**To explore the effectiveness of a specific Sportshall Athletics Programme on the fitness levels of primary school children.**

By

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A dissertation submitted in part fulfilment of the requirement for the B.A.(hons) Degree in Exercise and Health Studies

April 2014

Waterford Institute *of* Technology

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# STATEMENT OF ORIGINALITY AND OWNERSHIP OF WORK

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I confirm that all the work submitted in this dissertation is my own work, not copied from any other person's work (published or unpublished) and that it has not previously been submitted for assessment on any other course, in any other institution.

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## ACKNOWLEDGEMENTS

To my supervisor, Maire Harney, thank you for all your help, guidance and encouragement throughout this research project.

To the principals, teachers and pupils of both schools, this study would not have been possible without your assistance. Thanks for being so helpful and generous with your time.

To my Mam and Dad,
Mam, thanks for all the help, encouragement and opportunities you've provided me with over the years. Dad, thanks for keeping a close eye on me from above.

To my brother Kevin and my sisters Karen and Lisa, thanks for all the fun and minding over the years.

To my nephew Joey and my niece Katie thanks for all the cuddles and your ability to provide a welcomed distraction.

To Tom, thank you for your help, patience and always being there to make me smile.

To all my friends at home, thanks for everything.

To all my friends in WIT, especially class G/H, it's been an amazing four years, thank you.

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# ABSTRACT

**Overview:**

This research seeks to explore the effectiveness of a specific Sportshall Athletics Programme on the fitness levels of primary school children. Previous research indicates that children are becoming less physically active. It is evident that there is a need for effective physical activity programmes and interventions to prevent the growing problem of childhood obesity. The school setting has been widely recognised as an area for improving physical activity and fitness levels in children. The purpose of this project is to examine the role that a specific physical activity intervention such as the Sportshall Athletics Programme can play in improving the fitness levels of primary school children.

The fundamental research questions to be addressed in this study are:

1. Was there an improvement in cardiovascular fitness in the intervention and control school students following an 8 week Sportshall Athletics Programme?
2. Was there an improvement in muscular strength in the intervention and control school students following an 8 week Sportshall Athletics Programme?
3. Was there an improvement in muscular endurance in the intervention and control school students following an 8 week Sportshall Athletics Programme?
4. Was there an improvement in flexibility in the intervention and control school students following an 8 week Sportshall Athletics Programme?
5. Was there a difference in cardiovascular fitness, muscular endurance, muscular strength and flexibility in males and females following an 8 week Sportshall Athletics Programme?

**Methods:**

Through pre and post fitness testing of 84 fifth and sixth class pupils in two schools, the author was able to collect significant data and thus consider the extent to which the Sportshall Athletics Programme affected the fitness levels of primary school children.

**Results:**

Results show that the Sportshall Athletics Programme did have an effect on the fitness levels of primary school children. The study found that there was an improvement in cardiovascular fitness, muscular strength, muscular endurance and flexibility after the intervention (Sportshall Athletics Programme) had taken place with the intervention group. No such improvements were established in the control group which did not take part in the Sportshall Athletics Programme. The study also found that males achieved higher results in the initial testing however significant improvements were achieved by females after the 8 week Sportshall Athletics Programme had taken place.

**Conclusions:**

In conclusion, as this study has implications for pupils and teachers in primary school settings the author puts forward recommendations which seek to improve participation and enjoyment in school-based physical activity; thus, helping raise levels of fitness among primary school students.

# CHAPTER 1: LITERATURE REVIEW

## 1.1 Introduction

It is evident that children have become less physically active than their predecessors' with children today expending roughly around 600 kcal per day less than children 50 years ago (Boreham & Riddoch, 2001). Wang and Lobstein (2006) stated that there is a growing global childhood obesity epidemic in many countries and that effective programmes are needed to address the issue. Research has found that childhood and adolescence are significant times where sedentary behaviour can be prevented by encouraging the habit of physical activity throughout the school years (U.S Department Of Health And Human Services, 1998; Cale & Harris, 2005; Ekelund et al., 2007; Johndottie, 2009). There is little indication that the swift rise in weight and obesity in children will slow down in the close future (Dollman, Nortan, & Nortan, 2005). Consequently there is a need for environmental changes and interventions to halt this pattern of the increasing prevalence of obesity among children. Experts stress that daily life physical activity habits need to be developed early in life (Sallis & McKenzie, 1991) and those early positive experiences in physical activity can have a constructive outcome and help maintain a physically active way of living (Weiss, 2000). The school setting has been widely recognised as an area for improving physical activity (National Prevention Council, 2010; Cale & Harris, 2005). Research shows that primary schools are an ideal setting for physical activity interventions as, on average, children spend 779 hours each year in primary school (Froio, 2013). Primary schools are also a perfect setting as children who attend primary schools are quick to react to health messages and change their behaviour (Johndottie, 2009). Therefore, it is clear that high quality physical activity programmes and effective physical educators are needed to provide children with early positive experiences of physical activity (Alderman, Beighle, & Pangrazi, 2006).

## 1.2 Physical Activity

"Physical activity is defined as any bodily movement produced by skeletal muscles that result in energy expenditure" (Caspersen et al., 1985, p 126); (Shephard, 1994). The amount of physical activity a person does is mainly due to personal choice and

physical activity levels in people may vary over time (Caspersen et al., 1985). Physical activity can be characterized in a range of different ways (World Health Organisation, 2013). It can include forms of activity such as sport, exercise or other activities which engage bodily movement and are done as part of house work, working, playing or recreational activities (World Health Organisation, 2013).

Intensities of physical activity include light, moderate and vigorous intensities (Lee & Paffenbarger, 2000). Lee and Paffenbarger (2000) assessed the links of different intensities associated with physical activity and longevity. The study found that light physical activities were not associated with a reduction in mortality rates and benefits could be seen from partaking in moderate activities while vigorous activities clearly predicted lower mortality rates (Lee & Paffenbarger, 2000). In a study conducted by Abbott and Davies (2004), the relation in 47 children aged from five to 10.5 years between habitual physical activity, minutes spent in moderate, vigorous and hard intensity activity and body composition parameters were examined. It was found that children who took part in vigorous and hard activity had significantly lower body fat percentages than those who took part in light and moderate physical activity (Abbott & Davies, 2004).

Sport has previously been defined as vigorous physical activity that is taken on in an aim for such pleasures as social interaction, excitement, competition, danger and vertiginous stimulation (Shephard, 1994). It can be used to describe all forms of recreational activity such as competitive games and also individual health related aerobic pursuits such as walking or jogging (Oja, 1991).

The terms exercise and physical activity have many elements in common and both are used interchangeably quiet often (Taylor, 1983). Both physical activity and exercise involve any bodily movement involving skeletal muscles that expends energy (Caspersen, Powell, & Christenson, 1985). Exercise however is a subcategory; it is physical activity that is planned, structured and repetitive and has a final aim of improving or maintaining physical fitness (Caspersen, Powell, & Christenson, 1985).

Caspersen et al., (1985) described physical fitness as “a set of attributes that people have or achieve”. Being physically fit has been described as being able to carry out

daily tasks easily without getting tired while having lots of energy to enjoy leisure activities and meet unforeseen circumstances (Presidents council on physical fitness and sports, 1971). Physical fitness can be divided into two groups, health related fitness and performance related fitness (Pate, 1983). Health related fitness consists of five components: cardio respiratory endurance; muscular endurance; muscular strength; body composition; and flexibility (Casperson et al, 1985). Physical fitness and physical activity are closely related since physical fitness levels are mostly, but not entirely, influenced by the amount of physical activity a person does (Blair, Cheng, & Holder, 2001).

