

**LEVELS AND DETERMINANTS OF PHYSICAL ACTIVITY AMONG  
STUDENTS IN PUBLIC BOARDING SECONDARY SCHOOLS IN  
NAIROBI CITY COUNTY, KENYA**

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## DECLARATION

This thesis is my original work and has not been presented for a degree or any other award in this or any other University.



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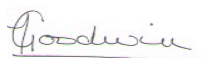
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## **DEDICATION**

This study is wholeheartedly dedicated first, to God for all the favour, secondly to my children Lewis, Derick, Victor and Ted, who have been my source of inspiration and strength even when I felt like giving up. And finally, to the memory of my late mother Mercy Wambui Ngahu for motivating me to strive for excellence.

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## ABBREVIATIONS AND ACRONYMS

<b>ACSM:</b>	American College of Sport Medicine
<b>AHKA:</b>	Active Healthy Kids Australia
<b>ATLS:</b>	Arab Teens Lifestyle Study
<b>BHF:</b>	British Heart Foundation
<b>CD:</b>	Chronic Diseases
<b>CDC:</b>	Centre for Disease Control and Prevention
<b>CDE:</b>	County Director of Education
<b>CVD:</b>	Cardio-Vascular Diseases
<b>DPAQ:</b>	Determinant Physical Activity Questionnaire
<b>FITT:</b>	Frequency, Intensity, Time/Duration and Type
<b>GAO:</b>	Government Accountability Office
<b>GSHS:</b>	Global School Based Student Health Survey
<b>HAKK:</b>	Healthy Active Kids Kenya
<b>HDL:</b>	High Density Lipoproteins
<b>HEPA:</b>	Health Enhancing Physical Activity
<b>HR:</b>	Heart Rate
<b>IPAQ:</b>	International Physical Activity Questionnaire
<b>KU/ERC:</b>	Kenyatta University Ethics Review Committee
<b>MET:</b>	Metabolic Equivalent of Task
<b>MIN:</b>	Minutes
<b>MoEST:</b>	Ministry of Education, Science and Technology
<b>MOH:</b>	Ministry of Health
<b>MPA:</b>	Moderate Physical Activity
<b>MVPA:</b>	Moderate to Vigorous Physical Activity
<b>NACOSTI:</b>	National Council for Science, Technology and Innovation
<b>NCD:</b>	Non-Communicable Diseases
<b>PA:</b>	Physical Activity
<b>PAEE:</b>	Physical Activity Energy Expenditure
<b>PAD:</b>	Physical Activity Determinants
<b>PAL:</b>	Physical Activity Level
<b>PE:</b>	Physical Education
<b>SBRN:</b>	Sedentary Behaviour Research Network

<b>SES:</b>	Socio Economic Status
<b>SPSS:</b>	Statistical Package for Social Sciences
<b>UNESCO:</b>	United Nations Educational, Scientific and Cultural Organization
<b>USA:</b>	United States of America
<b>USDHHS:</b>	United State Department of Health and Human Services
<b>VPA:</b>	Vigorous Physical Activity
<b>WHO:</b>	World Health Organization

## OPERATIONAL DEFINITION OF TERMS

**Action Planning:** Process of linking goal directed behaviour to environmental cues towards achieving PA.

**Adolescents:** Public secondary school students aged between 11-18 years.

**Attitude:** Positive or negative effect and emotion toward PA.

**Barrier Determinant:** Negative factor in a school set-up that discourage students from participating in physical activities.

**Boarding Secondary Schools:** Schools in which students reside throughout the term when schools are in session.

**Belief about Capability:** Perceived competence or regret toward PA.

**Belief about Consequences:** Anticipated outcome or expectancies of PA.

**Boarding Secondary Schools:** Schools in which students reside throughout the term when schools are in session.

**Chronic Disease or Condition:** Condition or a disease that has developed over some time and is persistent with long lasting effects.

**Coping Planning:** Mental link between anticipated situation or a barrier and PA.

**Environmental Profile:** School standing in terms of PA facilities, equipment and co-curricular policy.

**Facilitator Determinant:** Positive factors in a school set up that encourage students from participating in physical activities.

**Goal Conflicts:** Existence of other interests or goals competing with PA.

**Insufficient Physical Activity:** When a student does not meet the current daily physical activity requirement of an average of 60 minutes at moderate to vigorous intensity recommended by the World Health Organization(WHO).

**Intensity:** The amount of effort exerted when performing a physical activity.

**Knowledge:** Information about recommended PA guidelines and the benefits.

**Moderate Intensity Physical Activity:** Physical activity that raises the heart and breathing rates and feeling of warmth.

**Motivation and Goals:** Implementation intention of PA and reinforcement.

**Non-communicable Diseases:** Slow developing long lasting medical condition that are non-infectious and non-transmissible.

**Physical Activity:** All levels of skeletal muscular contractions that lead to movement, innervation of muscular activity and energy expenditure.

**Physical Inactivity:** State in which a student does not expend low to moderate or vigorous physical activity of about 10 minutes daily.

**School Resources:** Material resources that act as facilitators for doing PA  
or barriers against PA.

**School Status:** Categorization of public boarding secondary schools as National, Extra-County or County schools.

**Sedentary:** Extended periods of low energy expenditure of less than 1.5 METs/min/week as in sitting, reclining or lying.

**Skills:** Competence or ability to do physical activities.

**Socio-Demographic Characteristics:** students factors in relation to gender, level of study and school type.

**Social Influence:** Group comparisons among students toward PA.

**Vigorous Intensity Physical Activity:** Physical activity that uses the highest amount of energy characterized by high heart rate and extremely rapid breathing rate.



## ABSTRACT

The purpose of this study was to establish the levels and factors that determine physical activity (PA) among adolescents in public boarding secondary schools in Nairobi City County. The study was guided by the following objectives; establish PA levels and determinants of PA, assess the relationship between PA levels across socio-demographic characteristics of students and environmental profile of schools in Nairobi City County and moderating influence of PA determinants on relationship between environmental profile and PA levels. Schools were stratified as National, Extra-County and County schools; and further tabulated based on gender and level of study. Schools were randomly selected from every stratum such that, there was equal representation from boys' and girls' schools in every stratum. Using Fisher's formula, a sample size of 408 students was obtained from the targetted population of 40,200 students aged 14-17 years in this study. Simple random sampling method was used to obtain the respondents in the study. The validated International Physical Activity Questionnaire (IPAQ) was used to determine levels of PA; while determinants of physical activity were established using the Determinant Physical Activity Questionnaire (DPAQ). A checklist was also used to collect information about status of equipment, facilities and schools PA co-curricular policy. Physical activity data were coded and organized for analysis using Statistical Package for Social Sciences (SPSS) version 20.0 at the significant level of 0.05. Chi-square was used to determine the relationship between PA levels across school environmental profiles and students demographic characteristics. The one way ANOVA was used to compare PA levels across environmental profile of public secondary schools while pearson product moment correlation and multiple regression analysis were used to measure influence of PA determinants on the relationship between the environmental profile of school and PA levels. Results were presented as frequency counts, percentages, and in tables, charts and graphs. Most students (61.1%) were found to engage in PA of between 601-3000 METs, while 74.4% of students were moderately active achieving 1680 METs/min/week. Below half of the students (47.6%) achieved 2520 METs/min/week of the recommended PA of MVPA. A large proportion (73.9%) of students reported sitting for over seven hours and 31 minutes daily. Six determinants assessed facilitates PA such as environmental PA resources, motivation and goals while five determinants were barriers such as knowledge on current PA recommendation, social influence. Demographic characteristics of students such as gender ( $\chi^2 = 35.44$ ,  $p \leq 0.001$ ) and school status ( $\chi^2 = 21.47$ ,  $p \leq 0.001$ ) had a significant influence on PA levels as well as school environmental profile ( $F(2,388) = 20.489$ ,  $p \leq 0.001$ ). There was a significant correlation between PA levels and school environmental profile ( $r = 0.406$ ,  $p = 0.000$ ) as well as PA determinants ( $r = 0.183$ ,  $p = 0.000$ ). The study concludes that gender, school status, environmental profile of schools and determinants of PA influence engagement in PA, determining levels of PA. The study recommends that girls, County schools, schools with poor environmental profiles, as well as barrier determinants of PA, be targetted and promoted to increase PA participation to achieve recommended MVPA levels of activity. In order to promote PA, the study strongly suggests that both, students and teachers, be made aware about the current minimal PA recommendations. In addition, it is also recommended that tailor-made programmes be developed based on the students' needs and daily routines. The study recommends that similar studies be conducted among students in public day secondary schools, as well as students in private secondary schools for comparison purposes.

## CHAPTER ONE: INTRODUCTION

### 1.1 Background of the Study

The World Health Organization (WHO, 2020) refers to physical activity (PA) as energy consuming contraction of skeletal muscles that produce body movements. Further, the WHO recommends that people aged 5-17 years should participate in moderate to vigorous physical activity (MVPA) mostly aerobic PA for an average of 60 minutes a day across the week. Intensities of physical activities are classified according to the amount of energy expended in an activity as determined by the Metabolic Equivalent of Task (MET) (United States Department of Health & Human Services [USDHHS], 2018; WHO, 2020). Adolescents should participate daily in activities with more than 6 METS values to obtain sufficient health benefits (USDHHS, 2018; WHO, 2020). Regular and adequate physical activities produces long term health benefits on bones and muscles, reduces risks of obesity and chronic diseases such as cardio-vascular disease (CVD) and diabetes (British Heart Foundation [BHF], 2014; WHO, 2020).

Globally, Physical activity is declining by a big margin during adolescence (Collings, Wijndaele, Corder, Westgate, Ridgeway, Sharp & Brage, 2015; Reilly, 2015). World wide statistics show that over 80% of adolescents do not meet the recommended PA levels (Reilly, 2015; WHO, 2013). Physical inactivity is a global problem and presents a serious challenge to lowering the burden of lifestyle diseases (Reilly, 2015; WHO, 2014). In the long term, physical inactivity increases one's risk of non-communicable diseases (NCDs) such as diabetes, hypertension, overweight and obesity and or premature death (WHO, 2014). According to the WHO (2014), NCDs caused 38 million deaths globally in 2012, which translated to 68% of world's

deaths in that year. It further indicates that whereas the burden of NCDs affect all countries, it is more concentrated in middle and low income countries, including Kenya.

A 2019 policy brief by Ministry of Health (MOH) reported that Kenya is undergoing an epidemiological transition marked by an increase in the burden of NCDs such as cancers, diabetes, cardiovascular disease and chronic respiratory infections (MoH, 2019). A report by 2015 STEPwise survey for NCDs in Kenya showed that NCDs accounts for 27% of total deaths and over 50% total hospital admissions (MoH, 2015). For this reason, researchers emphasize the importance of physical activity in the prevention of many chronic diseases like cardiovascular illness, childhood overweightedness, obesity and hypertension (USDHHS, 2018). Most students in secondary schools are aged between 13-18 years, which is a critical developmental stage in life. The National Academies of Science, Engineering and Medicine (2019) explains that this is the period during which many risky health habits, such as lack of exercises which is linked to poor health in adulthood, are formed. This age group, therefore, presents an opportunity to encourage healthy behaviours early in life that may lead to active lifestyle later in life.

Upon entry to form one in Kenya, the number of physical education lessons reduce from the four lessons offered in primary schools, to one lesson per week. The situation is further compounded by lack of the school administrators' compliance with the Ministry of Education, Science and Technology (MoEST) PA related guidelines (Wachira, Muthuri, Tremblay & Onywera., 2014). Similarly, as indicated by Kibua and Chepkwony (2017), that in Kenyan secondary schools, games and PE time are

clearly defined in school programs but rarely adhered to. He, Ishii, Shibata, Adachi, Nonoue and Oka., (2013) and Bergier, Bergier and Paprzycki (2014a) suggest that students be provided with opportunities to participate in PA through quality Physical Education (PE), Sports and club events, because these activities have the potential for contributing substantially to the recommended physical activity levels. But, as emphatically expressed by Booth, Rowlands and Dollman (2015) PE, sports and club activities are not sufficient in schools.

The school environment is a key factor in determining levels of physical activity among adolescents because they spend a lot of time in school (He et al., 2013; Hills, Dengel & Lubans, 2015). The environmental influences notably school PA resources provide the opportunity for sustained engagement in PA and sports such as PA access to facilities, equipment, PA programmes and supportive teachers and coaches (Gavin, Mc Brearty, Malo, Abravenel & Moudrakovski, 2016; Morton, Atkin, Corder, Suhrcke & Sluijs, 2016). More importantly, interaction with teachers and peers in schools facilitate the adoption of different behaviours (Corder, Schiff, Kesten & Sluijs, 2015). The secondary school curriculum has provision for co-curricular activities aimed at promoting physical activity among students. However, families and schools in Kenya value academic work more than co-curricular activities. Therefore, learners are forced to spend more time, even during leisure time, in academic work (Reilly, 2015). The National Assembly for Wales' Health, Social Care and Sports committee (2019) found that many schools undervalue physical activity to the extent that schools gives it a low priority and less importance. The committee also found that students in secondary schools often found sedentary behaviour more alluring; further adding to the already low participation in physical activity.

The findings by Healthy Active Kids Kenya [HAKK] (2016) show that approximately half of Kenyan children meet the recommended level of more than 60 minutes of MVPA per day. These children were, however, sampled from day primary schools. Students in boarding schools may, therefore, be different since they reside in school and follow a highly restrictive routine, unlike students who commute to school daily. Studies done elsewhere have shown that several factors may affect physical activity among adolescents in school. Some of these factors include gender, age, time availability, social economic status (SES), facilities and equipment, and support from family, friends, teachers and coaches (Bergier et al., 2014a; Hills et al., 2015). This study sought to establish the levels and the determinants of physical activity as an important processes in promoting positive physical activity lifestyles among adolescents in boarding secondary schools in Nairobi City County.

## **1.2 Statement of the Problem**

Adolescence is a period when independence is established and PA patterns that are carried to adulthood and followed for years, are adopted (Jaworska & MacQueen, 2015). Most of physiological, psychological and social changes take place during this period when they search for identity and meaning in life (Visagurskiene, Jankauskiene, Vizbaraitė, Pajaujiene & Gričiute, 2012). Visagurskiene et al. (2012) states that along with these changes, physical activity seems to decline with sexual maturation and body consciousness among adolescents. Ojiambo, Easton, Casajus, Konstabel, Reilly and Pitsiladis (2012) found that PA levels decline while sedentary behaviour increases among adolescents in Kenya. Despite the benefits and the need for sufficient physical activity during the critical developing adolescent years, there is

paucity of empirical evidence on levels and determinants, as well as their relationship, to physical activity participation among Kenyan adolescents in boarding secondary schools. Knowledge concerning levels and determinants of physical activity among students in boarding secondary schools in Kenya, like in any other developing country, is limited.

Several studies have focused on the status of physical activity with limited focus on levels of PA and factors that determine students participation. Wachira et al. (2014) examined the status of PA among pre-adolescents in primary schools and recommended further studies to establish factors that influence participation. The current study examined levels and determinants of physical activity among Kenyan adolescents to address the identified gap. This study addressed the gap using validated questionnaires to collect information about levels and determinants of physical activity, and how they influence participation among students in boarding secondary school. This is a subjective method which is common and feasible since it is cost effective and less complex to use (Biddle, Gorely, Pearson & Bull, 2011).

There is also lack of surveillance information about physical activity levels among students in Kenyan boarding schools that can be compared to international recommended physical activity guidelines. Such data could be used to categorise students' PA levels as low, moderate or vigorous, as well as identifying the proportion of those meeting the recommended MVPA of 60 minutes daily. The study also intended to identify and understand the determinants of physical activity to formulate effective guidelines for promoting physical activity. A structured physical activity programme in boarding schools, with consideration for gender, time, choice of

activity, school status and age could be tailor-made to fit in to the school curriculum to promote early adoption of a physically active healthy lifestyle.

### **1.3 Purpose of the Study**

The purpose of this study was to determine physical activity levels and factors that influence physical activity among students in public boarding secondary schools in Nairobi City County.

### **1.4 Objectives of the Study**

The over-all objective of the study was to determine physical activity levels and factors that influence participation among students in public secondary boarding schools. The specific objectives that guided this study were to:

1. Establish physical activity levels among students in public boarding secondary schools in Nairobi City County, Kenya.
2. Examine the determinants of physical activity among students in public boarding secondary schools in Nairobi City County, Kenya.
3. Assess the relationship between physical activity levels across socio-demographic characteristics of students and environmental profile of public boarding secondary schools in Nairobi City County, Kenya.
4. Investigate the moderating influence of physical activity determinants on the relationship between environmental profile and physical activity levels.

### **1.5 Research Questions**

1. What are the levels of physical activity among students in public secondary boarding schools in Nairobi City County?

2. What are the determinants of physical activity among students in public boarding secondary schools in Nairobi City County, Kenya?

### **1.6 Hypotheses of the Study**

The study was guided by the following null hypothesis:

H0<sub>1</sub>: There is no significant difference in physical activity levels in relation to socio-demographic characteristics of students in public boarding secondary schools in Nairobi City County.

H0<sub>2</sub>: Environmental profile does not have a significant influence on students' engagement in physical activity levels in public boarding secondary schools in Nairobi City County.

H0<sub>3</sub>: Determinants of physical activity do not mediate the relationship between environmental profile and physical activity levels in public boarding secondary schools in Nairobi City County.

### **1.7 Significance of the Study**

The findings of this study may provide information that could guide Co-curricular policy in the State Department of Early Learning and Basic Education under the Ministry of Education, Science and Technology (MoEST). This could guide in planning, organizing and implementing appropriate physical activity programmes and curricular for healthy active lifestyle in public boarding schools in Kenya. The study provides data concerning physical activity levels among Kenyan students in boarding secondary schools which can be compared to other local or international information locally and internationally. The study also provides data based on the WHO physical



activity recommendation for children aged 5-17 years which can be compared to international recommended physical activity guidelines.

The study also provides information about factors that determine physical activity among students in boarding schools and how these factors influence physical activity participation in schools. The information about levels and determinants of physical activity could be useful in identifying adolescents at risk of low levels of physical activity and sedentary lifestyle. The study generated empirical evidence that may guide appropriate primary prevention, intervention in the risk population and to enrich future physical activity policy, and improve physical activity in schools. Data regarding relationship of PAL across students' demographic characteristics and school' environmental profile is an important information that could guide future studies and formulate appropriate recommendations in physical activity.

### **1.8 Delimitation of the Study**

The study was confined to students in public boarding secondary schools in Nairobi City County. Boarding schools were selected because, compared to day schools, students in boarding schools operate within the confinement of the school's calendar of events and environment.

### **1.9 Limitation of the Study**

The busy schedule of most school's principals resulted to unavailability to assist in filling the checklist. Most principals delegated the same to the physical education tutors. School records provided did not include relevant information on health issues

of students, therefore the researcher used class teachers to obtain the information for exclusion of study participant.

### **1.10 Assumption of the Study**

The study assumed that all students in all boarding schools in Nairobi City County followed a common Co-curriculum program. It also assumed that all respondents gave truthful responses regarding participation in physical activity in school, since schools follow a scheduled PA program that is strictly followed as PE lessons and games session after classes.

### **1.11 Conceptual Framework**

Physical activity is a multi-dimensional behaviour that results from complex inter-relationship involving several variables (Pettee, Morrow & Woolsey, 2012). Both, the WHO and the CDC use frequency (F), intensity (I) and time (T) or duration when recommending PA for children and adolescents (WHO, 2020; CDC, 2011). The studies recommend that children and adolescents engage in an average of 60 minutes (T) of MVPA (I) every day (F). As indicated by Canfield (2012), some also include a second 'T' in the abbreviation, to denote the type of physical activity. Therefore, PA as multi-dimensional behavior varies according to frequency, intensity, duration/time, and type of physical activities (FITT) summarised as principles of PA (Canfield, 2012; USDHHS, 2018). Michie et al. (2011) suggest that behavior occurs as an interaction of the three necessary components of capability, motivation and opportunity. Their study states that these components interact to generate behavior that consequently influences the same components.

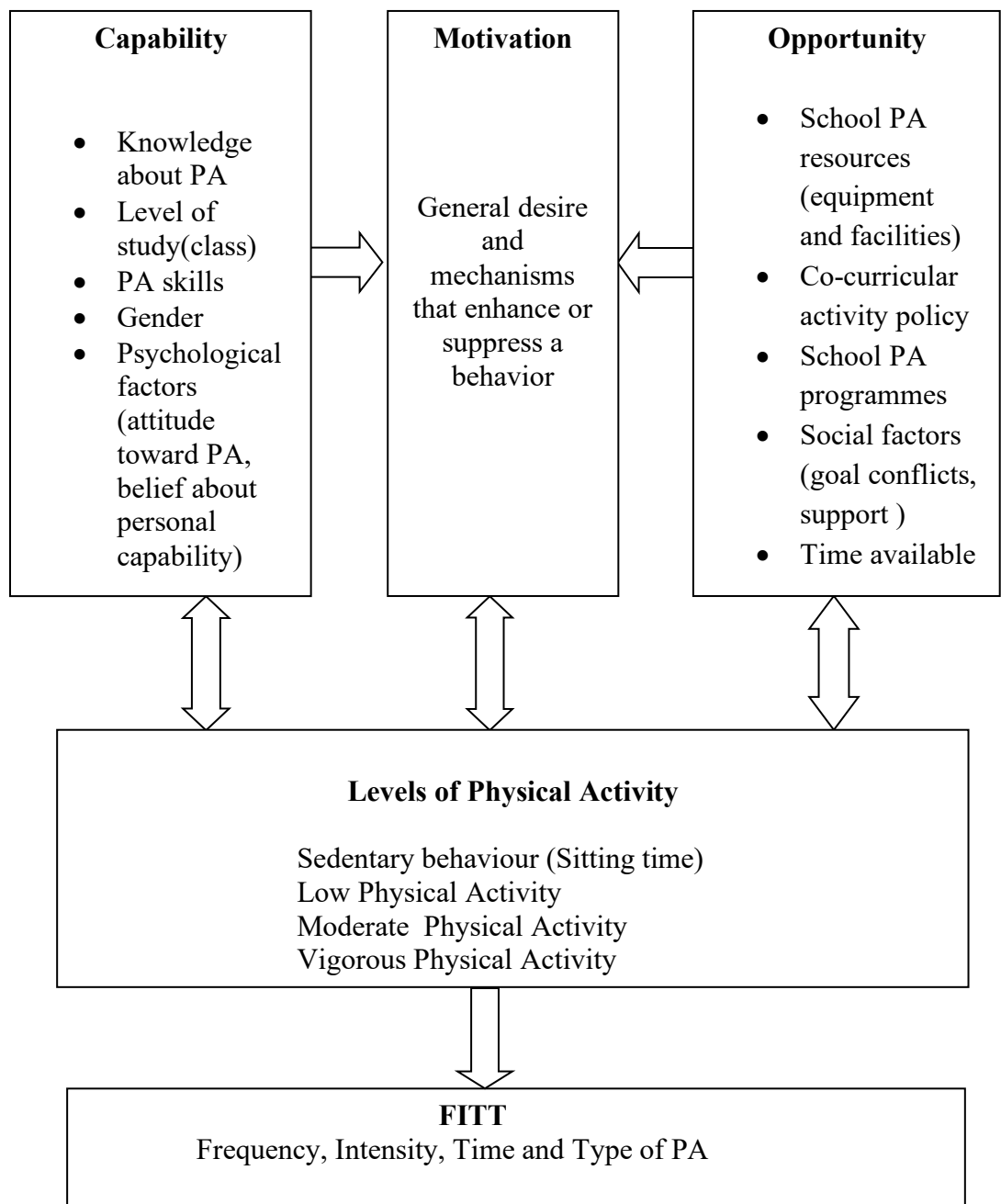
Capability is the individual's physical and psychological potential to do PA and represents factors such as gender, age, knowledge about PA, skills acquired and attitude toward PA that influences motivation to become physically active. Opportunity represents physical opportunities provided by the school environment such as facilities and equipment, trained PA tutors, co-curricular programmes, time availability, as well as social opportunities in schools that influence motivation in order to enact physical activity. Motivation is the drive that energizes or directs engagement in PA. Figure 1.1 proposes that for an adolescent to engage in adequate PA for health, they must be physically and psychologically able (capability), have physical and social chance (opportunity) to do PA and also have a drive that direct them to do PA (motivation) irrespective of other competing behaviour.

