibly should have had a carry-over effect into other perceptions of competence domains. A plausible example of this may be self-confidence related to physical appearance, and overall self-worth may have positive implications for improving adolescents’ confidence in social situations with their peers (peer acceptance).
Introduction to chapter eight

Chapter eight will discuss the OE and PE RCT study summary, and recommendations for future research into the effects of OE and PE physical activity programmes for adolescents, and a conclusion.
CHAPTER EIGHT

SUMMARY, RECOMMENDATIONS AND CONCLUSION

Introduction

The prevalence and level of inactivity and obesity in adolescence is rapidly increasing worldwide (Norton, Dollman, Martin & Harten, 2006; Ogden, Carroll, Curtin, McDowell, Tabak, & Flegal, 2006). One potential contributor to the rise in overweight is a decline in physical activity (PA) (Deforche, De Bourdeaudhuij, D’Hondt & Cardon, 2009). Physical inactivity is known to be associated with increased risk for many chronic diseases including: coronary artery disease, stroke, hypertension, colon cancer, Type 2 diabetes (T2D), osteoporosis, and premature death (Katzmarzyk & Janssen 2004). Many of these diseases do not become apparent until adulthood; their etiologies can often be traced back to earlier childhood behaviours (Adamo, Prince, Tricco, Connor-Gorber & Tremblay, 2008).

Sedentary behaviour in adolescence may track into adulthood; therefore the promotion of a physically-active lifestyle during adolescence is an important prevention mechanism (Adamo, et al., 2009). Adolescence is a period of major physical and cognitive changes, but inactivity choices are making adolescent obesity one of the most common chronic disorders in this age group (Perrin, Bloom & Gortmaker, 2007). Physical activity levels attained in adolescence are likely to set the pattern for adult life (Telemata, Yang, Vikari, Valimai, Wanne & Raitakari, 2005). Higher levels of health-related fitness (HRF) and self-esteem (SE) are associated with higher levels of PA. It is therefore essential to investigate the types of physical activities that adolescents could participate in that may prevent physical inactivity, increase HRF and SE, and reduce preventable chronic diseases.

The primary aim of the OE and PE RCT study was to investigate the effects of two different 18-week PA programmes for Year 9 male adolescents’ HRF and SE. The
secondary aim of the study was to contribute to the body of knowledge in outdoor education (OE), physical education (PE) and exercise science.

This was achieved by utilising a two-site random control trial (RCT) research design. The RCT involved the random allocation of 136 Year 9 male students to either an OE experimental physical activities group \( (N =73) \), or a control PE physical activities group \( (N = 63) \). The OE physical activities consisted of land and water-based activities, complemented by a run/ride challenge at The Scots College Glengarry residential campus in Kangaroo Valley, on the South Coast of New South Wales (NSW). The PE activities consisted of PE land-based activities (sports and games), and the water-based Royal Life Saving Society bronze medallion. The PE programme was complemented by extra-curricular coaching in two designated traditional sports, (one per two school terms), and participation in either The Scots College Pipes and Band or the cadets (for two school terms). The PE programme was conducted at The Scots College city campus in the Eastern Suburbs of Sydney.

Both the experimental and control groups completed HRF pre-tests and a SE questionnaire in week one of the RCT. A post-test was conducted in week 18 of the respective PA programmes. The results were analysed and discussed. This final chapter is a summary of the main study, recommendations for future research and a conclusion. Specifically, this chapter:

- Provides a summary of the OE and PE RCT study.
- Details recommendations for future research designs.
- Provides recommendations for the OE physical activities programme.
- Provides recommendations for the PE physical activities programme.
- States recommendations for the NSW Department of Education.
- States recommendations for PE programme development in high schools.
- Details recommendations for State Governments and Local Councils.
- States the conclusion to the OE and PE RCT study.
Summary

This research was undertaken to examine the efficacy of two different PA programmes for Year 9 adolescent males’ HRF and SE outcomes. The hypotheses tested in, and developed through this study are consistent with, and contribute to, past and current theories and research findings in the areas of adolescent PA promotion to increase HRF and SE in male adolescents. Evidence testing the six research hypotheses has been provided, and explanations for the varying results have been discussed. The results in chapter six and subsequent discussion in chapter seven add to the body of research endeavouring to promote adolescent PA, increase HRF and provide preliminary interventions for adolescent obesity and low HRF problems caused by adolescent physical inactivity.

This study indicated that an OE physical activities programme at a residential extended stay outdoor education school programme (ESOESP) was effective in improving HRF of Year 9 males in the short-term. Four of the five HRF variables (body composition, cardiorespiratory endurance, muscular endurance and muscular strength) were all significantly increased at the p<.05 level; the fifth variable flexibility was not significantly increased as a cohort, but within-group results were improved. The ESOESP HRF feasibility study participants also had significant improvements in their HRF variables in particular the BMI, Muscular endurance, strength, and cardiorespiratory endurance HRF variables. Despite these positive changes in HRF, findings were unable to clearly demonstrate a benefit to perceived athletic competence, behavioural conduct, close friendship, global self-worth, scholastic competence and social acceptance after 18 weeks of the experimental OE physical activities intervention. Within-group findings did indicate that the OE physical activities programme positively influenced the OE cohorts’ self-perceptions in the physical appearance domain.

Evidence from this study indicated that an 18-week PE physical activities programme at the city-based campus in Sydney was not effective in improving HRF in Year 9 males in the short-term. The results indicated that only two of the five HRF variables were significantly improved but with mixed results (cardiorespiratory endurance, and muscular endurance). The undistinguished changes in HRF through
participation in the PE physical activities programme were also reciprocated in the self-perception domains (no significant improvements in athletic competence, behavioural conduct, global self-worth, scholastic competence and social acceptance). Within-group findings did indicate that the PE physical activities programme positively influenced the PE cohorts’ self-perceptions in the physical appearance and close friendship domains.

Both evaluated PA programme interventions were associated with improvements in cardiorespiratory fitness measured in the CRF tests (multistage fitness test results) at the 18-week follow-up. This is very important particularly as high HRF during childhood and adolescence has been associated with a healthier cardiovascular profile during these years (Mesa, Ortega, Ruiz, Castillo, Hurtig Wennlof et al., 2006), and later in adulthood (Ruiz, Ortega, Meusel, Harro, Oja, & Sjostrom, 2006). Differences in effectiveness between the OE and PE physical activities programmes in the short-term were significant in HRF at the p<.05 level. The OE participants HRF outcomes were significant in all five HRF variables at the p<.05 level. However, differences in effectiveness between the OE and PE physical activities programmes in perceptions of competence were not apparent. Both the OE and PE physical activities programmes were not associated with significant improvements in SE at the 18-week post-test follow-up. The changes in HRF were achieved by the OE cohort following the 18-week experimental intervention in the hypothesised direction; the changes in the PE cohort were not.

Physical activities and sport have been recognised as a means for children and adolescents to achieve positive outcomes such as competence in motor skills, self-confidence, sportspersonship and interpersonal skills (Weiss, et al., 1996). However, these developmental contributions which include socialising experiences, cooperative behaviours and in some cases leadership skills associated with PA, can only be accomplished if children and adolescents are motivated, and have the opportunity to become involved. In both the OE and PE physical activities programmes in this study, the opportunity was there to be involved, but were the Year 9 adolescents motivated? If they were not motivated, then their SE and perceptions of competence would not be positively changed.
Competence Motivation Theory (CMT) was identified by Weiss and Ferra-Caja (2002) as an educational approach to studying the multidimensional outcomes linked to participation in PA and sport. Within CMT, the perception of competence has frequently been studied and found to be a predictor of SE (Weiss & Ferra-Caja, 2002). A reason for possibly selecting this particular educational theoretical approach (which also included Harter’s 1988, questionnaires), is based on its inclusion of adolescents and children’s perceptions of their physical competence as one aspect of SE. Opportunities to improve physical competence are considered to be central to both OE and PE programmes; attention to perceived physical competence are seen as important outcomes of any educationally-driven PA programme (Corbin, 2002).

Weiss and Ferra-Caja (2002, p.123) stated that “Perceptions of competence are consistently related to motivation orientation, perceived control, SE and attraction to PA”. It would appear that there is a strong relationship among perceptions of competence, SE and motivation to participate in PA. A research example of this can be seen from the research conducted by Ebbeck and Stuart (1996) whose findings indicated that perceived physical competence was a predictor of global self-worth and SE among different age groups of young basketball players (8-9, 10-11, and 12-13 years of age).

The impact of SE on motivation to participate in PA was summarised by Fox (2002, p.84) by stating “SE and specific self-perceptions are closely tied to how we choose to invest our time and effort, and whether or not we persist”. This statement may be one explanation as to why there was no significant change in the OE participants’ SE; some of the participants may not have been motivated to participate in the OE physical activities because they did not choose to invest their time and effort. They were randomly allocated to the ESOESP. Additionally, the participants in the PE physical activities programme may not have been motivated to participate as they had been involved with a traditional PE programme both at primary school, and in Years 7 and 8 in high school and they did not perceive themselves as being competent in the PE physical activities.

The OE and PE RCT study participants’ perception of their abilities in the OE and PE physical activities may have influenced their SE outcomes. Fredenburg, Lee and Solomon (2001) noted that it is not as important to understand what ability is as it is to
understand what children think ability is. In this study, the adolescents’ perception of ability or competence in the OE and PE physical activities may have effected their perception of the physical self, which may have impacted on their SE.

**Recommendations**

In relation to the findings, strengths, limitations, and implications the following recommendations are made:

**Future research designs**

1. The current study’s design included an active control in the form of the PE group. There is however some uncertainty in regards to the representation of changes in HRF and SE in the PE group who were composed of participants living in two different environment, (living with parents/guardians or as boarding school boys at the main school); compared with the OE group who were living in at the Glengarry residential campus. As such, inclusion of a representative sample from the OE group could be compared to a representative sample of the PE boarding school boys. This may eliminate potential bias that may have impacted on the conclusions regarding the effect of the physical activities programmes on the HRF, and SE variables.

Future research evaluating the effects (short-term of 18 weeks or similar) of PA programmes may need to consider other potential forms of comparative groups, such as including a larger representative sample of Year 9 boarders from St Joseph’s College, Hunters Hill, Sydney, where all the Year 9 boys are boarding school boys.

2. In an attempt to understand more clearly the effects of the PA intervention programmes, an intermediate testing phase should be employed prior to the Easter school holidays as the participants in both PA groups (in particular the Glengarry and The Scots College boarding school students) returned to living with their parents. This could have had an effect in their PA levels and changes in levels and types of nutrition. Additionally a maintenance testing phase for the OE group should be completed at the end of Year 9 to: a) examine the residual effect of the OE programme; b) the effect of returning to the city-based campus lifestyle; and c) the
effect of the PE physical activities programme on completion of the 18-week OE programme (second cohort in terms three and four).