Previous research indicates that the aerobic fitness levels of children are declining worldwide (Tomkinson, Leger, & Olds, 2003; Tremblay, Sheilds, Laviolette, & Mannon, 2010). A worldwide meta analysis conducted recently found that children's aerobic performance has declined by 1% a year over the last twenty years (Tomkinson et al., 2003). There is also overwhelming support which shows that enhanced fitness which includes measurements of body composition, cardiorespiratory function (such as aerobic fitness) and musculoskeletal fitness (such as strength, muscular endurance and flexibility) is linked to vast improvements in children's health (Janssen, 2007) (Physical Activity Guidelines Advisory Committee, 2008) (Anderssen, Cooper, & Riddoch, 2007) (Ekelund, Anderssen, & Froberg, 2007) (Tremblay et al, 2010).

### 1.3 Physical activity recommendations

A general consensus has been reached in recent years on the amount and type of physical activity recommended to improve and maintain health. The world health organisation (2013) has divided recommendations into three age groups: 5-17; 18-64; and 65 +.

Individuals aged between the age of eighteen and sixty four should participate in 150 minutes of moderate intensity aerobic physical activity throughout the week or at least 75 minutes of vigorous intensity aerobic physical activity or a combination of both. Activities should be performed in no less than ten minute bouts while activities which strengthen the muscles should be carried out on two or more days of the week (World Health Organisation, 2013). Older adults should also do 150 minutes of moderate

intensity aerobic physical activity throughout the week or at least 75 minutes of vigorous intensity aerobic physical activity or a combination of both. Older adults with poor mobility should perform exercises which will help their balance and prevent falls at least three days of the week (World Health Organisation, 2013).

It is recommended that children between the ages of five and 17 accumulate at least 60 minutes of moderate to vigorous intensity exercise each day. Physical activity should mostly be aerobic while resistance training should also be carried out (World Health Organisation, 2013). There are a number of ways to carry out physical activity with children. Moderate activities such as brisk walking, bike riding with friends or skate boarding are all advantageous while vigorous activities such as football, swimming laps, running, soccer and training for other different sports are also beneficial (Department of Health, 2013). Children usually build up activity in intermittent bursts which can range from a few seconds to several minutes so it is clear that any sort of active play is beneficial (Department of Health, 2013). The most important thing in relation to physical activity for children is that they are provided with the opportunity to participate in a variety of activities that are fun and suit their interests, skills and abilities as this will offer a child a number of health benefits, experiences and challenges (Department of Health, 2013).

## 1.4 Benefits of Physical Activity

Partaking in physical activity is one of the most important things that people of all ages can do to benefit their health (National Prevention Council, 2010). Research has found that physical activity can provide many benefits for children today. Children's health can improve as a direct result of physical activity (Boreham & Riddoch, 2001). Children who are active are more likely to possess healthier cardiovascular profiles, higher peak bone mass and they also tend to be leaner than children who are less physically active (Boreham & Riddoch, 2001; National Prevention Council, 2010). An active lifestyle also leads to weight maintenance, reduced risk of diseases, reduced risk of mortality and an overall better quality of life (Bouchard et al, 1994; Centres for Disease Control and Prevention, 2011). It is also believed that children who took part in physical activity in their childhood have a superior health status when they reach adulthood (Boreham & Riddoch, 2001). In addition to a biological carryover effect,

data suggests that there may be a behavioural carryover into adulthood also as it is perceived that active children are more likely to become adults who are healthy and participate in physical activity on a regular basis (Boreham & Riddoch, 2001).

## 1.5 Current trends in physical activity

Although there is worldwide knowledge that participating in physical activity can provide many benefits, only a small population of the world today are taking part in regular physical activity (National Center on Health, Physical Activity, and Disability, 2013). The National Taskforce on Obesity (2005) stated that children's levels of physical activity have declined over time and that this has lead to the current problems of weight and obesity among children in society today.

### 1.5.1 Data from United States

In America today less than half (48%) of all adults meet the recommended guidelines of physical activity while less than three in ten high school students partake in 60 minutes of physical activity a day (Centres for disease control and prevention, 2012).
Nelson, stzainer, Hannon, Sirard & Story (2006) carried out a study in America which investigated the longitudinal and secular trends in physical activity and sedentary behaviour during adolescence over five years. The study found that there was a large decrease in the amount of time spent carrying out moderate to vigorous physical activity especially in girls over the five years (Nelson et al., 2006). Leisure time computer use was also seen to increase over the five years, particularly among boys while secular trends indicated a substantial rise in mid-adolescent computer use over the five years (Nelson et al., 2006). This highlights that effective health promotion programmes are needed to target the declining levels of physical activity among children (Nelson et al., 2006).

### 1.5.2 Data from European Union

In the World health organisation European region, one in five of the population undergoes minimal physical activity with the lowest rates witnessed in the eastern countries (World Health Organisation Europe, 2013). In 2002, an analysis of a survey

of a number of countries in the EU was carried out. Sjostrom (2006) found that two thirds of the adult population did not meet the recommended levels of physical activity. Children's (aged 11, 13 and 15) participation in physical activity was also assessed across European countries between 2001 and 2002 (Sjostrom, 2006). Sjostrom (2006) noted that, on average, only 34% of children in Europe meet the current guidelines of physical activity. In the majority of countries boys were more active than girls and a decrease in activity could be witnessed as age increased in both boys and girls (Sjostrom, 2006). A range of variations could be witnessed between different countries; for example, the amount of active 15 year olds in Czech Republic was 49% compared to 25% in Portugal (World Health Organisation Europe, 2006). Mckenzie, Sallis, & Elder (1997) investigated the difference in physical activity levels during recess in preschool and elementary school. The study found that children exhausted nearly twice as much energy in preschool than they did in elementary school (McKenzie, Sallis & Elder, 1997). As children moved into elementary school, teacher's prompts decreased and in turn children's physical activity levels decreased (McKenzie, Sallis & Elder, 1997). This suggests that school settings should be used to encourage and promote health enhancing physical activity to children.

### 1.5.3 Data from Ireland

Three out of four Irish adults and four out of five Irish children do not meet the Department of Health and Children's National Physical Activity guidelines (Woods, Murphy, MacDonncha, & Murphy, 2012). Kelleher, NicGabhainn and Daly (2003) conducted The National Health and Lifestyle Surveys in 1998 and 2002. Research on both adults' and children's physical activity levels in Ireland were carried out to assess the changes in physical activity levels in Ireland. Nationally it was found that 50.8% of respondents engaged in regular physical activity per week (Kelleher et al., 2003). More females than males participated in moderate physical activity regularly although more males than females took part in strenuous physical activity frequently (Kelleher et al., 2003). It could also be seen that 48% of children exercise four or more times a week while 12% exercise less than weekly (Kelleher et al., 2003). Furthermore, some significant gender differences could be seen from the survey. While only 8% of boys and 14% of girls were exercising less than weekly, 59% of

boys and 38% of girls were exercising four or more times per week (Kelleher et al., 2003).

### 1.6 Gender differences in Physical Activity

Identifying group differences in health enhancing behaviours such as physical activity is extremely important (Macera & Pratt, 2000). Previous studies of youth physical activity have reported that male subjects are more active than female subjects and that physical activity levels decrease with age (Sallis, 1993; Trost & Pate, 1999).