DiClemente, Salazar and Crosby (2013) state that before behaviour can be changed, we must understand the determinants and nature of the behaviour as well as motivation for behaviour change. Motivation suppresses unhealthy behaviour or enhances healthy behaviour and is affected by various individual and environmental factors from the two components (DiClemente et al., 2013). Opportunity has the potential to influence motivation just like capability (Michie et al., 2011). Consequently, the level of physical activity alters the components of capability, motivation and opportunity. Some of the factors reduce motivation suppressing PA or become barriers to PA; while those that enhance motivation increase PA (Canfield, 2012). Therefore, barrier could be capability or opportunity which needs to be changed to achieve the desired PA levels. The main goal should be to increase the proportion of adolescents who engage in MVPA of 60 minutes daily.

To increase physical activity levels in adolescents, it is important to first identify determinants of physical activity among the group. These will provide the determinants that will help to guide and implement the programme. (Higgins, Gaul, Gibbons & Gyn, 2003). Using the Determinant Physical Activity Questionnaire (DPAQ) tool by Taylor, Lawton and Conner (2013) determinants of PA in these components could be identified. Understanding of the determinants of physical activity can effectively guide promotion of physical activity; while interventions could target components that hinder physical activity in order to enhance intensity that is beneficial to health. By addressing the determinant areas with high barriers to physical activity, PA intervention programmes for adolescents in boarding schools could be structured and tailor-made to suit the school curriculum.

The level of participation in physical activity in Kenyan secondary boarding schools could be enhanced by increasing the number of PA facilities, equipment and personnel; and by manipulating the frequency, intensity, time/duration and type of activities (FITT) appropriately (USDHHS, 2018; WHO, 2020). Figure 1.1 illustrates that level of physical activity directly influences components of capability, motivation and opportunity across individuals of all ages and gender. The International Physical Activity Questionnaire (IPAQ) was developed by World Health Organization (WHO) in 1998, and categorizes PA in four types as vigorous, moderate, walking and sitting. According to the IPAQ guidelines, data on frequency, intensity, amount of time and type of physical activities engaged in (FITT) is used to estimate the levels of physical activity.

The levels of physical activity using standard compendium of physical activities, associates sedentary behaviour with no overall health benefits, low PA with some overall health benefits, and moderate PA with substantial overall health benefits and vigorous PA with additional health benefits (Butte et al., 2017). Therefore, should there be obvious lack of MVPA or MPA for health or an increase in sedentary behaviour, an analysis of the determinants of PA could guide what needs to shift for desired PA levels to occur and reduce sedentary time. It is important to provide adolescents in schools an opportunity to engage in physical activities, by encouraging them to remain physically active for maintaining general health and combating NCDs early in life. This study therefore, sought to establish the levels of physical activity among adolescent students and the determinants of physical activity in secondary boarding schools in Nairobi City County.



**Figure 1.1:** Conceptual framework showing relationship among factors influencing physical activity behavior

**Source:** Adapted from Michie et al. (2011) and Higgins et al. (2003).

## CHAPTER TWO: LITERATURE REVIEW

### 2.1 Physical Activity Guidelines

The World Health Organization (WHO, 2020) defines physical activity (PA) as all contractions of skeletal muscles using energy to produce body movements. These activities include work, play, household chores, active transport and participating in recreational activities. World Health Organization physical activity recommendation for children and adolescents aged 5-17 years is moderate to vigorous physical activity (MVPA) per day for an average of 60 minutes across the week. As part of their 60 minutes or more every day activities, children and adolescents should include muscle strengthening physical activity on at least three days a week.

In addition, children and adolescents should include bone strengthening physical activity on at least three days a week. The report further indicates that most of the 60 minutes of the physical activity should be done between moderate to vigorous intensity of aerobic physical activity and, should include vigorous intensity physical activities at least three days a week. USDHHS (2018) advise that moderate to vigorous physical activity (MVPA) of more than 60 minutes per day gives more health benefits to children and adolescents. Additionally, the report recommends that all children and adolescents reduce the amount of time spent being sedentary or sitting for extended periods such as when viewing screens based entertainments.

The International Physical Activity Questionnaire (IPAQ) Committee (2005) guide indicates that total average physical activity could be expressed in time spent as total physical activity (PA) Minutes per week or in MET Scores as MET Minutes per week.

Metabolic equivalents (METs) are commonly used to express the physical activity intensity; and generally used in the analysis of IPAQ and Global Physical Activity Questionnaire (GPAQ) data. The compendium of physical activities, defined METs (Metabolic equivalent) as the ratio of work metabolic rate to a standard resting metabolic rate of 1.0 MET (USDHHS, 2018; WHO, 2020). The studies further state that one MET is considered a resting metabolic rate acquired during quiet sitting. This study, therefore, used MET Scores where total PA of the students was determined according to the accepted standards. PA time and intensity were converted into metabolic equivalents (METs) for the work performed

According to IPAQ guidelines, data on each item at vigorous PA, moderate PA and walking are used to estimate total weekly METs/MIN by adding the sum of indicated time and frequency for each item by a MET value assigned to each category of Physical Activity (IPAQ Committee, 2005). The conversion factor applied in IPAQ is 8.0 METs for vigorous PA, 4.0 METs for moderate PA and 3.3 METs for walking. MET value from combination of vigorous, moderate and walking for 7 days produces categorical score for METs. The guideline further categorises METs scores as Low intensity physical activity below 600 METs-Minutes/week, moderate physical activity/ MPA ranges from 600 to 3000 METs-Minutes/week and vigorous physical activity/ VPA above 3000 METs-Minutes/week. The recommended physical activity for children and adolescents aged 5-17 years of 60 minutes daily of MVPA by World Health Organization is equivalent to  $\geq 6$  METs to obtain sufficient health benefits (USDHHS, 2018; WHO, 2020). Physical activities assigned 6 METs value and meeting the WHO recommendation of 60 minutes daily corresponds to 2520 METs/Minutes/week; while total METs value for moderate physical activity



corresponds to 1680 METs/Minutes/Week (Al-Haifi et al., 2013; Al-Hazzaa, Alahmadi, , Al-Sobayel, Abahussain, Qahwaji & Musaiyer, 2014; Al-Hazzaa et al., 2013).

It is also concluded that adolescents getting moderate physical activities (MPA) equivalent to MET values of 1680 METs/Minutes/week get more health benefits than those achieving lower METs (USDHHS, 2018). The report further explained that those individuals attaining moderate to vigorous physical activity (MVPA) equivalent to 2520 METs/min/week get additional more health benefits. The IPAQ Committee (2005) guide, indicates that individuals achieving 3000 METs/Min/week or exceeding 3000 METs/min/week are considered in the Health-Enhancing Physical Activity (HEPA) category since they accumulate sufficient activity for producing greater health benefits and lifestyles. The guide further reports that persons achieving 300 METs/Min/week are considered minimally active but insufficient. Though there are other classification criteria for categorizing physical activity, this study chose to use total physical activity MET/minutes/week score.

## **2.2 Benefits of Physical Activity**

Benefits of meeting recommended physical activity have been clearly defined across the life course of an individual. There is sufficient scientific evidence for age group 5-17 years supporting the overall conclusion that physical activity in youth and children gives fundamental health benefits (WHO, 2020). Regular and adequate level of physical activity has significant benefits associated with short and long term benefit for physical, social, cognitive and economic well-being of an individual (Cheah, Lim, Kee & Ghazali, 2015; Higgins et al., 2003). Long term benefits contribute to the

prevention of major cases of premature disability and death from non-communicable diseases (NCDs) such as diabetes, cardiovascular diseases, certain cancers and depression (WHO, 2014). Documented short term health benefits include increased cardiorespiratory fitness, muscular strength, reduced body fatness, reduced metabolic disease risk profiles, enhanced bone health and reduced symptoms of depression (WHO, 2020).

The World Health Organization (2020) suggests that MVPA of an average of 60 minutes daily would help children and youth maintain a healthy lifestyle. Further, the report states that physical activity is positively related to muscular strength and that participation in physical activities significantly improves muscular strength. In addition, there is strong and consistent evidence based support from experimental studies for many health outcomes, showing that participation in moderate to vigorous intensity PA is associated with significant health benefits (Poitrais et al., 2016). The Poitrais et al., (2016) systematic review examined 162 studies from 31 countries and 204,171 total participants. The study examined relationship between objectively measured PA and several health indicators among 5 - 17 years school going children gives evidence from studies that, sufficient total PA improves critical or primary health indicators such as body composition, cardio metabolic biomarkers; as well as important or secondary health indicators such as bone health, self esteem among others (Poitrais et al., 2016).

A systematic review and Meta-Analysis study on adult using 160 randomized controlled trials with 7,487 participants, indicate that PA significantly improved cardio respiratory fitness and cardio metabolic biomarkers (Lin, Zhang, Guo, Roberts,

Mckenzie, Wu, Liu & Song, 2015). Therefore, there is sufficient scientific evidence to conclude that physical activity has a positive effect on cardio-respiratory fitness.

Regular PA across life course shows beneficial effects on adiposity level and normal body weight. According to the WHO (2013), as the level of physical activity increases so does the benefits in preventing various non-communicable diseases (NCDs) among adolescents. Studies on primary prevention of NCDs or CD, support the use of physical activity at recommended levels to lower disease risks and secondary disease treatment on those already inflicted in children and youth (Dustine, Cheng & Armstrong, 2013). Consequently, physical activity has been termed the most cost-effective method for primary prevention and secondary disease treatment (WHO, 2014). A systematic study on role of PA in management of blood pressure indicate a positive relationship between physical activity and cardiovascular fitness. Moderate levels of PA, such as walking, caused a reduction of about  $9.4 \pm 2.8$  mmHg for systolic and light intensity PA reduced  $5.7 \pm 2.2$  mmHg for diastolic blood pressure in hypertensive patients (Lopes, Mesquita-bastos, Alves & Ribeiro, 2018).

A statement by American Diabetes Association reported that since regular PA substantially lowers the risk of type 2 diabetes, children and youth with diabetes should meet the current PA recommendation set for children and youth (Colberg et al., 2016). The report also revealed that although protection from diabetes comes about from activities ranging from moderate to vigorous intensity, regular light intensity PA is also beneficial to diabetic persons. It would seem that structured PA programmes have significant beneficial effects on glycemic control. Another study, a systematic review drew strong evidence showing a favourable association between

total PA and adiposity, physical fitness and bone health (Poitras et al., 2016). The review emphasised that intense PA results in larger, stonger and more minerally dense bones; and stressed that this effect is more pronounced if the PA starts early in life. It is, therefore, very important to sensitize adolescents about the benefits of physical activity in the prevention of chronic diseases and that, putting in place prevention programmes against chronic diseases early in life, provide greater benefits.

There is strong evidence that school going children and adolescents improve academic achievement in public examinations when recommended levels of physical activity are met. (Buscemi, Kong & Fitzgibbon, 2014; Reilly, 2015). Ardoy, Fernandez-Rodriguez, Jimenez-Pavon, Castillo, Ruiz and Ortega (2014) investigated the effects of increased time and intensity in PA on Spanish adolescents' cognitive performance and academic achievements using group randomized controlled trials. The researchers revealed that cognitive performance indicators such as abstract reasoning, attention, information processing, numerical ability, storage and retrieval of information, spatial ability, verbal and non verbal ability improved significantly in most adolescents. High levels of MVPA resulted not only in better academic achievements by school grades in examinations among 11- 16 years old students; but als positive impact on cognitive skills and attitude (Ardoy et al., 2014; Reilly, 2015). The review also identified a positive relationship between PA and a broad range of indicators surrounding physical, psychological and cognitive dimensions.

Similar outcome was reported by a systematic review of associations between PA, cognitive and academic performance (Esteban-Cornejo, Terejo-Gonzalez, Sallis & Veiga, 2014). The findings support the notion of positive relationship of PA with both,

cognitive and academic performance. The findings associate cognitive performance with vigorous physical activity (VPA); while relating academic achievement to general physical activity among school going adolescent students. It is obvious that these academic benefits lead to enhanced learning in both, formal and informal settings. However, almost all the evidence are from day-schools. It is possible that, due to the changing nature of adolescence, physical activity benefits among students in boarding schools, could be different from those investigated so far. Physical activity is a complex, multidimensional behaviour that can never be separated from various aspect of life (Petee et al., 2012).

Regular participation in physical activity is generally associated with improved self-confidence while undertaking activity, improved self-esteem, reduced anxiety as well as improved social skills and bigger social network in schools (BHF, 2014; Coalter, 2013). Asare and Danquah (2015) report that moderate physical activity is associated with good mental health and high self-esteem levels among Ghanaian adolescents. The study further indicates that Ghanian adolescents with higher levels of PA are less likely to report depression symptoms. There is other evidence that increased leisure time PA is significantly associated with less depressive symptoms (US Government Accountability Office [USGAO], 2012). The youth therefore, stand to gain a lot from regular and adequate physical activity that promotes improved social skills, integration into peer group and reduces anxiety (BHF, 2014).

Physical activity directly and positively affects the growth and enhancement of realistic and healthy self-esteem and leadership along with other life skills in adolescents (USGAO, 2012). The environment, nature and choice of activities offered

in boarding secondary school, and the social circles at the school are likely to affect learners' participation in physical activity.

### **2.3 Consequences of Inactivity**

Available data show that children, adolescents as well as adults are leading sedentary lives (Olubusola, Adebimp & Faniran, 2013; Onywera, Adamo, Sheel, Waudo, Boit & Tremblay, 2012; Reilly, 2015; WHO, 2013). Sedentary behaviour is an extended period of low energy expenditure of  $\leq 1.5$  Metabolics Equivalents (METs) for children and adolescents aged 5-17 years including any waking behaviour while sitting, reclining or lying down at school either doing assignments, reading non-electronic books or playing board games (Tremblay et al., 2017; Sedentary Behaviour Research Network[SBRN], 2017; WHO, 2013). The  $\leq 1.5$  Metabolics Equivalents (METs) corresponds to PA of 600 METs/min/week which represent low intensity physical activity.

There is compelling evidence that variations in PA and sedentary behaviour are of enormous importance to the current and future health of children and adolescents (Gontarev & Kalac, 2016). This was a conclusion of a study using Macedonian adolescent aged 14- 18 years measuring levels of participation (MVPA) and sedentary behaviour. From all perspectives, having high levels of sedentary behaviour has a negative impact on health, independent of other factors such as body weight, diet and physical activity (SBRN, 2017; Tremblay et al., 2017). The Ministry of Health, Division of Non-Communicable Diseases on National Physical Activity Action Plan 2018 report indicates that physical inactivity in Kenya is estimated to be 10% in males and 14% in females among the Kenyan population of all ages (MoH, 2018).

It is also clear that meeting the recommended PA in life has many important health benefits. Sedentary behaviour, on the other hand, is associated with an increased risks of various chronic diseases and decreased longevity and quality of life (Guthold, Stevens, Riley & Bull, 2019). In addition, a meta-regression analysis involving over one million adults suggest that, there is strong and consistent evidence-based information demonstrating dose response association between daily sedentary time and mortality from all causes among adults (Ku, Steptoe, Liao, Hsueh & Chen, 2018). However, this meta-analysis involved adults aged 18-64 years old, encouraging sedentary time of fewer than 9 hours a day.

Adolescence as a formative stage may require far less than 9 hours of sedentary time to produce physically active healthy adults. Therefore, right from inactivity to low PA, there is a negative effect on the health of a person. The promotion of physical activity could discourage sitting for extended periods. The Kenya 2014 PA Report card indicates that only half of these group members aged 5-17 years old are participating in sufficient PA levels (Healthy Active Kids Kenya [HAKK], 2014). The average 8.6 hours per day of sitting time among Canadian students has been identified as the major cause of sedentary behaviour among them (Tremblay et al., 2011). Although there is paucity of literature on sitting time among Kenyan children and adolescent, one recent study involving children in Nairobi City County showed direct assessed sedentary time of 398 minutes, which translates to 6.6 hours per day (HAKK, 2016). Another study carried out among 10-12 years school children across five European countries using accelerometer, shows that students spend 8.3 hours in sedentary activity or sitting (Verloigne et al., 2012).

Spending a lot of time being sedentary increases the risk of some unhealthy outcomes, even in persons who are active (WHO, 2020). Another systematic review study and harmonized meta-analysis conducted among middle aged and older adults indicates that achieving the minimum recommended level of PA compared to inactivity led to a reduction in all cause mortality by 19% and this could be increased to 24% if more time was spent daily in physical activity (Ekelund et al., 2019). The study further indicate that higher sedentary behavior was positively associated with higher risk of death from NCDs, and the risk increased at levels higher than 9.5 hours of sedentary behavior each day. Guthold et al. (2019) found that there is lower risk for all cause mortality in active people compared to inactive individual.

Currently, there is a sudden increase in NCDs prevalence rate throughout the world. Studies show that physical inactivity is the biggest life threatening factor and fourth leading risk factor causing 6% death globally (Centre for Disease Control and Prevention [CDC], 2011; WHO, 2020). Sedentary behaviour is linked to increased risk to health, which results in NCDs later in life (Muller, Khoo & Lambert, 2013). The most common NCDs are cardiovascular diseases (CVD), Type 2 diabetes, some cancers, and various respiratory diseases (Dustine et al., 2013; WHO, 2014).

Excessive involvement in academic activities such as assignments and reading accompanied by lack of physical education classes, all contribute to physical inactivity as observed on non-PE days (Chen, Kim & Gao, 2014). A study involving adults found that individuals who spent about 9 hours a day of their time sitting were more likely to die during the follow-up time than those who sit less (Ku et al., 2018). The study also revealed that with sedentary time of more than 10 hours a day, there is



rapid increased risk of mortality. Thus indicating that there was progressively higher risk of mortality across higher levels of sitting time. One of the objectives of the Ministry of Health's National Physical Activity Action Plan 2018 to 2033, is to lower levels of physical inactivity by 5% in the Kenyan population (Ministry of Health [MoH], 2018). He et al. (2013) suggest that schools could be effective settings for promoting physical activity. The authors add that sedentary behavior or physical activity levels practised during formative stages could potentially influence the onset of diseases in adult life or healthy lives. This current study, focusing on boarding schools in Kenya, may encourage students to meet the recommended physical activity levels and reduce the accumulated time while sitting.

#### **2.4 Physical Activity for Adolescents and Youth**

Studies and public health surveillances concerning levels of physical activity have indicated that physical activity declines from childhood through adolescence to adulthood (Bergier et al., 2014a; Reilly, 2015). The United State Department of Health and Human Services, on cardiovascular benefits and recommendations warns that adolescents who are inactive pose a big challenge to future wellbeing and health (USDHHS, 2018). WHO (2014) warns that the 6% of global deaths that occur due to physical inactivity translate to more than 3.1 million deaths annually. Importance of PA to the health of adolescents has led to the development of surveillance systems to monitor compliance with WHO guidelines among young individual (WHO, 2013).

Despite the guidelines, data from various studies in different countries indicate that many adolescents do not meet the minimum guidelines. According to IPAQ Committee (2005) guideline, inactive individuals accumulate less than 600

METs/min/week and this is the lowest level of PA. The Asare and Danquah (2015) study among Ghanaian adolescents aged between 13-18 years, found that 44.3% had low physical activity compared to 55.7% that achieved moderate physical activity/MPA. Another study carried out in 2011 involving Canadian youth and children indicates that only 7% meet the guidelines (Barnes, Colley & Tremblay, 2012). In the USA, only 27% of participants accumulated the recommended PA daily (Landry and Driscoll, 2012).

Wachira et al. (2014) indicated that only 40% of children and adolescents meet recommended levels in developed countries and 59% in developing countries. Ismail and Fairuz (2009) used the IPAQ to determine PA levels of Malaysian adolescents. The results revealed that majority of adolescents (upto 79.2%) achieved between MPA (moderate physical activity) and VPA (vigorous physical activity) of more than 600 METs/minutes/week, while 20.8% of adolescents were found to be physically inactive. A Jordanian study used the validated self-administered Arab Teens Lifestyle Study (ATLS) questionnaire to determine PA among Jordanian adolescents. This study found that almost 60% of students achieved MPA while 44.2% met the recommended MVPA daily (Abu-mweis, Tayyem, Bawadi, Musaiger & Al-Hazzaa, 2014).

Physical activity levels in developing countries are likely to fall further due to economic development and availability of new technology as well as urbanization (Reilly, 2015). Though a developing country, Kenya is experiencing the same challenges as developed countries. Onywera et al. (2012) point out that recommended levels of physical activity among adolescents are threatened by sedentary lifestyles

resulting from readily available technology such as computers, internet, television, and cell phones. The current study critically examined physical activity levels and determinants among students who are confined to boarding school environment to determine their compliance with WHO physical activity recommendations.

A systematic review to identify correlates associated with PA among children and adolescents aged 3-18 years, found consistent positive association between sex and PA, as well as between age and PA (Sterdt, Liersch & Walter, 2014). Thus, declaring sex and age as key determinants of levels of physical activity. Using the IPAQ, Bergier, Tsos and Bergier (2014b) found that Ukrainian male students are more physically active than girls; with boys receiving the much higher favoured status because of their participation in sports. A similar study involving 13 – 16 year old also used the IPAQ and found that PA decreases with age and that the decrease is higher among adolescent females (Corder et al., 2016). Telford, Telford, Olive, Cochrane and Davey (2016) study using pedometer measured PA among 8 – 12 years old pre-adolescents showed that girls are 19% less active compared to boys.

In contrast to these findings, a recent longitudinal study in England and ICAD (International Children's Accelerometry Database) did not support the hypothesis that there is a marked decline in MVPA during adolescence, neither did it find the decline to be greater among girls than in boys (Reilly, 2016). Another United Kingdom study involving Cambridgeshire high school students aged between 15-18 years where individually calibrated Combined Heart Rate (HR) monitors and Movement Sensor devices was used to estimate energy expenditure (PAEE), daily sedentary time and PA levels. The study found that MVPA decreases annually with age, but the change

is greater among the boys because MVPA in girls is much lower than for boys to start with (Collings et al., 2015). Combined Heart Rate (HR) monitors and Movement Sensor devices objectively measure PA, and the data obtained is used to determine different characteristics of physical activity unlike subjective methods.

The data for PA among adolescents from 105 countries sourced from cross sectional surveys world wide indicated prevalence of engaging in PA decreases with age. The decrease from 28.2% to 21.2% among boys and 19.4% to 11.1% among girls across these countries (Marques, Henriques-neto, Peralta, Maltins, Demetriou, Schonbach, & Gaspar, 2020). Another cross- sectional study by Al-Hazzaa et al. (2014) among Saudi adolescents aged between 15-19 years in secondary schools using a validated youth PA questionnaire found that 44% of boys and than 20% of girls met the recommended physical activity level of MVPA, equivalent to 2520 METs/Minutes/week. Similar findings across samples of Western Australian secondary students aged 12-17 years indicated that 24% boys and 9% girls reportedly engage in the recommended 60 minutes of PA daily (Active Healthy Kids Australia [AHKA], 2018).

The 2012 Health Survey of England showed that only 14% girls and 23% boys aged between 13-15 years met the recommended level, while low PA was recorded for 39% boys and 45% for girls (BHF, 2014). Gender differences and age are determinants of physical activity levels among these students. This current study addressed various determinants that affect physical activity participation and levels among students in relation to gender and age among other determinants.