3. To further understand the HRF effects of the OE physical activities programme the methodology for the HRF tests could be changed to: a) pre-test in week one; b) a 2nd test prior to the Easter school holidays, to observe the effects of the first 12 weeks of the PA programme; and c) post-test at the end of the 18-week PA programme.

4. The pre-test results of HRF tests from week one and the 2nd test completed prior to the Easter holidays could also be compared with the HRF results at the conclusion of the Year 8 PE programme. This study did investigate the Year 8 results, but data was missing due to boys being absent at the end of the year. To minimise loss of participants in the PE programme at post-test, using similar trials that include assessments of HRF and SE, the boys’ parents could be asked to accompany the boys on a Saturday that is not in the extra-curricular competitive GPS sports programme.

5. Recommended research in the determinants of adolescent PA would be an in-depth study investigating teacher-student relationships in OE and PE. The research could examine how teacher-student relationships affect participant HRF and SE outcomes, and how the PA programme affects their teacher-student relationships after completion of the PA intervention.

6. The outcomes of the OE and PE perceptions of competence subscales for SE were both undistinguished. Further research is therefore necessary to develop a sensitive Australian adolescent-specific questionnaire that examines SE and self-perception changes of Australian adolescents. This would more appropriately evaluate the efficacy of the OE and PE physical activities in improving SE in Year 9 males.

7. Future research designs should involve an investigation of PA programmes focusing on social interactions among peers, and how this affects OE programme outcomes on HRF and SE (living in dormitories, OE structured physical activities at weekends, available free time verses the free living lifestyle of the PE participants in the city).
8. Future research is needed to investigate the contributions of inherited factors and lifestyle behaviours, personal attributes, and social and physical environment factors on adolescents. Bouchard, et al., (2007) designed a model that defines the relationship among physical, HRF and health status. The model indicates that HRF is related to health in a reciprocal manner. That is, fitness influences health. This model could be the starting point to investigate how an adolescent HRF influences their health, and that health status also influences both habitual PA levels and HRF. This is very important when evaluating the contribution of PA programmes contribution to habitual PA established in adolescence that may track into adulthood. This is especially important when considering the health consequences of adolescent physical inactivity.

9. A further recommendation for future PA research involving adolescents HRF using Bouchard et al., (2007) model of the relationship among physical, HRF and health status, is to include metabolic testing, specifically in relation to research involving PA intervention programmes aimed at reducing obesity and overweight adolescents. The 18-week OE physical activities programme was effective in reducing the body composition HRF variables (BMI, BMI z-scores, and waist circumference) of the OE obese and overweight participants. Further research that includes a specific dietary programme to complement the OE physical activities programme could be investigated. The OE physical activities programme could be adjusted to include both aerobic exercise and resistance training in the morning to increase the obese and overweight participants’ metabolic rate.

10. A recommendation for future research that includes pathological blood-based measurements for obese and overweight adolescents who were diagnosed as being pre-diabetic, or Type 2 diabetic (T2D). Blood samples could be taken by a registered nurse to check the HbAC1c changes over a period of 12 weeks (the PA intervention period). There is a strong correlation to cardiovascular disease (CVD) and diabetes, and a correlation to CVD and inflammation. In relation to cardiovascular disease prevention, obese adolescents could have an hsCRP (high sensitivity C-reactive protein) test that measures inflammation levels. Those adolescents with a high HbAC1c and/or hsCRP results could be included in an
ESOESP intervention programme to measure those pathological blood-based changes.

11. Recently other risk factors have been shown to contribute toward the development of CVD, including elevated concentrations of Fibrinogen (fg), a coagulation protein in plasma that promotes increased blood viscosity, and platelet aggregation; elevated levels of fg have been found in obese individuals (Sola, Vaya, Simo, Hernandez-Mijares, Morillas, Espana, et al., 2007) and may have an indirect effect on CVD through levels of adiposity (Rees, Thomas, Brophy, Knox & Williams, 2009). Interleukin-6 (IL-6) is responsible for active inflammation which is an underlying cause of CVD (Rees et al., 2009). Early detection of Fg and IL-6 as part of an adolescent PA intervention programme could be very valuable, and is a recommendation for future research.

12. A recommendation for future HRF research that involves body composition assessment of adolescents is to use adolescent waist cut-off points (McCarthy, Jarrett, & Crawley, 2001) rather than BMI or BMI z-scores, as there is a strong relationship with waist circumference, CVD and T2D. Recently, proposed research involving body composition measurements (Rees et al., 2009) in which included neck circumference measurements of children aged 11-13 years are to be completed.

13. A recommendation to continue using the modified Preliminary Health Screening and Pre-Participation Fitness Examination (Kibler, 1990) that was used in this study. This was an ethical consideration for the study, and is now part of the recommendations for safety guidelines for children and young people in sport and recreation (Sports Medicine Australia, 2008).

14. A recommendation to use the Yo Yo intermittent recovery test (Nybo, Krustrup, Bangsbo, Mohr, Jensen, Majgaard, et al., 2006) as part of a HRF test battery, as this particular test evaluates more closely the energy systems that are actually used in both the OE and PE physical activities.

15. Future research designs that incorporate an investigation into the relationship of adolescent SE, should investigate the motivation of the participants to participate in
PA. Intrinsic motivation and perceptions of competence is one area of research that warrants further attention in adolescence. Previous research in PE and sport (Ntoumanis, 2001) has shown that intrinsic motivation to participate in PA is positively related to students’ reports that they feel less bored, invest greater effort, and are more interested in future participation in PA.

**Recommendations for the Outdoor Education and Physical Education Random Control Trial study PE programme evaluation**

This study investigated the effects of two different PA programmes on the HRF and SE of Year 9 male adolescents. Both the pilot study and the main study illustrated consistent short-term (18 weeks) improvements in HRF in Year 9 males who received the OE physical activities programme. “A curriculum must be continually modified to meet the changing needs of students” (Lacy & Hastad, 2003).

1. The findings of this study indicate that the curriculum (or more appropriately, the PE programme) may need to be modified to meet the needs of the students. The low HRF results in the pre-test indicate that the Year 8 PE programme is not meeting the needs of the students. There may be a need therefore to re-emphasise the educational purpose of PE. Sport should certainly be a part of a PE curriculum but it must be remembered that sport may not be the most reinforcing movement form for everyone (Tinning, 2004).

2. As significant improvements in HRF were evident following the OE physical activities programme intervention in this study, (and the pilot study), effectiveness trials are warranted to further test the OE physical activities under more generalised conditions for high schools. The findings from this study also suggest that PE teachers seeking to improve HRF in high school students should consider developing future PE programmes utilising some of the pedagogical approaches used in OE, as it has been shown to be successful in providing a beneficial HRF physiological outcome in the short-term for adolescent males.

3. Adolescents should have more opportunities to accumulate moderate intensity PA for heart and circulatory health; and complete resistance training for muscular fitness and bone health and to do more weight-bearing movements for
increasing energy expenditure and avoiding obesity. Additionally, there should be modes of PA that provide mental health benefits for adolescents that develop a sense of achievement and satisfaction.

**Recommendations for State Governments and Local Councils**

1. Although this study did not investigate the State Government and Local Councils position in regards to promotion of PA, the author recommends that there should be encouragement of State Governments and Local Councils to examine ways in which they can promote more physical activities that can be incorporated into a PA habitual lifestyle. Examples are cycle paths and outdoor waking tracks. This could be through advertising what PA facilities and programmes are available for adolescents, through increasing the safety of specific areas and building appropriate facilities. The reason is that individuals need opportunities to maintain their individual and family motivation to continue being physically active to increase/maintain their HRF.

2. In relation to adolescents maintaining their motivation to be physically active, State Governments could be encouraged to develop an active transport system to and from school (walking or cycling) to encourage opportunities for the parents’ involvement by leaving their cars at non-fee paying car parks, and either walking or cycling to the school with their children. Install safe, secure cycle storage at schools, railway stations and shopping centres.

**Conclusion**

In conclusion, the 18-week OE physical activities programme was found to significantly improve HRF in Year 9 adolescent males. Despite these results, findings were unable to clearly demonstrate a benefit to SE after 18 weeks of the OE physical activities intervention. Within-group findings indicated that the 18-week OE physical activities programme influenced the boys’ self-perceptions in the physical appearance domain. The PE physical activities programme was found to improve the
cardiorespiratory endurance and muscular endurance HRF variables after 18 weeks. The PE programme enhanced the boys’ perceptions of their physical appearance and close friendship domains.

Despite the contribution of this study to the fields of male adolescent PA promotion of improving HRF variables, findings indicated that several hypotheses could not be supported. Therefore further research is required to elucidate generalisation strategies that improve HRF and SE of Year 9 males and to determine if subsequent PA programmes improve HRF and SE, and future adult health. Several recommendations were provided to assist in improving the evaluated PA interventions so as to enhance its impact in future research trials in high schools. Hence, the insights developed throughout the pilot study and the main study could be used as a foundation for future HRF and SE research seeking to understand how to promote PA in male and female adolescent populations. The promotions of PA programmes that improve HRF and SE of adolescents and that prevent obesity in adolescence are contemporary issues central to the current and future health status of both Australians and global populations. These are essential issues that warrant further consideration and continued global research.
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APPENDIX ‘A’ preamble: Appendix A contains the ESOESP HRF feasibility study information sheets for the parents/guardians, consent forms and research information.

Appendix

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The effect of outdoor education and physical education physical activity programmes upon male adolescents

INFORMATION SHEET FOR PARENTS/GUARDIANS

Dear Parent/guardian,

During your son’s Year 9 studies at The Scots College Glengarry outdoor education campus in terms one and two, your permission is requested to conduct some health-related fitness tests. Your permission is also requested for your son to complete health-related fitness test result sheets. To protect your son’s privacy, the information on the Preliminary Health Screening and Pre-Participation Fitness Examination questionnaires and health-related fitness results will be converted to a coded sheet, and the name on the cover sheet will be removed. The information will be stored in coded format only, and stored in the researcher’s locked files at the University of Newcastle.

It is not anticipated that there will be any risk, harm or embarrassment to your child in this pilot study. Withdrawal from the research will be possible at any time during the project. Your child’s confidentiality will be maintained throughout the data collection and analysis process by the use of codes and no identifying information will be used. The University of Wollongong Ethics Committee has approved this project. If you have any complaints or reservations about the ethical conduct of this project, you may contact the Human Research Ethics Committee, University of Wollongong on (02) 4221-4457). Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

What is the purpose of this study?