In 2001 Trost, Pate, Sallis, Freedson, Taylor and Dowda carried out a study to evaluate age and gender differences in physical activity. The amount of time they spent partaking in bouts of physical activity was measured as well as the amount of minutes they spent in moderate to vigorous physical activity and vigorous physical activity alone. Trost et al. (2001) found that the greatest age related differences occurred during elementary school rather than during the teen years and across all age groups boys were more active than girls. For daily vigorous physical activity there was a large gap of 45% between boys and girls; however, there was a smaller margin of 11% when assessing daily moderate physical activity (Trost et al., 2001). This indicates that boys are more active than girls and they also partake in greater amounts of vigorous physical activity. The major difference in boys and girls may be the low participation of girls in vigorous physical activity. Manios, Kafatos and Codrington (1999) also found that more boys took part in moderate to vigorous physical activity in school. Manios, Kafatos & Codrington (1999) assessed physical activity, physiological fitness parameters and gender differences among six year old children in Crete. 569 children (305 boys and 264 girls) took part in the study. Assessments of physical activity were based on observational methods involving teachers and parents. Cardiorespiratory fitness, BMI, skinfold thickness, Muscle Circumference and haemoglobin were also measured. While boys were found to take part in moderate to vigorous physical activity in school, it was noted that girls were more likely to be involved in physical activity related lessons outside of school (Manios et al, 1999). Sarkin, McKenzie, & Sallis (1997) also found gender differences between boys and girls physical activity levels. In a study carried out in South California gender differences in children’s physical activity levels during physical education and break

times were measured with 91 fifth grade children (Sarkin, McKenzie & Sallis, 1997). Activity was measured by an accelerometer over a three day period. The study found that boys and girls had similar activity levels during PE, but there was a significant difference in activity during break time (Sarkin, McKenzie, & Sallis, 1997). Boys were considerably more active than girls during break as they preferred activities such as basketball and tag compared to girls who engaged in walking, talking and taking snacks (Sarkin, McKenzie, & Sallis, 1997). It could be seen that girls were significantly more active during PE than they were at break (Sarkin, McKenzie, & Sallis, 1997). The results of this study suggest that structured PE classes, programmes or interventions may be beneficial to children of both genders as it can provide them with similar amounts of physical activity.

## 1.7 Physical Activity and Schools

The importance of the school setting as an area for improving physical activity has been widely recognised (Cale & Harris, 2005; Alderman et al, 2006; National Prevention Council, 2010). It has become evident that the role of the school in health promotion has become more prominent and that there has been a rise in health-related physical education programmes in schools (Harris & Cale, 1997). Research shows that primary schools are an ideal setting for health promotion programmes as children within these settings are quick to respond to health messages and behavioural changes may be maintained into adolescence and adulthood (Johndottie, 2009).

### 1.7.1 Physical Activity Programmes/Interventions in Schools

In 1997, Harris & Cale presented a comprehensive review of physical activity programmes. It measured if school physical education contributes to young people's health. The review suggested that health-related physical education programmes can have positive outcomes in physiological, clinical, behavioural, cognitive and affective measures (Harris & Cale, 1997). The U.S Department Of Health And Human Services (1998) stated that efforts should be made to encourage schools to incorporate daily physical activity into each school day as school based interventions have been shown to be successful in increasing physical activity levels. A study carried out in 2001 found that when schools improved physical activity facilities and improved adult

supervision of physical activity, significant improvements were found in how active children were (Sallis, Conway, Prochaska, McKenzie, Marshall, & Browne, 2001). Boys and girls physical activity levels were four and five times higher, respectively, after these changes occurred (Sallis et al, 2001). Kriemler, Zahner, Schindler, Meyer, Hartmann and Hebestreit (2010) carried out a cluster randomized control trial where they sought to assess the effectiveness of a school based physical activity intervention. The study involved a control group and an intervention group. Both groups continued their normal three sessions of physical activity a week (taught by their normal teachers) while the intervention group was given an extra two sessions of physical activity a week (taught by physical education teachers). The intervention group was also allocated ten minutes of physical activity homework each day and as well as this they were given two to five short activity breaks during lessons to do stand up, jumping and balancing activities. Kriemler et al., (2010) found that a physical activity intervention for one year had a positive effect on body composition, aerobic fitness, physical activity and cardiovascular risk. It concluded in stating that the implementation of similar interventions will help to improve the health and fitness of children while also improving their health in later life by decreasing their risk of disease (Kriemler, et al., 2010).

### 1.7.2 Fitness Testing in Schools

It has been found that carrying out fitness tests in schools can provide many benefits (Pate, 1983). Test results can be used to assess fitness, monitor the risk of disease, set health goals and help provide information on physical activity (Pate, 1983). Recent studies have reported that children who are physically fit take in and retain more information in school and also achieve higher scores when tested in comparison to children who have lower fitness levels (Reynolds, 2013). Data also suggested that those who have higher levels of fitness during childhood and adolescence are likely to be more active in adulthood (Malina, 2001). Brunner (2007) stated the most important thing in relation to fitness testing is that the chosen system should be simple and not require “expert” application or expensive equipment. In America and other countries they have developed a standardized battery of fitness tests for children, however Ireland has none and this is a key issue which needs to be addressed.

## 1.8 Summary and Rationale

In the 21st century, everyday life provides fewer opportunities for physical activity and the follow-on sedentary lifestyles have significant consequences for public health (World Health Organisation, 2013). Although the relationship between exercise and health has been established in adults, much less scientific research for the same relationship exists in youth. It is clear that improving and maintaining physical activity and physical fitness in children can provide many short and long term health benefits (Bouchard, Blair & Haskell, 2007; Boreham & Riddoch, 2001; Cale & Harris, 2005; Jannssen, 2007; Kriemler et al, 2010; Malina, 2001; Active living, 2010). The amount of physical activity children are taking part in these days is on the decline while increases can be witnessed in a surrounding technological society and higher rates of obesity (Bouchard, Blair, & Haskell, 2007). Previous research indicates that the adult diseases which are influenced by physical activity often originate in the paediatric years (Boreham & Riddoch, 2001; Malina, 2001; The National Taskforce on Obesity, 2005; Weiss, 2000). Therefore, there is a significant need for the promotion of physical activity programmes so that children's health can be improved and maintained into adulthood. Schools can provide a brilliant opportunity to allow students gain the knowledge and skills needed to increase their activity levels (U.S Department Of Health And Human Services, 1998; Cale & Harris, 2005; Ekelund et al, 2007; Johndottie, 2009; Froio, 2013; Alderman et al., 2006; National Prevention Council, 2010, Sallis et al, 2001; Kriemler et al, 2010). As young children spend a significant amount of their lives in the school setting, educational programmes can be put into action and maintained on a regular basis which could yield the necessary increases that are needed in physical activity (World Health Organisation, 1996).

## 1.9 Research Questions

1. Was there an improvement in cardiovascular fitness in the intervention and control school students following an 8 week Sportshall Athletics Programme?
2. Was there an improvement in muscular strength in the intervention and control school students following an 8 week Sportshall Athletics Programme?

3. Was there an improvement in muscular endurance in the intervention and control school students following an 8 week Sportshall Athletics Programme?
4. Was there an improvement in flexibility in the intervention and control school students following an 8 week Sportshall Athletics Programme?
5. Was there a difference in cardiovascular fitness, muscular endurance, muscular strength and flexibility in males and females following an 8 week Sportshall Athletics Programme?

# CHAPTER 2: METHODOLOGY

## 2.1 Introduction

The purpose of this study was to explore the effectiveness of a specific Sportshall Athletics Programme on the fitness levels of primary school children.