## **2.5 Determinants of Participation in Schools**

The Higgins et al., (2003) study concerning factors influencing physical activity of Canadian youth aged between 12-24 years suggests that an active lifestyle will only be realized when factors influencing PA participation have been understood. These factors can either be modifiable or non-modifiable determinants. Modifiable determinants of physical activity include active transportation to school, sports participation, active play and household chores (HAKK, 2016).

In a boarding school environment, modifiable factors of PA may be affected differently compared to a non-restricted environment. Non modifiable determinants of PA such as age, sex, ethnicity and SES are indicators of a special group of individuals that need special interventions (Wiiium & Safvenbom, 2019). The authors add that there are factors that can be controlled and their effects minimized by bringing changes in the lifestyle of the special group by providing special interventions programmes. Adolescents can therefore, be considered a risk group that requires intervention in order to promote physical activity. Therefore, this study aimed at generating guidelines that may influence active lifestyle in schools which subsequently affect the general health status of adolescents in boarding schools.

Since physical activity is a complex multi-dimensional behavior (BHF, 2014), factors affecting physical activity also have a wide range. From research conducted in various countries, sex appears to be the most consistently examined factor (Bergier et al., 2014a; Cheah et al., 2015; He et al., 2013). Boys are more active compared to girls (Bergier et al., 2014a; He et al., 2013; Olubusola et al., 2013). However, according to Bergier et al., (2014a) physical activity structure for boys is different from that of girls

in Poland, where boys' physical activity at 6.1% is lower compared to the girls' at 8.6%. The cross-sectional survey of adolescents which obtained data from 105 countries on PA indicated that about 24% of boys and over 15% of girls across these countries, met the WHO recommended PA (Marques et al., 2020). In almost all countries where data on physical activity has been obtained, boys are more active compared to girls; and a proportion of both, males and females do not meet the recommended level of 60 minutes of MVPA every day.

Schools are recognized as the most important arena where students develop love for exercises, physical activity and sports (MoEST, 2015). Quality PE and sports in schools exist as part of the curriculum and are generally recommended as a means of solving low MVPA and other related problems like obesity in adolescents (Reilly, 2015). In the recent past, while total physical activity among adolescents is declining, there has also been a significant decline from 70% to 60% in PE per week in schools (Booth et al., 2015). The PE programme in a school is likely to affect overall PA levels, participation and patterns as argued by Pardo et al. (2013) and Bergier et al. (2014a). According to Ardoy et al. (2014), increasing time spent in PE classes and other physical activity programmes do not have a negative impact on academic performance among students.

Despite this understanding, many schools face a lot of pressure to reduce or eliminate PE scheduling due to financial constraints and more so, because of an over emphasis on academic grades (MoEST, 2015). Similarly National Assembly for Wales (2019), report indicated that both, the school curriculum and the students' class time table are crowded leaving little room for PA and giving PA programmes least priority. The

2014 UNESCO report isolated one factor that have negative impact on PE in schools as deficiencies in the provision of PE facilities and equipment, inadequate and or poor maintenance of existing ones (UNESCO, 2014). The report further adds other factors identified by the report including reduction or cancellation of the number of PE lessons from the time table, absence of PA programmes and didactical materials. School physical activity programmes are believed to play a very important role but only a small proportion of adolescents are receiving it.

Schools, therefore, represent modifiable determinants that can be targeted as an intervention for promoting physical activity throughout adolescence years (He et al., 2013). The recommended levels of MVPA in youth can be achieved and sustained in school settings if proper school based policies, environment, administrators and students are integrated (Pardo et al., 2013). Majority of schools in Kenya provide physical activity programmes in the form of PE and sports; but, the main concern is whether these are adequate for enabling the youth to meet the recommended physical activity level.

Although equipment is a key factor in influencing physical activity, accessibility, availability and adequacy remain a challenge. Safe facilities, adequate equipment and appealing programmes should be provided for students to spend their leisure time actively (WHO, 2013). Many schools do not have adequate facilities especially indoor spaces, access to playing fields like basketball and football for team sports for conducting PE and sports throughout the year, (USGAO, 2012). Kirui, Langat & Rop's (2014) investigation into the adequacy of PE equipment and facilities for teacher trainees in the colleges, found the colleges ill equipped, inadequate,

insufficient and poorly maintained. Severe cuts in PE and sports budgets in schools hinder the ability to purchase sufficient and quality equipment; as well as for upkeep and maintenance of facilities (USGAO, 2012). According to Gathu, Ndungu and Bomett (2015), increasing sports equipment, teaching materials as well as improving PE curriculum can increase physical activity in schools.

School Physical Education and sports facilities provide opportunities for PA to all school going children. Diverse facilities in schools could provide choice of various physical activities which equip students with variety of skills (Wachira, 2014). Among the various co-curricular activities provided by schools are those that focus on physical activities including athletics, different games and sports, swimming and dance. The 2016 HAKK report indicates that sports participation provide an opportunity for students to engage in PA. However, some of the activities provided involve few participants at a time. The Bergier et al. (2014a) study concerning 16-18 year old Polish adolescents, revealed that 60% of adolescents have high level of physical activity. The study also found that the highest determinant of levels of PA was physical education classes in schools. This current study, therefore, examined the influence of various factors in conditioning students in boarding setup to increase physical activity levels while in school.

## **2.6 Assessment of Physical Activity**

The level of physical activity has been assessed in different parts of the world across all ages using different assessments tools. According to Welk, Morrow and Saint-Maurice (2017) assessments of physical activity are generally categorized as subjective and objective methods. Subjective methods use validated questionnaires,



self-reports, diaries and direct observation; while objective methods include Heart Rate (HR) monitors, Combined sensor devices, accelerometers, and pedometers.

Subjective methods rely very heavily on the participants' ability to accurately recall relevant details about their involvement in PA. They are more common and feasible because they are cost effective and less complex to use (Biddle et al., 2011). Objective methods involve measurements of physiological or biomechanical parameters where the information obtained is used to assessment of physical activity (Welk et al., 2017). Pedometry uses an electronic device called pedometer that records total ambulatory activity using the number of steps taken within a given period of time, but does not assess intensity, duration or frequency of activity (Welk et al., 2017). Pedometers are low cost and easy to use by researchers to capture changes in physical activity levels, especially MVPA (Clemes & Biddle, 2013).

Accelerometers are devices that measure acceleration in a range of movement that can be programmed to a specific to age groups. Therefore, this method is commonly used to assess physical activity in youth (Strath et al., 2013). The device stores time resolved data for the desired monitoring period. Accelerometer provides an objective measure of physical activity and is used across all ages (Skender et al., 2016). Heart rate (HR) monitors assess Physical Activity Energy Expenditure (PAEE) in both controlled and free living environment (Strath et al., 2013). Individual HR-PAEE, used to predict PAEE in a free living environment, are measured in the laboratory environment. Combined sensor devices determine more than one physiological measure such as heart rate, temperatures and motion of multiple body segments. The

data obtained is used to determine different characteristics of physical activity (Strath et al., 2013).

Subjective methods are suitable in assessing large populations for the purpose of estimating levels of physical activity in order to obtain the percentage of subjects meeting physical activity guidelines (Biddle et al., 2011). Despite increased use of objective methods like accelerometers, subjective methods will continue to be used to obtain data on type and context of physical activity (Biddle et al., 2011). However most objective methods are expensive, need specialized and trained expertise, and could be time-consuming. Therefore, not ideal for large populations as was the case with the present study. This study used the subjective questionnaires and checklists to obtain data on levels of physical activity and factors that determine levels of physical activity.

## **2.7 Summary of Literature Review**

It was evident from the information in the literature that physical activity declines greatly during adolescence stage. Some recent studies suggested that total physical activity declines across childhood and adolescence with no marked decline during adolescence. With or without a marked decline in PA during adolescence, recommended physical activity levels of MVPA were not achieved by many. Studies conducted among Kenyan adolescents focused mainly on physical activity levels both in rural and urban areas. Few existing studies in Kenya established that majority of adolescents have high physical activity levels.

Unfortunately, none of these studies were conducted in boarding schools. Majority of young people in this age category are secondary schools students with the highest number in boarding schools. Several determinants of PA in schools have been done where sex and age appear to be the key determinants. Majority of existing study reveals that boys are more active than girls while a higher proportion of girls do not meet the recommended PA guidelines for adolescent and children aged between 5 – 17 years. Majority of studies also recognize that school environment provide the opportunity needed by students to engage in physical activities. Some existing studies in Kenya established that majority of schools quality of PA facilities and equipment are below average and are limited in quantity.

Unfortunately, none of these studies laid any emphasis on boarding schools set-up. Therefore, the current study sought to address the information gap regarding the bigger group of adolescents in boarding schools. The study sought to establish their physical activity levels, determinants of PA, the relationship of physical activity levels with socio-demographic characteristics of the students as well as the environmental profile of the schools. The proposal based on relationship of PA levels and determinants of physical activity assisted in drawing conclusions that could influence the formulation of strategies that enhance physical activity participation.

## **CHAPTER THREE: METHODOLOGY**

### **3.1 Research Design**

The study used the cross-sectional analytical design to investigate physical activity levels and selected factors that determine participation in physical activity. It compared variables such as gender, class or level of study, type of school, school facilities, equipment and co-curricular activities to determine whether these variables affect physical activity. The design was applicable in this study in that the researcher was able to examine the association between variables and identify possible causes and effects of such associations.

### **3.2 Research Variables**

The dependent variables were the level of physical activity and determinants of physical activity among students in boarding secondary schools. The independent variables were gender, level of study or class, type of school, status of facilities, equipment and co-curricular policies at school.

### **3.3 Study Area**

The study was carried out in Nairobi City County (Appendix K). Nairobi was purposively selected since it is the cosmopolitan capital city of Kenya with 46 public boarding secondary schools admitting students from all over the country. It also has 33 day schools commonly referred to as Sub-County schools (MoEST, 2015). Consequently, majority of students are in boarding schools compared to day schools. Most public boarding secondary schools are located on small pieces of land, providing limited spaces and this could affect physical activities of students compared to day

scholars. Boarding schools operate under similar routines and offer a highly restrictive lifestyle; these dynamics build a certain level of homogeneity.

All public schools offer a common curriculum guided by the ministry of education therefore public schools have common policies that guide Co-curricular activities in schools. Public schools are also funded by the government and fixed school fees from parents using ministry of education guidelines (MoEST, 2014). It is informative and educative to determine physical activity levels and the determinants of physical activity participation in boarding secondary schools.

### **3.4 Target Population**

The target population comprised all students who were boarders in public boarding secondary schools in Nairobi City County. Kenyan children and youth, especially those in urban settings, are experiencing a physical activity transition marked by decline in levels of physical activity and increased sedentary behaviour (HAKK, 2016; Kibet, 2006). According to Ministry of Education, State Department of Early Learning and Basic Education, Nairobi City County has a total of 46 public boarding secondary schools with a total population of 40,200 students (MoEST, 2015).

Based on the task force report on secondary school fees, public secondary schools are categorised as National, Extra-County, County and Sub-County schools (MoEST, 2014). Of the 46 Public boarding schools in Nairobi City County, seven are National schools, nine are Extra-County Schools and 30 are County schools. All 33 Sub-County schools in Nairobi City County are day schools and therefore, were not included in the current study. Schools status and populations are shown in Table 3.1.

**Table 3.1: Public Boarding Secondary Schools**

<b>School status</b>	<b>Boys</b>	<b>n</b>	<b>Girls</b>	<b>n</b>	<b>Total</b>	
<b>National schools</b>	4	5960	3	4530	7	<b>10,490</b>
<b>Extra-County schools</b>	3	3564	6	6062	9	<b>9,626</b>
<b>County schools</b>	14	9,230	16	10854	30	<b>20,084</b>
<b>Total</b>	<b>21</b>	<b>18,754</b>	<b>25</b>	<b>21,446</b>	<b>46</b>	<b>40,200</b>

### 3.4.1 Inclusion Criteria

The study targeted all students who were boarders in public boarding secondary schools in the three strata of National, Extra-County and County Schools in Nairobi City County. The study included only those students who were boarders in the boarding secondary schools and in a specified age category in each class level. The study included only those students who assented to participate in the study.

### 3.4.2 Exclusion Criteria

Students who presented with any chronic illness or any other condition such as students living with disability that might limit physical activity were excluded from the study. The study also excluded any student whose age was above or below the specified age category of 14 to 17 years. The study also excluded students who were

day scholars from the study. Exclusion criteria was done using class registers and in consultation with class teachers.

### 3.5 Sample Size

Boarding secondary public schools in Nairobi City County are categorized as National, Extra-County or County school. The sample size was calculated using the Fisher formula:

$$n = z^2 pq/d^2$$

where :

n – the desired sample size when the population is greater than 10,000.

z- standard normal deviate at a required confidence level, statistic is 1.96.

p- proportion in target population, characteristics measured is 50%

q- 1-p

d- significance level was 0.05 (Mugenda & Mugenda, 2003).

Therefore  $n = (1.96^2) (0.5) (1-0.5) / (0.05)^2 = 384$  participants plus 10% of 384 students was added to obtain total of 422 participants. For equal distribution of participants in each of the four levels of study, 68 participants were sampled from every school giving a sum sample size of 408 participants.

### 3.6 Sampling Techniques

This study used the three strata of schools, recruiting participants from boys and girls schools. Systematic random sampling was used to select one secondary boarding school from every stratum in boy or girl schools category to ensure equal representation as presented in Table 3.2. The average age in each class level was determined to be 14, 15, 16 and 17 years in form 1, 2, 3 and 4 respectively. Participants

were recruited based on their dates of birth as recorded in the school register. A sample of 408 participants was obtained and distributed equally among the six schools selected, such that every school provided 68 participants. For equity, 17 participants were randomly selected from every class or level of study (Form 1, 2, 3 & 4) by simple random sampling method.

**Table 3.2: Randomly selected Schools from every School Strata**

		Number of Schools	Selected schools	Students
<b>National schools</b>	Boys	4	1	68
	Girls	3	1	68
<b>Extra-County</b>	Boys	3	1	68
	Girls	6	1	68
<b>County schools</b>	Boys	14	1	68
	Girls	16	1	68
<b>Total</b>		<b>46</b>	<b>6</b>	<b>408</b>

### 3.7 Research Instruments

The physical activity level data was collected using the shorter form of the International Physical Activity Questionnaire (IPAQ) (Appendix H). IPAQ is available in two versions of the long and short form. The short form was chosen because of its acceptance as the more practical version. It is a suitable, validated and internationally recognized instrument for assessing physical activity across all ages (Biddle et al., 2011). IPAQ is a self-administered questionnaire requiring one to recall physical activity events during the past seven days. The information was then used to



estimate the time spent on different PA intensities per week and converted to metabolic equivalent (METs). The METs obtained are used to classify intensities as low, moderate and vigorous physical activity levels in the general population.

A checklist to record the status of facilities, equipment and PA co-curricular policies was used to determine their effects on physical activity among students in public boarding secondary schools in Nairobi City County (Appendix J). The study also used Determinant Physical Activity Questionnaire (DPAQ) to collect information concerning determinants of physical activity (Appendix I). Development and validation of DPAQ was done by Taylor et al. (2013) to measure determinants of PA. A final 11 factor model and 34 items that compared well to other validated psychometric questionnaires was developed, tested, validated, revised and retested (Taylor et al., 2013). The revised DPAQ version indentified nine out of 11 determinants from TDF (theoretical domains framework) of behaviour change as relevant to PA behaviour and two additional ones were specified (Taylor et al., 2013).

The revised DPAQ were used to assess the determinants of physical activity by obtaining mean scores that reflected agreement or disagreement to the item on the determinant area. A low mean score signifies disagreement while high mean scores of respondents signifies agreement to the item. Results were used to classify determinants as barrier or facilitator for PA. Barrier determinants calls for intervention to address the particular determinant area so as to increase physical activity levels of a student deemed to be below the recommended levels (Taylor et al., 2013).

### **3.8 Pre-Testing Research Instruments**

The two research assistants (RAs) were trained by the researcher on the exact procedures to be followed, the appropriate behaviour during data collection and methods for ensuring the security of the data in a secondary boarding school setting. The researcher worked with the research assistants when the instruments were being pre-tested at a school not selected in the main study. The pre-testing was done in one school and engaged a total of 20 students.

Every level of study or class (Forms 1, 2, 3 and 4) was represented by five students each. This representative pre-test sample was subjected to the full study assessments and procedures. Reliabilities of the three instruments were established during pre-testing using test re-test method. The instruments were adjusted according to results from the pre-test, in consultation with experts from the Departments of Physical Education, Exercise and Sports Science and Recreation Management and Sports Administration.

### **3.9 Validity and Reliability of the Research Instrument**

#### **3.9.1 Validity of the Instrument**

Validity according to Wong, Ong and Kuek (2012) is the degree to which a test measures what it purports to measure. There are four forms of validity: face validity, content validity, criterion-related validity and construct validity. In this study, the researcher tested face and content validity. Face validity refers to the likelihood that a question will be misunderstood or misinterpreted, thus, pilot study helped to iron out ambiguity. Pre-testing a survey is a good way to increase the likelihood of face

validity. On the other hand, content validity refers to whether an instrument provides adequate coverage of a topic (Creswell, 2007). According to Mugenda and Mugenda (2003), the usual procedure in assessing the content validity of a measure is to use professional or expert in a particular field which helps in discovering question content, connection in the wording and sequencing problems. The researcher therefore sought assistance from supervisors, and other lecturers in order to help improve validity of the research instruments.

The IPAQ questionnaire had been validated by several researchers (Ács, Betlehem, Oláh, Bergier, Melczer, Prémusz and Makai (2020); Craig et al. (2003) as well as DPAQ questionnaire (Taylor et al. (2013); Marques et al. (2013). The validation assessment revealed a validity correlation of 0.53 suggesting that the IPAQ is an acceptable tool for psychometric/PA performance (Craig et al., 2003). Similarly for the IPAQ short form it obtained a good validity of 0.52 according to Murphy, Murphy, Macdonncha, Murphy, Nevill and Woods (2017) and a fair validity of 0.46 according to Tran, Lee, Nyugen and Hoang (2013). As for the DPAQ, validity of all determinant areas ranged between 0.43 to 0.90 (Taylor et al., 2013). However, the researcher conducted a pre-test of the checklist to determine its clarity and precision, which was found to be suitable as it obtained a good validity of 0.8.

### **3.9.2 Reliability of the Instrument**

IPAQ indicated a good reliability of 0.8 for all PA domains according to Craig et al. (2003); Tran et al. (2013) and reliability of 0.7 according to Murphy et al. (2017). As for the DPAQ all determinants obtained reliability ranging between 0.45 to 0.91 indicated acceptable to strong levels of Test-retest reliability (Taylor et al., 2013). The

reliability of the IPAQ and DPAQ questionnaires and the checklist were determined using Test re-test technique. The tools were given to the same group of 20 students on two different occasions with a two week interval between each session. The results from the pretest was correlated to evaluate the test for consistency of the data collected and obtained reliability of 0.70 for IPAQ, the 11 determinant areas ranging between 0.42 to 0.85 for DPAQ and 0.8 for checklist.

### **3.10 Data Collection Procedure**

Respondents met with the research team after classes, starting from 4:30 pm to complete the questionnaires. Participants were given full explanation about the questionnaire and technical guidance on how to complete the questionnaire. Participants read and completed the IPAQ Questionnaire (Appendix H) as well as DPAQ Questionnaire (Appendix I). The researcher was on hand to clarify any issues or queries raised by the respondents. The questionnaires were collected immediately after completion by the participant.

After collection of IPAQ and DPAQ questionnaires from the students, the checklist was used to obtain data on the status of the PA equipment, facilities and co-curricular policies in the school. This was done by the researcher, by observing where applicable and ticking the answer that best described the situation. School principals or the Physical Education teachers were also presented with the checklist to assist the researcher by clarifying issues not obviously evident during the observation exercise (Appendix J).

### **3.11 Data Analysis and Presentation**

Physical activity data obtained from the questionnaire was cleaned and converted to Metabolic Equivalent (METs). The data obtained was then used to categorize physical activity as outlined by the WHO guidelines. All data was then entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 20. The following is a description of how data scoring process was conducted.

#### **3.11.1 Data Scoring**

The first objective was to establish physical activity levels among students in public boarding secondary schools in Nairobi City County, Kenya. Total average PA was converted to Metabolic Equivalent of Task (MET)- minutes per week (MET/min/wk). MET/min/wk was calculated using time in minutes for adequate PA (VPA, MPA and Walk) multiplied by corresponding METs for every physical activity intensity. The reported activities in each category of PA were given MET values using IPAQ guideline as Vigorous PA = 8.0 METs, Moderate PA = 4.0 METs and walking = 3.3 METs. The total METs value of a student was calculated by adding walking, moderate and vigorous METS-minutes per week.

The students were then categorized into three levels of physical activity proposed to classify population as having vigorous, moderate, or low physical activities (IPAQ Committee, 2005). The study further assigned MET values to physical activity levels such that those below 600METs/min/wk were indicative of low physical activity; METs between 600 – 3000 METs/min/wk reflected moderate physical activity level; and values above 3000 METs/min/wk reflected vigorous physical activity.

The researcher further sought to determine the number of students that met the recommended daily physical activity. According to WHO (2020), children and adolescents aged between 5 and 17 years should participate in moderate to vigorous physical activity (MVPA) for an average of 60 minutes every day. To achieve this objective, the researcher calculated METS scores using the following cut-off levels:

- (i) Moderate physical activity (MPA) of 60 minutes daily corresponding to 1680 METs/min/wk ( $60 \text{ min} \times 7 \text{ days/week} \times 4 \text{ MET}$ ) and
- (ii) Moderate to vigorous intensity physical activity (MVPA) of 60 minutes daily corresponding to 2520 METs/min/wk ( $60 \text{ min} \times 7 \text{ days/week} \times 6 \text{ MET}$ ).

One type of sedentary behaviour that was reported using IPAQ was the amount of time spent sitting by students while in school. This question about sitting was an additional variable that was not included as part of any PA score. Total sitting time was accumulated during classes, while doing assignment and during personal study time. The Sitting question is an additional indicator variable to reflect time spent sitting instead of engaging in activities that leads to expenditure of energy.

The second objective of the study was to examine the determinants of physical activity among students in public boarding secondary schools in Nairobi City County, Kenya. To meet this objective, the researcher used determinants of physical activity that were categorized into eleven determinant areas of students' knowledge about recommended physical activity, school PA resources, motivation and goals, belief about capability, skills, attitude, social influence, belief about consequences, action planning, coping planning and goal conflicts. Under each determinant area, the researcher presented three items on a four point Likert scale except for one with four items. The scale

ranged from 1 to 4 with 1 representing strongly disagree, 2 denoting disagree, 3 agree and 4 strongly agree. The midpoint of the scale was a mean score of 2.5. Therefore, a mean score of above 2.5 signified that the respondents were in agreement with the items while mean score of below 2.5 denoted that respondents were in disagreement with the items on the scale. Total proportion of respondents either agreeing or disagreeing on an item categorizes a determinant as an facilitator or a barrier to PA participation.

The third objective of the study was to assess the relationship between physical activity levels across demographic characteristics of students and environmental profile of public boarding secondary schools in Nairobi City County, Kenya. To address the part of demographic characteristics of students, the researcher used reported PA levels and proportion of those meeting recommended PA across gender, level of study and school status. To address part of environmental profile of public boarding secondary schools, the researcher presented the school principals with a check list containing 17 items measuring schools' PA facilities, equipment and Co-Curriculum policy. The check list was categorised in terms of playing fields criteria with six items, equipment criteria with seven items while PA co-curricular policies criteria had four items. In each item, principals were required to indicate their responses using a "Yes" or "No" to indicate whether the institution meets the criteria.