The aim of this feasibility study is to examine the effect of the outdoor education physical activities conducted at Glengarry on Year 9 males’ health-related fitness. Adolescents’ low health-related fitness levels and associated health problems are increasing in Australia. I would therefore seek the opportunity to investigate whether the Year 9 male adolescents who participate in outdoor education physical activity programmes at the Glengarry outdoor education campus, change positively in their health-related fitness.
As I would like to test how effective the Glengarry outdoor education physical activities are in improving health-related fitness of adolescent males, I cannot place boys into the Glengarry programme. To ensure the results of the pilot study are not affected by either parent/guardian or child motivation for the Glengarry programme, the boys need to be randomly placed into either the Glengarry programme or the Scots College physical education programme.

To test the effectiveness of the Glengarry programme I would like to take some health-related fitness measurements in week one and again in week 18 of the programme. This will allow me to determine how effective the Glengarry outdoor education programme is in the short-term.

Description of the research procedures

There are two key requirements for involvement in this research pilot study:

1) Assessment:

- Parents/guardians will be asked to complete the Preliminary Health Screening and Pre-Participation Fitness Examination questionnaire prior to the start of the Glengarry programme.
- Your child will complete a range of health-related fitness tests in week one, and repeated in week eighteen of the Glengarry programme.

2) Participation:

- Your child will participate in the Glengarry outdoor education programme as part of The Scots College Year 9 academic programmes.
- Your child’s participation in the pilot study health-related fitness tests and your completion of the sports pre-participation fitness questionnaires are voluntary. Consent will be freely obtained, and the participant can withdraw at any time without fear of sanction.

(1) Assessment

Your child’s health-related fitness will be measured in the following order:

- Blood pressure
- Height, weight, waist circumference, hip circumference
- Sit-ups, press-ups
- Handgrip strength, back and leg lift strength
- Lung capacity, and completion of a multistage fitness test
- Bend/twist/touch flexibility tests

The health-related fitness tests are briefly described in the accompanying participant information sheet.
(2) Participation

Your child will participate in the Glengarry extended stay outdoor education school programme in terms one and two.

The time commitment for the ESOESP HRF Feasibility study

Each Glengarry dormitory group will be allocated a time of 2 hours for the health-related fitness testing in the Glengarry gymnasium. Two hours are allocated for the week-one pre-tests, and 2 hours are allocated in week 18. Therefore the total time commitment for the participants is four hours.

What are the potential risks and discomforts of the ESOESP HRF feasibility study?

- Parents: there are no risks involved to parents/guardians of this study.
- Health-related fitness measurements taken for the children: The health-related fitness tests are just like those in which they would participate in the physical education classes at The Scots College. The tests may involve your child participation in a physical activity that may be moderate to vigorous in intensity for a short period of time. As such there are some risks, such as, muscular and joint discomfort, elevated systolic blood pressure, possible asthma or bronchoconstriction (if the child is asthmatic). An asthma spacer will be provided by the researcher, and the school’s nurse is available during the tests. There is a minimal possibility of a soft tissue ankle injury during the multistage fitness test.
- The ESOESP HRF feasibility study health-related fitness testing programme conducted by the researcher will minimise these risks by applying appropriate warm-up, cool-down and stretching activities. I will also allocate frequent rest and hydration breaks, and will not sustain bouts of moderate to vigorous activities for long periods of time. As a physical education and sports science lecturer, and ex-physical education teacher, I am sensitive to the specific needs of adolescent’s boys who are all individuals, and I will be flexible according to their requirements. Your child will be given the opportunity to have his health-related fitness tested in an enjoyable environment.

The arrangements for treatment in the case of injury

- There is a nurse on the Glengarry campus, and she is aware of the health-related fitness testing days, and will be available if a child is injured.
- There is a physiotherapist in Kangaroo Valley who is available if treatment should be required.
- The researcher, Stephen Jolley has a senior first aid, remote first aid and sports medicine qualifications; additionally he is a full member of Sports Medicine Australia.
Participation in the ESOESP HRF Feasibility study

Individual boys will be free to discontinue participation in the health-related fitness tests at any time. Discontinuation of your child’s involvement will not jeopardise his current or future relationship with The Scots College or the University of Wollongong.

The individual participant potential benefits from the ESOESP HRF feasibility study

The potential benefits for each individual student undergoing the health-related testing procedures are similar to those conducted at The Scots College. There are a few new procedures which will provide new experiences and results for each participant. Each participant is free to ask relevant questions about the testing procedures and how health-related fitness affects each person as an adolescent and in the future as an adult.

Who is conducting the ESOESP HRF feasibility study?

The people in charge of the study are:

- Dr Tonia Gray, Faculty of Education, University of Wollongong-Doctor of Education Thesis supervisor.
- Dr Paul Webb, Faculty of Education, University of Wollongong-Doctor of Education Thesis supervisor.
- Stephen Jelley, School of Education, University of Newcastle-Doctor of Education student.

If you and your child agree to participate in this ESOESP HRF feasibility study, you are requested to complete the attached consent form, and the sport pre-participation fitness questionnaire. If you require further information about this research, you may contact me either by telephone or by email. Your co-operation in this pilot study will be greatly appreciated.

Yours faithfully,


Stephen Jelley
School of Education
University of Newcastle
University Drive
Callaghan NSW 2308
Tel. (02) 4921 5446
Email: Stephen.Jelley@newcastle.edu.au
PARTICIPANT INFORMATION SHEET

The effect of outdoor education and physical education physical activity programmes upon male adolescents.

Researcher: Stephen Jelley

HEALTH-RELATED FITNESS TESTS:

1. BODY COMPOSITION:

The tests for body composition are simple field tests, including the measurement of height, weight, waist circumference, and hip circumference. Differences in physical performance and health can be partially accounted for by differences in body composition. The numbers of measures are stated per test (pre-test/post-test).

   a) Height: measured twice using a height stadiometer
   b) Weight: measured twice using a portable scale
   c) Waist circumference: measured twice using a tape measure
   d) Hip circumference: measured twice using a tape measure

2. MUSCULAR ENDURANCE:

   a) Bent knee sit-up: measures endurance of the abdominal muscles (60 seconds, the number of repetitions are counted), measured once.
   b) Push-ups: measures chest muscle endurance (30-second exercise, the number of repetitions are counted); measured once.

4. MUSCULAR STRENGTH:

   a) Handgrip dynamometer test: simple test using a handgrip dynamometer to measure handgrip strength; measured twice.
   b) Back and leg lift dynamometer test: a simple strength test using a back and leg dynamometer to measure back and leg strength; measured twice.

5. CARDIORESPIRATORY FITNESS:

   a) Dry spirometer lung function tests: a simple field test to evaluate pulmonary function to gain an insight into normal cardiorespiratory
function in healthy subjects. (average recording of 2 expired breaths into a portable hand-held dry spirometer).

b) **Blood Pressure** measurement of systolic and diastolic blood pressure using a sphygmomanometer and stethoscope. This is measured twice.

c) **Multistage fitness test**: cardiorespiratory field fitness test utilising minimal equipment. It is not time-consuming and is practical in its application in field testing. This is measured once.

6. **FLEXIBILITY**:

   a) **Bend/Twist/ Touch test**: flexibility test in which the participant stands with back against a vertical wall, twists and touches his hands either side of a vertical line, turns and touches the floor with his hands and then twists in the opposite direction and touches the vertical wall again with his hands on either side of the vertical line. The number of completed bend/twist/touches in 20 seconds is counted. This test is completed once.
Appendix A.3

ESOESP HRF FEASIBILITY STUDY RESEARCH INSTRUMENTATION

1. PRELIMINARY HEALTH SCREENING and PRE-PARTICIPATION FITNESS EXAMINATION QUESTIONNAIRE:

The Preliminary Health Screening and Pre-Participation Fitness questionnaire goals are to:

a) Prepare the child and the researcher for participation in the health-related fitness tests;

b) Prepare a profile of the subject (musculoskeletal, family medical and personal medical);

c) Delineate negative information that may prohibit or modify participation in the tests (eg. a knee injury that is not fully healed);

d) Delineate positive information to decrease injury risk; and

e) Delineate possible negative information that may prohibit participation (eg. diabetes, asthma, heart disease).

2. HEALTH-RELATED FITNESS RESULT SHEET

The health-related fitness result sheet will be completed by your child in the Glengarry gymnasium, with the assistance of the researcher. The results will be completed in the following order:

- Blood pressure
- Height
- Weight
- Waist circumference
- Hip circumference
- Sit-ups
- Press-ups
- Handgrip strength (right and left hands)
- Back and leg lift strength
- Lung capacity (dry spirometer)
- Multistage fitness test
- Flexibility (bend/twist/touch).

It is not possible to complete only some of the health-related fitness tests, as the ESOESP HRF feasibility study is investigating the effects of and correlations of all the measures.
I have read the foregoing carefully and understood its contents. Any questions which might have occurred to me concerning the research instrumentation and the informed consent have been answered to my satisfaction.

Signed (parent/guardian)………………………………………………………………

Please print your name………………………………………………………………..

Date……………………………………………………………………………………

Signed (student)………………………………………………………………………

Please print your name………………………………………………………………

Date……………………………………………………………………………………
CONSENT FORM FOR RESEARCH PARTICIPANTS, PARENTS/GUARDIANS

RESEARCH TITLE: The effect of outdoor education and physical education physical activity programmes upon male adolescents

RESEARCHER’S NAME: STEPHEN JELLEY

I have been given information about the following research: The effect of outdoor education physical activity programmes upon male adolescents, and discussed the research project with Stephen Jelley who is conducting this research as part of a Doctor of Education degree supervised by Dr Tonia Gray and Dr Paul Webb in the Faculty of Education at the University of Wollongong.

I understand that if I consent to participate in this project I will be asked to complete the:

- Preliminary Health Screening and Pre-participation Fitness Examination questionnaire: (parent/guardian)
- Health-related fitness tests; (pre and post-test undertaken by my son in the Glengarry gymnasium).

I have been advised of the potential risks and burdens associated with this research, the most significant of which being a possible soft tissue sprain while running a multistage fitness test, and I have had the opportunity to ask Stephen Jelley any questions I might have about the research and my participation.

I understand that my participation in this research is voluntary; I am free to refuse to participate and I am free to withdraw from the research at any time. My refusal to participate or withdrawal of my consent will not affect my relationship with either my school or the University of Wollongong. If I have any enquiries about the research, I can contact Stephen Jelley on (02) 4921 5446, or if I have any concerns or complaints regarding the way the research is or has been conducted, I can contact the complaints officer, Human Research Ethics Committee, University of Wollongong on (02) 4221 4457.