To obtain the relevant information the researcher carried out fitness testing with a selection of fifth and sixth class students in two primary schools. A battery of fitness tests was carried out with both schools before the Sportshall Athletics Programme began in October and the same fitness testing was carried out with both schools after the Sportshall Athletics Programme was completed in December.

To obtain a more detailed evaluation of the effects of physical activity programmes on children's fitness levels, research would need to be done on a larger scale with primary school children all over Ireland. However, due to time and financial constraints such a study was not possible. The results of this small scale research project simply seek to provide an insight into the effect a particular physical activity programme, the Sportshall Athletics Programme, has on the fitness levels of primary school children.

## 2.2 Sportshall Athletics Programme

Sportshall Athletics was created in 1976 by George Bunner so that youngsters at his local athletics club could continue to train indoors on dark winter nights. Sportshall became very popular so a competition was soon developed and in 1980 the first UK Championships were held. Sportshall Athletics was first developed for 12-15 year olds but Bunner has continued to progress and expand the concept and the programmes now cater for youngsters aged 4-16 (Bunner, 2001). Sportshall Athletics is a fun bright and colourful way of getting children involved in athletics. It provides safe, enjoyable multi skill activities which appeal to young people, parents, coaches and teachers. It is carried out indoors so it is safe and-suitable in unfavourable weather conditions. There are five key elements to the Sportshall concept – Enjoyment, Fair play, Flexibility, Potential talent and Ability. Future stars are

protected through the emphasis of team performance and each child's all round ability is encouraged in the opinion that specialisation at an early age should be avoided (Brunner, 2001). The Sportshall Athletics Programme offers an exciting mix of skills, awards and competition which appeals to children of all abilities, sizes and ages. In Ireland the programme is run by the local Sports Partnership in each county and is carried out in primary schools and local athletics clubs. The Sporthall Athletics Programme for the purpose of this study involved an 8 week programme of one class a week for the intervention school. Each class involved non-stop physical activity for sixty minutes and was delivered by a qualified physical activity instructor.

## 2.3 Research Design

Research is defined as "the systematic, controlled, empirical and critical investigation of hypothetical propositions" (Kerlinger 1970 cited in Cohen and Manion, 1989, p.6). There are a variety of approaches to data collection; however, Bell (1993) stated that researchers generally can be classified into two different types – quantitative and qualitative researchers. Quantitative researchers "collect facts and study the relationship of one set of facts to another. They measure, using scientific techniques that are likely to produce quantified and, if possible, generalizable conclusions" (Bell, 1993, pp.5-6). In contrast, qualitative researchers are "concerned to understand individual's perceptions of the world. They seek insight rather than statistical analysis" (Bell, 1993, pp.5-6).

Before choosing the research method to be used in the study the researcher was aware that the method chosen would depend "on the nature of enquiry, and the type of information required" (Bell, 1993, p.6) which is why the approach adopted was a quantitative one. The researcher would describe herself as a quantitative researcher as she collected facts through the use of fitness testing and then through detailed analysis, studied the relationship between these facts.

The research design used was a randomized control trial.

## 2.4 Study Population and Sample

The researcher used convenience sampling methods due to the location of some of the schools and also time and cost factors. Primary Schools in county Offaly were drawn up on a list. From this sample two schools which were of mixed gender were selected. The schools were chosen for their proximity to the researcher, their school type and the availability of pupils to participate in the research. These particular schools were chosen as one of them was completing the Sportshall Athletics Programme and one of them was not. Of the schools which were chosen students (n=84) from fifth and sixth class with ages ranging from nine years of age to 12 years of age were fitness tested. Participants who had an injury or had not received consent from their parents were excused from the study. A copy of the consent form can be viewed in the appendix.

## 2.5 Concepts to be Measured & Measurement Tools

The research instrument and measurement tools for this study were a battery of fitness tests. The fitness tests were used to measure the children's physical fitness levels by measuring the four components of physical fitness - cardiovascular fitness, flexibility, muscular strength and muscular endurance. The results of these tests were also used to compare male and female physical fitness. A protocol of each component can be viewed below.

### 2.5.1 Cardiovascular fitness

UK Academy Endurance Test (British Athletics Academy, 2013)

Objective:

- To measure cardiovascular fitness.

Method:

- Each participant carries out a 1 minute and a 2 minute run.
- They run up and down a line which is 50 metres in length (cone marking each 5 metres).

- Participants score is measured by how many times they run up and down the line and what cone they stop at.

### 2.5.2 Muscular Strength

Vertical Jump Test (Safrit, 1995)

Objective:

- To measure muscular strength.

Method:

- Participant stands next to vertical jump board.
- Height is measured.
- Participant jumps using explosive leg power.
- Height of jump is measured.
- Participant carries out 3 jumps and an average score is taken.

### 2.5.3 Muscular Endurance

Sit- Ups Test (Safrit, 1995)

Objective:

- To measure endurance of abdominal muscles.

Method:

- The participant lies on a mat with knees bent and feet flat on the floor.
- Hands rest on the thighs.
- Participant sits up until the fingertips touch the knees.
- Participant stops after 30 seconds.
- Participant’s partner counts the number of proper sit ups completed in this time.

### 2.5.4 Flexibility

Sit and Reach Test (Safrit, 1995)

Objective:

- To measure hamstring flexibility.

Method:

- The participant sits with both legs straight out with soles of feet against the flat of the sit and reach box.
- The participant places two hands on the box, palms down and reaches out as far as possible.
- Participant carries out three attempts.
- Results are recorded and an average is obtained.

## 2.6 Data collection procedures

In order to ensure a high rate of response and to answer any questions about the study, the researcher met personally with the pupils participating in the study. The researcher also carried out all fitness tests herself with the help of another exercise and health studies student.

## 2.7 Procedures

The pre-intervention data was collected on Friday 11th of October in Ballinagar National School from 11.30 to 2.30 and on Friday 18th of October in Killeigh National School from 9.00 to 12.30.

- Once the researcher had collected the consent forms from the participants willing to take part, each participant was handed a score sheet where they had to enter their name, class, age and the results of the 4 tests in the spaces provided.
- They were then taken outside where the running test took place to measure their cardiovascular fitness. Once the cardiovascular test was completed the

participants were then brought inside to the gym to carry out the other three tests.

- Once inside the participants were given a short break and a drink of water. They then were asked to get a partner and complete the sit up test.
- The participants were then divided into two groups. The number ones were told to line up at the sit and reach test while the number twos were asked to line up at the vertical jump test.
- When each participant had completed the test they were at, they swopped over and completed the other test.
- After each test had been completed the participants' score sheets were collected and the researcher thanked them for their participation.

## 2.8 Data Analysis

In order to analyse the data and each of the research questions, the author input the data into S.P.S.S (Statistical Package for Social Science).

Descriptive statistics will be used to obtain information and also variables where means and standard deviations will be found.

Independent *t*-test will be used to assess if there was any significant differences between the two groups on comparing the difference change from pre to post.

Paired Samples *t*-test will be used to compare the difference for each group from pre fitness testing to post fitness testing. This will establish if there is a significant difference for the intervention group and control group from pre to post fitness testing.

## 2.9 Ethical Considerations

"Conducting research is subject to guidance and control at a number of levels" (Lewis and Lindsay, 2000, p.5). In order to complete this research project it was necessary for the researcher to obtain consent from each school and each child. An information sheet and informed consent form can be viewed in the appendix.