The fourth objective of the study was to investigate the moderating influence of physical activity determinants on the relationship between environmental profile and physical activity levels (PALs) among the students in public boarding secondary schools in Nairobi City County. The assumption underlying this objective was that

environmental profile (X) is correlated with physical activity levels (Y) because it influences changes in physical activity determinants (the mediating variable, (M) and then the mediating variable causes changes in physical activity levels. Presented below is the criterion for establishing mediation, as summarized by Howell (2013).

- X must be correlated with Y (Physical activity levels [PAL]).
- X (Environmental profile) must be correlated with M (Physical activity determinants[PAD]).
- M (PAD) must be correlated with Y(PAL), holding constant any direct effect of X on Y.

When the effect of M (PAD) on Y (PAL) is removed, X (Environmental profile) is no longer correlated with (PAL) Y (complete mediation) or the correlation between X (Environmental profile) and Y (PAL) is reduced (partial mediation).

### **3.11.2 Data Analysis**

Descriptive statistics including means, percentages, frequency and standard deviations were used to describe PA levels, determinant areas and environmental profile of schools. Chi-square was used to establish relationship among categorical variables. Chi square was used to determine the association between physical activity levels and PA recommendation across student socio-demographic characteristics such as gender, level of study (class) and school status.

The researcher also compared PA levels and recommendations across environmental profile of public secondary schools such as PA equipment, facilities and PA Co-Curricular policies. One way ANOVA was used to compare means for three or more variables. Further, Pearson Product Moment Correlation and Multiple regression



analysis were used to measure the moderating influence of PA determinants on the relationship between environmental profile and PA levels. Pearson Product Moment Correlation was used to test the relationship among variables. The main goal of using PPMC test was to quantify the strength and the relationship between the independent variables (PA determinants and environmental profile) and the dependent variable (Physical Activity). The assumptions made were that both variables were continuous and they had an association.

Multiple regression analysis on the other hand was used to measure the relationship between two or more independent variables and one dependent variable. The assumptions made were that there exists a linear relationship between the independent variables,  $x$ , and the dependent variable,  $y$ . The other assumption made was that the data follows a normal distribution. To determine whether these assumptions were met, the researcher used a scatter plot diagram to obtain coefficient of correlation. The level of significance was set at  $\leq 0.05$ . Results were presented in tables, charts and graphs.

### **3.12 Logistical and Ethical Considerations**

Research approval was obtained from Kenyatta University Graduate School, (Appendix B). Ethical clearance was sought from Kenyatta University Ethics Review Committee (KU/ERC) (Appendix C). A research permit was obtained from National Council for Science, Technology and Innovation (NACOSTI) (Appendix D). A research authorization letter was obtained from State Department of Early Learning and Basic Education, County Director of Education (CDE) (Nairobi Region) offices for the school Principals (Appendix E).

In the absence of the parents or parent designated guardians, the school Principals or the class teachers were requested to sign the Guardian's informed consent to allow their student to participate in the study (Appendix F). Schools' authority takes over the guardianship of students in absence of parents as is the case of boarding schools in some activities that are non-invasive with no risks involved.

Once the guardian's consent was obtained, the researcher informed the participants about the purpose of the study and explained the procedures to be followed. The researcher assured the participants that any information from the research will be used for the sole purpose of the study or research publication thereafter and that their personal details or information would remain confidential. The participants then signed the participant informed assent form (Appendix G).

## CHAPTER FOUR: FINDINGS AND INTERPRETATION OF RESULTS

### 4.1 Introduction

The over-all objective of the study was to determine physical activity levels and factors that influence physical activity among students in public boarding secondary schools in Nairobi City County. This chapter is organized into five parts. The first part of this chapter consists of demographic characteristics of the respondents. The remaining four sections contain findings of the study based on the following specific research objectives that guided the study. These were to:

- (i) Establish physical activity levels among students in public boarding secondary schools in Nairobi City County, Kenya.
- (iii) Examine the determinants of physical activity among students in public boarding secondary schools in Nairobi City County, Kenya.
- (iv) Assess the relationship of physical activity levels across socio-demographic characteristics of students and environmental profile of public boarding secondary schools in Nairobi City County, Kenya, and
- (v) Investigate the moderating influence of physical activity determinants on the relationship between environmental profile and physical activity levels.

Questionnaires were used to collect data from the 408 selected participating student sample from the six sampled public boarding schools in Nairobi City County. As can be noted in Table 4.1, of the 408 originally selected participants, 391 (95.8%) participants completed the questionnaires, provided adequate data regarding physical activity levels and determinants of this physical activity level. The observation

checklists, used to gather information regarding the status of PA facilities, PA equipment and PA co-curricular policy were completed based on the accounts of school principals of the six sampled public boarding schools in Nairobi City County. The addition of the six heads of schools or school Principals or PE teachers, who were the respondents in the checklists group, brought the total to 397 respondents. The combined students and school principals (PE teachers) return total translated to a 95.9% return rate.

**Table 4.1: Distribution of Study Participants**

Type	school status	Principal (PE Tutor)	N				Total	%
			1	2	3	4		
National	Girls'	1	17	17	17	16	68	<b>16.43</b>
	Boys'	1	16	17	17	17	68	<b>16.43</b>
Extra- County	Girls'	1	16	16	16	16	65	<b>15.70</b>
	Boys'	1	16	16	17	16	66	<b>15.94</b>
County	Girls'	1	16	16	16	16	65	<b>15.70</b>
	Boys'	1	16	16	16	16	65	<b>15.70</b>
<b>Total</b>		<b>6</b>	<b>97</b>	<b>99</b>	<b>99</b>	<b>96</b>	<b>397</b>	<b>95.90</b>

#### 4.2 Demographic Characteristics of the Respondents

The information captured in this section includes gender, level of study (class) in the school, and the school type.

The distribution of participants by gender is presented in Table 4.2.

**Table 4.2: Participant Distribution by Gender**

<b>Gender</b>	<b>n</b>	<b>Percent</b>
Male	196	50.1
Female	195	49.9
<b>Total</b>	<b>391</b>	<b>100</b>

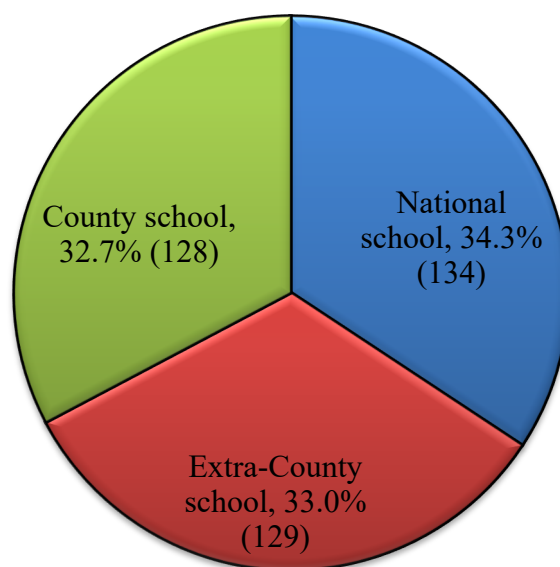
As shown in Table 4.2, 50.1% (196) of the students who took part in the study were males while 49.9% (195) were females.

The distribution per level of study (class) was such that 24.8% (97) students were in form one, 25.3% (99) were in form two, 25.3% (99) were in form three and 24.6% (96) were in form four. Table 4.3 shows students' distribution by level of study (class).

**Table 4.3: Student Distribution by Level of Study or Class**

<b>Form</b>	<b>Age</b>	<b>n</b>	<b>Percent</b>
Form 1	14	97	24.8
Form 2	15	99	25.3
Form 3	16	99	25.3
Form 4	17	96	24.6
<b>Total</b>		<b>391</b>	<b>100</b>

The study also considered the three types of schools in the recruitment exercise. Figure 4.1 Illustrates that 34.3% (134) students were from National schools, 33.0% (129) were from Extra-County schools and 32.7% (128) were from County schools.



**Figure 4.1: Distribution of Participants by Type of School**

### 4.3 Physical Activity Levels among Students

The shorter version of the IPAQ was used to establish physical activity levels of the participants in public boarding secondary schools in Nairobi City County, Kenya.

Table 4.4 shows the physical activity level of participants in the sampled schools.

**Table 4.4: Reported PA Volumes of the Study Participants**

PA Volumes	Yes		No	
	n	%	n	%
Vigorous	318	81.3	73	18.7
Moderate	331	84.7	60	15.3
Walking	391	100.0	0	0.0
Sitting	391	100.0	0	0.0

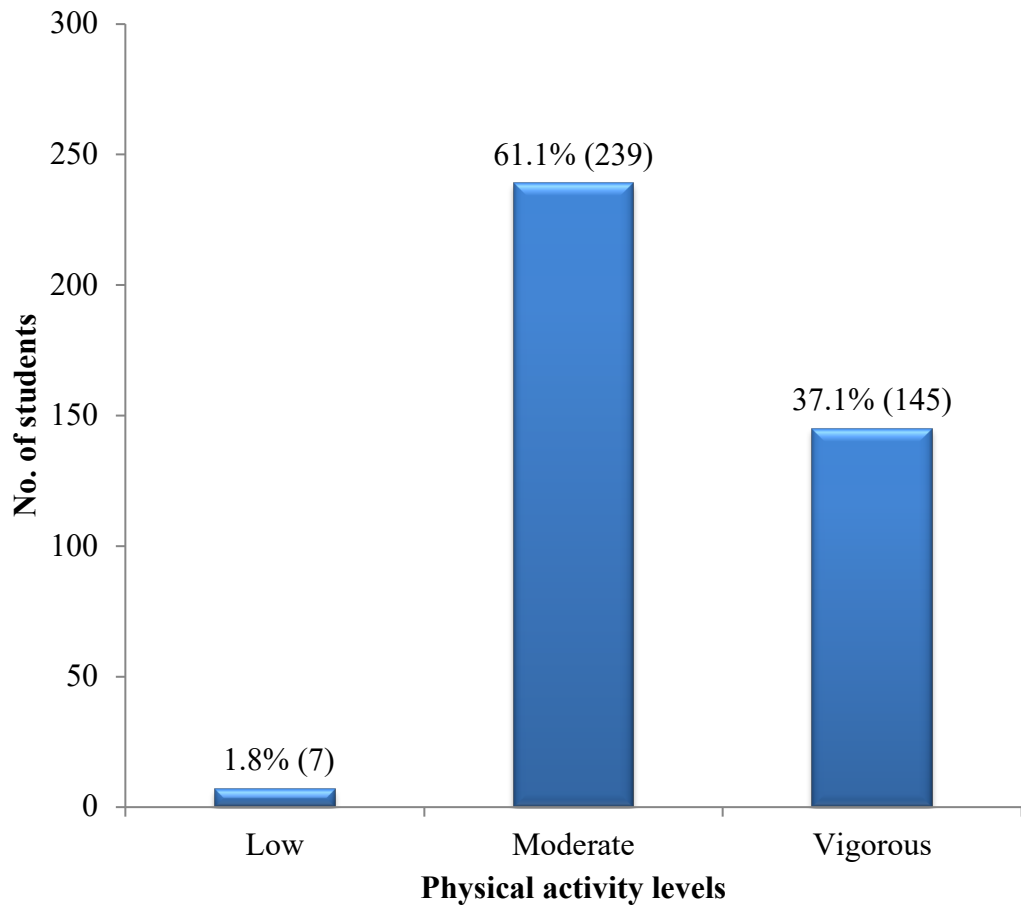
Results of time spent on physical activities in the last 7 days indicated that 81.3% (318) of the students engage in vigorous activities and 84.7% (331) engage in moderate intensity activities for at least more than 10 minutes. The results also revealed that all 100% (391) students reported participating in walking activities for at least 10 minutes at a time in the last 7 days. Results also show that during the last 7 days, all 391 participants spent time sitting on weekdays while in the classroom, dormitory, doing assignments or during leisure time.

In order to better classify the reported physical activity volumes into levels or categories, scores were converted to METs. Table 4.5 shows the converted descriptive physical activity levels to their Metabolic Equivalent of Tasks (METs), a more objective measure of the rate at which a person expends energy.

**Table 4.5: Levels of Physical Activity using Total Mets/Min/Wk**

<b>Total</b>	<b>n</b>	<b>%</b>	<b>Categories or</b>
<b>METs/minutes/week</b>			<b>Levels</b>
Less than 600	7	1.8	Low
601-3000	239	61.1	Moderate
Above 3000	145	37.1	Vigorous
<b>Total</b>	<b>391</b>	<b>100</b>	

Based on the categorization in Table 4.5 and the results presented in Figure 4.2, show that 61.1% (239), making up the majority of the students, engage in moderate intensity activities.



**Figure 4.2: Physical Activity Levels**

#### **4.3.1 Recommended Physical Activity for Adolescents**

The researcher sought to establish the proportion of students who attained the recommended moderate physical activity (MPA) of 1680 METs and 2520 METs of MVPA as presented in Tables 4.6 and 4.7. In Table 4.6, results indicate that 74.4% (291) of the students met the least recommended physical activity level at 1680 METs/min/wk of moderate intensity and duration for active lifestyle daily while 25.6% (100) students did not meet this minimum level.



**Table 4.6: Students Meeting MPA of 1680 METs/min/wk**

<b>MPA of</b>	<b>n</b>	<b>%</b>
<b>1680 METs/min/wk</b>		
Students who met the METs level of 1680 METs/minutes/week.	291	74.4
Students who did not meet 1680 METs/minutes/week	100	25.6
<b>Total</b>	<b>391</b>	<b>100</b>

Table 4.7 shows the proportion of students who met moderate to vigorous physical activity of 2520 METs/min/wk. Only 47.6% (186) of the students met the recommended MVPA of an average of 60 minutes daily for youth and children aged 6-17 years; while 52.4% (205) or just over half did not meet the recommended level of MVPA for physical active lifestyle.

**Table 4.7: Students Meeting MVPA of 2520 METs/min/wk**

<b>MVPA of 2520 METs/min/wk</b>	<b>n</b>	<b>%</b>
Met the recommended MVPA of 2520 METs/minutes/week	186	47.6
Did not meet the recommended MVPA of 2520 METs/minutes/week	205	52.4
<b>Total</b>	<b>391</b>	<b>100</b>

#### 4.4 Sitting Time

The researcher sought to establish the amount of sitting time reported by the students during weekdays. Table 4.8 shows the amount of time participants spent in sitting.

**Table 4.8: Sitting Time**

<b>Sitting time</b>	<b>n</b>	<b>Percentage (%)</b>
0 hours-4 hours and 30 minutes	14	3.6
4 hours and 31 minutes-7 hours and 30 minutes	88	22.5
Above 7 hours and 31 minutes	289	73.9
<b>Total</b>	<b>391</b>	<b>100</b>

As shown in Table 4.8, 73.9% (289) constituting the majority of the students, reported spending more than 7 hours and 31 minutes sitting; while 22.5% (88) spent between 4 hours and 31 minutes to 7 hours and 30 minutes sitting. Just 3.6% (14) of the students indicated that they spent less than 4 hours and 30 minutes sitting during weekdays.

#### 4.5 Determinants of Physical Activity among Students

The second objective of the study was to examine the determinants of physical activity among students in public boarding secondary schools in Nairobi City County, Kenya. Several determinant factors were examined.

#### 4.5.1 Knowledge of Current PA Guidelines

Results relating to the participants knowledge about recommended physical activity guidelines were computed as frequencies, percentages, means and standard deviations and are presented in Table 4.9.

**Table 4.9: Student’s Knowledge of Current to PA Guidelines**

<b>Knowledge</b>		<b>SA</b>	<b>A</b>	<b>D</b>	<b>SD</b>	<b>Mean</b>	<b>SD</b>
I do not have any information on the current PA guidelines for adolescents	<b>f</b>	122	160	74	35	2.94	0.93
	<b>%</b>	31.2	40.9	18.9	9.0		
I don’t know the reason why I should meet recommended PA?	<b>f</b>	79	189	85	38	2.79	0.88
	<b>%</b>	20.2	48.3	21.7	9.7		
I know the recommended levels of PA in children and adolescents aged 12-17 years?	<b>f</b>	100	157	108	26	2.15	0.88
	<b>%</b>	25.6	40.2	27.6	6.6		

**Key: SA-Strongly agree, A-Agree, D-Disagree, SD – Strongly Disagree**

As shown in Table 4.9, the mean scores obtained from responses given by the students ranged from  $2.15 \pm 0.88$  to  $2.94 \pm 0.93$ . The students’ responses were in agreement with two statements in this determinant area with means of  $2.94 \pm 0.93$  and  $2.79 \pm 0.88$ , that “I do not have any information on the current PA guidelines for adolescents” and “I don’t know the reason why I should meet the recommended PA” respectively. However the students’ responses disagreed with the statement (mean of  $2.15 \pm 0.88$ ) that was lowest ranked that “I know the recommended levels of PA for children and adolescents aged between 12 and 17 years”. It was also evident that majority, 72.1%

(strongly agree 31.2% and agree 40.9%) of the students did not have information of the current PA guidelines for adolescents.

Most students comprising 68.5% (strongly agree 20.2% and agree 48.3%) were not aware why they should meet the recommended PA. However, only a small proportion of 34.2% (disagree 27.6% and strongly agree 6.6%) of students were aware about the current recommended PA guidelines for children and adolescents. Thus, implying that lack of knowledge about physical activity recommendations and benefits work as a barrier to the students' participation in physical activities.

#### 4.5.2 School Physical Activity Resources

Table 4.10 depicts students' responses relating to physical activity resources.

**Table 4.10: School Physical Activity Resources**

School PA resources		SA	A	D	SD	mean	SD
Facilities are readily obtainable to you to do PA	f	129	162	55	45	2.96	0.97
	%	33.0	41.4	14.1	11.5		
There are no facility to do PA near me	f	28	42	170	151	1.86	0.87
	%	7.2	10.7	43.5	38.6		
My school is not appealing and this puts me off from PA.	f	34	48	124	185	1.82	0.96
	%	8.7	12.3	31.7	47.3		

**Key: SA-Strongly agree, A-Agree, D-Disagree, SD – Strongly Disagree**

Results indicate the means and standard deviations obtained on the scale measuring school' PA resources. The students' responses were in agreement with highest ranked

item that “facilities are readily obtainable to you to do PA ” with a mean of  $2.96 \pm 0.97$ . However, the students’ responses disagreed with the other two items with means of  $1.86 \pm 0.87$  and  $1.82 \pm 0.96$  that “There are no facility to do PA near me” and “my school is not appealing and this puts me off physical activities ” respectively. It is evident that majority, 74.4% (strongly agree 33.0% + agree 41.4%) of the students indicated that PA facilities were readily obtainable in schools. Another 82.1% (disagree 43.5% and strongly disagree 38.6%) of the students reported that there are facilities to do PA near them and 79.0% (disagree 31.7% and strongly disagree 47.3%) also reported that their respective schools are appealing for them to do PA. Thus, making the school PA resources appealing to the students and this facilitates student’s participation in physical activities.

#### 4.5.3 Student Motivation and Goals towards Physical Activity

Table 4.11 presents results about students’ motivation and goals towards physical activity.

**Table 4.11: Students’ Motivation and Goals**

Students’ Motivation and Goals		SA	A	D	SD	mean	SD
I would like to do PA	<b>f</b>	210	153	16	12	3.43	0.72
	<b>%</b>	53.7	39.1	4.1	3.1		
I feel encouraged to do PA	<b>f</b>	141	182	45	23	3.13	0.84
	<b>%</b>	36.1	46.5	11.5	5.9		
I am not interested to do PA	<b>f</b>	20	20	177	174	1.71	0.79
	<b>%</b>	5.1	5.1	45.3	44.5		

**Key: SA-Strongly Agree, A-Agree, D-Disagree, SD – Strongly Disagree**

Highest ranked items with means of  $3.43 \pm 0.72$  and  $3.13 \pm 0.84$ , indicate that students' responses agreed with the statements that "I would like to do physical activities" and "I feel encouraged to do in physical activities" respectively. However, the students' responses disagreed with the item that "I am not interested to do PA". It is clear from Table 4.11 that majority, 92.8% (strongly agree 53.7% + agree 39.1%), 82.6% (strongly agree 36.1% + agree 46.5%) and 89.8% (disagreed 45.3% + strongly disagree 44.5%) of the students would like to do PA, they feel encouraged and have interest to do PA. Thus, indicating that intentions and reinforcement of PA facilitates PA participation since most of the students were encouraged and interested in participating in physical activities.

#### 4.5.4 Student Belief about Personal Capability in Physical Activity

Presented in Table 4.12 are the results of students' responses concerning their beliefs about their capability in physical activities.

**Table 4.12: Student Belief about Personal Capability in PA**

<b>Belief about capability</b>		<b>SA</b>	<b>A</b>	<b>D</b>	<b>SD</b>	<b>mean</b>	<b>SD</b>
It is difficult to do PA when others are better than me in PA	<b>f</b>	72	115	109	95	2.42	1.05
	<b>%</b>	18.4	29.4	27.9	24.3		
When doing PA I don't feel confident	<b>f</b>	38	50	149	154	1.93	0.95
	<b>%</b>	9.7	12.8	38.1	39.4		
Doing PA puts me off and this makes me feel embarrassed	<b>f</b>	15	47	144	185	1.72	0.82
	<b>%</b>	3.8	12.0	36.8	47.3		

**Key: SA-Strongly Agree, A-Agree, D-Disagree, SD – Strongly Disagree**

As shown in Table 4.12, the mean scores regarding the student belief about personal capability in PA ranged from  $1.72 \pm 0.82$  to  $2.42 \pm 1.05$ . Students' responses disagreed with all the three items that "it is difficult to do PA when others are better than me" (mean of  $2.42 \pm 1.05$ ) while the lowest ranked statement indicating "Doing PA puts me off and this makes me feel embarrassed" had a mean of  $1.72 \pm 0.82$ ). These findings reveal that majority of the students 52.2% (disagree 27.9% and strongly disagree 24.3%), 77.5% (disagree 38.1% and strongly disagree 39.4%) as well as 84.1% (disagree 36.8% and strongly disagree 47.3%) indicated they have no difficult in doing PA, are confident and not embarrassed nor did doing physical activities puts them off respectively. Thus, students perceived competence in PA facilitates participation in physical activities.

#### 4.5.5 Students' Skills in Physical Activity

Table 4.13 presents results of students' responses regarding their skill capability for participating in PA.

**Table 4.13: Students' Skills in PA**

Skills		SA	A	D	SD	mean	SD
I can do PA very well	f	156	126	85	24	3.06	0.93
	%	39.9	32.2	21.7	6.1		
I have never been interested in sport skills, so I don't do PA	f	25	34	149	183	1.75	0.87
	%	6.4	8.7	38.1	46.8		
I don't have the skill to be in any PA session	f	29	34	144	184	1.76	0.90
	%	7.4	8.7	36.8	47.1		

**Key: SA-Strongly agree, A-Agree, D-Disagree, SD – Strongly Disagree**

Results show the mean scores obtained on the scale measuring students' skills in PA ranged from  $1.75 \pm 0.87$  to  $3.06 \pm 0.93$ . The students' responses were in agreement with item ( mean of  $3.06 \pm 0.93$ ) that "I can do PA very well" but disagreed with the other two items with means of  $1.76 \pm 0.90$  and  $1.75 \pm 0.87$ . From these findings, it emerged that majority of students, 72.1% (strongly agreed 39.9% and agreed 32.2%), 84.9% (disagree 38.1% and strongly disagree 46.8%) and 83.9% (disagree 36.8% and strongly disagree 47.1%) indicated that they can do PA very well, have interest in sport skills, and they have the skills to be in any PA session. Thus competency, interest and ability of students to do PA, facilitates participation in physical activities.

#### 4.5.6 Students' Attitude towards Physical Activity

Frequency counts, percentages, means and standard deviations obtained on the scale measuring students' attitude towards PA are presented in Table 4.14.