By signing below I am indicating my consent to participate in the research entitled the effects of outdoor education and physical education physical activity programme, conducted by Stephen Jelley as it has been described to me in the information sheet and in discussion with Stephen Jelley. I understand that the data collected from my participation will be used for a Doctor of Education degree thesis and I consent for it to be used in this manner.

Signed: Parent/Guardian  Date:Signed: Participant

………………………………………………..  …./…./……..  …………………………..

Name (Please Print):  Name (please print)

………………………………………………………………………………………………………………
APPENDIX ‘B’ preamble: Appendix B contains the ESOESP HRF feasibility study sport pre-participation questionnaires for the parent/guardian to complete prior to their child’s participation in the pilot study at Glengarry.

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<td>history questionnaire</td>
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<td>Appendix B.2 Feasibility study personal</td>
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<td>medical history questionnaire</td>
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<td>Appendix B.3 Feasibility study family</td>
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<tr>
<td>medical history questionnaire</td>
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</table>
STUDENT NAME:_________________________________________ CODE No: G

DATE OF BIRTH (DAY/MONTH/YEAR): __________________________

GLENGARRY CAMPUS DORMITORY:_______ TEST DATE: __________

To protect your child’s privacy this cover sheet will be removed and destroyed once your child has been allocated a study number and code.

Parent/guardian: please complete the following three questionnaires about your child

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<th>ORTHOPAEDIC HISTORY QUESTIONNAIRE</th>
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<td>Has your son had any of the following orthopaedic problems that required medical treatment in the last 24 months?</td>
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<td>Elbow</td>
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<td>Wrist</td>
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<td>Hand</td>
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<td>Other Arm Injury</td>
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<td>Rib</td>
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<td>Hip or Pelvis</td>
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<td>Knee</td>
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<tr>
<td>Ankle</td>
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<td></td>
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<tr>
<td>Foot</td>
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<td></td>
<td></td>
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<tr>
<td>Other Leg Injury</td>
<td></td>
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</tr>
</tbody>
</table>
## PERSONAL MEDICAL HISTORY QUESTIONNAIRE

Has your son had any of the following medical problems that required medical treatment in the last 24 months?

(Please tick Yes or No)

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>If Yes, briefly state the injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allergies</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Asthma or (Exercise-Induced</td>
<td></td>
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<tr>
<td>Bronchospasm)</td>
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<tr>
<td>Chronic Cough</td>
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<td></td>
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<tr>
<td>Heart Disease</td>
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<td></td>
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<tr>
<td>Chest Pains</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shortness of Breath</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>High Blood Pressure</td>
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<td></td>
<td></td>
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<tr>
<td>Low Blood Pressure</td>
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<td></td>
<td></td>
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<tr>
<td>Epilepsy</td>
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<tr>
<td>Fainting Spells</td>
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<tr>
<td>Diabetes</td>
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<tr>
<td>Concussions</td>
<td></td>
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<td></td>
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<tr>
<td>Heat Intolerance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequent Headaches</td>
<td></td>
<td></td>
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</tbody>
</table>
## FAMILY MEDICAL HISTORY QUESTIONNAIRE

Has anyone in your son’s immediate family (Father, Mother, Grandparents, Brothers or Sisters) had any of the following medical problems?  
(Please tick Yes or No)

<table>
<thead>
<tr>
<th>Family member</th>
<th>Yes</th>
<th>No</th>
<th>If Yes, please state which immediate family member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death under the age of 40 from heart disease</td>
<td>___</td>
<td>___</td>
<td>_______________________________________________</td>
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<tr>
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<td>___</td>
<td>___</td>
<td>_______________________________________________</td>
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<td>___</td>
<td>___</td>
<td>_______________________________________________</td>
</tr>
<tr>
<td>Asthma</td>
<td>___</td>
<td>___</td>
<td>_______________________________________________</td>
</tr>
</tbody>
</table>
APPENDIX ‘C’ Preamble: Appendix C contains the health-related fitness results sheet for the ESOESP HRF feasibility study.

Appendix                                                                 Page

Appendix C.1 Feasibility study health-related fitness result sheet ....................322

Appendix C.2 Feasibility study multistage fitness shuttle run record form ..........323
STUDENT NAME:__________________________________________ CODE No: G

DATE OF BIRTH (DAY/MONTH/YEAR):______________________________

GLENGARRY CAMPUS DORMITORY:________________________________

TEST DATE (DAY/MONTH/YEAR):____________________________________

<table>
<thead>
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</thead>
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<tr>
<td>BLOOD PRESSURE (left arm) mmHg</td>
</tr>
<tr>
<td>Height (m)</td>
</tr>
<tr>
<td>Weight (kg)</td>
</tr>
<tr>
<td>BMI</td>
</tr>
<tr>
<td>WAIST CIRCUMFERENCE (cm)</td>
</tr>
<tr>
<td>HIP CIRCUMFERENCE (cm)</td>
</tr>
<tr>
<td>SIT-UPS 60 seconds</td>
</tr>
<tr>
<td>PRESS-UPS 60 seconds</td>
</tr>
<tr>
<td>HANDGRIP DYNAMOMETER (Right Hand kg)</td>
</tr>
<tr>
<td>HANDCRIP DYNAMOMETER (Left Hand kg)</td>
</tr>
<tr>
<td>BACK &amp; LEG DYNAMOMETER (kg)</td>
</tr>
<tr>
<td>LUNG CAPACITY (Dry Spirometer, c.c.)</td>
</tr>
<tr>
<td>MULTISTAGE FITNESS TEST (level number, shuttle number)</td>
</tr>
<tr>
<td>BEND/TWIST/TOUCH (in 20 seconds)</td>
</tr>
</tbody>
</table>

To protect your privacy this cover sheet will be removed and destroyed once you have been allocated a study code number (Top right hand corner of this page e.g. G 21).
# Appendix C.2

## SHUTTLE RUN RECORD FORM

*circle the final level number, shuttle number*

<table>
<thead>
<tr>
<th>Level</th>
<th>Number</th>
<th>Shuttle Number</th>
</tr>
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<tbody>
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</tr>
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<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16</td>
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</tbody>
</table>

323
APPENDIX ‘D’: preamble: Appendix D contains the OE and PE RCT study information sheets for the parents/guardians, consent forms and research information.

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix D.1</td>
<td>OE and PE RCT study information sheet for parent/guardian</td>
<td>325</td>
</tr>
<tr>
<td>Appendix D.2</td>
<td>OE and PE RCT study participant information sheet</td>
<td>329</td>
</tr>
<tr>
<td>Appendix D.3</td>
<td>OE and PE RCT study research instrumentation</td>
<td>331</td>
</tr>
<tr>
<td>Appendix D.4</td>
<td>OE and PE RCT study consent form</td>
<td>333</td>
</tr>
</tbody>
</table>
The effect of outdoor education and physical education physical activity programmes upon male adolescents

INFORMATION SHEET FOR PARENTS/GUARDIANS

Dear Parent/guardian,

During your son’s Year 9 studies at either The Scots College Glengarry outdoor education campus, or The Scots College main school campus in terms one and two, I would like to request permission to conduct some health-related fitness tests, and completion of a self-esteem questionnaire with your child, and completion by the parent/guardian of a sports pre-participation questionnaire. To protect your son’s privacy, the information on the Preliminary Health screening and Pre-Participation Fitness Examination questionnaire, health-related fitness and self-esteem results will be converted to a coded sheet, and the name on the cover sheet will be removed. The information will be stored in coded format only, and stored in the researchers locked files at the University of Newcastle.

It is not anticipated that there will be any risk, harm or embarrassment to your child in this study. Withdrawal from the research will be possible at any time during the project. Your child’s confidentiality will be maintained throughout the data collection and analysis process by the use of codes, and no identifying information will be used. The University of Wollongong Ethics Committee has approved this project. If you have any complaints or reservations about the ethical conduct of this project, you may contact the Human Research Ethics Committee, University of Wollongong on (02) 4221-4457). Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

What is the purpose of this study?

The aim of this study is to examine the effect of the outdoor education physical activities conducted at Glengarry, and the physical education physical activities at the main school campus on Year 9 males’ health-related fitness and self-esteem. Adolescents low health-related fitness levels and associated health problems are increasing in Australia. I would therefore seek the opportunity to investigate whether the Year 9 male adolescents who participate in outdoor education physical activity programmes at the Glengarry outdoor education campus, or the physical education
physical activities at the main school campus change positively in their health-related fitness and self-esteem.

As I would like to test how effective the physical activities are in improving health-related fitness and self-esteem of adolescent males, I cannot place specific boys on request into either the Glengarry outdoor education or the Scots College physical education programmes. To ensure the results of the study are not affected by either parent/guardian or child motivation for either physical activity programme, the boys need to be randomly placed into either the Glengarry outdoor education programme or the Scots College physical education programme.

To test the effectiveness of the individual physical activity programmes I would like to take some health-related fitness measurements, and the boys are to complete an adolescent self-perception questionnaire in week one, and again in week 18 of each programme. This will allow me to determine how effective the individual physical activity programmes are in the short-term.

**Description of the research procedures**

There are two key requirements for involvement in this research study:

1) **Assessment:**

- Parents/guardians will be asked to complete the Preliminary Health Screening and Pre-Participation Fitness Examination questionnaire prior to the start of either the Glengarry or The Scots College physical education programmes.
- Your child will complete a range of health-related fitness tests in week one, and complete a Self-Perception Profile for Adolescents questionnaire, which will be repeated in week 18 of both programmes.

2) **Participation:**

- Your child will voluntarily participate in either the Glengarry outdoor education programme, or The Scots College physical education physical activity programme.

(1) **Assessment**

I will measure your child’s health-related fitness in the following order:

- Height, weight, and waist circumference.
- Sit-ups, press-ups.
- Handgrip strength (right and left hands).
- Lung capacity, and completion of a multistage fitness test.
- Sit-and-reach flexibility test.

The health-related fitness tests are briefly described in the accompanying participant information sheet.
Your child will complete a Self-Perception Profile for Adolescents questionnaire called ‘What I am like’, which consists of 35 questions of their self-perceptions of what they are like on the day of testing. There are no right or wrong answers to these questions; they are just your son’s self-perceptions.

(2) Participation

Your child will participate in either the Glengarry extended stay outdoor education school programme or The Scots College physical education programme in terms one and two, depending on the random allocation placement.

The time commitment for the OE and PE RCT study

Each Glengarry dormitory group or Scots College PDHPE class will be allocated a time of 2 hours for the health-related fitness testing in the Glengarry gymnasium, which includes time for completion of the self-esteem questionnaire. Two hours are allocated for the week one pre-tests, and 2 hours are allocated in week 18. Therefore the total time commitment for the participants is four hours.