# CHAPTER 3: PRESENTATION OF RESULTS

## 3.1 Introduction

The purpose of this chapter is to present the findings obtained from the fitness testing that was completed by fifth and sixth class students in two primary schools. Both schools were of mixed gender. One school took part in the Sportshall Athletics Programme (intervention) and one school did not (control). A battery of fitness tests was carried out with both schools before the Sportshall Athletics Programme began in October and the same fitness testing was carried out with both schools after the Sportshall Athletics Programme was completed in December. Overall, fitness testing was carried out with 84 pupils (43 male, 41 female). The results of the battery of fitness tests were examined, which evidenced the effectiveness or lack of, of the intervention on the fitness levels of the participants in both the control group and the intervention group. Each of the components (Cardiovascular fitness, Muscular Strength, Muscular Endurance and Flexibility) of the fitness test were examined individually to clearly show any changes that may have occurred. In this chapter the data collected will be presented in tables and where necessary explanations which point out the salient features will accompany the tables. The findings from these results will be discussed in chapter 4.

## 3.2 Comparison of intervention and control schools pre fitness test scores

Initially Independent t test was used to assess whether there was any significant difference between the school which would be taking part in the Sportshall Athletics Programme and the school which would not be taking part in the intervention. Both schools pre fitness test scores were compared. Table 3.2.1 depicts no significant difference between the schools in the one minute test (p=.237), two minute test (p=.214), vertical jump test (p=.106) and sit up test (p=.596). A significant difference was ascertained in the sit and reach test (p=.035*), the control school (M=30.56) achieved a higher score on the sit and reach test than the intervention school (M=28.00).

Table 3.2.1– Independent t-tests comparing intervention and control schools pre score

| Test | Group | N | Mean | Std. Deviation | P Value |
|---|---|---|---|---|---|
| | Intervention | 43 | 230.81 | 21.545 | |
| **One Minute Pre Test** | | | | | .237 |
| | Control | 41 | 225.00 | 23.184 | |
| | Intervention | 43 | 404.65 | 52.638 | |
| **Two Minute Pre Test** | | | | | .214 |
| | Control | 41 | 390.49 | 50.951 | |
| | Intervention | 43 | 22.35 | 3.823 | |
| **Vertical Jump Pre Test** | | | | | .106 |
| | Control | 41 | 24.12 | 5.951 | |
| | Intervention | 43 | 20.21 | 5.866 | |
| **Sit Up Pre Test** | | | | | .596 |
| | Control | 41 | 20.80 | 4.220 | |
| | Intervention | 43 | 28.00 | 5.610 | |
| **Sit and Reach Pre Test** | | | | | .035* |
| | Control | 41 | 30.56 | 5.292 | |

*Significant difference ($p \leq .05$)

### 3.3 Was there an improvement in cardiovascular fitness in the intervention and control school students following an 8 week Sportshall Athletics Programme?

The UK Academy Endurance Test (British Athletics Academy, 2013) was used to measure cardiovascular fitness. Each student carried out a one minute and two minute run. The results from each run are displayed separately.

Paired-Samples t-tests were conducted to establish the difference in each group's pre and post-test results. Table 3.3.1 demonstrates that there was a significance increase found when the intervention group's pre (M=230.81) and post (M=241.28) test scores were compared for the one minute test (p=.001*). It also shows that there was a

significance decrease found when the control group's pre (M=225.00) and post (M=218.90) test scores were compared for the one minute test (p=.000*).

Table 3.3.1 – One Minute test scores pre and post intervention and control

| Test | Group | N | Mean | Std. Deviation | P Value |
|---|---|---|---|---|---|
| **One Min Pre Test** | Intervention | 43 | 230.81 | 21.545 | |
| | | | | | .001* |
| **One Min Post Test** | Intervention | 43 | 241.28 | 24.715 | |
| | | | | | |
| **One Min Pre Test** | Control | 41 | 225.00 | 23.184 | |
| | | | | | .000* |
| **One Min Post Test** | Control | 41 | 218.90 | 25.063 | |

*Significance difference (p ≤ .05)

Table 3.3.2 depicts the mean differences for the intervention group (M=10.47) and the control group (M=-6.10) from pre to post intervention for the one minute test. A significant difference was found (p=.000*).

Table 3.3.2 - Difference scores for 'One Minute Test' for control and intervention groups

| Test | Group | N | Mean | Std. Deviation | P Value |
|---|---|---|---|---|---|
| | Intervention | 43 | 10.47 | 18.284 | |
| **One Minute Test** | | | | | .000* |
| | Control | 41 | -6.10 | 9.907 | |

*Significant difference (p ≤ .05)

Paired-Samples t-tests were conducted to establish difference in each group's pre and post test results. Table 3.3.3 demonstrates that there was a significance increase found when the intervention group's pre (M=404.65) and post (M=419.65) test scores were compared for the two minute test (p=.000*). No significant difference was reported for the control group (p=.156).

Table 3.3.3– Two Minute test scores pre and post intervention and control

| Test | Group | N | Mean | Std. Deviation | P Value |
|---|---|---|---|---|---|
| **Two Min Pre Test** | Intervention | 43 | 404.65 | 52.638 | |
| | | | | | .000* |
| **Two Min Post Test** | Intervention | 43 | 419.65 | 42.572 | |
| | | | | | |
| **Two Min Pre Test** | Control | 41 | 390.49 | 50.951 | |
| | | | | | .156 |
| **Two Min Post Test** | Control | 41 | 395.98 | 49.298 | |

*Significant difference ($p \leq .05$)

Table 3.3.4 depicts the mean differences for the intervention group (M=15.00) and the control group (M=5.49) from pre to post intervention for the two minute test. No significant difference was found (p=.062).

Table 3.3.4 Difference scores for 'Two Minute Test' for control and intervention groups

| Test | Group | N | Mean | Std. Deviation | P Value |
|---|---|---|---|---|---|
| | Intervention | 43 | 15.00 | 21.740 | |
| **Two Minute Test** | | | | | .062 |
| | Control | 41 | 5.49 | 24.311 | |

*Significant difference ($p \leq .05$)

### 3.4 Was there an improvement in muscular strength in the intervention and control school students following an 8 week Sportshall Athletics Programme?

The Vertical Jump test (Safrit, 1995) was used to measure muscular strength.

Table 3.4.1 outlines that there was a significant increase found (p=.001*) for the intervention's pre and post test scores on the vertical jump section of the fitness test (M=22.35; M=24.56) respectively. There was also a significant decrease found (p=.076*) for the control's pre and post test scores on the vertical jump section of the fitness test (M=24.12; M=22.20) respectively.

Table 3.4.1 – Vertical Jump test scores pre and post intervention and control

| Test | Group | N | Mean | Std. Deviation | P Value |
|---|---|---|---|---|---|
| **Vertical Jump Pre Test** | Intervention | 43 | 22.35 | 3.823 | |
| | | | | | .001* |
| **Vertical Jump Post Test** | Intervention | 43 | 24.56 | 4.361 | |
| | | | | | |
| **Vertical Jump Pre Test** | Control | 41 | 24.12 | 5.951 | |
| | | | | | .076* |
| **Vertical Jump Post Test** | Control | 41 | 22.20 | 8.346 | |

*Significant difference ($p \leq .05$)

Differences in both groups' pre and post test scores were compared with the results reported in Table 3.4.2. A significant difference was ascertained (p=.001*)

Table 3.4.2 - Difference Scores for 'Vertical Jump Test' for control and intervention groups

| Test | Group | N | Mean | Std. Deviation | P Value |
|---|---|---|---|---|---|
| | Intervention | 43 | 2.21 | 3.943 | |
| **Vertical Jump Test** | | | | | .001* |
| | Control | 41 | -1.93 | 6.765 | |

*Significant difference ($p \leq .05$)

### 3.5 Was there an improvement in muscular endurance in the intervention and control school students following an 8 week Sportshall Athletics Programme?