**Table 4.14: Students' Attitude about PA**

Attitude		SA	A	D	SD	mean	Std.D
I feel am very busy for PA on daily basis	f	75	118	130	68	2.51	0.99
	%	19.2	30.2	33.2	17.4		
I lack interest in PA which prevents me from doing PA	f	28	71	153	139	1.97	0.91
	%	7.2	18.2	39.1	35.5		
PA sessions are stressful	f	24	45	139	183	1.77	0.88
	%	6.1	11.5	35.5	46.8		

**Key: SA-Strongly agree, A-Agree, D-Disagree, SD – Strongly Disagree**



The mean scores obtained ranged from  $1.77 \pm 0.88$  to  $2.51 \pm 0.99$ . Students' responses were in agreement with the statement that "I feel am very busy for PA on daily basis" (mean of  $2.51 \pm 0.99$ ) however they disagreed with the other two items. Although nearly half, 49.4% (strongly agree 19.2% and agree 30.2%) of the students reported that they are busy for PA on a daily basis, majority 74.6% (disagree 39.1% and strongly disagree 35.5%) and 82.3% (disagree 35.5% and strongly disagree 46.8%) of them were interested in PA and they did not consider PA sessions stressful. Thus, students' attitude toward PA was positive but perceived lack of time as a barrier toward PA participation.

#### 4.5.7 Students' Social Influence towards Physical Activity

The researcher further sought to establish the influence of students' social aspects on their participation in physical activity. The findings of this analysis are presented in Table 4.15.

**Table 4.15: Social Influences on Student PA**

Social influence		SA	A	D	SD	mean	SD.
People around me are not interested in PA even during free time	f	82	114	119	76	2.52	1.03
	%	21.0	29.2	30.4	19.4		
My friends are not supportive of or encourage my PA	f	57	82	153	99	2.25	0.99
	%	14.6	21.0	39.1	25.3		
I find am all alone doing PA	f	43	53	170	125	2.04	0.95
	%	11.0	13.6	43.5	32.0		

**Key: SA-Strongly agree, A-Agree, D-Disagree, SD – Strongly Disagree**

The mean scores obtained on the scale measuring the social influence on students towards PA ranged from  $2.04 \pm 0.95$  to  $2.52 \pm 1.03$ . Students' responses were in agreement with the statement that "people around them are not interested with PA even during free time" (mean of  $2.52 \pm 1.03$ ) but disagreed with the other two items with means of  $2.25 \pm 0.99$  and  $2.04 \pm 0.95$ . Half of the students 50.2% (strongly agree 21.0% and agree 29.2%) indicated that people around them lack interested in PA even during free time.

However, majority of the students 64.4% (disagree 39.1% and strongly disagree 25.3%) and 75.5% (disagree 43.5% and strongly disagree 32.0%) feel supported by their friends and they have company while doing PA. Though most students reported that they have company doing PA and they are supported by friends, they feel people around them lack interest in PA during leisure time. Thus, lack of interest toward physical activities among people who surround students, presents students' the social influence as a barrier toward PA participation.

#### **4.5.8 Student Belief about Benefits of Physical Activity**

Results concerning the students' belief about benefits related to participation in physical activity are presented in Table 4.16.

**Table 4.16: Belief about the PA Benefits**

<b>Belief about consequences</b>		<b>SA</b>	<b>A</b>	<b>D</b>	<b>SD</b>	<b>mean</b>	<b>SD.</b>
In doing PA, we get long term benefits such as live longer, lose weight, strong bones	<b>f</b>	247	118	15	11	3.54	0.70
	<b>%</b>	63.2	30.2	3.8	2.8		
I believe PA will have positive changes in my life	<b>f</b>	243	116	15	17	3.50	0.77
	<b>%</b>	62.1	29.7	3.8	4.3		
In doing PA, we get short term benefits such as burning calories, sleep better	<b>f</b>	163	109	66	53	2.98	1.06
	<b>%</b>	41.7	27.9	16.9	13.6		

**Key: SA-Strongly agree, A-Agree, D-Disagree, SD – Strongly Disagree**

The means obtained ranged from  $2.98 \pm 1.06$  to  $3.54 \pm 0.70$ . The students' responses were in agreement with all three statements in this determinant area. The findings indicate that majority of the students 93.4% (strongly agree 63.2% and agree 30.2%), 69.6% (strongly agree 41.7% and agree 27.9%) and 91.8% (strongly agree 62.1% and agree 29.7%) are aware that, in doing PA they get long term and short term benefits as well as positive changes in life. Thus, indicating that overall, majority of the students were aware of the benefits related to participation in physical activities which facilitates PA participation.

#### **4.5.9 Students' Physical Activity Action Planning**

The findings regarding the students' plan of action for PA are presented in Table 4.17. Frequencies, percentages, means and standard deviations of participants are based on the scale measuring their PA action planning.

**Table 4.17: Students' PA Action Planning**

Action planning		SA	A	D	SD	mean	SD.
I will choose what is needed for my PA to happen e.g. Costumes, shoes, equipment	f	143	178	56	14	3.15	0.79
	%	36.6	45.5	14.3	3.6		
I will choose where to do PA	f	115	222	36	18	3.11	0.75
	%	29.4	56.8	9.2	4.6		
I will not choose what time to engage in PA e.g. 4:30pm	f	39	79	204	69	2.23	0.85
	%	10.0	20.2	52.2	17.6		
I will not choose the type of PA to engage in e.g. Football, basketball, running, swimming	f	41	50	178	122	2.03	0.93
	%	10.5	12.8	45.5	31.2		

**Key: SA-Strongly agree, A-Agree, D-Disagree, SD – Strongly Disagree**

The means scores presented in Table 4.17 ranged from  $2.03 \pm 0.93$  to  $3.15 \pm 0.79$ . Students' responses were in agreement with the first two items in this determinant area with means of  $3.15 \pm 0.79$  and  $3.11 \pm 0.75$  and disagreed with the other two items. From these findings, it emerged that the majority 82.1% (strongly agree 36.6% and agree 45.5%) of students choose what is needed for PA to happen. Further 86.2%, (strongly agree 29.4% and agree 56.8%) of the students choose where to do PA and 69.8% (disagree 52.2% and strongly disagree 17.6%) of students choose the time to engage in PA. Additional 76.7% (disagree 45.5% and strongly disagree 31.2%) of the students would choose the type of PA to engage in. Thus, linking goal directed behaviour toward achieving physical activity in which students choose the type of PA,

materials and equipment required, the venue and time to do physical activities facilitates PA.

#### 4.5.10 Student Plan for Coping with PA Obstacles

Table 4.18 illustrates students' responses on the scale measuring their PA coping planning.

**Table 4.18: Student Plan for Coping with PA Obstacles**

<b>Coping planning</b>		<b>SA</b>	<b>A</b>	<b>D</b>	<b>SD</b>	<b>mean</b>	<b>SD</b>
I easily deviate from the planned PA	<b>f</b>	30	72	172	117	2.96	0.89
	<b>%</b>	7.7	18.4	44.0	29.9		
I purpose to engage in PA planned despite any difficult situations	<b>f</b>	57	94	145	95	2.71	0.99
	<b>%</b>	14.6	24.0	37.1	24.3		
Despite obstacles encountered, am focused to do PA	<b>f</b>	48	154	147	42	2.47	0.84
	<b>%</b>	12.3	39.3	37.6	10.7		

**Key: SA-Strongly agree, A-Agree, D-Disagree, SD – Strongly Disagree**

The mean scores obtained for student plan for coping with obstacles to PA ranged from  $2.47 \pm 0.84$  to  $2.96 \pm 0.89$ . Students' response were in agreement with the first two items with means of  $2.96 \pm 0.89$  and  $2.71 \pm 0.99$  and disagreed with the statement that "despite obstacles encountered, am focussed to do PA" (mean of  $2.47 \pm 0.84$ ). The results revealed that few students 38.6% (strongly agree 14.6% and agree 24.0%) would still purpose to engage in planned PA when faced with difficult situations and only 48.3% (disagree 37.6% and strongly disagree 10.7%) of the students would

remain focussed to do PA when they encounter obstacles. However, only 26.1% (strongly agree 7.7% and agree 18.4%) of the students would easily deviate from the planned physical activities. Thus, students' mental preparation between anticipated situations and PA serves as a barrier as student lose focus and purpose for engaging in planned PA due to various obstacles or difficulties.

#### 4.5.11 Students' Goal Conflicts

Presented in Table 4.19 are the students' responses concerning PA and conflicts.

**Table 4.19: Students' Goal Conflicts**

Goal conflicts		SA	A	D	SD	mean	SD
I would not sacrifice time for socializing with my friends for PA	f	62	93	144	92	2.81	0.99
	%	15.9	23.8	36.8	2.81		
I would not sacrifice work or friendship to do PA	f	82	113	122	74	2.71	0.99
	%	21.0	28.9	31.2	18.9		
I would sacrifice my leisure time for PA	f	110	148	82	51	2.52	1.03
	%	28.1	37.9	21.0	13.0		

**Key: SA-Strongly agree, A-Agree, D-Disagree, SD – Strongly Disagree**

The findings presented in Table 4.19 indicate that the mean scores obtained ranged from  $2.52 \pm 1.03$  to  $2.81 \pm 0.99$ . Students' responses were in agreement with all the three items presented with means above 2.50. At 39.7%, nearly half of the students (strongly agree 15.9% and agree 23.8%) would not sacrifice their time for socializing with friends to engage in physical activities. Additionally, 49.9% (strongly agree

21.0% and agree 28.9%) would not sacrifice their work or friendship to engage in physical activities. However, majority of students 66.0% (strongly agree 28.1% and agree 37.9%) would sacrifice leisure time for PA. Thus, the student's inability in dealing with other existing interests competing simultaneously with PA, serve as a barrier to participation in physical activities.

#### **4.6 Relationship between PAL across School Environment and Students' Characteristics**

##### **4.6.1 Physical Activity Levels across Demographic Characteristics**

Chi-square analysis was conducted to compare physical activity levels across demographic characteristics of study participants. The researcher cross tabulated gender, level of study (class) and the school type with physical activity levels, the dependent variable of the study.

##### **4.6.1.1 Association between PAL and Gender**

Table 4.20 presents results for physical activity levels by students' gender.

**Table 4.20: Physical Activity Levels across Students' Gender**

Physical activity levels	Gender				Total		Chi-square statistics
	Male		Female		n	%	
	n	%	n	%			
Low	2	0.5	5	1.3	7	1.8	$\chi^2=35.44$ P value 0.000
Moderate	93	23.8	146	37.3	239	61.1	
Vigorous	101	25.8	44	11.3	145	37.1	
<b>Total</b>	<b>196</b>	<b>50.1</b>	<b>195</b>	<b>49.9</b>	<b>391</b>	<b>100</b>	

\*Significant at  $p < 0.05$  level

Chi-square results revealed that gender had a significant association with levels of physical activities among the students,  $\chi^2 = 35.44$ , p value as  $p = 0.000$ . Specifically, out of the 7 students whose level of engagement in physical activities was low, 0.5% (2) were male students and 1.3% (5) were female students. Among the 239 students with moderate intensity engagement in PA, 23.8% (93) were males and 37.3% (146) were females.

Results further showed that 25.8% (101) of the male students and 11.3% (44) of the female students were engaged in vigorous physical activities. This implies that while majority of the female students were engaged in moderate physical activities, most of the male students were engaged in vigorous physical activities.



#### 4.6.1.2 Association between Recommended PA and Gender

**Table 4.21: Recommended Physical Activity and Gender**

Gender	Met recommended MVPA of 2520 METs/min/wk		Did not meet recommended level		Total	Chi-square statistics	
	n	%	n	%		$\chi^2=$	P
Girls	61	31.3	134	68.7	195	45.14	value 0.001
Boys	125	63.8	71	36.2	196		
<b>Total</b>	<b>186</b>	<b>47.6</b>	<b>205</b>	<b>52.4</b>	<b>391</b>		

\*Significant at  $p < 0.05$  level

The Chi-square results  $\chi^2 = 45.14$ ; P value as  $p = 0.001$ , indicates that gender had a significant relationship with students meeting recommended physical activity levels. More boys, comprising 63.8% (125), meet the recommended physical activity levels of 60 minutes of MVPA daily compared to the 31.3% (61) among the girls. Consequently, the study also revealed that a higher percentage of girls 68.7% (134) did not meet the recommended level of MVPA of 2520 METs/min/week compared to the 36.2% (71) of boys.

#### 4.6.1.3 Association between PAL and Level of Study (class)

The researcher further sought to determine whether students from different classes or level of study differed in their level of engagement in physical activities. Results of chi square analysis are presented in Table 4.22.

**Table 4.22: Students' PAL in different Levels of Study (class)**

Level of study  (Class)	Physical activity levels						Total		Chi-square statistics	
	Low		Moderate		Vigorous		n	%		
	n	%	n	%	n	%			n	%
<b>Form 1</b>	1	0.3	63	16.1	33	8.4	97	24.8	$\chi^2=6.58$ P value 0.361	
<b>Form 2</b>	1	0.3	65	16.6	33	8.4	99	25.3		
<b>Form 3</b>	1	0.3	56	14.3	42	10.7	99	25.3		
<b>Form 4</b>	4	1.0	55	14.1	37	9.5	96	24.6		
<b>Total</b>	<b>7</b>	<b>1.8</b>	<b>239</b>	<b>61.1</b>	<b>145</b>	<b>37.1</b>	<b>391</b>	<b>100</b>		

Not significant at  $p < 0.05$  level

As shown in Table 4.22, Chi-square  $\chi^2=6.58$ ; P value as  $P=0.361$  results showed that students' level of study had no significant relationship with their level of engagement in PA. Only 1.8% (7) proportion of students had a low level of PA compared to 61.1% (239) who had moderate intensity in PA while 37.1% (145) had PA of vigorous intensity. Of the 96 students in form four, only 1.0% (4) of the students had low level of PA, 14.1% (55) had moderate intensity while 9.5% (37) had vigorous intensity in PA engagement. This trend is clearly repeated in all other levels of study. The findings indicates that majority of the students in all levels of study in secondary school engaged in moderate intensity physical activities.

#### 4.6.1.4 Association between Recommended PA and Level of Study (class)

Further analysis, carried out to obtain the percentage of students who meet the recommended MVPA of 2520 METs/min/wk based on class or level of study is shown in Table 4.23.

**Table 4.23: Recommended PA in Relation to Level of Study (class)**

Level of study (class)	Met recommended MVPA of 2520 METs/min/wk		Did not meet recommended MVPA of 2520 METs/min/wk		Total	Chi-square statistics
	n	%	n	%		
	Form 1	44	44.9	53		
Form 2	47	48.5	52	51.5	99	P value 0.193
Form 3	49	49.5	50	50.5	99	
Form 4	46	47.4	50	52.6	96	
<b>Total</b>	<b>186</b>	<b>47.6</b>	<b>205</b>	<b>52.4</b>	<b>391</b>	

**Not significant at  $p<0.05$  level**

The chi-square results of  $\chi^2=4.721$  with P value as  $P=0.193$ , indicate that students' level of study or class had no significant relationship with the recommended PA levels. The percentage of students who met the recommended PA levels were all in the same range. Students who met the recommended MVPA of 2520 METs/min/week were 44.9% (44), 48.5% (47), 49.5% (49) and 47.4% (46) from Form one, two, three and four respectively. All levels of study had slightly over half of students not meeting the recommended MVPA of 2520METs/min/week

#### 4.6.1.5 Association between PAL and School Status

Table 4.24 depicts students' levels of engagement in physical activities across the school status.

**Table 4.24: Physical Activity Levels across School Status**

School status	Physical activity levels						Total	Chi-square statistics	
	Low		Moderate		Vigorous				
	n	%	n	%	n	%	n		%
National	0	0.0	72	18.4	62	15.9	134	34.3	$\chi^2=21.47$
Extra-County	2	0.5	73	18.7	54	13.8	129	33.0	P value 0.000
County	5	1.3	94	24.0	29	7.4	128	32.7	
<b>Total</b>	<b>7</b>	<b>1.8</b>	<b>239</b>	<b>61.1</b>	<b>145</b>	<b>37.1</b>	<b>391</b>	<b>100.0</b>	

\*Significant at  $p < 0.05$  level

Results presented in Table 4.24 show that school status of National, Extra-County and County, had a positive significant association with levels of physical activity,  $\chi^2 = 21.47$ , p value as  $p = 0.000$ . In particular, out of 134 students in National schools, none recorded low PA, 18.4% (72) engaged in MPA/Moderate Physical Activity while 15.9% (62) engaged in vigorous activities. Among the 129 students in Extra-County schools, 0.5% (2) had low level of engagement in PA, 18.7% (73) had moderate level of engagement and 13.8% (54) had vigorous level of physical activity.

Those in County schools, 1.3% (5) had low physical activity level in PA, 24.0% (94) had moderate PA and 7.4% (29) had vigorous physical activity level. Comparison of students' PA levels across the three school status, revealed that majority of the students in National and Extra-County schools engaged in vigorous physical activities while most of the students in County schools were engaged in moderate physical activities.

#### 4.6.1.6 Association between Recommended PA and School Status

The researcher further sought to investigate the percentage of students meeting the recommended MVPA of 2520 METs/min/week as stipulated in PA guidelines by World Health Organization. Table 4.25 depicts the data of recommended PA in relation to school status.

**Table 4.25: Recommended Physical Activity across School Type**

School status	Met MVPA of 2520 METs/min/wk		Not met MVPA of 2520 METs/min/wk			Chi-square statistics
	n	%	n	%	n	
	<b>National</b>	82	60.74	52	39.26	
<b>Extra-County</b>	68	53.12	61	46.88	129	
<b>County</b>	36	28.12	92	71.88	128	
<b>Total</b>	<b>186</b>	<b>47.57</b>	<b>205</b>	<b>52.43</b>	<b>391</b>	

Significant at  $p < 0.05$  level

Chi-square results  $\chi^2= 38.87$  with P value as  $P=0.001$  was recorded. This means that the status of the school had a positive significant association with recommended PA levels, with the highest levels reported among national schools. The number of students meeting the recommended MVPA levels were highest in National schools; decreased in Extra-County schools; and decreased even further in County schools. Over 60% (82) of students in National schools meet the recommended MVPA of 2520 METs/min/week, compared to 53% (68) in Extra-County and to a lower proportion of less than 30% (36) in County schools.

In summary, the study findings indicate that the socio-demographic characteristics of gender and school status among the students, have a significant relationship with physical activity levels and recommended physical activity, while the level of study or class do not. Therefore, null hypothesis one ( $H_{01}$ ), that expected no significant difference in physical activity levels in relation to socio-demographic characteristics of students in public boarding secondary schools in Nairobi City County, is rejected at  $p<0.05$  level of significance.

#### **4.6.2 Physical Activity Levels across Environmental Profile**

The second part of the third objective of the study was to compare physical activity levels across environmental profile of public boarding secondary schools in Nairobi City County, Kenya. The findings of the analysis are presented in Tables 4.26, 4.27, 4.28, 4.29, 4.30 and 4.31.

##### **4.6.2.1 Reported Status of School Playing Fields**

Table 4.26 illustrate principals' responses in relation to the status of the playing fields.

**Table 4.26: Status of the Playing Fields**

Playing fields	Yes		No	
	n	%	n	%
Playing field spacious to enable students to engage in activities safely.	3	50	3	50
School have all weather facilities to be used by the students when the playing fields are affected by the weather.	1	16.7	5	83.3
Field have flat surface and good condition.	3	50	3	50
Students have access to the playing fields.	4	66.7	2	33.3
Stationary objects on the playing fields well marked or clearly indicated restricted area.	2	33.3	4	66.7
Playing field adhere to all safety standards.	4	66.7	2	33.3

As shown in Table 4.26, Principals reported that over half of the schools' playing fields were spacious enough to enable students engage in activities safely, They had flat surfaces, were in good condition, they adhered to safety standards and all students had access to them. However, five out of six of the Principals indicated that there were no all-weather facilities available in their respective schools to be used by the students when playing fields were affected by the poor weather. Responses given by the school principals in the table shows that more than half of the schools indicated that stationary objects such as goal posts on the playing fields were not well marked.

#### 4.6.2.2 Reported Status of School Playing Fields by School Type

Table 4.27 Illustrates Principals' responses with regard to the status of the playing fields and school type.

**Table 4.27: School Type and Status of Playing Fields**

School status	National		Extra-County		County		f
	Boys'	Girls'	Boys'	Girls'	Boys	Girls'	
Spacious fields	Yes	Yes	Yes	-	-	-	3
All weather facility	Yes	-	-	-	-	-	1
Flat surface, good	Yes	Yes	-	-	Yes	-	3
Access to all students	Yes	-	Yes	-	Yes	Yes	4
Stationary objects marked	Yes	-	-	Yes	-	-	2
Adhere to safety standards	Yes	Yes	-	Yes	-	Yes	4
f	6	3	2	2	2	2	

Results in Table 4.27 indicate that only National boys' schools met all the six criteria for a playing fields, whereas, National girls' school met half of the criteria. All other school status of Extra-County and County schools, principals reported that only a third met the criteria for playing fields.



#### 4.6.2.3 Reported Status of School Playing Equipment

Table 4.28, Illustrates principals' responses with regard to the status of the playing equipment.

**Table 4.28: Status of the Playing Equipment**

Equipment	Yes		No	
	n	%	n	%
Equipment enough for the number of students if used at the same time.	0	0	6	100
Equipment well maintained and safe for use.	2	33.3	4	66.7
Is the equipment suitable for use by the students.	6	100	0	0.0
Equipment suitable for the age of the students.	6	100	0	0.0
Equipment durable for daily use and is it suitable for the playing fields.	5	83.3	1	16.7
Equipment well securely stored.	6	100	0	0.0
Equipment readily available to all students.	3	50	3	50

Results in Table 4.28 indicate that all six Principals from the sampled schools reported inadequate playing equipment relative to the number of students, especially when all students used the equipment at the same time. All six school principals reported that equipment was suitable for use, suitable for the age of the students; and that the equipment was well stored. Results in the table further revealed that five out of six of the principals agreed that the playing equipment was durable for daily use and was suitable for the playing fields. However, a third of the schools' principals reported

that school equipment was not well maintained and safe for use, while half of the principals reported that equipment was readily available to all students.

#### 4.6.2.4 Reported Status of Playing Equipment by School Type

School principals and schools results on criteria for playing equipment across school type are presented in Table 4. 29.

**Table 4.29: School Type and Status of Playing Equipment**

School status	National		Extra-C		County		f
	Boys	Girl	Boys	Girl	Boys	Girl	
Enough if used at the same time.	-	-	-	-	-	-	0
Well maintained and safe for use.	Yes	-	Yes	-	-	-	2
Suitable for use by the students.	Yes	Yes	Yes	Yes	Yes	Yes	6
Suitable for the age of the students	Yes	Yes	Yes	Yes	Yes	Yes	6
Durable for daily use and suitable for the playing fields.	Yes	Yes	Yes	Yes	Yes	-	5
Well securely stored.	Yes	Yes	Yes	Yes	Yes	Yes	6
Readily available to all students	Yes	Yes	-	Yes	-	-	3
<b>f</b>	<b>6</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>4</b>	<b>3</b>	

Results in Table 4.29 indicated that none of the schools from National, to Extra-County to County schools, had enough equipment for use by all students if used at the

same time. All schools from the three status provided equipment that was suitable for use, suitable for the age and well secured in proper stores. National boys' schools scored high on meeting the criteria for school playing equipment (six out seven criteria) while the Extra-County girls' schools scored low with only three of the seven criteria met. All girls' schools reported that equipment was not well maintained and therefore, not safe for use.

#### 4.6.2.5 Reported Status of School PA Co-Curricular Policy

Table 4.30 illustrates the Principals' responses regarding to school co-curricular activities.