What are the potential risks and discomforts of the OE and PE RCT study?

- Parents: there are no risks involved to parents/guardians of this study
- Children: The health-related fitness tests are just like those in which they would participate in the physical education classes at The Scots College. The tests may involve your child’s participation in a physical activity which may be moderate to vigorous in intensity for a short period of time. As such there are some risks, such as, muscular and joint discomfort, elevated systolic blood pressure, possible asthma or bronchoconstriction (if the child is asthmatic). An asthma spacer will be provided by the researcher and the school’s nurse is available during the health-related fitness tests. There is a minimal possibility of a soft tissue ankle injury during the multistage fitness test.

- The main study health-related fitness testing programme conducted by the researcher will minimise these risks by applying appropriate warm-up, cool-down and stretching activities. I will also allocate frequent rest and hydration breaks, and will not sustain bouts of moderate to vigorous activities for long periods of time. As a physical education and sports science lecturer, and previously a physical education teacher, I am sensitive to the specific needs of adolescent boys who are all individuals, and I will be flexible according to their requirements. Your child will be given the opportunity to have his health-related fitness tested in an enjoyable environment.

The arrangements for treatment in the case of injury

- There is a nurse on duty at both the Glengarry and Scots College campuses, and they are aware of the health-related fitness testing days, and will be available if a child is injured.
- There is a physiotherapist nearby in both locations that are available if treatment should be required.
• The researcher, Stephen Jelley has senior first aid, remote first aid and sports medicine qualifications; additionally he is a full member of Sports Medicine Australia.

Participation in the study

Individual boys will be free to discontinue participation in the health-related fitness tests and completion of the Self-Perception Profile for Adolescents questionnaires at any time. Discontinuation of your child’s involvement will not jeopardise his current or future relationship with either The Scots College or the University of Wollongong.

Who is conducting the main study?

The people in charge of the study from are:

• Dr Tonia Gray, Faculty of Education, University of Wollongong-Doctor of Education Thesis supervisor.
• Dr Paul Webb, Faculty of Education, University of Wollongong- Doctor of Education Thesis supervisor.
• Stephen Jelley, School of Education, University of Newcastle-Doctor of Education student.

If you and your child agree to participate in this OE and PE RCT study, could you please complete the attached consent form, and the sport pre-participation fitness questionnaires. If you require further information about this research, you may contact me either by telephone or by email. Your co-operation in this main study will be greatly appreciated.

Yours faithfully,


Stephen Jelley
School of Education
University of Newcastle
University Drive
Callaghan NSW 2308
Tel. (02) 4921 5446
Email: Stephen.Jelley@newcastle.edu.au
Appendix D.2

PARENT/GUARDIAN/PARTICIPANT INFORMATION SHEET

The effect of outdoor education and physical education physical activity programmes upon male adolescents.

Researcher: Stephen Jelley

HEALTH-RELATED FITNESS TESTS:

1. BODY COMPOSITION:

The tests for body composition are simple field tests, including the measurement of height, weight, and waist circumference. Differences in physical performance and health can be partially accounted for by differences in body composition. The number of measures is stated per test (pre-test/post-test).

a) Height: Measured twice using a portable height stadiometer.

b) Weight: measured twice using portable measuring scales.

c) Waist circumference: measured twice using a tape measure.

2. MUSCULAR ENDURANCE:

a) Bent knee sit-up: measures endurance of the abdominal muscles (30 second exercise, the number of repetitions are counted). Measured once.

b) Push-up: measures chest muscle endurance (30 second exercise, the number of repetitions are counted). Measured once.

4. MUSCULAR STRENGTH:

a) Handgrip dynamometer test: simple test using a handgrip dynamometer to measure handgrip strength: measured twice for each hand.

5. CARDIORESPIRATORY FITNESS:

a) Dry spirometer lunch function tests: a simple field test to evaluate pulmonary function to gain an insight into normal cardiorespiratory function in healthy subjects. (average recording of 2 expired breaths into a portable hand-held dry spirometer)

b) Multistage fitness test: cardiorespiratory field fitness test utilising minimal equipment. It is not time-consuming and is practical in its
application in field testing.

6. FLEXIBILITY:

   Sit and reach flexibility test: a simple field test in which the student sits on
   The floor (without shoes), places his feet on the end of the sit-and-reach
   box, places his fingers on the end of the measuring plate and pushes this plate
   forwards until maximum flexibility is obtained, and a measurement on the
   the sit-and-reach box is taken. The test is completed twice.

SELF-PERCEPTION PROFILE FOR ADOLESCENTS QUESTIONNAIRE

Completion of 35 questions relating to adolescents’ self-perceptions at the time of
testing. There are no right or wrong answers to the questions.
MAIN STUDY RESEARCH INSTRUMENTATION

1. PRELIMINARY HEALTH SCREENING and PRE-PARTICIPATION FITNESS EXAMINATION QUESTIONNAIRE: (completed by the parent/guardian):  

The sport pre-participation fitness questionnaire goals are to:

a) Prepare the child and the researcher for participation in the health-related fitness tests;

b) Prepare a profile of the subject (musculoskeletal, family medical, personal medical);

c) Delineate negative information that may prohibit or modify participation (e.g. a knee injury that is not fully healed);

d) Delineate positive information to decrease injury risk; and

e) Delineate possible negative information that may prohibit participation (e.g. diabetes, asthma, heart disease).

2. HEALTH-RELATED FITNESS RESULT SHEET (completed by the student):

The health-related fitness result sheet will be completed by your child in either the Glengarry or The Scots College gymnasiums, with the assistance of the researcher. The results will be completed in the following order:

- Height
- Weight
- Waist circumference
- Sit-ups
- Press-ups
- Handgrip strength (right and left hands)
- Lung capacity (dry spirometer)
- Multistage fitness test
- Flexibility (sit and reach).

3. SELF-PERCEPTION PROFILE FOR ADOLESCENTS QUESTIONNAIRE (completed by the student):

The Self-Perception Profile for Adolescents questionnaire will be completed by your child in either the Glengarry or The Scots College gymnasiums prior to the health-related fitness tests pre and post-tests). It is essential for this research project that both
the health-related fitness tests and the Self-Perception Profile for Adolescents questionnaires are completed. It is not possible to complete just one of the assessment procedures, as the research is investigating the effects and correlations of both measures.

I have read the foregoing carefully and I understand its content. Any questions which might have occurred to me concerning the research instrumentation and the informed consent have been answered to my satisfaction.

Signed (parent/guardian).................................................................................................

Please print your name............................................................................................

Date........................................................................

Signed (student)....................................................................................................

Please print your name............................................................................................

Date........................................................................
CONSENT FORM FOR RESEARCH PARTICIPANTS, PARENTS/GUARDIANS/STUDENT

RESEARCH TITLE: The effect of outdoor education and physical education physical activity programmes upon male adolescents

RESEARCHER’S NAME: STEPHEN JELLEY

I have been given information about the following research: The effect of outdoor education physical activity programmes upon male adolescents, and discussed the research project with Stephen Jelley who is conducting this research as part of a Doctor of Education degree supervised by Dr Tonia Gray and Dr Paul Webb in the Faculty of Education at the University of Wollongong.

I understand that if I consent to participate in this project I will be asked to complete the:

- Preliminary Health Screening and Pre-participation Fitness Examination questionnaire: (parent/guardian)

- Health-related fitness tests; (pre and post-test undertaken by my son in either the Glengarry or The Scots College gymnasiums).

- The Self-Perception Profile for Adolescents Questionnaire (pre and post-test by your son in either the Glengarry or The Scots College gymnasiums).

I have been advised of the potential risks and burdens associated with this research, the most significant of which being a possible soft tissue sprain while a running multistage fitness test, and I have had the opportunity to ask Stephen Jelley any questions I might have about the research and my participation. I understand that my participation in this research is voluntary; I am free to refuse to participate and I am free to withdraw from the research at any time. My refusal to participate or withdrawal of consent will not affect my relationship with either my school or the University of Wollongong.

If I have any enquiries about the research, I can contact Stephen Jelley on (02) 4921 5446, or if I have any concerns or complaints regarding the way the research is or has been conducted, I can contact the complaints officer, Human Research Ethics Committee, University of Wollongong on (02) 4221 4457. By signing below I am indicating my consent to participate in the research entitled the effects of outdoor education and physical education physical activity programme, conducted by Stephen Jelley as it has been described to me in the information sheet and in discussion with Stephen Jelley. I understand that the data collected from my participation will be used for a Doctor of Education degree thesis and I consent for it to be used in this manner.

Signed: Parent/guardian       Date:       Signed: Participant

...........................................................................  .../.../....  ...........................................

........................................................................................................................................................................
APPENDIX ‘E’ preamble: Appendix E contains the orthopaedic, personal medical history and family medical history questionnaires for the Glengarry and The Scots College participants.

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix E.1 Orthopaedic questionnaire (Glengarry)</td>
<td>335</td>
</tr>
<tr>
<td>Appendix E.2 Personal medical history questionnaire (Glengarry)</td>
<td>336</td>
</tr>
<tr>
<td>Appendix E.3 Family medical history questionnaire (Glengarry)</td>
<td>337</td>
</tr>
<tr>
<td>Appendix E.4 Orthopaedic questionnaire (The Scots College)</td>
<td>338</td>
</tr>
<tr>
<td>Appendix E.5 Personal medical history questionnaire (The Scots College)</td>
<td>339</td>
</tr>
<tr>
<td>Appendix E.6 Family medical history questionnaire (The Scots College)</td>
<td>340</td>
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</tbody>
</table>
STUDENT NAME:_________________________________________ CODE No: G

DATE OF BIRTH (DAY/MONTH/YEAR): ________________________________

GLEN GARRY CAMPUS DORMITORY: _______ TEST DATE: _____________

To protect your child’s privacy this cover sheet will be removed and destroyed once your child has been allocated a study number and code.

Parent/guardian: please complete the following three questionnaires about your child

<table>
<thead>
<tr>
<th>ORTHOPAEDIC HISTORY QUESTIONNAIRE</th>
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<tbody>
<tr>
<td>Has your son had any of the following orthopaedic problems that required medical treatment in the last 24 months?</td>
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<td>(Please tick Yes or No)</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>If Yes, briefly state the injury</th>
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</thead>
<tbody>
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<td>Neck</td>
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</tr>
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<td>___</td>
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<tr>
<td>Shoulder</td>
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<tr>
<td>Elbow</td>
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<tr>
<td>Wrist</td>
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<tr>
<td>Hand</td>
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<td>___</td>
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<tr>
<td>Other Arm Injury</td>
<td>___</td>
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<td>Rib</td>
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<tr>
<td>Hip or Pelvis</td>
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<tr>
<td>Knee</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Ankle</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Foot</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Other Leg Injury</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
</tbody>
</table>
# PERSONAL MEDICAL HISTORY QUESTIONNAIRE

Has your son had any of the following medical problems that required medical treatment in the last 24 months?