The Sit Up Test (Safrit, 1995) was used to assess muscular endurance.

Table 3.5.1 shows that there was a significant increase found (p=.000*) for the intervention's pre and post test scores on the sit up section of the fitness test (M=20.21; M=24.88) respectively. No significant differences (p=.822) were found in relation to the control group's pre and post test scores.

Table 3.5.1 – Sit Up test scores pre and post intervention and control

| Test | Group | N | Mean | Std. Deviation | P Value |
|---|---|---|---|---|---|
| **Sit Up Pre Test** | Intervention | 43 | 20.21 | 5.866 | |
| | | | | | .000* |
| **Sit Up Post Test** | Intervention | 43 | 24.88 | 8.195 | |
| | | | | | |
| **Sit Up Pre Test** | Control | 41 | 20.80 | 4.220 | |
| | | | | | .822 |
| **Sit Up Post Test** | Control | 41 | 20.66 | 5.275 | |

*Significant difference ($p \leq .05$)

Table 3.5.2 depicts the mean differences for the intervention group (M=4.67) and the control group (M=-.15) from pre to post intervention for the sit up test. A significant difference was found (p=.000*).

Table 3.5.2 - Difference Scores for 'Sit Up Test' scores for control and intervention groups

| Test | Group | N | Mean | Std. Deviation | P Value |
|---|---|---|---|---|---|
| | Intervention | 43 | 4.67 | 5.584 | |
| **Sit Up Test** | | | | | .000* |
| | Control | 41 | -.15 | 4.139 | |

*Significant difference (p ≤ .05)

### 3.6 Was there an improvement in flexibility in the intervention and control school students following an 8 week Sportshall Athletics Programme?

The Sit and Reach Test (Safrit, 1995) was used to measure flexibility.

Paired-Samples t-tests were conducted to establish difference in each group's pre and post-flexibility test results. Table 3.6.1 demonstrates that there was a significance difference found when the intervention group's pre (M=28.00) and post (M=29.26) sit and reach test scores were compared (p=.007*). No significant differences were reported for the control group (p=.423).

Table 3.6.1 – Sit and Reach test scores pre and post intervention and control

| Test | Group | N | Mean | Std. Deviation | P Value |
|---|---|---|---|---|---|
| **Sit & Reach Pre Test** | Intervention | 43 | 28.00 | 5.610 | |
| | | | | | .007* |
| **Sit & Reach Post Test** | Intervention | 43 | 29.26 | 5.916 | |
| | | | | | |
| **Sit & Reach Pre Test** | Control | 41 | 30.56 | 5.292 | |
| | | | | | .423 |
| **Sit & Reach Post Test** | Control | 41 | 30.22 | 4.937 | |

*Significant difference ($p \leq .05$)

Mean differences in both groups, from pre to post intervention were compared with the results reported in Table 3.6.2. A significant difference was ascertained (p=.011*)

Table 3.6.2 - Difference Scores for 'Sit and Reach Test' scores for control and intervention groups

| Test | Group | N | Mean | Std. Deviation | P Value |
|---|---|---|---|---|---|
| | Intervention | 43 | 1.26 | 2.920 | |
| **Sit and Reach Test** | | | | | .011* |
| | Control | 41 | -.34 | 2.698 | |

*Significant difference ($p \leq .05$)

### 3.7 Was there a difference in cardiovascular fitness (UK Academy Endurance Test), muscular endurance (Sit Up Test), muscular strength (Vertical Jump Test) and flexibility (Sit and Reach Test) in males and females following an 8 week Sportshall Athletics Programme.

An Independent t test was conducted to assess whether there was a significant difference between males and females before the intervention started. A significance difference was found in the one minute pre test (p=.000*), two minute pre test (p.000*) and vertical jump pre test (p=.025*) with males achieving a higher score than females. A significant difference was also found in the sit and reach pre test (p=.007*) where females achieved a higher score than males. No significant difference was found in the Sit up pre test (p=.461).

As significant differences were found between males and females before the intervention began Paired samples t test was conducted to establish the difference in males pre and post scores and females pre and post scores. No significant difference was found in males pre and post scores for the one minute test (p=.121), two minute test (p=.423). sit and reach test (p=1.000) and vertical jump test (p=.480). However, a significant increase (p=.002*) was found from the sit up pre test (M=19.52) to the sit up post test (M=22.48).

Table 3.7.1 depicts the significant increases that were found from females' pre to post test scores. Females achieved significant increases in all four components of the fitness testing.

Table 3.7.1- Females pre fitness test scores and post fitness test scores

| Test | Group | N | Mean | Std. Deviation | P Value |
|---|---|---|---|---|---|
| **One Min Pre Test** | Female | 22 | 220.00 | 22.254 | |
| | | | | | .000* |
| **One Min Post Test** | Female | 22 | 232.05 | 20.740 | |
| | | | | | |
| **Two Min Pre Test** | Female | 22 | 375.23 | 51.188 | |
| | | | | | .000* |
| **Two Min Post Test** | Female | 22 | 400.68 | 46.247 | |
| | | | | | |
| **Sit and Reach Pre Test** | Female | 22 | 30.18 | 5.001 | |
| | | | | | .000* |
| **Sit and Reach Post Test** | Female | 22 | 32.64 | 4.875 | |
| | | | | | |
| **Vertical Jump Pre Test** | Female | 22 | 21.09 | 3.558 | |
| | | | | | .000* |
| **Vertical Jump Post Test** | Female | 22 | 24.77 | 3.829 | |
| | | | | | |
| **Sit Up Pre Test** | Female | 22 | 20.86 | 6.735 | |
| | | | | | .000* |
| **Sit Up Post Test** | Female | 22 | 27.18 | 9.951 | |

*Significant difference ($p \leq .05$)

# CHAPTER 4: DISCUSSION

## 4.1 Introduction

The purpose of this research was to explore the effectiveness of a specific Sportshall Athletics Programme on the fitness levels of primary school children. The purpose of this chapter is to summarise the main findings of this dissertation and to discuss and analyse the data that was presented in chapter three. The discussion will attempt to link the data with the literature in a coherent and concise manner by establishing the reliability of this data in relation to previous research which has been undertaken in the area of physical activity interventions and their effectiveness on the fitness levels of primary school children.

The overall findings of this study were that the Sportshall Athletics Programme did have an effect on the fitness levels of primary school children. The study found that there was an improvement in cardiovascular fitness, muscular strength, muscular endurance and flexibility after the intervention (Sportshall Athletics Programme) had taken place with the intervention group. No such improvements were established in the control group which did not take part in the Sportshall Athletics Programme. The study also found that males achieved higher results in the initial testing however significant improvements were achieved by females after the 8 week Sportshall Athletics Programme had taken place.

In order to discuss the main findings from the research, the data will be examined under the five research questions:

1. Was there an improvement in cardiovascular fitness in the intervention and control school students following an 8 week Sportshall Athletics Programme?
2. Was there an improvement in muscular strength in the intervention and control school students following an 8 week Sportshall Athletics Programme?
3. Was there an improvement in muscular endurance in the intervention and control school students following an 8 week Sportshall Athletics Programme?
4. Was there an improvement in flexibility in the intervention and control school students following an 8 week Sportshall Athletics Programme?

5. Was there a difference in cardiovascular fitness, muscular endurance, muscular strength and flexibility in males and females following an 8 week Sportshall Athletics Programme?

## 4.2 Was there an improvement in cardiovascular fitness in the intervention and control school students following an 8 week Sportshall Athletics Programme?