**Table 4.30: Status of School PA Co-Curricular Policy**

School co-curricular policy	Yes		No	
	n	%	n	%
School have student leaders that oversee implementation of PA.	6	100	0	0.0
Short and long term goals in the implementation plan.	5	83.3	1	16.7
PA consider all students including students with special needs.	0	0	6	100
School provide appropriate support to staff.	3	50.0	3	50.0

As depicted in Table 4.30, all six Principals reported that their schools selected student leaders who oversee the implementation of physical activity; but none of the schools considered students with special needs, when planning for physical activities. It

further emerged that 5 out of 6 of the Principals agreed that there were short and long term goals in the implementation plan for physical activities. However, half number of the Principals confirmed that their respective schools did not provide appropriate support to the staff.

#### 4.6.2.6 Reported Status PA Co-Curricular Policy by School Type

Table 4.31 illustrates Principals' responses in relation to school type and the status of school PA policy and co-curricular activities.

**Table 4.31: School Type and Status of PA Co-Curricular Policy**

School status	National		Extra-County		County		f
	Boys'	Girls'	Boys'	Girls'	Boys'	Girls'	
Have student leaders that oversee PA.	Yes	Yes	Yes	Yes	Yes	Yes	<b>6</b>
Have short and long term goals in the plan.	Yes	Yes	Yes	Yes	Yes	-	<b>5</b>
PA including students with special needs	-	-	-	-	-	-	<b>0</b>
Have appropriate support to staff.	Yes	Yes	Yes	-	-	-	<b>3</b>
<b>f</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>	

Table 4.31 shows that no school from any of the three school status has PA that includes all students, including students with special needs. All schools from the three

status have students leaders to oversee the implementation of PA, as well as short and long term goals in implementation plan. Only National schools and Extra-County boys' schools accord appropriate support regarding PA to staff. County schools scored lower in meeting the criteria for PA, Co-curricular policy and leadership in schools. The girls' County schools scoring only one of the four criteria in this category.

#### 4.6.2.7 Comparison between PAL and School Environmental Profile

To compare physical activity levels (PAL) across environmental profile of public boarding secondary school students, the researcher conducted one way ANOVA and the results are presented in Table 4.32 and Table 4.33.

**Table 4.32: Descriptive Statistics on School Status across students' PAL**

Physical activity levels	N	Mean	Std. Deviation
Low	7	9.14	0.900
Moderate	239	10.22	1.913
Vigorous	145	11.58	2.463
<b>Total</b>	<b>391</b>	<b>10.70</b>	<b>2.227</b>

Results in Table 4.32 show that the mean scores and standard deviations concerning school environmental status differed across the students' levels of engagement in physical activities. In particular, students with low engagement level in physical activities obtained a mean score of 9.14 on aspects measuring school environmental status, those with moderate intensity level obtained a mean score of 10.22 while those with vigorous intensity level obtained a mean score of 11.58. This implies that school

environmental profile had a positive influence on students' engagement in physical activities. Table 4.33 shows ANOVA results on aspects measuring school environmental profile and students' physical activity levels.

**Table 4.33: School Environmental Profile and Student Physical Activity Levels**

ANOVA statistics	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	184.704	2	92.352	20.489	.000*
Within Groups	1748.881	388	4.507		
<b>Total</b>	<b>1933.586</b>	<b>390</b>			

\*Significant at  $p < 0.05$  level

ANOVA statistics results presented in Table 4.33 show that school environmental profile had a significant influence on students' levels of engagement in physical activity,  $F(2,388)=20.489$ ,  $p=0.001$ . In summary, the study findings indicate that the school environmental profile has a significant influence on students' levels of engagement in physical activity, ( $F(2,388)=20.489$ ,  $p=0.000$ ). Therefore, the null hypothesis two ( $H_{02}$ ) that states that the environmental profile of a school does not have a significant influence on students' engagement in physical activity levels in public boarding secondary schools in Nairobi City County was rejected at  $p < 0.05$  level of significance.

#### 4.7 Moderating influence of PAD on the Relationship between Environmental Profile and PAL

The fourth objective of the study was to investigate the moderating influence of physical activity determinants (PAD) on the relationship between environmental profile and physical activity levels (PALs) among students in public boarding secondary schools, Nairobi City County. Table 4.34 presents results regarding correlations among environmental profile of public secondary schools, physical activity determinants and physical activity levels.

**Table 4.34: Correlations among Independent, Dependent and Mediating Variables**

<b>Variables</b>	<b>PPMC</b>	<b>EP</b>	<b>PAD</b>	<b>PAL</b>
<b>Environmental profile overall scores</b>	Pearson Corr.	1	0.098	0.406*
	Sig. (2-tailed)	.	0.054	0.00
	n	391	391	391
<b>PAD</b>	Pearson Corr	0.098	1	0.183*
	Sig. (2-tailed)	0.054	.	0.00
	n	391	391	391
<b>PAL</b>	Pearson Corr.	0.406*	0.183*	1
	Sig. (2-tailed)	0.00	0.00	.
	n	391	391	391

\* Correlation is significant at the 0.05 level

Results of the Pearson Product Moment Correlation presented in Table 4.34 show that environmental profile correlates with physical activity level ( $r=0.406$ ,  $p=0.000$ ) and physical activity levels are also correlated with physical activity determinants ( $r=0.183$ ,  $p=0.000$ ) and environmental profile ( $r=0.406$ ,  $p=0.000$ ). The next step was to use both environmental profile and physical activity determinants as predictors of physical activity levels among the students. This is shown in the following multiple regression output, where the dependent variable is physical activity level.

**Table 4.35: Regression Coefficient and Part Correlation**

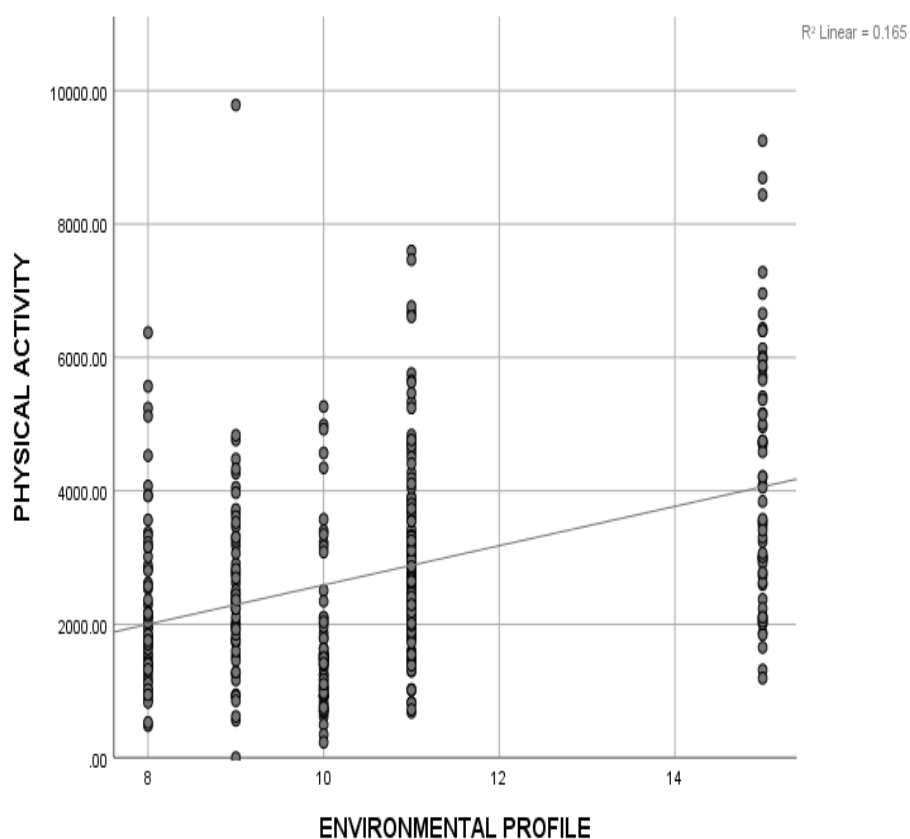
Model		Unstandardized		Standardized		Correlations				
		Coefficients		Coefficients		t	Sig.	Zero-order	Partial	Part
B	Std. Error	Beta								
1	Constant	-357.324	367.997			-.971	.332			
	Environmental profile	294.646	33.663	.406		8.753	.000	.406	.406	.406
2	Constant	-2678.072	822.959			-3.254	.001			
	Environmental profile	284.390	33.444	.392		8.503	.000	.406	.396	.390
	PAD	24.146	7.680	.145		3.144	.002	.183	.158	.144

a Dependent Variable: Physical activity levels



Table 4.35 shows that the first model used environmental profile of schools as the sole predictor while the second model added physical activity determinants as a predictor. Results show that there was a significant correlation between environmental profile and physical activity levels, when environmental profile was used alone to predict physical activity levels; and even after adding physical activity determinants ( $t=8.503, p=0.000$ ). This means that determinants of physical activity do not serve as mediating variables between environmental profile of schools and physical activity levels. The table further depicts a part correlation between environmental profile and physical activity level of 0.390, whereas the zero-order (simple correlation) between environmental profile and physical activity levels was 0.406.

This shows that, although after introducing the physical activity determinants, partial correlation decreased slightly, the correlation coefficient of environmental profile and physical activity levels still remain significant. This means that physical activity determinants did not serve as mediating variables between environmental profile of schools and physical activity levels. Figure 4:3 depicts a scatter diagram that show that there is a weak correlation between environmental profile of schools and physical activity levels with coefficient correlation of 0.165. Thus implying that physical activity determinants did not have a significant influence on the relationship between environmental profile of schools and physical activity levels. As such, students' participation in physical activity in public boarding secondary schools is not dependent on school environmental profile.



**Figure: 4.3: Scatter with Fit Line of PA by Environmental Profile Score**

From the above findings, the third null hypothesis stated that determinants of physical activity do not mediate relationship between environmental profile of schools and physical activity levels in public boarding secondary schools in Nairobi City County is accepted at  $p < 0.05$  level of significance.

## CHAPTER FIVE: DISCUSSION

### 5.1 Introduction

The main goal of the study was to determine physical activity levels and factors that influence physical activity behaviour among students in public boarding secondary schools, Nairobi City County. The specific objectives of the study were to: (i) establish physical activity levels among students, (ii) examine the determinants of physical activity among students, (iii) assess the relationship of physical activity levels across socio-demographic characteristics of students and environmental profile of public boarding secondary schools in Nairobi City County, and finally (iv) to investigate the moderating influence of physical activity determinants on the relationship between environmental profile of schools and physical activity levels. The following are the discussions of the findings based on the literature reviewed in Chapter Two.

### 5.2 Physical Activity Levels among Students

The study established that whereas over 80% of the students were engaged in vigorous and moderate intensity activities, all (100%) students reported participating in walking activities for at least 10 minutes at a time. The study further established PA levels such that 1.8% of the students achieved low PA (less than 600 METs/minutes/week), 61.1% achieved moderate PA (between 601 and 3000 METs/minutes/week) while 37.1% achieved vigorous PA (above 3000 METs/minutes/week) levels. This indicates that majority of the students achieved moderate physical activity levels. This is expected because all students reported walking daily for over 10 minutes which contributes to individuals' PA levels. Majority (81.3%) of the students reported

engaging in vigorous physical activities that required a lot of hard physical effort that forced faster and deeper breathing for about 10 minutes at a time daily.

It is also note worthy that majority of students (84.7%) reported engaging in activities that required moderate physical effort daily for about 10 minutes. This seems to be in line with the findings of a study by Olubusola et al. (2013) which established that both, children and adults reported moderate level of physical activity. However, comparing the two groups of that study, the number of children who were moderately active was higher than the number of the adults. Malaysian adolescent physical activity levels showed that 20.8% of adolescents have less than 600 METs/Minutes/week (Ismail and Fairuz 2009) compared to the 2% among Kenyan adolescents in boarding schools. This could be contributed by the fact that all students reported walking for at least 10 minutes daily. Students walking from dormitories to classroom, to various special rooms such as laboratories and library, to the dining hall for meals, to the playing fields for sports and also leisure walks in the school compound. Students in the Nairobi boarding schools also reported that they engage in light chores, such as carrying light loads like chairs or doing school duties assigned to keep the school clean such as sweeping the compound and mopping the floors on daily basis.

In addition, the study revealed that the majority (74.4%) of students achieved daily moderate physical activity (4.0 METs) equivalent to 1680 METs/minutes/week. This is considered an adequate volume for there to be health benefits from physical activity; and for the prevention of health conditions associated with insufficient physical activity. Thus, suggesting that majority of Kenyan adolescents, lead a healthy active

lifestyle by accumulating sufficient PA. These findings are in agreement with those of Olubusola et al. (2013) who established that majority (73.8%) of children and adolescents in Nigeria also achieved moderate PA levels. The results of the current study are also consistent with those reported by Kibet (2006), who had found that 71.8% of secondary boarding school students in Kenya were physically active.

Another study, with slightly higher incidents of low PA compared to the current study on Kenyan adolescents investigated Polish adolescents. The Polish study found that overall only 7% of students (6% boys and 8.6% girls) reported low physical activity that failed to meet the recommended minimum PA for health volumes (Bergier et al., 2014a). However, different to the current findings, Al-Hazzaa (2018) found that most teenagers and children in Saudi Arabia were not active enough to meet the recommended guidelines for moderate physical activity. The Saudi study concluded that the main factors influencing low participation in physical activities in Saudi included increased urbanization, crowded traffic, extreme weather, cultural barriers, lack of social support, the absence of female school PA programmes and lack of time and resources.

Comparatively, the current study recorded a higher proportion of students with moderate levels of physical activity (61.1%), and the proportion of students not achieving 1680 METs/min/week ( 25.6%) is much lower to Ghanaian adolescents. Asare and Danquah (2015) who investigated Ghanaian adolescents aged between 13-18 years, found that 55.7% achieved moderate physical activity (MPA) while 44.3% had low physical activity.

Global guidelines advocate that children and youth aged between 5 and 17 years accumulate an average of 60 minutes of Moderate to Vigorous Physical Activity (MVPA) daily. Further analysis revealed that only 47.6% of the students met the recommended MVPA (6 METs) for children and youth up to 17 years of an average of 60 minutes daily corresponded to 2520 METs/min/week. The study results indicate that more than half the students did not meet the recommended physical activity level (MVPA) for healthy physically active lifestyle. This could be attributed to the fact that majority of Kenyan youths in boarding schools are in a restricted environment that may not allow increased volumes of PA. As boarders, they do not need to engage in active transport for travelling to and from home when coming to school. Unlike their non-boarding day scholars, they do not acquire the necessary distances that add to physical activity levels during movement to and from school. At the same time, due to the nature and policy of schools where hired school staffs do much of the work, boarders engage in minimal daily chores that could increase their PA levels.

This finding is similar to result among Jordanian adolescents in which 44.2% (64% males and 24.4% females) met the recommended daily PA of Moderate to Vigorous Physical Activity/MVPA (Abu-mweis et al., 2014). This findings also concur with those of Al-Hazza et al. (2014), where less than 44% males and 20% females from Saudi secondary schools achieved recommended MVPA. The finding of this current study also concurred with those of Alhwaikan and Alshammar (2017), who had established that the majority of male and female adolescents from Riyadh City in Saudi Arabia did not meet the recommended daily physical activity levels of (2520 METmin/week) MVPA (moderate to vigorous intensity); but spent more time in sedentary behaviour. The findings of the current study differ slightly from the study

by Fan and Cao (2017) who found that only 30% of school going Chinese children and youth engaged in sufficient volumes of MVPA. This MVPA accumulation was attributed to the fact that some of Chinese children and youth commute to school; and their active transportation contributed to MVPA levels. Comparatively, this MVPA proportion is lower despite their active transportation unlike the Kenyan students in boarding schools.

The findings obtained by Global School-Based Students Health Survey (GSHS) from 105 countries are comparable to the outcome of the current study. The GSH survey revealed that, at 7.7% are Philippines and Sudan at 8.8% youth ranked among the lowest in accumulating the recommended PA amount; and the United States youth at 37.5%, Bangladesh at 48.2% were ranked highest in MVPA accumulation (Marques et al., 2020). Comparatively, at 47.6%, the Kenyan students did better in meeting the recommended WHO requirements for MVPA.

The current study also revealed that majority of Kenyan students (73.9%) spend an average of 7 hours and 31 minutes daily sitting. Thus, implying that a significant proportion of Kenyan students in boarding schools spend a lot of their time sitting. This could be attributed to the number of classroom lessons assigned between the 8.00 am to 4.00 pm school hours on weekdays. In addition to this, the students were also involved in personal study time during non-assigned classtime and in the evenings. Students reported sitting in classroom and laboratories for lessons, in dormitories, in the library for assignments, and outdoor during leisure time with friends. In addition, students could be ignorance on importance of PA due to lack of information on current PA guidelines and sedentary behaviour.

In concurrence with the Kenyan findings, Diouf et al. (2016) established that learners spent more time (minutes per day) in sedentary activities and light activities than in moderate and intense activity levels. Onywera et al. (2012) point out that recommended levels of physical activity among adolescents are threatened by sedentary lifestyles resulting from the use of readily available less active technologies such as computers, internet, television, and cell phones. Interestingly, the Onywera et al. (2012) findings concur with those of Verloigne et al. (2012), who found that 10 – 12 year old boys and girls across five European countries spent over eight hours a day being sedentary or sitting. The Verloigne et al. (2012) research, suggest reducing sitting time and replacing sedentary activities with light activities such as walking or standing.

In relation to the first objective, the study concludes that most (over 90%) of the students participate in moderate and vigorous physical activities. Majority (61.1%) of the students achieved 601- 3000 METs/minutes/week while a majority (74.4%) of the students met the minimum PA levels of 60 minutes daily of MPA equivalent to 1680 METs/minutes/week for health. However, only 47.6% of the students met the recommended MVPA for children and adolescents of an average of 60 minutes daily corresponding to 2520 METs/minutes/week. Majority (73.9%) of the students spent over 7 hours and 31minutes every weekday while sitting.

### **5.3 Determinants of Physical Activity among Students**

The study findings reveal that majority of the Kenyan students did not have information about the current PA guidelines. They were not aware of the recommended PA levels; nor were they aware of the reasons for meeting specific PA



guidelines. Therefore, most students lacked knowledge about recommended physical activities and its benefits. Such ignorance translates to being a barrier toward PA participation. This may be attributed to the academic pressure on the students for producing high academic grades. Producing high academic results are the competing priority among students in the current education system in Kenya. Students, parents and schools' desire to excel academically causing them to devote more time to studies. Consequently, time that could be spared for physical activities is therefore limited.

Financial constraints for hiring qualified PA teachers coaches, instructors or tutors who could disseminate PA information to students in many government schools, leaves an information gap among students. Abula, Gropel, Chen and Beckmann (2016) observed that lack of knowledge is a major barrier to physical activity among students. They found that in schools, where students were well informed about PA guidelines, the students were more physically active than those without the knowledge. The findings of this current study concur with those of the Malaysian secondary schools study, which showed that knowledge was an important factor influencing PAL among adolescents. The Malaysian study indicated that knowledge about exercise and physical activities differ significantly between students who were grouped as active and those students in inactive group (Ismail & Fairuz, 2009).

Results of the current study also concurred with those of Abula et al. (2016) whose study on perceived barriers to leisure-time physical activity in adults, established that lack of skills and knowledge was one of the perceived barriers, hindering individuals from engaging in physical activities. Therefore, knowledge regarding PA is an important factor for creating awareness among adolescents. As emphasised by

Huberty, Dinkel, Coleman, Beighle and Apenteng (2012), knowledge about specific PA and recommended PA guidelines for children could motivate teachers and other PA allied staff to sustain physical activity programmes.

With regard to the school PA resources, this study discovered that most students agreed that physical activity facilities, equipment and school environment enhances PA participation. The students affirmed that facilities were readily available in their respective schools; and that the school environment was appealing enough for them to engage in physical activities. Despite the positive student response regarding facilities and equipment, it is noteworthy that financial constraints in many schools compromises investment in quality equipment and PA facilities. Students adapt and adjust to limited equipment and inadequate physical infrastructure during their scheduled PA sessions.

The research also observed that the increasing student population has forced rationalization of class students sizes and putting more pressure to limited PA resources. High students population in schools due to 100% transition policy by the Kenyan Government has led to construction of new classrooms, dormitories, special rooms for studies taking up the available spaces that could be used for physical activities. According to Gontarev and Kalac (2016) demonstrated that access to equipment and facilities is the primary factor affecting teenagers' participation in physical activity. At the same time, Gavin et al. (2016) noted that access to adequate physical activity facilities and equipment amounted to increased PA participation among students. HAKK (2016) reported that more than half the schools in Nairobi had facilities and equipment for various sports like football, volleyball, swimming,

and track and field; an encouraging situation for students to participate in physical activities. The study further noted that increasing both, human and material resources in support of PA in schools facilitates the potential for students to engage in physical activity, increasing intensity and consequently meeting the recommended amount of physical activity.

Motivation and goals were the other determinants of physical activity examined among the public secondary school boarding students in Kenya. The study established that most of the students were interested and would like to participate in physical activities. In addition, a significant number of students reported that they felt encouraged to participate in physical activities, therefore, intentions motivation and reinforcement of most students facilitate participation in physical activities. This could be attributed to student's desire for a break from normal regular classroom lessons and relief from daily academic routine. Students find PA sessions relaxing, enjoyable and a chance to express their feelings outside academic walls. According to self determination theory, autonomous motivation among students distinguishes an inner willingness to do PA (intrinsic motivation) as well as willingness to do PA driven by others (extrinsic motivation) are major motivational factors (Dishman, McIver, Dowda & Pate, 2018).

The current findings agree with those of Dishman et al. (2018) on a study to determine whether changes in intrinsic motivation and goals causes decline in PA among adolescents. The study revealed that PA decline less among adolescents who maintain higher intrinsic motivation and maintains higher enjoyment goal. Gavin et al. (2016) points that supportive teachers and coaches has a profound influence on adolescents'

motivation to engage in PA and remain physically active. Encouragingly, motivation from teachers and coaches among students in boarding schools in absence of parents will persuade the students to engage in sports and PA. Provision of a variety of fun-filled activities, verbal encouragement, acknowledging students' skills, matching one's skills or physique to a particular sport or activities will encourage students to engage in PA. Another study by Kalajas-tilga, Koka, Hein, Tilga and Raudsepp (2019) noted that students' daily MVPA can be increased by increasing intrinsic motivation through providing activities that they enjoy since enjoyment and competence is the major motivation.

With regard to students' beliefs about their capability in physical activity, the study established that most students are confident while engaging in physical activities and they are neither embarrassed nor discouraged while doing physical activities. Similarly, majority of the students indicated that they have no difficult to engage in physical activity when others were doing better than themselves. Generally, students perceived that competency facilitates their participation in physical activities. This could be attributed to the fact that, most students seize the opportunity where they can show off their ability or talent in PA, regardless of their academic performance; thus, motivating them to excell in co-curricular activities.

As expressed by Gontarev, Kalac, Ameti, and Redjepi (2016) that perception towards one capability or self-efficacy affects PA in adolescents and children both, directly and indirectly. However, boys perceive a greater degree of self-efficacy; therefore, they have more confidence in their ability, and receive greater social support from friends than girls. Coalter (2013) emphasized that regular participation in physical

activity is generally associated with improved self confidence while undertaking activity, improved self esteem, reduced anxiety, as well as improved social skills and bigger social network in schools. On a similar note Asare and Danquah (2015) reported that PA is associated with high self esteem among adolescent as well as physical self worth leading to body satisfaction.

With regard to student's skill competency in performing physical activities, the study established that over 80% of students had skill competency in executing physical activities and hence, do very well in PA. Encouragingly, students were not just interested in physical activity, but the majority were more interested in participating in PA. Therefore, competency and interest enhanced student participation in PA. This is because students are willing to try out new activities; they may be driven by curiosity or sense of achievement or a desire to stand out among peers. When one acquires a skills, it generally self motivate one and one is likely to engage in more PA. It may also be because of less sensitivity to PA barriers such as peer influence and competing lifestyle behaviour. It is also clear that students with low self motivation are less likely to do PA and acquire new skills.