(Please tick Yes or No)

<table>
<thead>
<tr>
<th>Medical Problem</th>
<th>Yes</th>
<th>No</th>
<th>If Yes, briefly state the injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allergies</td>
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</tr>
<tr>
<td>Asthma or (Exercise-Induced Bronchospasm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic Cough</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart Disease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chest Pains</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shortness of Breath</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Blood Pressure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Blood Pressure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epilepsy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fainting Spells</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concussions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heat Intolerance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequent Headaches</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### FAMILY MEDICAL HISTORY QUESTIONNAIRE

Has anyone in your son’s immediate family (Father, Mother, Grandparents, Brothers or Sisters) had any of the following medical problems?
(Please tick Yes or No)

<table>
<thead>
<tr>
<th>family member</th>
<th>Yes</th>
<th>No</th>
<th>If Yes, please state which immediate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death under the age of 40 from heart disease</td>
<td>___</td>
<td>___</td>
<td>_________________________________</td>
</tr>
<tr>
<td>Heart disease</td>
<td>___</td>
<td>___</td>
<td>_________________________________</td>
</tr>
<tr>
<td>Diabetes</td>
<td>___</td>
<td>___</td>
<td>_________________________________</td>
</tr>
<tr>
<td>High Blood Pressure</td>
<td>___</td>
<td>___</td>
<td>_________________________________</td>
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<td>___</td>
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<td>_________________________________</td>
</tr>
<tr>
<td>Asthma</td>
<td>___</td>
<td>___</td>
<td>_________________________________</td>
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</tbody>
</table>
ORTHOPAEDIC HISTORY QUESTIONNAIRE

Has your son had any of the following orthopaedic problems that required medical treatment in the last 24 months?

(Please tick Yes or No)

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>If Yes, briefly state the injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
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<td>___</td>
<td></td>
</tr>
<tr>
<td>Back</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Shoulder</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Wrist</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Hand</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Other Arm Injury</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Rib</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Hip or Pelvis</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Knee</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Ankle</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Foot</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Other Leg Injury</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
</tbody>
</table>
# Appendix E.5

## PERSONAL MEDICAL HISTORY QUESTIONNAIRE

Has your son had any of the following medical problems that require medical treatment in the last 24 months?

(Please tick Yes or No)

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>If Yes, briefly state the injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allergies</td>
<td>___</td>
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</tr>
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</tr>
<tr>
<td>Heart Disease</td>
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<td>___</td>
<td></td>
</tr>
<tr>
<td>Chest Pains</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Shortness of Breath</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>High Blood Pressure</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Low Blood Pressure</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Epilepsy</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Fainting Spells</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Concussions</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Heat Intolerance</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
<tr>
<td>Frequent Headaches</td>
<td>___</td>
<td>___</td>
<td></td>
</tr>
</tbody>
</table>
### FAMILY MEDICAL HISTORY QUESTIONNAIRE

Has anyone in your son's immediate family (Father, Mother, Grandparents, Brothers or Sisters) had any of the following medical problems?

(Please tick Yes or No)

<table>
<thead>
<tr>
<th>Family member</th>
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<th>If Yes, please state which immediate</th>
</tr>
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<tbody>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Heart disease</td>
<td></td>
<td></td>
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</tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Blood Pressure</td>
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<td></td>
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<tr>
<td>Asthma</td>
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</tr>
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</table>
APPENDIX ‘F’ preamble: Appendix F contains the health-related fitness test results sheets and the multistage shuttle run record forms for the Glengarry and The Scots College participants.

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix F.1 Health-related fitness result sheet (Glengarry)</td>
<td>341</td>
</tr>
<tr>
<td>Appendix F.2 Multistage fitness shuttle run record form (Glengarry)</td>
<td>342</td>
</tr>
<tr>
<td>Appendix F.3 Health-related fitness result sheet (The Scots College)</td>
<td>343</td>
</tr>
<tr>
<td>Appendix F.4 Multistage fitness shuttle run record form (The Scots College)</td>
<td>344</td>
</tr>
</tbody>
</table>
STUDENT NAME:_________________________________________  CODE No: G

DATE OF BIRTH (DAY/MONTH/YEAR): ________________________________

GLENGARRY CAMPUS: DORMITORY: __________________________________

TEST DATE (DAY/MONTH/YEAR):_____________________________________

To protect your privacy this cover sheet will be removed and destroyed once you have been allocated a study number and code.

Please complete the health-related fitness results sheet, and check this sheet with Stephen Jelley on completion of the health-related fitness tests.

<table>
<thead>
<tr>
<th>HEALTH-RELATED FITNESS TEST RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (m)</td>
</tr>
<tr>
<td>Weight (kg)</td>
</tr>
<tr>
<td>BMI</td>
</tr>
<tr>
<td>WAIST CIRCUMFERENCE (cm)</td>
</tr>
<tr>
<td>SIT-UPS 30 seconds</td>
</tr>
<tr>
<td>PRESS-UPS 30 seconds</td>
</tr>
<tr>
<td>HANDGRIP DYNAMOMETER (Right Hand kg)</td>
</tr>
<tr>
<td>HANDCRIP DYNAMOMETER (Left Hand kg)</td>
</tr>
<tr>
<td>LUNG CAPACITY (Dry Spirometer, c.c.)</td>
</tr>
<tr>
<td>MULTISTAGE FITNESS TEST (level number, shuttle number)</td>
</tr>
<tr>
<td>SIT-AND-REACH Flexibility test</td>
</tr>
</tbody>
</table>
Please use this record sheet to accurately record the level and shuttle number of your test buddy. Give him the multistage fitness result and he can place this on his own sheet.

<table>
<thead>
<tr>
<th>Level</th>
<th>Number</th>
<th>Shuttle Number</th>
</tr>
</thead>
<tbody>
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<td></td>
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</tr>
<tr>
<td>2</td>
<td></td>
<td>1 2 3 4 5 6 7 8</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>1 2 3 4 5 6 7 8</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>1 2 3 4 5 6 7 8 9</td>
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<td>6</td>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 11</td>
</tr>
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<td>9</td>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 11</td>
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<td>18</td>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</td>
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<td>19</td>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15</td>
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<td>20</td>
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<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16</td>
</tr>
<tr>
<td>21</td>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16</td>
</tr>
</tbody>
</table>
Please complete the health-related fitness results sheet, and check this sheet with Stephen Jelley on completion of the health-related fitness tests.

<table>
<thead>
<tr>
<th>HEALTH-RELATED FITNESS TEST RESULTS</th>
</tr>
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<tbody>
<tr>
<td>Height (m)</td>
</tr>
<tr>
<td>Weight (kg)</td>
</tr>
<tr>
<td>BMI</td>
</tr>
<tr>
<td>WAIST CIRCUMFERENCE (cm)</td>
</tr>
<tr>
<td>SIT-UPS 30 seconds</td>
</tr>
<tr>
<td>PRESS-UPS 30 seconds</td>
</tr>
<tr>
<td>HANDGRIP DYNAMOMETER (Right Hand kg)</td>
</tr>
<tr>
<td>HANDCRIP DYNAMOMETER (Left Hand kg)</td>
</tr>
<tr>
<td>LUNG CAPACITY (Dry Spirometer, c.c.)</td>
</tr>
<tr>
<td>MULTISTAGE FITNESS TEST (level number, shuttle number)</td>
</tr>
<tr>
<td>SIT-AND-REACH Flexibility test</td>
</tr>
</tbody>
</table>
Please use this record sheet to accurately record the level and shuttle number of your test buddy. Give him the multistage fitness result and he can place this on his own sheet.

### MULTISTAGE FITNESS SHUTTLE RUN RECORD FORM

*circle the final level number, shuttle number*

<table>
<thead>
<tr>
<th>Level</th>
<th>Number</th>
<th>Shuttle Number</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>2</td>
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<tr>
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<td></td>
</tr>
<tr>
<td>11</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12</td>
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</tr>
<tr>
<td>12</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12</td>
<td></td>
</tr>
<tr>
<td>13</td>
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<td></td>
</tr>
<tr>
<td>14</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14</td>
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<td>17</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14</td>
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<td>21</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX ‘G’ preamble: Appendix G contains the Self-Perception Profile for Adolescents (Harter, 1988).

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appendix G.1</strong> Self-Perception Profile for Adolescents (Harter, 1988) (Glengarry)</td>
<td>347</td>
</tr>
<tr>
<td><strong>Appendix G.2</strong> Self-Perception Profile for Adolescents (Harter, 1988) (The Scots College)</td>
<td>346</td>
</tr>
</tbody>
</table>
Appendix G.1

What I am Like

NAME: ____________________________________________________________

DATE OF BIRTH:____________________________________________________

GLENGARRY CAMPUS: DORMITORY: __________ TEST DATE: __________

To protect your privacy the cover sheet will be removed and destroyed once you have been allocated a study number and code

Please complete the sample sentence question after listening to the instructions by Stephen Jelley, and then complete the 35 questions. There are no right or wrong answers to the questions. Your answers are your responses to the questions.