An Independent *t*-test revealed that there was no significant difference between the intervention and control school in the pre fitness testing for both the one minute and two minute test. This establishes that both schools were of similar cardiovascular fitness in September so changes experienced in either group could be attributed to the effect or non-effect of the Sportshall Athletics Programme.

A Paired-Samples *t*-test reveals a significant increase when the intervention group's mean pre-test one minute score was compared to the mean post-test one minute score. This was not the case however for the control group. Upon analysing their mean pre and post test one minute scores, a significant decrease was found. On comparing the differences in both groups mean scores, a significant difference was established. The intervention did have a larger mean difference than the control groups mean difference score.

When the intervention group's pre-test two minute score was compared to its post-test two minute score, the results highlighted in Table 3.3.3 reflected a significant increase. No significant differences were found in relation to the control group's pre and post test two minute scores. When these mean differences were compared, no significant difference was reported as is evident from the significance value recorded in Table 3.3.4. From the results found through this statistical analysis of the one minute and two minute test we can answer research question 1 stating that yes there was an improvement in cardiovascular fitness in the intervention school students following an 8 week Sportshall Athletics Programme but there was no improvement in cardiovascular fitness in the control school students from pre-test to post-test.

These results would indicate that the increase in cardiovascular fitness in the intervention school was solely down to the Sportshall Athletics Programme as even

though the control school were still participating in their normal P.E. classes they did not experience the same improvements. This may be down to the organisation and use of fun equipment in the Sportshall Athletics Programme which allowed for more actual physical activity and greater participation to take place. It was ensured that all students were as active as possible for the duration of each Sportshall Athletics class by avoiding situations where groups were sitting or waiting for turns to participate. A central theme of the Sportshall Athletics Programme is the use of circuit type activities, which also allowed maximum participation. The decrease in the control group one minute test can be linked to previous research which indicates that the aerobic fitness levels of children are declining worldwide (Tomkinson, Leger, & Olds, 2003; Tremblay, Sheilds, Laviolette, & Mannon, 2010). A decrease may also have been witnessed in the other school had they not been participating in the Sportshall Athletics Programme. Tomkinson et al., (2003) found that children's aerobic performance has declined by 1% a year over the last twenty years.

### 4.3 Was there an improvement in muscular strength in the intervention and control school students following an 8 week Sportshall Athletics Programme?

Table 3.2.1 depicted that there was no significant difference in the intervention and control group's pre vertical jump test which was used to measure muscular strength. This communicates that both the intervention and control school had a similar level of muscular strength in September so changes experienced in either group could be attributed to the effect or non-effect of the Sportshall Athletics Programme.

When the intervention group's pre-test vertical jump score was compared to its post-intervention score results, a significant increase was revealed. This was not the case however for the control group where a significant decrease was established. On comparing the differences in both groups pre and post test scores, a significant difference was ascertained in favour of the intervention group. From the results found through this statistical analysis we can state that there was an improvement in muscular strength in the intervention school students but no such improvement was witnessed in the control group.

This outcome from the muscular endurance measurement shows that school based interventions can improve children's physical activity and fitness levels. Mckenzie, Sallis and Elder (1997) found that children exhausted nearly twice as much energy in preschool than they did in elementary school. As children moved into elementary school, teacher's prompts decreased and in turn children's physical activity levels decreased (McKenzie, Sallis & Elder, 1997). Sallis et al. (2001) also established a link between schools improved physical activity facilities and adult supervision with a significant improvement in children's fitness levels. This suggests that school based interventions which involve encouragement and prompts from teachers or other influential figures can prove significant in improving children's fitness levels. As the Sportshall Athletics Programme is an instructor led programme which offers great encouragement to each child this may be one explanation to the significant increase in the intervention group and significant decrease in the control group.

### 4.4 Was there an improvement in muscular endurance in the intervention and control school students following an 8 week Sportshall Athletics Programme?

An Independent *t*-test reveals that there was no significant difference between the intervention and control school in the pre fitness testing for the sit up test which was used to measure muscular endurance. This depicts that both the intervention and control school had a similar level of muscular endurance in September so changes experienced in either group could be attributed to the effect or non-effect of the Sportshall Athletics Programme.

Table 3.5.1 reveals that there was a significant increase found for the intervention's pre and post-test scores on the sit-up section of the fitness testing. No significant differences were found in relation to the control group's pre and post test scores. Table 3.5.2 revealed a significant difference in these mean scores when they were compared, in favour of the intervention group. From the results found through this statistical analysis it is possible to answer research question 3 stating that there was an improvement in muscular endurance in the intervention school students following an 8 week Sportshall Athletics Programme but no such improvement was achieved in the control group.

It is evident from these results that the Sportshall Athletics Programme provided a wide variety of health benefits including an improvement in muscular endurance for the children participating in it. The Department of Health (2013) stated that the most important thing in relation to physical activity for children is that they are provided with the opportunity to participate in a variety of activities that are fun and suit their interests, skills and abilities as this will offer a child a number of health benefits, experiences and challenges. This could explain how the intervention group experienced vast improvements in muscular endurance in comparison to the control group who were not taking part in the Sportshall Athletics Programme. Similar to this, Boreham and Riddoch (2001) also found that children who are active are more likely to possess healthier fitness profiles than those who are less active.

### 4.5 Was there an improvement in flexibility in the intervention and control school students following an 8 week Sportshall Athletics Programme?

An Independent t-test reveals that a significant difference was found between the intervention and control group in the sit and reach pre test scores. The control school achieved a higher score than the intervention school.

Paired-Samples t-tests then established the difference in each group's pre and post-flexibility test results. Table 3.6.1 demonstrated that there was a significant difference found when the intervention group's pre and post sit and reach test scores were compared. No significant differences were reported for the control group. When mean differences in both groups were compared a significant difference was found in favour of the intervention group. From the results found through this statistical analysis it is possible to answer research question 4; there was an improvement in flexibility in the intervention school students following an 8 week Sportshall Athletics Programme but there was no improvement in flexibility in the control school students.

An essential element of the Sportshall Athletics Programme was the inclusion of a warm-up and pre-stretch before the activities got underway. The stretching component may be the reason a significant increase was achieved in the intervention group. It is evident from these results that the Sportshall Athletics Programme did have positive results in many areas including flexibility. Similar to the findings in this

study, Harris & Cale (1997) found that physical education programmes contribute to young people's health. They found that such programmes can have positive outcomes in physiological, clinical, behavioural, cognitive and affective measures. The U.S Department of Health And Human Services (1998) are also in agreement with this as they state that efforts should be made to encourage schools to incorporate daily physical activity into each school day as school based interventions have been shown to be successful in increasing physical activity and fitness levels in children.

### 4.6 Was there a difference in cardiovascular fitness, muscular endurance, muscular strength and flexibility in males and females following an 8 week Sportshall Athletics Programme?

An Independent *t*-test was conducted to assess whether there was a significant difference between males and females before the intervention started. A significant difference was found in the one minute pre-test, two minute pre-test and vertical jump pre-test with males achieving a higher score than females. A significant difference was also found in the sit and reach pre-test where females achieved a higher score than males. No significant difference was found in the sit-up pre-test.

As significant differences were found between males and females before the intervention it would not have been sufficient to just compare males and female post test results as they were not the same at baseline. Males pre and post fitness testing scores were compared and showed no significant difference for the one minute test, two minute test, sit and reach test and vertical jump test. However, a significant increase was found from males' sit-up pre-test to post-test. In contrast to this, females experienced significant increases in all sections of the fitness testing. From the results found through this statistical analysis it is possible to answer research question 5 stating yes there was a difference in cardiovascular fitness, muscular endurance, muscular strength and flexibility in males and females following an 8 week Sportshall Athletics Programme.