Consistent with the findings of this study, are the observations given by Hulteen, Morgan, Barnett, Stodden, and Lubans (2018). It is their opinion that adequate motor skill competency is associated with increased PA levels during childhood and adolescent years. They also indicate that skill development could be hindered or enhanced by physical status (such as weight) and psychological attributes such as self-efficacy.

Regarding students' attitude toward PA, it was encouraging that most of the students did not find PA sessions emotionally stressful and had interest in doing PA. However, half of them indicated that they were too busy and hence, lacked time to engage in physical activities on daily basis. Therefore, students' attitude toward PA was positive but perceived lack of time was a barrier toward PA participation. Lack of time could be attributed to the increased academic burden such as assignments and extra classes on the students. Both, schools and society give academic grades high priority. Much of students' time, therefore, is occupied, giving majority of students little chance to engage in physical activities. Apart from the academic burden, adolescents find it more attractive to spend free time on sedentary activities such as sitting with friends or occasionally watching television.

This finding is similar to that of Ismail and Fairuz (2009) who concluded that burden of homework, tuition and other academic related activities occupied most of the students' time, reducing time for PA and ultimately affecting PA negatively. The National Assembly for Wales (2019) committee reported that time constraints is a key barrier to PA in schools, time allocated to physical activities such as PE classes and sports is reduced as first priority is given to other examinable subjects. Therefore, this research concludes that if students are optimally supported by the schools by allocating enough time daily for PA, drawing a workable PA programme and hiring trained PA tutors, students would have optimal PA output.

On the dimension of social influence, it is noteworthy that just over half (50.2%) of the students in the current study agreed that people around them were not interested in physical activities. Most students reported that they had company when doing PA

and they are encouraged and supported by their friends. However, they feel that people around them lack interest in PA even during leisure time. In light of this, it seems arguable that, they are variant personal challenges that might impede PA engagement among students such as physical inability in doing PA, lack of games kit or sports shoes, since physical inability or use of school uniform may lead to injuries.

In addition to this, lure of sedentary behaviour due to peer pressure especially among students with common negative attitude in order to maintain a clique of friends. Gontarev and Kahac (2016) study that examined factors that predicted physical activity among adolescents, established that support from family members and friends are consistently and positively associated with physical activity. The researchers emphasized that social support from friends and family members could assist students in enhancing their participation in physical activities. Social influence on physical activity among students functions through various means such as encouragement, modeling activity, joint action and practical support (Gontarev et al., 2016). This causes students to engage in PA more or less on the basis of attitude. Lack of interest and support by the significant others toward students on physical activities present students' social influence as a barrier toward PA participation. This could be one of the major factors influencing students against meeting the recommended MVPA of an average of 60 minutes daily corresponding to 2520 METs/min/wk.

In terms of belief about the physical activities' benefits, majority of the students were aware of the benefits derived from participation in physical activities. Over 90% of the students agreed that participation in PA helps one to live longer, lose weight and develop strong bones. Additionally, they agreed that physical activity made positive

changes in a participant's life apart from other short term benefits such as burning calories and sleeping well. This determinant on benefits related to participation in physical activities facilitates PA participation since it is an important predictor of PA. In boarding schools dynamics, PA is recognized for its benefits to have fun, opportunity to make new friends, relieve stress from academic pressure and for socialization.

Poitrais et al. (2016) in their study found that engagement in physical activity (moderate to high intensity) has positive effects on health, especially on bone mineral density. Just as in the Cheah et al. (2015) study, majority of adolescents in the current study were aware that PA is good for health, both short and long term benefits. Poitras et al. (2016) findings of systematic review on relationship between PA and health indicators in school-aged children and youth indicated a favourable effects of meeting PA guidelines on adiposity and quality of life. Similarly, as expressed by Gontarev et al. (2016) that the benefits manifest in both, boys and girls such that they are healthier, they have more energy and feel stronger and they look better.

With regard to action planning, majority of the students reported choosing what is needed for PA to happen, where to do physical activity, time to engage in PA and the type of physical activities to engage in. This implies that most of the students had a physical activity action plan. The process of linking goal directed behaviour toward achieving physical activity in which students choose the type of PA, materials and equipment required, the venue and time to do physical activities facilitates PA. This could be attributed to a highly structured environment in boarding schools where students have well programmed PA schedule to facilitate a smooth flow of activities.



Most boarding schools have PE/ game/ sport tutor to oversee Co-curricular activities and that they seamlessly fit into a school daily program. The Arau, McIntyre and Sniehotta (2009) study showed similar findings as in the current study. They noted that students with detailed specifications of when, where and how to act in accordance with one's intention is a predictor of success in PA programs.

With regard to coping planning, one out of four (26.1%) of the students indicated that they deviate easily from the planned physical activities. Similarly, a third (38.6%) of students also accepted that difficult situations against planned PA made it difficult for them to engage in their intended planned physical activities. However, nearly half (48.3%) of students agreed that they lost focus on doing physical activities when obstacles are encountered. There are many dynamics in boarding schools setup that may serve as obstacles to PA participation such as lack of PA program to guide the large population of students against limited facilities and inadequate equipment. In some instances, extreme weather especially when it is drizzling or very cold become an obstacle to PA participation, since many schools lack all weather indoor sport facility. In addition, some games require fewer participants due to their nature, hence stiff competition exist among students, this discourages some students who are left out and are passionate about the game.

Similarly, this could probably be due to less emphasis on PA compared to academic work on the part of the schools and parents; thus luring them to academics or sedentary activities. This would appear to agree with Ismail and Fairuz (2009) who found that the burden of homework, tuition and other learning activities occupies almost all the time, leaving limited time for adolescents to engage in physical activities. Hence, time

constraint is an obstacle that puts students in difficult situations for engaging in planned physical activities. In separate but related study by Kibua and Chepkwony (2017) on determinants of engagement in sports activities among students in secondary schools revealed that availability of time is a major determinant in Kenyan secondary schools. This is due to encroachment by academic program by the school administration.

Similarly, a study by Arau et al. (2009) explained that some adolescents make good PA plans but may fail to implement them because they lack means of resisting temptations or be assertive in the face of peer pressure. Another obstacle among students as indicated by Kibua and Chepkwony (2017) noted that lack of game kits is a major deterrent to students PA engagement. The study also reported that only 58.3% of students have personal game kits that enable one to engage in various sporting activities since use of school uniform and shoes predisposes students to injury (Kibua & Chepkwony, 2017). Furthermore, some of these issues are minor obstacles that can be easily handled, such as lack of proper training costumes like swimming kit, sports shoes among other accessories but they easily deviate students from planned PA. Individuals who plan for coping with risk situations are more likely to maintain a newly adopted behavior in the face of difficulties situations. Therefore, students' mental preparation between anticipated situations and PA serves as a barrier toward PA participation.

When asked about their goal conflicts, nearly half of the students (40%) confirmed that they would not sacrifice their time for socializing with friends to do PA. At the same time, an equal proportion (49.9%) of students also agreed that they would not

sacrifice work or friendship in order to engage in physical activities. However, majority (66.0%) of students reported that they would sacrifice leisure time to engage in physical activities. Therefore, students ability to disregard existence of other interest competing with PA could be compromised, presenting that factor as barrier to participation in physical activities. Generally, any conflicting interest between academic grades and PA would inhibit students from participating in physical activity. A significant number of students regard their academic grades a lot higher than PA; thus making academic work the first priority irrespective of any benefits of PA. Therefore, goal conflicts was one of the perceived barriers hindering students from engaging in physical activities. As also reported by Hyndman (2016) that students increasingly face the lure of sedentary behaviour that results in lower fitness levels; in turn, affecting PA participation, especially due to peer influence from friends.

#### **5.4 Physical Activity Levels Across Demographic Characteristics**

The results reveal that there was significant gender association in terms of levels of physical activities among the students. The study established that while the majority of the female students engaged in moderate physical activities, most of the male students engaged in vigorous physical activities. This could be attributed to socio-cultural expectations regarding PA relative to boys and girls. The cultural expectations mould the behaviour that boys' PA is more aggressive than girls', a fact reinforced by peers, parents, socio-media and schools. On the other hand, unlike the girls, boys are not selective about physical activities they engage in. This gives boys a wider choice of physical activities to choose from, increasing the probability of participating in one or more of the available activities. Girls on the other hand, are generally attracted to low and moderate physical activities such as walking, jogging, hide and

seek, role playing of mother and father that give them opportunities to bond and for social interaction which is their main motivation.

The current finding supports those of Bergier et al. (2014b) who established that Polish male students are more physically active than girls, with much of the boys' superiority being contributed because of sports participation. Telford et al. (2016) revealed similar findings with 19% lower PA levels in girls compared to boys. Interestingly, pre-adolescents boys in Nairobi County schools also spent more time in moderate and vigorous PA compared to girls (Wachira, 2014). The Wachira study further stated that lower PA among female students was associated with weaker influences at the school and family levels; and through lower participation in co-curricular activities. Similar results were also reflected among Saudi adolescents, where girls had very low levels of physical activity compared to boys (Al-Hazza et al., 2014). The differences in Saudi Arabia were attributed to over reliance on cars rather than walking even for short distances, limited Physical Education programmes in schools, as well as cultural limitation especially for girls.

Global School-Based Students Health Survey (GSHS) showed that on average girls were less physically active compared to boys (Marques et al., 2020). However, this current findings differed from the study by Kibet (2006) among adolescents in high school. Kibet found no significant difference between levels of PA in boys and girls, with girls having slightly higher prevalence of PA than boys. This was attributed to more PA recreational facilities in girls' schools compared to boys' schools. This last factor is where the current study differed from the Kibet study. Most studies revealed

that boys are more active than girls mainly because boys' participation in sports was much higher than the girls.

The results with regard to gender and the recommended WHO guidelines on meeting 2520 METs/min/week of MVPA showed that there was a significant relationship between gender and students meeting recommended PA levels. More boys (63.8%) meet the recommended PA levels of 60 minutes of MVPA daily compared to girls (31.3%). Consequently, the study also indicated that a higher percentage of girls (68.7%) did not reach the recommended level of MVPA of 2520 METs/min/week compared to boys (36.2%). This is attributed to the finding that boys find physical activities more enjoyable; they regard PA the best way of recreating, whereas, the girls find sedentary behavior more appealing. It is generally observed that girls during the same adolescent stage, have more fat and have developed secondary sexual characteristics such as breast and menstruation. Both of which might interfere with PA. Boys are more masculine with more muscles compared to girls which give them an advantage in PA.

The current Kenyan study revealed better results such that more adolescents were more active compared to those from 105 countries in the Global School-Based Students Health Survey (GSHS). The survey showed that very few students (24% boys and 15% girls) engaged in sufficient MVPA (Marques et al., 2020). A similar earlier study involving Kenyan students aged 12-16 years reported compliance with guidelines in which rural and urban boys reported an average of 40.5% compliance for boys and 31.5% for girls (Ojiambo et al., 2012). The current study reported similar (31.3%) compliance among girls but higher proportion (63.8%) for boys than the

study done by Ojiambo et al. (2012). Girls in this current Kenyan study are found to be more sedentary than boys because a higher proportion of girls did not meet the WHO recommendation of 60 minutes daily of MVPA equivalent to 2520 METs/min/week physical activity. Insufficient PA is associated with high prevalence rate of NCDs. It is well established that girls are less active than boys and also a higher proportion of girls are not meeting the WHO recommended PA in most populations including Kenyan adolescents. Therefore, girls schools need to be targeted for increasing the proportion of students achieving recommended levels.

The analysis concerning the relationship between students' level of study (Form or Class) and physical activity level showed that there was no significant relationship between students' level of study and their level of engagement in physical activities. Overall, majority of the students from Forms one, two, three and four, engage in moderate intensity physical activities. Further analysis into relationship between level of study (Form or Class) and recommended 2520 METs/min/week of MVPA revealed that there was no significant relationship between the level of study (class) and recommended PA levels. The percentage of students who met the recommended PA levels were all in the same range. Less than half of students in all the classes met the recommended MVPA of 2520 METs/min/week were. All levels of study (classes) had slightly over half of the students not meeting the recommended MVPA of 2520 METs/min/week.

This may mean that although students across all school forms reported some sufficient physical activity lifestyle, it really did not matter or reflect on their age or advancement in education level. This could have been determined by the scheduled

school PA routine that is strictly followed due to high number of students and limited PA resources. In most schools, a class is assigned a specific day during weekdays for PA after classes, during this time, the students are free to engage in any type of physical activity. Simultaneously, all other students in other classes are supposed to be attending personal study time in their various classes. A particular class has only one day in a week for such PA session due to four levels of study unless one is involved in competitive games. It was also observed that, on week-ends, Saturday and Sunday, students had a structured academic program to follow leaving limited time for PA.

The current study findings agrees with a systematic review study using 42 papers on factors associated with participation in PA among adolescents in Malaysia. The study revealed that age is one factor that showed inconsistent results therefore age does not possess any significant effect on participation in PA (Cheah et al., 2015). The current finding has differed with some studies on physical activity and age; though the available studies have no consistency regarding PA and age.

Contrary to the result of the current study, Corder et al. (2016) through a systematic review concerning PA change during adolescence concluded that, PA decline is a consistent finding with a mean decline of 7% per year in PA levels throughout adolescence period. Other studies indicated that older adolescents were more active compared to the younger ones (Abu-Mweis et al., 2014). This current study, therefore, concludes that the level of study of students has no association with levels of PA among students. Thus, strategies to promote an active lifestyle in schools should target all students irrespective of level of study or class.

On school status, it emerged from the findings that there was a significant association between the school status of National, Extra-County and County and PA. In Kenya, there is a difference among these three types of schools. For instance, National schools are most prestigious schools offering better PA, sports and academic infrastructure which give students a wide range of PA as well as academic options. Most of these schools, were established during the colonial era and are located on large pieces of land with many already well established physical activity facilities and wide choice of PA equipment for use. A wide range of PA options and availability of playing fields gives students an opportunity to participate in co-curricular activities eventually raising their PA levels.

Most Extra-County schools are also well established though PA, sports and academic infrastructure are not as elaborate compared to National schools. Non-the-less, availability of PA facilities and equipment also encourage students to engage in physical activities. County schools are newly created schools with many of them built on limited spaces denying them access to PA facilities. Inadequate PA facilities such as playground and PA equipment deny students an opportunity of participating in varied and adequate co-curricular activities.

Comparing students' PA levels in the three school categories, majority of the students in National and Extra-County schools were engaged in vigorous physical activities; while most of the students in County schools were engaged in moderate physical activities. According to Morton et al. (2016), sufficient space is important for PA as well as availability of specific facilities that must be adequate and accessible by students. For instance, it's a common occurrence to find most National schools and a



few Extra-County schools have a well maintained swimming pool and none of the County schools have a swimming pool. Lack of playing equipment or poor quality equipment is a prominent barrier to physical activities in schools (Morton et al., 2016). Although budgetary constraints to purchase adequate and quality PA equipment affects all schools in Kenya, it is more prominent in schools of lower status. In County and Sub-County schools, funding by the Government and school fees payable by the parents are lower compared to those of Extra-County and National schools (MoEST, 2014). However, the researcher found no known information locally on PA and school status for comparisons purposes, therefore making this current study an important research that may give more insights to the information gap identified.

Further analysis on percentage of students meeting the recommended MVPA of 2520 METs/min/week showed that there was a significant association between status of the school and recommended PA levels with highest levels being among students in National schools. The number of students meeting the recommended MVPA levels are higher in National schools and decrease in Extra-County schools and further decreases in County schools. National schools showed over 60% students meeting the recommended MVPA of 2520 METs/min/week compared to 53% in Extra-County and lower proportion of less than 30% obtained among students from County schools.

In their study on school environment, adolescent PA and sedentary behaviour, Morton et al. (2016), indicated that adequate accessibility of facilities and equipment contributed significantly to higher physical activity levels among students. For instance, National schools and most Extra-County schools, being more prestigious schools offer many games and sports giving students a wide range of PA options.

Sports such as Rugby, Swimming, Hockey, Cricket, Lawn tennis are only found in such schools providing a wider choice of PA options among students. This current study proposes that PA levels in schools, especially County schools, should be promoted by offering supervised PE programmes as well as after school PA sessions to promote an active healthy lifestyle, despite limited PA facilities. From this finding, the null hypothesis which stated that there is no significant difference in physical activity levels in relation to socio-demographic characteristics of students in public boarding secondary schools in Nairobi City County was rejected at  $p < 0.05$  level of significance.

### **5.5 Physical Activity Levels across Environmental Profile**

The study established that school environmental profile had a significant influence on students' levels of engagement in physical activity. This implies that students from schools with good environmental profile such as spacious playing fields, adequate playing equipment, suitable equipment for the age of students, well maintained and secured fields that adhere to the standards were more likely to engage in vigorous intensity physical activities as compared to students from schools with poor environmental profile. This finding concurs with that of Gathu et al. (2015) whose study affirms that increasing games and sports equipment, materials, as well as improving PE curriculum can increase physical activity in schools. Similar findings by Gavin et al. (2016) indicates that schools with adequate resources to support PA sessions enhance student potential for engaging in the recommended amount and intensity of physical activities.

The current study also revealed that levels of PA differ according to school status or category, this is possibly due to differences in availability and condition of PA resources defining profile of the schools. Most National schools had better PA facilities and therefore more students in National schools had higher MVPA compared to students in Extra-County and County schools. Extra-County and County schools met only a third of the playing fields criteria. Students both, boys and girls from Extra-County and County schools do not have access to playing fields that meet most recommended criteria. Morton et al. (2016) indicates that adequate facilities, their availability and accessibility by students contribute to increased physical activity levels among students. Extra-County and County schools need to invest in spacious fields with flat surfaces in good condition, well marked stationary objects that adhere to all safety standards. Most National schools are located on large pieces of land with many already well established physical activity facilities. Most Extra-County schools are also well established with PA facilities.

A similar findings conducted by USGAO (2012) on United States schools revealed that smaller schools lack the necessary space to expand PA facilities therefore students do not have access to many PA facilities. County schools are newly created schools with many schools built on limited spaces. Based on Morton et al. (2016) guidelines regarding optimal environmental profiles, County schools with their limited spaces will be unable to provide adequate facilities that could promote PA among students.

Concerning equipment, none of the schools had sufficient equipment for use by students if used at the same time; this was probably due to financial constraints in all public schools in Kenya. Equipment are not readily available to all students due to

limited funds in public schools to buy quality items; and for good maintainance of the same. Though none of the schools reported that playing equipment are enough if used at the same time by all students, County schools reported that equipment are not readily available to all students, not well maintained and safe for use. Both, boys' and girls' National and Extra-County schools scored higher in meeting criteria for playing equipment compared to County schools. This finding concurs with that of USGAO (2012) whose report affirms that budgetary constraints have affected purchase of sufficient and quality of PA equipment as well as maintainance of appropriate class size due to equipment availability. The USGAO report further revealed that some schools stopped offering several sports because the supply of equipment no longer matches the bigger class size. Upkeep and maintainance of equipment for safe use was cited as a challenge in most schools probably given the budget constraints.

School PA policies and co-curricular activities criteria were the poorest scored among the three criteria as obtained from responses given by schools principals or PE teachers. Co-Curricular activities are compulsory for all learners in primary, secondary and teachers' training colleges in Kenya, therefore it part of school curriculum (MoEST, 2015). Although PA is mandatory for all learners, over-emphasis on examinable subjects during delivery of curriculum, inadequate finances to implement, organise PA programmes results into negative attitude that de-emphasize physical activities among students.

Both boys' and girls' National schools and Extra-County boys' schools scored three criteria out of four, against Extra-County girls' and County boys' schools achieving half of the PA Co-Curricular policy. County girls' schools received the lowest score

of only one criterion met against four items. The inadequate sports personnel in Kenyan universities as reported by Rintaugu (2013) is replicated in Kenyan public secondary schools. Sports personnel in educational institutions oversee the planning and implementation of physical activities in schools.

The current study reported similar results as a study by Muthuri, Wachira, Leblac and Francis (2014) concerning PA and body weight among school children and youth in Kenya. Muthuri et al. (2014) further noted that, though 69.0% of schools had existing written PA policies, and 51.7% have committees to oversee PA development and implementation, there was no supporting evidence of the same, especially among schools in rural and low income urban areas. This was found to be an indicator of insufficient PA, since it was dependent on the location of the schools as well as school status. It is worthy to note, the research established that none of public boarding schools in Nairobi City County provided PA to students with various special needs. This could be due to low population of students with disabilities in regular schools as many would opt to attend special schools for learning. Therefore, schools PA policies and co-curricular programmes should be improved to cater for all students while in school.

From this finding, the second null hypothesis which stated that environmental profile of a school does not have a significant influence on students' engagement in physical activity levels in public boarding secondary schools in Nairobi City County was rejected at  $p < 0.05$  level of significance.

## **5.6 Moderating Influence of PAD on the Relationship between Environmental Profile and PAL**

The analysis showed that there was a significant correlation between the schools' environmental profile and physical activity levels when the environmental profile was used alone to predict physical activity levels; and even after adding physical activity determinants. These relationships satisfy the basic prerequisites as outlined by Howell (2013). This means that determinants of physical activity were not serving as mediating variables between environmental profile and physical activity levels. Thus, suggesting that the participation in physical activity is not dependent on school the environmental profile. This leads to the conclusion that apart from the environmental profile, there are other factors which influence students participation in physical activities in public boarding secondary schools in Nairobi City County. From this finding, the third null hypothesis which stated that determinants of physical activity do not mediate the relationship between environmental profile and physical activity levels in public boarding secondary schools in Nairobi City County was accepted at  $p < 0.05$  level of significance.

## **CHAPTER SIX: SUMMARY, CONCLUSION AND RECOMMENDATIONS**

### **6.1 Summary of the Findings**

The main goal of the study was to determine physical activity levels and factors that influence physical activity behaviour among students in public boarding secondary schools in Nairobi City County. The study comprised 391 students and 6 Principals from six sampled public boarding schools in Nairobi City County. Among the students, 50.1% were male while the remaining 49.9% were female. In terms of level of study (class), 24.8% of the students were in form one, 25.3% were in form two, another 25.3% were in form three and the remaining 24.6% were in form four. Considering the school type, the researcher selected 34.3% of the students from National schools, 33.0% were from Extra-County schools and 32.7% were from County schools. The following are the main study findings.

#### **6.1.1 Physical Activity Levels among Students**

The study found that majority of the students engaged in moderate and vigorous intensity activities, as well as walking, causing majority of students (61.1%) to achieve moderate PA levels of between 601-3000 METs/minutes/week. The study also found that only 47.6% of students met the recommended moderate to vigorous physical activity (MVPA) of an average of 60 minutes daily corresponding to 2520 METs/minutes/week. The study also revealed that most students spent most of their daily time sitting. Though the majority of students engaged in moderate and vigorous intensity activities, an equally high proportion (73.9%) of students spent over 7 hours and 30 minutes daily while sitting.

### **6.1.2 Determinants of Physical Activity among Students**

The study's objective to establish positive factors in PA revealed six determinants or factors that promote PA, increase student PA levels, and encourage students meet the WHO recommended PA guidelines, were noted. These facilitator determinants are school's PA resources, student's motivation and goals regarding PA, student's belief about capability to do PA, student's skill competency in PA, student's belief about the benefits and consequences accrued from PA, and student's action planning capacity to enable PA. Emphasis on these facilitator determinants would continuously encourage PA participation to improve PA levels, and ultimately enable students meet the WHO recommended PA levels. On the other hand, the study also revealed five negative determinants that are barriers or hinderances to student engagement in PA. These determinants are student's knowledge about recommended PA guidelines and the benefits of PA, student's attitude or feelings towards PA, social influence towards PA, student's planning capacities, and goal conflict among students. Intervention on these barrier (hindrance) determinants among students would encourage PA participation and eventually, improve student PA levels and increase the number of those meeting the recommended PA guidelines.