Sample Sentence

<table>
<thead>
<tr>
<th>Really True For Me</th>
<th>Sort of True For Me</th>
<th>BUT</th>
<th>Other teenagers would rather go to sports events</th>
<th>Really True For Me</th>
<th>Sort of True For Me</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

1. ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
2. ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
3. ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
4. ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
5. ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
6. ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
7. ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
8. ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
9. ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
10. ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
11. ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
12. ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
13. Some teenagers do have a close friend they can share secrets with BUT Other teenagers do not have a really close friend they can share secrets with

14. Some teenagers don’t like the way they are leading their life BUT Other teenagers do like the way they are leading their life

15. Some teenagers do very well at their classwork BUT Other teenagers don’t do very well at their classwork

16. Some teenagers are very hard to like BUT Other teenagers are really easy to like

17. Some teenagers feel that they are better than others their age at sports BUT Other teenagers don’t feel they can play as well

18. Some teenagers wish their physical appearance was different BUT Other teenagers like their physical appearance the way it is

19. Some teenagers feel really good about the way they act BUT Other teenagers don’t feel that good about the way they often act

20. Some teenagers wish they had a really close friend to share things with BUT Other teenagers do have a close friend to share things with

21. Some teenagers are happy with themselves most of the time BUT Other teenagers are often not happy with themselves

22. Some teenagers have trouble figuring out the answers in school BUT Other teenagers almost always can figure out the answers

23. Some teenagers are popular with others their age BUT Other teenagers are not very popular

24. Some teenagers don’t do well at new outdoor games BUT Other teenagers are good at new outdoor games right away

25. Some teenagers think that they are good looking BUT Other teenagers think that they are not very good looking

26. Some teenagers do things they know they shouldn’t do BUT Other teenagers hardly ever do things they know they shouldn’t do

27. Some teenagers find it hard to make friends they can really trust BUT Other teenagers are able to make close friends they can really trust

28. Some teenagers like the kind of person they are BUT Other teenagers often wish they were someone else

29. Some teenagers feel that they are pretty intelligent BUT Other teenagers question whether they are intelligent

30. Some teenagers feel that they are socially accepted BUT Other teenagers wish that more people their age accepted them

31. Some teenagers do not feel that they are very athletic BUT Other teenagers feel that they are very athletic

32. Some teenagers really like their looks BUT Other teenager wish they looked different

33. Some teenagers usually act the way they know they are supposed to BUT Other teenagers often don’t act the way they are supposed to

34. Some teenagers don’t have a friend that is close enough to share really personal thoughts with BUT Other teenagers don’t have a close friend that they can share personal thoughts and feelings with

35. Some teenagers are very happy being the way they are BUT Other teenagers wish they were different
Appendix G.2

What I am Like

NAME: ________________________________________________

DATE OF BIRTH:__________________________________________

SCOTS COLLEGE PDHPE CLASS: _______________ TEST DATE: ____________

To protect your privacy the cover sheet will be removed and destroyed once you have been allocated a study number and code

Please complete the sample sentence question after listening to the instructions by Stephen Jelley, and then complete the 35 questions. There are no right or wrong answers to the questions. Your answers are your responses to the questions.

Sample Sentence

<table>
<thead>
<tr>
<th>Really True For Me</th>
<th>Sort of True For Me</th>
<th>BUT</th>
<th>Other teenagers would rather go to sports events</th>
<th>Sort of True For Me</th>
<th>Really True For Me</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
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<tr>
<td>b.</td>
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</tr>
</tbody>
</table>

1. Some teenagers feel that they are just as smart as others their age BUT Other teenagers aren’t so sure and wonder if they are as smart

2. Some teenagers find it hard to make friends BUT For other teenagers it’s pretty easy

3. Some teenagers do very well at all kinds of sports BUT Other teenagers don’t feel that they are very good when it comes to sport

4. Some teenagers are not happy with the way they look BUT Other teenagers are happy with the way they look

5. Some teenagers usually do the right thing BUT Other teenagers often don’t do what they know is right

6. Some teenagers are able to make really close friends BUT Other teenagers find it hard to make really close friends

7. Some teenagers are often disappointed with themselves BUT Other teenagers are pretty pleased with themselves

8. Some teenagers are pretty slow in finishing their school work BUT Other teenagers can do their school work more quickly

9. Some teenagers have a lot of friends BUT Other teenagers don’t have very many friends

10. Some teenagers think they could do well at just about any new athletic activity BUT Other teenagers are afraid they might not do well at a new athletic activity

11. Some teenagers wish their body was different BUT Other teenagers like their body the way it is

12. Some teenagers often get into trouble for the things they do BUT Other teenagers usually don’t do things that get them into trouble
<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
<th>BUT Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Some teenagers do have a close friend they can share secrets with</td>
<td>Other teenagers do not have a really close friend they can share secrets with.</td>
</tr>
<tr>
<td>14</td>
<td>Some teenagers don’t like the way they are leading their life</td>
<td>Other teenagers do like the way they are leading their life.</td>
</tr>
<tr>
<td>15</td>
<td>Some teenagers do very well at their classwork</td>
<td>Other teenagers don’t do very well at their class work.</td>
</tr>
<tr>
<td>16</td>
<td>Some teenagers are very hard to like</td>
<td>Other teenagers are really easy to like.</td>
</tr>
<tr>
<td>17</td>
<td>Some teenagers feel that they are better than others their age at sports</td>
<td>Other teenagers don’t feel they can play as well.</td>
</tr>
<tr>
<td>18</td>
<td>Some teenagers wish their physical appearance was different</td>
<td>Other teenagers like their physical appearance the way it is.</td>
</tr>
<tr>
<td>19</td>
<td>Some teenagers feel really good about the way they act</td>
<td>Other teenagers don’t feel that good about the way they often act.</td>
</tr>
<tr>
<td>20</td>
<td>Some teenagers wish they had a really close friend to share things with</td>
<td>Other teenagers do have a close friend to share things with.</td>
</tr>
<tr>
<td>21</td>
<td>Some teenagers are happy with themselves most of the time</td>
<td>Other teenagers are often not happy with themselves.</td>
</tr>
<tr>
<td>22</td>
<td>Some teenagers have trouble figuring out the answers in school</td>
<td>Other teenagers almost always can figure out the answers.</td>
</tr>
<tr>
<td>23</td>
<td>Some teenagers are popular with others their age</td>
<td>Other teenagers are not very popular.</td>
</tr>
<tr>
<td>24</td>
<td>Some teenagers don’t do well at new outdoor games</td>
<td>Other teenagers are good at new outdoor games right away.</td>
</tr>
<tr>
<td>25</td>
<td>Some teenagers think that they are good looking</td>
<td>Other teenagers think that they are not very good looking.</td>
</tr>
<tr>
<td>26</td>
<td>Some teenagers do things they know they shouldn’t do</td>
<td>Other teenagers hardly ever do things they know they shouldn’t do.</td>
</tr>
<tr>
<td>27</td>
<td>Some teenagers find it hard to make friends they can really trust</td>
<td>Other teenagers are able to make close friends they can really trust.</td>
</tr>
<tr>
<td>28</td>
<td>Some teenagers like the kind of person they are</td>
<td>Other teenagers often wish they were someone else.</td>
</tr>
<tr>
<td>29</td>
<td>Some teenagers feel that they are pretty intelligent</td>
<td>Other teenagers question whether they are intelligent.</td>
</tr>
<tr>
<td>30</td>
<td>Some teenagers feel that they are socially accepted</td>
<td>Other teenagers wish that more people their age accepted them.</td>
</tr>
<tr>
<td>31</td>
<td>Some teenagers do not feel that they are very athletic</td>
<td>Other teenagers feel that they are very athletic.</td>
</tr>
<tr>
<td>32</td>
<td>Some teenagers really like their looks</td>
<td>Other teenager wish they looked different.</td>
</tr>
<tr>
<td>33</td>
<td>Some teenagers usually act the way they know they are supposed to</td>
<td>Other teenagers often don’t act the way they are supposed to.</td>
</tr>
<tr>
<td>34</td>
<td>Some teenagers don’t have a friend that is close enough to share really personal thoughts with</td>
<td>Other teenagers don’t have a close friend that they can share personal thoughts and feelings with</td>
</tr>
<tr>
<td>35</td>
<td>Some teenagers are very happy being the way they are</td>
<td>Other teenagers wish they were different.</td>
</tr>
</tbody>
</table>
APPENDIX ‘H’ preamble: appendix H contains the ESOESP HRF programme

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Page</th>
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</thead>
<tbody>
<tr>
<td>Appendix H.1 The ESOESP HRF study outdoor</td>
<td>352</td>
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<td>education orientation week</td>
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<tr>
<td>Appendix H2 The ESOESP HRF physical activity</td>
<td>354</td>
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<tr>
<td>programme term one</td>
<td></td>
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<tr>
<td>Appendix H3 The ESOESP HRF physical activity</td>
<td>356</td>
</tr>
<tr>
<td>programme term two</td>
<td></td>
</tr>
<tr>
<td>Session 1</td>
<td>Monday</td>
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</table>
| 8.30 – 10.30 | ESOESP Staff – get ready  
Check dorms; allocate beds & pigeon holes, Collect dorm list, post notices & lists on boards in dorms. Obtain afternoon checklist of items that must be covered | A - Equipment Issue, checking, fitting  
B - Ice Breakers Outside  
C - Dorm Session, Outside Rules, expectations, Mini Solo, Goals  
D - River Crossing Lesson | A - Fitness testing Mr Jelley Uni of Wollongong  
B - Map Making  
C - Pastoral Care; Letters, mail, journals, medical matters, dorm photos  
D - Campus Orienteering/Orientation Flag Pole |

<table>
<thead>
<tr>
<th>Session 2</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
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</table>
| 10.50 – 12.50 | 12.00pm – 2.00 Arrive  
Walk down – intro to dorm staff and dorm mates. Brief sharing circle on way down where each student can introduce themselves and share initial feelings about coming to Glengarry. Snack & drink available when get off bus. | A - River Crossing Lesson  
B - Equipment Issue, checking, fitting  
C - Ice Breakers  
D - Dorm Session Rules, expectations, Mini Solo, Goals | A - Campus Orienteering/Orientation  
B - Fitness Testing Mr Jelley, Uni of Wollongong  
C - Map Making  
D - Pastoral Care: Letters, mail, Journals, Medical matters, dorm photo |

<table>
<thead>
<tr>
<th>Session 3</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
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</thead>
</table>
| 1.30 – 3.30 | 2.00pm – 2.30 Lunch All Staff  
Hendricks welcome students & introduces staff. Unpack & organization in the dorms. – All Dorm Staff  
See list of chores to complete: | A - Dorm Session, Rules, Expectations, Mini Solo, Goals  
B - River Crossing Lesson  
C - Equipment Issue, checking, fitting  
D - Ice Breakers | A - Pastoral Care, letters, mail, journals, medical matters, dorm photos  
B - Campus Orienteering/Orientation  
C - Fitness testing Mr Jelley, Uni of Wollongong  
D - Map Making |

<table>
<thead>
<tr>
<th>Session 4</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
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</thead>
</table>
| 3.50 – 5.50 | Unpack etc – Dorm Staff: Guide & facilitate unpacking process  
Locker allocation: Deposit books in lockers | A - Ice Breakers  
B - Dorm Session, rules, expectations, mini solo, goals  
C - River Crossing Lesson  
D - equipment issue, checking, fitting | A - Map Making  
B - Pastoral care; letters, mail, journals medical matters, dorm photos  
C - Campus Orienteering/Orientation  
D - Fitness Testing Mr Jelley, Uni of Wollongong |

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<thead>
<tr>
<th>Monday</th>
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<tr>
<td>6.00pm</td>
<td>All Staff</td>
<td></td>
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</table>
Intake BBQ on lawn outside kitchen. All Students, Staff, and families. Eat, pray. Introduce staff families to students. Sing along under the stars. Guitar and amp. Select a series of classic sing-a-longs. Print of word sheets for each dorm. | 7.00pm Campfire Chapel at the Pontoon  
Supper at Pontoon fire 8.30pm  
Intro to entertainment via the fire  
Supper, Bed |