Males achieved a higher score than females in the one minute and two minute running test (cardiovascular fitness) and the vertical jump test (muscular strength) while females achieved a higher score in the sit and reach test (flexibility) and the sit-up test

(muscular endurance) following the 8 week Sportshall Athletics Programme. As stated above there was also a considerable difference in the improvements made by each group from pre to post fitness testing. This could be due to the fact males pre-test scores were above baseline, therefore a significant increase would have been difficult to achieve. As there were significant differences in the pre-test in favour of males it would appear that females scores were under baseline levels which would explain why they found it relatively easier to achieve significant increases in each aspect of the fitness testing.

Many previous studies have found similar evidence to these findings. Sallis (1993) and Trost and Pate (1999) reported that male subjects are more active than female subjects. Trost et al. (2001) also found that the greatest age related differences occur during elementary school rather than during the teen years and across all age groups, boys were more active than girls. The findings from this small piece of research indicate that school based physical activity interventions may be especially beneficial for girls as it is clear that girls are lagging behind boys and that interventions can be used to increase their fitness levels. Manios, Kafatos and Codrington (1999) also found that more boys than girls took part in moderate to vigorous physical activity in school. Sarkin, McKenzie and Sallis (1997) further back up this point as they found that although boys and girls have similar activity levels during P.E classes, the same cannot be said for break times. Boys are considerably more active than girls during break as they prefer activities such as basketball and tag compared to girls who engage in walking, talking and taking snacks (Sarkin, McKenzie, & Sallis, 1997). The results of this study suggest that structured P.E. classes, programmes or interventions such as the Sportshall Athletics Programme would be beneficial to children of both genders but in particular girls as they may not achieve adequate levels of physical activity levels outside of school time.

## 4.7 Limitations

As this is an undergraduate research project, the scope of the study is limited.

Firstly, due to time constraints, fitness testing was carried out with just 84 pupils from two schools. This study would have had even more validity had the author had the opportunity to assess more students from more schools.

Secondly, some inconsistencies may have occurred during data collection. As the one minute and two minute running test to measure cardiovascular fitness took place outside on grass, adverse conditions may have affected scores. If it was windy or the grass was wet it may have slowed down the children's scores. Also although the testing was carried out by competent Exercise and Health studies students, human error may still have occurred throughout the fitness testing.

Finally, there was no true control group in the study. Although there was a control group, this group were still taking part in their own P.E classes. A true control group, pupils who were not taking part in any P.E classes may have benefited the study also.

## 4.8 Conclusions and Implications

Overall, findings from this study were largely concurrent with the relevant literature from the Irish context as well as literature internationally. As expected, the intervention group attained an increase in cardiovascular fitness, muscular strength, muscular endurance and flexibility. It seems the Sportshall Athletics Programme which focused on maximum movement and non-competitive and individual physical activity for the whole duration of the class, was successful in its aim to increase the physical fitness levels of primary school children. Physical activity which provides a variety of activities that are fun and suit children's interests, skills and abilities can entice children to participate at a greater level. It is plausible to assume from the significant increases in fitness levels of the intervention group participants that these opportunities were provided within the Sportshall Athletics Programme.

These findings may have implications for the future practice of physical education. Physical activity in schools should be structured in a way that students can experience different activities in a fun and enjoyable way. If possible, bright equipment which entices children to participate in physical activity should be availed of. Primary school physical education can be improved with programmes that are feasible in real world settings like the Sportshall Athletics Programme. Physical activity interventions, with effective teacher training and support have the potential to provide children with much more physical activity than they currently receive in typical physical education classes and this increase in physical activity could be expected to contribute to numerous health benefits in youth.

Although this research was a small scale study the positive findings on the effect of the Sportshall Athletics Programme on the fitness levels of primary school children indicates that similar interventions could see vast improvements in the fitness levels of primary school children also. Kriemler et al., (2010) found that a physical activity intervention for one year had a positive effect on body composition, aerobic fitness, physical activity and cardiovascular risk. It is clear that the implementation of interventions can help to improve the health and fitness of children which will also prove beneficial by improving their health in later life and decreasing their risk of disease.

## 4.9 Recommendations for Practice and Further Research

The author is aware that the study undertaken was a small scale study and so the results cannot be generalised for the whole of Ireland. However, it is clear that interventions do play a role in the fitness levels of primary school students and so the author wishes to make some recommendations for practice and further research.

The author suggests that primary schools implement the Sportshall Athletics Programme or similar physical activity programmes for part of the year during P.E class. Its individual, non-competitive nature allows maximum participation and enjoyment for all children, unlike game based activities such as soccer, basketball or GAA. Sport tends to exclude, to a certain extent, those children who see themselves as lacking the appropriate skills that other children possess. This can lead to children not fully participating or opting out altogether from the class. The wide range of activities and events within the Sportshall Athletics Programme incorporates and encourages the development of the core fundamental physical skills at the heart of the primary curriculum.

It is important that influential figures who children look up to such as teachers and other physical activity administrators are informed of the important role they have in promoting physical activity. Teachers need to encourage and prompt their pupils to participate fully in physical activity. It is important that teachers ensure that they create a safe physical activity class so that pupils feel comfortable enough to ask questions and participate to the best of their ability, therefore achieving maximum health benefits. Teachers should aim to ensure that all pupils in the class are catered for and that appropriate challenges and opportunities to succeed are provided to every pupil. Such an environment would help to decrease the number of pupils who may feel physically inadequate and not want to participate.

Further research in this area would lead to a greater understanding of the physiological benefits of physical activity interventions in primary school children. This would allow for more appropriate forms of P.E which would have a higher likelihood of leading to participation in lifelong physical activity.

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# APPENDIX A

## Parent and Student Information Letter

Dear Parent and Student,

I am a final year student in Exercise and Health Studies in Waterford Institute of Technology. I am contacting you in relation to my Final Year Project. The title of my project is "**The effectiveness of a specific Sports Hall Programme on fitness levels of primary school children".**

I will be basing my research on fitness tests completed by a selection of primary school children. The fitness test will measure four components of physical fitness such as cardiovascular fitness, flexibility, muscular endurance and muscular strength. It is designed so that there is minimal potential for embarrassment when completing it and it will not pose a risk to the student's health or well-being. The results of the fitness test will be confidential and no names will be used in the final report. The information which I receive from the fitness tests will be the driving force behind my final year project. Participation in this study is optional.

If you have any further questions in relation to this study, please don't hesitate to ask me. I would like to thank you in advance for your help on this project.

Yours faithfully,
Jean Brady,
4th year Exercise and Health Studies Student.

# APPENDIX B

## Subject Consent Form

I the undersigned have read and understood the subject information sheet. I understand what the project is about, and what the results will be used for. I am fully aware of the role which my child will play in the study and of any risks and benefits associated with the study. I know that my child's participation in the study is voluntary and that he/she can withdraw from the project at any stage. I am aware that the results of the project will be kept confidential.

I _____ (parent/ guardian) give consent for _____ (student) to participate in the study and fitness test outlined above.

Date: _____

# APPENDIX C

## Score Sheet

**Name:**

**Class:**

**Age:**

**Cardiovascular Fitness Test:** 1 minute test 2 minute test

**Sit and Reach Test:** 1 2 3

**Average**

**Vertical Jump:** 1 2 3

**Average**

**30 second sit-up test:**