### **6.1.3 Physical Activity Levels across Demographic Characteristics**

In terms of gender, the study found that while majority of the female students reported being engaged in moderate physical activities, most male students participated in vigorous physical activities. Boys are more physically active and a higher proportion met the recommended MVPA of 2520 METs/minutes/week than girls. In relation to level of study (class or form), most students in all the Forms (Form one, two, three and four) engaged in moderate intensity physical activities. Comparisons of student's



PA levels across the three school types, revealed that majority of the students in National and Extra-County schools were engaged in vigorous physical activities while most of the students in County schools were engaged in moderate physical activities. Higher proportion of students in National schools met the recommended MVPA of 2520 METs/minutes/week while the majority from County schools did not meet the recommended PA levels. Generally, most students had sufficient levels of physical activity, boys were more active than girls, and there was no significant association in participation across the four level of study (classes, forms). However, students in the National schools were the most active.

#### **6.1.4 Physical Activity Levels across Environmental Profile**

The analysis revealed that students from schools with good environmental profiles with spacious playing fields, adequate playing equipment, suitable equipment for the age of students, well maintained and secured fields adhering to the standards, were more likely to engage in vigorous physical activities compared to students from schools with poor environmental profiles. Schools with adequate equipment in good condition and appropriate for students age are likely to increase PA opportunities to the recommended levels. Schools with appropriate PA Co-Curricular policies, PA educators and PA policies enhance students potential for engaging in the recommended PA amount and intensity.

#### **6.1.5 Moderating Influence of PAD on the Relationship between Environmental Profile and PAL**

The study found that student participation in physical activity in public boarding secondary schools is not dependent on physical activity determinants in school. This

leads to the conclusion that apart from the environmental profile of schools, there are other factors which influence student participation in physical activities.

## **6.2 Conclusion of the Study**

The following conclusions have been made based on the study findings:

Most of the students engaged in moderate intensity physical activities, while majority of students achieved moderate levels of PA. Majority of the students met the minimum PA levels of 60 minutes daily of MPA equivalent to 1680 METs/minutes/week for moderate active lifestyle. However, majority of the students did not meet the recommended MVPA for children and adolescents of an average of 60 minutes daily corresponding to 2520 METs/minutes/week.

Most students are interested in physical activities, have physical activity skills, are confident while engaging in PA and they feel encouraged to participate in physical activities. In addition, most of the students believe that participation in PA has both, long and short term benefits and this facilitate participation in PA. A majority of students choose what is needed for PA to happen, type of PA, where and time to do PA. Therefore, these factors presented during PA on a daily basis facilitates PA participation among students. However, a significant number of them not only lack knowledge about current PA guidelines; but also lacked support from their families and friends for participation in PA. A majority of the students report that they lose focus to do PA when they encounter challenges or are too busy for PA on daily basis. In addition, half of the students would not sacrifice their work or friendship to engage in physical activities. Therefore, these challenges presented during PA on a daily basis are barriers to PA participation.

There are significant gender-based associations in the levels of physical activities among the students as revealed that males are more active than girls. There is no significant relationship between students' level of study (class) and their level of engagement in physical activities. There is a significant association between the category of school the students were enrolled in and engagement in physical activity. Students from National and Extra-County schools are found to be more active than those in County schools.

School environmental status has significant influence on students' levels of engagement in physical activity. Physical activity equipment, facilities and positive policies on Co-curricular activities appear to be key factors in influencing PA. Determinants of physical activity do not serve as mediating variables between environmental profile of a school and physical activity levels.

### **6.3 Recommendations of the Study**

Arising from the findings, the following recommendations are made:

#### **6.3.1 Recommendations for Practice**

- i. Schools should create awareness among the students on the importance of participation in adequate physical activities and the dangers of sedentary lifestyles.
- ii. Strategies should be found to persuade parents and the community members to support schools through provision of necessary PA facilities, equipment and co-curricular policy required for physical activities in boarding secondary schools.

- iii. All school stakeholders should encourage students to participate frequently in Moderate Physical Activity (MPA) to Moderate to Vigorous Physical Activities (MVPA) for physically active lifestyle of students.
- iv. Create awareness among teachers and students about current PA recommendations to promote PA and adapt PA programmes tailored to their needs and school daily programme.
- v. Advocate for early induction into a regular and adequate physical activity programmes as well as reducing sitting time among students.

### **6.3.2 Policy Recommendations**

- i. Ministry of Education, State Department of Early Learning and Basic Education should ensure that all schools embrace PA programmes by promoting participation in organised sports, unorganized physical activities, and leisure time PA for adolescents.
- ii. Ministry of Education, State Department of Early Learning and Basic Education should prioritize the provision of facilities, trained personnel and physical activity equipment for promoting PA in schools.
- iii. Ministry of Education, State Department of Early Learning and Basic Education should recognize girls and County schools as high priority groups for PA promotion due to lower compliance with current PA recommendations.
- iv. Ministry of Education, State Department of Early Learning and Basic Education should improve access to PA promoting resources such as appropriate PA programme in schools, appropriate PA educator (tutor) to student ratio; and allocate funds for PA equipment, facility and their maintenance.

#### **6.4 Areas for Further Research**

- i. A similar study should be conducted focusing on public day secondary schools (Sub-County schools) students to establish whether they will reveal the same findings.
- ii. A similar study should be conducted involving private secondary schools students for comparisons purposes.
- iii. A similar study should be conducted on adolescents PA focussing on different types of sports and leisure time physical activities and how they could increase their PA levels.
- iv. A similar study should be conducted among adolescents on physical activity levels that could be compared across international boundaries against recommended physical activity guidelines by the World Health Organization to determine 'young' Kenya's active position globally.

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**APPENDICES****APPENDIX A: INTRODUCTION LETTER****COUNTY DIRECTOR OF EDUCATION, NAIROBI COUNTY**

My name is Lydiah Ngahu, I am a Master of Science (Physical Education) student from Kenyatta University. I am carrying out a study on levels and determinants of physical activity among students in boarding secondary school in Nairobi City County. The participants will be randomly selected from National, Extra-County and County schools in Nairobi City County. The study will be carried out using International Physical Activity questionnaire (IPAQ), Determinant Physical Activity Questionnaire (DPAQ) and a Checklist. The information could be used by the Ministry of Education, Science and Technology to improve access and quality of physical activity in boarding secondary schools as well as other institutions of learning in Kenya.

All relevant documents such as ethical approval, research permit, guardian's consent and participant's assent forms have been given by the relevant authorities.

I will be grateful for your support in this venture.

Thank you

**APPENDIX B: RESEARCH APPROVAL, KENYATTA UNIVERSITY**  
**GRADUATE SCHOOL**



KENYATTA UNIVERSITY  
GRADUATE SCHOOL

E-mail: [dean-graduate@ku.ac.ke](mailto:dean-graduate@ku.ac.ke)

Website: [www.ku.ac.ke](http://www.ku.ac.ke)

P.O. Box 43844, 00100  
NAIROBI, KENYA  
Tel. 020-8704150

Our Ref: H68/CE/28474/13

DATE: 17<sup>th</sup> January, 2018

Director General,  
National Commission for Science, Technology  
& Innovation  
P.O. Box 30623-00100,  
NAIROBI

Dear Sir/Madam,

**RE: RESEARCH AUTHORIZATION FOR LYDIAH N. NGAHU– REG. NO. H68/CE/28474/13**

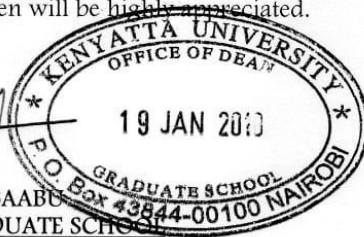
I write to introduce Ms. Lydiah Ngahu who is a Postgraduate Student of this University. She is registered for M.Sc Degree programme in the Department of Physical and Health Education.

Ms. Ngahu intends to conduct research for an M.Sc Proposal entitled, “Level and Determinants of Physical Activity among Students in Public Boarding Secondary Schools in Nairobi City County, Kenya”.

Any assistance given will be highly appreciated.

Yours faithfully,

MRS. LUCY N. MBAABU  
FOR: DEAN, GRADUATE SCHOOL



**APPENDIX C: ETHICAL CLEARANCE, KENYATTA UNIVERSITY**  
**ETHICAL REVIEW COMMITTEE**



**KENYATTA UNIVERSITY**  
**ETHICS REVIEW COMMITTEE**

Fax: 8711242/8711575  
 Email: [kuerc.chairman@ku.ac.ke](mailto:kuerc.chairman@ku.ac.ke)  
[kuerc.secretary@ku.ac.ke](mailto:kuerc.secretary@ku.ac.ke)  
 Website: [www.ku.ac.ke](http://www.ku.ac.ke)

P. O. Box 43844,  
 Nairobi, 00100  
 Tel: 8710901/12

Our Ref: **KU/ERC/ APPROVAL/VOL.1 (113)**

Date: 14<sup>th</sup> June, 2018

Ngahu Lydiah Nduta  
 P.O Box 30152 – 00100  
 NAIROBI

Dear Lydiah,

**APPLICATION NUMBER: PKU/799/1865 “LEVELS AND DETERMINANTS OF PHYSICAL ACTIVITY AMONG STUDENTS IN PUBLIC BOARDING SECONDARY SCHOOL IN NAIROBI CITY COUNTY, KENYA”**

**1. IDENTIFICATION OF PROTOCOL**

The application before the committee is with a research topic “Levels And Determinants of Physical Activity Among Students In Public Boarding Secondary School In Nairobi City County, Kenya ” received on 31<sup>st</sup> January, 2018 and discussed on 12<sup>th</sup> June, 2018

**2. APPLICANT**

Lydia Nduta Ngahu

**3. SITE**

Nairobi City County, Kenya

**4. DECISION**

The committee has considered the research protocol in accordance with the Kenyatta University Research Policy (section 7.2.1.3) and the Kenyatta University Ethics Review Committee Guidelines and **APPROVED** that the research may proceed for a period of ONE year from 12<sup>th</sup> June , 2018.

5. **ADVICE/CONDITIONS**


- i. Progress reports are submitted to the KU-ERC every six months and a full report is submitted at the end of the study.
- ii. Serious and unexpected adverse events related to the conduct of the study are reported to this committee immediately they occur.
- iii. Notify the Kenyatta University Ethics Committee of any amendments to the protocol.
- iv. Submit an electronic copy of the protocol to KUERC.

**When replying, kindly quote the application number above.**

**If you accept the decision reached and advice and conditions given please sign in the space provided below and return to KU-ERC a copy of the letter.**

  
  
**DR. TITUS KAHIGA**  
**CHAIRMAN ETHICS COMMITTEE**

I LYDIAH NGAHU.....accept the advice given and will fulfill the conditions therein.

Signature.......... Dated this day of 20/06 /..... 2018.

cc.  
DVC-Research Innovation and Outreach

**APPENDIX D: RESEARCH PERMIT FROM NATIONAL COMMISSION  
FOR SCIENCE, TECHNOLOGY AND INNOVATION**



**NATIONAL COMMISSION FOR SCIENCE,  
TECHNOLOGY AND INNOVATION**

Telephone: +254-20-2213471,  
2241349, 3310571, 2219420  
Fax: +254-20-318245, 318249  
Email: dg@nacosti.go.ke  
Website: www.nacosti.go.ke  
When replying please quote

NACOSTI, Upper Kabete  
Off Waiyaki Way  
P.O. Box 30623-00100  
NAIROBI-KENYA

Ref. No. **NACOSTI/P/18/57958/21182**

Date: **14<sup>th</sup> August, 2018**

Lydia Nduta Ngahu  
Kenyatta University  
P.O. Box 43844-00100  
**NAIROBI.**

**RE: RESEARCH AUTHORIZATION**

Following your application for authority to carry out research on "*Levels and determinants of physical activity among students in public boarding secondary schools in Nairobi City County, Kenya,*" I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for the period ending **14<sup>th</sup> August, 2019.**


You are advised to report to **the County Commissioner and the County Director of Education, Nairobi County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

  
**BONIFACE WANYAMA  
FOR: DIRECTOR-GENERAL/CEO**

Copy to:

The County Commissioner  
Nairobi County.

**FAITH A. ONYANGO**  
ACC  


**COUNTY COMMISSIONER  
NAIROBI COUNTY**  
P. O. Box 30124-00100, NBI  
TEL: 341666

The County Director of Education  
Nairobi County.

**APPENDIX E: RESEARCH AUTHORIZATION FROM MINISTRY OF  
EDUCATION, STATE DEPARTMENT OF EARLY LEARNING AND BASIC  
EDUCATION**



Republic of Kenya

**MINISTRY OF EDUCATION  
STATE DEPARTMENT OF EARLY LEARNING AND BASIC EDUCATION**

Telegrams: "SCHOOLING", Nairobi  
Telephone; Nairobi 020 2453699  
Email: [rcenairobi@gmail.com](mailto:rcenairobi@gmail.com)  
[cdenairobi@gmail.com](mailto:cdenairobi@gmail.com)

REGIONAL COORDINATOR OF EDUCATION  
NAIROBI REGION  
NYAYO HOUSE  
P.O. Box 74629 – 00200  
NAIROBI

When replying please quote

Ref: RCE/NRB/GEN/VOL.1

Date: 16<sup>th</sup> August, 2018

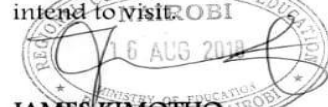
Lydia Nduta Ngahu  
Kenyatta University  
P. O. Box 43844 - 00100  
NAIROBI

**RE: RESEARCH AUTHORIZATION**

We are in receipt of a letter from the National Commission for Science, Technology and Innovation regarding research authorization in Nairobi County on "*Levels and determinants of physical activity among students in public boarding secondary schools in Nairobi City County, Kenya*"

This office has no objection and authority is hereby granted for a period ending **14<sup>th</sup> August, 2019** as indicated in the request letter.

Kindly inform the Sub County Director of Education of the Sub County you intend to visit.



**JAMES KIMOTHO**  
FOR: REGIONAL COORDINATOR OF EDUCATION  
NAIROBI

Copy to: Director General/CEO  
National Commission for Science, Technology and Innovation  
NAIROBI



**APPENDIX F: GUARDIAN’S CONSENT FORM**

**SCHOOL PRINCIPAL AND PHYSICAL EDUCATION TEACHERS**

I am Lydiah Ngahu, a Master of Science (Physical Education) student in the Department of Physical Education, Exercise and Sports Science at Kenyatta University’s School of Public Health and Applied Human Sciences. My postal contacts is P.O Box, 30152-00100 Nairobi and Mobile number is +254721568473.

As part of my studies, I am undertaking an examination of the levels of physical activity and factors that determine physical activity among students in boarding secondary schools in Kenya

Your school has been randomly selected to take part in the study. I would appreciate your consent for the participation of your students in this research. Participants in this study will be required to complete two questionnaires which will take less than 30 minutes. A standard recall International Physical Activity Questionnaire/IPAQ will be used to establish PA levels while a revised version of the Determinant Physical Activity Questionnaire (DPAQ) will be used to establish determinant of physical activity. In addition, a study assessment checklist will be used to obtain information from the school principal or PE teachers on physical activity facilities, equipment and Co-Curricular policies.

For any questions or clarification, you may contact Dr. Lucy Joy Wachira on 0723 842 543 or Dr. Yasmin Goodwin on 0724 935 594 or the Kenyatta University Ethical Review Committee Secretariat on [chairman.kuerc@ku.ac.ke](mailto:chairman.kuerc@ku.ac.ke), [secretary.kuerc@ku.ac.ke](mailto:secretary.kuerc@ku.ac.ke), [secretariat.kuerc@ku.ac.ke](mailto:secretariat.kuerc@ku.ac.ke).

Name of the School .....

Signature of the Principal .....



## **APPENDIX G: PARTICIPANT INFORMED ASSENT FORM**

I am Lydia Ngahu a Post-Graduate student in the Department of Physical Education, Exercise and Sports Science of Kenyatta University, P O BOX 30152-00100 Nairobi. I am carrying out a study on “levels and determinants of physical activity among adolescent students in boarding secondary schools”. The information could guide policy making in the state department of early learning and basic education under the Ministry of Education in planning, organizing and implementing appropriate PA programmes and curricular for healthy active lifestyle in public boarding schools.

### **Procedures to be followed**

Participants in this study will be required to complete two questionnaires which will take less than 30 minutes. A standard recall International Physical Activity Questionnaire/IPAQ will be used to establish PA levels while a revised version of the Determinant Physical Activity Questionnaire/DPAQ will be used to establish determinants of physical activity. In addition, a study assessment checklist will be used to obtain information from school principals/ PE teachers on physical activity facilities, equipment and Co-Curricular policies.

You have the right to opt out of this study. Please note participation is voluntary and cannot be compelled to do so. You may be picked to answer few questions related to the study. You may decline to answer any questions if you wish.

### **Discomforts and Risks**

Some questions in the questionnaire may require personal information and may cause you to feel uncomfortable. In such a situation, you are at liberty to omit them if you wish. The process is non-invasive with no risks involved.

### **Benefits**

Participation in this study will help us to identify levels of physical activity among boarders in secondary schools as well as identify determinants that influence physical activity participation. Participants will also gain information about their physical activity levels and short and long term health benefits of physical activity.

### **Reward**

If you accept to participate in this study, there is no payment for participation since it is voluntary.

### **Confidentiality**

The name of the student will not be recorded on the questionnaire. The information given in the questionnaires will be confidential and will only be used for the intended purpose of this study.

**Participant's statement**

I have read and I understand the information in the study requires my participation which is entirely voluntary. I have been allowed to ask questions and all questions were answered well. I have been assured that my records are confidential and I have the freedom to leave the study if I feel uncomfortable.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

**Investigator's statement**

I, the undersigned, have instructed the respondents in a manner they understand the questions in the study and the importance of the study.

Name of investigator .....

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

**APPENDIX H: INTERNATIONAL PHYSICAL ACTIVITY****QUESTIONNAIRE (IPAQ)****Section one: Determining levels of physical activity using IPAQ**

The tool seeks to establish the types of physical activities people engage in as part of their day to day lives. The information contained here will seek to obtain how much time is spent in physical activities in the last 7 days (IPAQ, 2002). It is necessary to give an answer to each question even if you have not engaged in physical activity. Recall the activities you do in school, Physical Education/ PE classes, part of your duties and work to keep school clean, moving from one place to another, leisure time, games, exercise or sport.

Recall all vigorous activities that you have engaged in the last seven days. Vigorous physical activities require a lot of hard physical effort making your breathing much faster and deeper. Recall those physical activities that you did for about ten minutes at a time.

1. In those seven days, state the number of days you engaged in vigorous physical activities such as heavy lifting, digging, cutting grass, running or sport? Indicate the amount of time you used to do vigorous physical activities on any one of those days in minutes?

Recall all the moderate activities that you engaged in the last seven days. Moderate physical activities are the activities that require average physical effort leading to moderate faster breathing rate. Recall those physical activities that you engaged in for more than ten minutes at a time.

2. State how many days you engaged in moderate physical activities such as carrying light loads, badminton, table tennis or double tennis. Do not include walking. State the amount of time you used to do moderate physical activities on any one of those days in minutes?

Recall the amount time you used while walking in the last seven days such as walking from place to place, dormitory to dining hall to classes to laboratories or to the fields and any other walking such as leisure walk in the school compound.

3. Indicate the number of days you walked for at least 10 minutes at a time in the last seven days? State how much time you spent while walking on one of those days?

Recall the amount of time you used while sitting on weekdays in the last seven days. These include time used in classroom, in the dormitory, while doing assignments and during leisure time. This may include time used while sitting in classroom, visiting friends, reading, or sitting or lying down to watch television.

4. State how much time in minutes you used while sitting on a week day?

Activities	Tick either yes or no	Indicate number of days per week	Indicate time spent in min /day	Not sure or do not know
1.Vigorous	Yes			
	No			
2.Moderate	Yes			
	No			
3.Walking	Yes			
	No			
4.Sitting	Yes			
	No			

The end, thank you for the time spent.

## APPENDIX I: DETERMINANT PHYSICAL ACTIVITY QUESTIONNAIRE

### (DPAQ)

#### Section two: Identifying determinants of PA using DPAQ

This instrument is used to identify and measure determinants of physical activity among people of all ages. It is a revised validated tool containing 34 items assessing 11 determinant areas (Taylor et al., 2013). Every item from the 11 determinant areas is assessed using a scale of 1 to 4 where 1 is strongly agree, 2 is agree, 3 is disagree while 4 is strongly disagree. The respondents are supposed to tick one of the scale of 1-4 which best describe the statement in the determinant areas.

Determinant		Strongly agree (1), Agree (2), Disagree (3) or Strongly disagree (4)
Knowledge	I know what are the recommended levels of PA in children and adolescents aged 12-17 years? I don't know the reason why I should meet recommended PA? I do not have any information on the current PA guidelines for adolescents	
School PA Resources	Facilities are readily obtainable to you to do PA There are no facility to do PA near me My school is not appealing and this puts me off PA	
Motivation and Goals	I would like to do PA I am not interested to do PA I feel encouraged to do PA	
Belief about Capability	When doing PA I don't feel confident Doing PA puts me off and this makes me feel embarrassed It is difficult to do PA when others are better than me in PA	
Skills	I can do PA very well I have never been interested in sport skills, so I don't do PA I don't have the skill to be in any PA session	

Attitude	<p>I feel am very busy for PA on daily basis</p> <p>I lack interest in PA which prevent me from doing PA</p> <p>PA sessions are stressfully</p>	
Social Influence	<p>My friends are not supportive or encourage my PA</p> <p>People around me are not interested in PA even during free time</p> <p>I find am all alone doing PA</p>	
Belief about Consequences	<p>In doing PA, we get short term benefits such as burning calories, sleep better</p> <p>In doing PA, we get long term benefits such as live longer, lose weight, strong bones</p> <p>I belief PA will have positive changes in my life</p>	
Action Planning	<p>I will choose where to do PA</p> <p>I will not choose what time to engage in PA eg. 4:30pm</p> <p>I will choose what is needed for my PA to happen eg. Costumes, shoes, equipment</p> <p>I will not choose the type of PA to engage in eg. Football, basketball, running, swimming</p>	
Coping Planning	<p>I purpose to engage in PA planned despite any difficult situations</p> <p>I easily deviate from the planned PA</p> <p>Despite obstacles encountered, am focused to do PA,</p>	
Goal Conflicts	<p>I would not sacrifice work or friendship to do PA</p> <p>I would sacrifice my leisure time for PA</p> <p>I would not sacrifice time for socializing with my friends for PA</p>	

**APPENDIX J: CHECKLIST: FACILITIES, EQUIPMENT AND CO-  
CURRICULAR POLICY**

This is a tool devised for use by the school principals since they play an important leadership role in planning, implementing, monitoring as well as reviewing physical activity programs (Ministry of Education, Ontario, 2006). The researcher will obtain information through observation with help of a school Physical Education teacher.

	<b>Yes</b>	<b>No</b>
Is the playing field spacious to enable students to engage in activities safely?		
Does the school have all weather facilities to be used by the students when the playing fields are affected by the weather?		
Does the field have flat surface and good condition?		
Do all the students have access to the playing fields?		
Are stationary objects on the playing fields well marked or clearly indicated restricted area?		
Does the playing field adhere to all safety standards?		
Is the equipment enough for the number of students if used at the same time?		
Is the equipment well maintained and safe for use?		
Is the equipment suitable for use by the students?		
Is the equipment suitable for the age of the students?		
Is the equipment durable for daily use and suitable for the playing fields?		
Is the equipment well securely stored?		
Is the equipment readily available to all students?		
Does the school have student leaders that oversee implementation of PA?		
Are there short and long term goals in the implementation plan?		
Does the PA consider all students including students with special needs?		
Does the school provide appropriate support to staff?		

**APPENDIX K: MAP OF NAIROBI COUNTY**