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<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
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<tr>
<td>7.00-9.00</td>
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</table>
6.45 MJIC WELCOME & frame up the semester  
7.00pm: Candle circle & foundation talk  
7.30pm: Ice breakers. Toss a name game, Have you ever, Balloon trolley, fire in the hole. Brandings stuck in the mud  
Sing along under the stars. Guitar and amp. Select a series of classic sing-a-longs. Print of word sheets for each dorm. |  
7.00pm Campfire Chapel at the Pontoon  
Supper at Pontoon fire 8.30pm  
Intro to entertainment via the fire  
Supper, Bed |

### Supper
- All dorm staff in dorms  
- Overview of day 2, Bed down procedure, Ensure students know AM duties and waking procedures  
- Supper: Sat on staff to dorm to help settle students and answer any questions about program  
- Supper: Sun on staff to dorm to help settle students and answer any questions about program

### Staff responsible for organizing resources, lesson preparation for activity
- Dorm documentation  
- Checklist of areas to cover during orientation  
- Locker allocation  
- Welcome and short talk  
- Candle circle and activities  
- Equipment Issue, checking, fitting  
- Ice Breakers  
- Dorm Session  
- River Crossing Lesson  
- BBQ Welcome & Prayer  
- Music and sing-a-long sheets  
- Fitness Testing Mr Jelley  
- Map Making  
- Pastoral care; letters, mail, journals  
- Medical Matters  
- Dorm Photos  
- Campus Orienteering/Orientation Flag Pole  
- Chapel Service  
- Music at Chapel
<table>
<thead>
<tr>
<th>Session 1</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
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</thead>
<tbody>
<tr>
<td>8.45 – 10.20</td>
<td>A - Lost in the Bush Lesson Room 2-3</td>
<td>A - Leadership in the Wilderness Theatre</td>
<td>• 7.45 breakfast, Hike staff to attend breakfast</td>
<td></td>
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<tr>
<td></td>
<td>B - Wilderness Hazard Lesson Theatre</td>
<td>B - Swim test; Raft Building Challenge Pontoon</td>
<td>First Hike Weekend</td>
<td></td>
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<tr>
<td></td>
<td>C - Academic Orientation Room 1</td>
<td>C - Traffic Light Risk Management Room 2-3</td>
<td>All dorms on short away hike to orient students to camp craft, safety, policy and procedures, organization, team building, fun</td>
<td></td>
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<tr>
<td></td>
<td>D - Intro to climbing wall Hall</td>
<td>D - Hike packing, Pre-trip procedures, weekend hike brief Dorm (Library orientation at start of session for 15 minutes)</td>
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<tr>
<th>Session 2</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.40 – 12.40</td>
<td>A - Intro to climbing wall – Hall</td>
<td>A - Hike packing, pre-trip procedures, weekend hike brief Dorm (Library orientation at start of session for 15 minutes)</td>
<td>Camp Locations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B - Lost in the Bush lesson Room 2-3</td>
<td>B - Leadership in the Wilderness Theatre</td>
<td>A - Kings Creek Area</td>
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<tr>
<td></td>
<td>C - Wilderness Hazard Lesson Theatre</td>
<td>C - Swim test: raft building challenge pontoon</td>
<td>B - Trendally East</td>
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<td></td>
<td>D - Academic Orientation Room 1</td>
<td>D - Traffic Light Risk Management Room 2-3</td>
<td>C - Treandally West</td>
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<td></td>
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<td></td>
<td>D - Nogarra</td>
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<tr>
<th>Session 3</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
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</thead>
<tbody>
<tr>
<td>1.20 – 3.20</td>
<td>A - Academic Orientation Rm 1</td>
<td>A - Traffic Light Risk Management Room 2-3</td>
<td>Saturday Staff: 7.45am-9.000pmConduct hike as per hike notes Non-highlighted staff on until 9.00pm Sat</td>
<td></td>
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<tr>
<td></td>
<td>B - Intro to climbing wall Hall</td>
<td>B - Hike packing, Pre-trip procedures, Weekend hike brief Dorm (Library orientation at start of session for 15 minutes)</td>
<td>Highlighted staff camp out &amp; on until hike pack up Sunday PM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C - Lost in the Bush Lesson Rm 2 – 3</td>
<td>C - Leadership in the Wilderness Theatre</td>
<td>A - Kings Creek area</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D - Wilderness Hazard Lesson Theatre</td>
<td>D - Swim test: Raft Building Challenge Pontoon</td>
<td>B - Trendally East</td>
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<td>C - Treandally West</td>
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<td>D - Nogarra</td>
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<tr>
<th>Session 4</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.30 – 5.30</td>
<td>A - Wilderness Hazard Lesson Theatre</td>
<td>A - Swim test; Raft building challenge Pontoon</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B - Academic Orientation Room 1</td>
<td>B - Traffic Light Risk Management Room 2-3</td>
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<tr>
<td></td>
<td>C - Intro to climbing wall - Hall</td>
<td>C - Hike packing, Pre-trip procedures, weekend hike brief Dorm (Library orientation at start of session for 15 minutes)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>D - Lost in the Bush Lesson Room 2-3</td>
<td>D - leadership in the Wilderness Theatre</td>
<td></td>
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</tbody>
</table>

| 7.00-9.00 | Trangia Cooking Demonstration by Catering staff headed by Chef Aunty Mandy | Video in Theatre | Video or supervised hall time Organize assistants to help with supervision | |

<p>| Lost in the Bush Lesson Room 2-3 Wilderness Hazard lesson Theatre Academic Orientation Room 1 Intro to climbing wall Hall | Leadership in the Wilderness Theatre Swim test: Raft Building Challenge Pontoon Traffic Light Risk Management Room 2-3 Hike packing, Pre-trip procedures, weekend hike brief Dorm Library orientation | A - Kings Creek area | |
| Staff responsible for organizing resources, lesson prep for activity | | B - Trendally east | |
| | | C - Treandally West | |
| | | D - Nogarra | |</p>
<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
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<tbody>
<tr>
<td><strong>Week 1</strong></td>
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</tr>
<tr>
<td><strong>January 28</strong></td>
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<tr>
<td>Boys at main campus in Bellevue Hill, Sydney</td>
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<tr>
<td><strong>Week 2</strong></td>
<td><strong>February 4</strong></td>
<td>ESOESP Orientation Week</td>
<td>ESOESP Orientation Week</td>
<td>ESOESP Orientation Week</td>
<td>ESOESP Orientation Week</td>
<td>ESOESP Orientation Week</td>
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<tr>
<td><strong>Boys arrive</strong></td>
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<td>(see table 4).</td>
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<td>ESOESP</td>
<td>ESOESP Orientation Week</td>
<td>Heath-related fitness testing</td>
<td>ESOESP Orientation Week</td>
<td>ESOESP Orientation Week</td>
<td>ESOESP Orientation Week</td>
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<td>Week 3</td>
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<td><strong>February 11</strong></td>
<td>Hike packing/ hike</td>
<td>Hike</td>
<td>A = Bike maintenance</td>
<td>A = Backrun/Coolend.</td>
<td>A = Backrun</td>
<td>A = Backrun</td>
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<tr>
<td>A=Upper Kings Creek</td>
<td>B=Trendally East</td>
<td>B = bike maintenance</td>
<td>B = Physiosize</td>
<td>B = Coolendel/Backrun</td>
<td>B = Coolendel</td>
<td>B = Coolendel/Backrun</td>
</tr>
<tr>
<td>C=Trendally West</td>
<td>D=Lower Kings Creek</td>
<td>C = traffic lights</td>
<td>C = Safety quiz</td>
<td>C = Climbing/</td>
<td>C = Climbing/</td>
<td>C = Climbing/</td>
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<tr>
<td></td>
<td></td>
<td>D = physiosize</td>
<td>D = River crossing</td>
<td>First aid / Orienteering</td>
<td>First aid / Orienteering</td>
<td>First aid / Orienteering</td>
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<tr>
<td></td>
<td></td>
<td>Movie night</td>
<td>Behavior &amp; expectations</td>
<td>Sports night</td>
<td>Sports night</td>
<td>Sports night</td>
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<tr>
<td><strong>Week 4</strong></td>
<td>Run / Ride Orientation</td>
<td>Run / Ride Challenge</td>
<td>A = First aid / Orienteering</td>
<td>A = Parent hike</td>
<td>A = Parent hike</td>
<td>A = Parent hike</td>
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<tr>
<td><strong>February 18</strong></td>
<td></td>
<td></td>
<td>B=Orienteering/First aid</td>
<td>B,C, D = Sports night</td>
<td>B,C, D = Sports night</td>
<td>B,C, D = Sports night</td>
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<tr>
<td><strong>Run / Ride</strong></td>
<td></td>
<td></td>
<td>C=Coolendel/Backrun</td>
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<tr>
<td><strong>Orientation</strong></td>
<td></td>
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<td>D=Backrun/Coolend.Sp</td>
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<tr>
<td><strong>Challenge</strong></td>
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<td></td>
<td>A, C, D = Sports night</td>
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<tr>
<td><strong>Run / Ride</strong></td>
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<td>Parent visiting day</td>
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<td><strong>Challenge</strong></td>
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<td>Movie night</td>
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<tr>
<td><strong>Run / Ride</strong></td>
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<tr>
<td><strong>Orientation</strong></td>
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<tr>
<td><strong>Run / Ride</strong></td>
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<tr>
<td><strong>Challenge</strong></td>
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<tr>
<td><strong>Week 5</strong></td>
<td>Run / Ride Orientation</td>
<td>Run / Ride Challenge</td>
<td>A= Parent hike</td>
<td>A= Parent hike</td>
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<tr>
<td><strong>February 25</strong></td>
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<td></td>
<td>B,C, D = Sports night</td>
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<tr>
<td><strong>Run / Ride</strong></td>
<td></td>
<td></td>
<td>A= Parent hike</td>
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<tr>
<td><strong>Orientation</strong></td>
<td></td>
<td></td>
<td>B= Parent hike</td>
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</tr>
<tr>
<td><strong>Run / Ride</strong></td>
<td></td>
<td></td>
<td>C= Land care, Climbing</td>
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<tr>
<td><strong>Challenge</strong></td>
<td></td>
<td></td>
<td>D= Climbing, Land care</td>
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<tr>
<td><strong>Run / Ride</strong></td>
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<td></td>
<td>A,C, D = Sports night</td>
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Appendix H3 The ESOESP HRF feasibility study ESOESP physical activities programme for term two

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