EVALUATION OF CHILDREN PARTICIPATION IN PHYSICAL ACTIVITIES DURING RECESS IN SELECTED PRIMARY SCHOOLS IN NAIROBI CITY COUNTY, KENYA

ANGELA WAMUCII NDURU (BSc.)

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DECLARATION

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

Signature..... Date: 23/11/2020

Angela Wamucii Nduru - H108/10484/08

Department of Recreation and Sports Management

SUPERVISORS:

We confirm that the work reported in this thesis was carried out by the candidate under our supervision.

Signature..... Date 23/11/2020

Prof. Vincent O. Onywera PhD, ISAK 2

Department of Physical Education, Exercise and Sports Science

Kenyatta University, Nairobi

Signature..... Date 23/11/2020

Dr. Festus Kiplamai PhD, ISAK 1

Department of Physical Education, Exercise and Sports Science

Kenyatta University, Nairobi

DEDICATION

I dedicate this work to my children; Matilda Nthenya Mutungi, Benjamin Muinde Mutungi and Grace Muthoni Mutungi. You inspired me to keep going even when things got tough. To my dearest husband David Mutungi Muinde, I thank God for you every day. You bring out the best in me.

To baby Josh, you are in my heart, now and always.

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To Matilda, Benjamin, and Grace, you fill our lives with joy and meaning. To baby Josh, this one is especially for you.

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LIST OF ABBREVIATIONS AND ACRONYMS

CDC	-	Centers for Disease Control and Prevention
GDP	-	Global Gross Domestic Product
HSES	-	High Socio-Economic Status
IB	-	International Baccalaureate
KUERC	-	Kenyatta University Ethics Review Committee
LSES	-	Low Socio-Economic Status
MoE	-	Ministry of Education
MVPA	-	Moderate to Vigorous Physical Activity
NACOSTI	-	National Commission for Science, Technology, and Innovation
PA	-	Physical Activity
PE	-	Physical Education
SES	-	Socio-Economic Status
SPSS	-	Statistical Package for Social Sciences
WHO	-	World Health Organization

DEFINITIONS OF TERMS

Healthy food: food that is rich in the essential nutrients of carbohydrates, proteins, vitamins, minerals, fats, fiber, and water for healthy living.

Junk food: high-calorie food that is low in nutritional value.

Pedometer: a portable device clipped at the waist to measure steps taken by an individual.

Physical activity: body movement produced by skeletal muscles that result in energy expenditure.

Physical Education: a lesson allocated in the school timetable specifically for children to participate in a structured PA.

Private Schools: Schools that follow the International Curriculum such as the International Baccalaureate (IB) and the British National Curriculum,

Public School: a school maintained or assisted out of public funds

Sedentary Behavior: this is behavior which involves taking part in activities that result in the expenditure of minimal energy such as watching television, reading a book or playing video games.

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OPERATIONAL DEFINITION OF TERMS

Child:	A male or female individual attending primary school in Westlands Constituency, Nairobi City County.
Intervention Measures:	Efforts made by selected private and public primary schools in Westlands Constituency, Nairobi City County, to encourage PA participation during recess.
Recess:	Morning and lunch breaks at selected private and public primary schools in Westlands Constituency, Nairobi City County.
School Environment:	The playing space, PA equipment and facilities, and PA programs in selected private and public primary schools in Westlands Constituency, Nairobi City County.
Evaluate:	To assess or investigate PA participation during recess by children in Westlands Constituency, Nairobi City County.

ABSTRACT

There is a global concern that children are insufficiently active to experience health benefits of physical activity (PA). The World Health Organization recommends that children should engage in at least one hour of moderate to vigorous intensity PA (MVPA) daily, or accumulate at least 12,000 steps a day to achieve health benefits associated with the PA. This study investigated the contribution of recess PA towards alleviating the burden of overweight and obesity among children in Nairobi City County, Kenya, to help form the basis for intervention. The current cross-sectional design study evaluated PA participation using pedometers to count steps accumulated by learners during recess periods in relation to gender and the type of school attended (socioeconomic status) in selected primary schools in Westlands Constituency, Nairobi City County. The participants were grade/class five pupils (N = 262: Male n = 137; 52.3%; Female n = 125; 47.7%). Most of the participants (n = 164; 62.6%) were pupils in public schools compared to those enrolled in private schools (n = 98; 37.4%). Data was collected using belt clip piezo-electric pedometers. The dependent variable was the average steps collected twice a day for three days using a pedometer. The independent variables were the socioeconomic status of schools (represented by private and public schools), gender (male and female) and the duration of recess (short and long). Consent was sort from the pupils, parents, Headteachers, KUERC, NACOSTI and MoE before carrying out the research. Data was analyzed using IBM statistics SPSS version 24. Independent-Samples t-Tests were conducted to test the first two hypotheses associated with the study while the Paired-Samples t-Test was also conducted to test the third hypothesis with the confidence level for the three tests set at alpha = .05. There was no significant difference in mean three-day steps during recess between public and private primary school pupils, $t(259.79) = 1.69$, $p = .09$. The mean steps between male and female participants was significant, $t(259.50) = 4.85$, $p = .001$. Male pupils (M = 4,775.19, SD = 1,208.88), on average, accumulated more steps compared to female pupils (M = 4,097.29, SD = 1,055.24). The mean steps for short and long recess were significantly different, $t(261) = 23.17$, $p = .001$. The participants on average accumulated significantly more steps during long recess (M = 2,708.49, SD = 834.15) compared to short recess (M = 1,743.27, SD = 484.09). The researcher recommends replicating this study in more schools within Nairobi City County to establish whether the results obtained in this study are a true reflection of the whole population (urban schools), conduct a similar study to establish PA participation level during recess in rural public schools, and to evaluate PA participation level during PE lessons, before/after school, and during non-school days to comprehensively evaluate PA trends of Kenya's school children. Based on the results from this study, the researcher recommends that schools in Westlands Constituency, Nairobi City County should encourage recess time PA since it contributes to 37% of the recommended 12,000 steps per day.

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

World Health Organization (WHO) defines overweight and obesity as abnormal or excessive fat that may impair health and wellbeing (WHO, 2020). While several factors have been linked to excess body fat such as genetics; it is noted that nutrition and physical activity behaviour stand out regarding the rising obesity epidemic globally (Crossman, 2015; De Onis, Blössner, & Borghi; 2010; Gregg & Shaw, 2017; Powers & Dodd, 2017). Obesity can be prevented by making the choice of healthier foods and regular physical activity. The WHO lists healthy foods as reduced calories from fats and sugars and increased portions of daily intake of fruit, vegetables, legumes, whole grains, and nuts (2020). In addition, children are recommended to engage in at least one hour of moderate to vigorous physical activity (MVPA) a day, or 12,000 steps a day to achieve health benefits associated with the PA participation (CDC, 2019; Chiarlitti & Kolen, 2018; Jaunzarins, Gauthier, King, Lariviere & Dorman, 2014; Morera, Rudisill, Wadsworth & Robinson, 2014; Wang, 2018). There is a global concern that children are not meeting the recommended physical activity (PA) dosage enough to experience health benefits (Centers for Disease Control and Prevention (CDC), 2019; Fryar, Carrol & Ogden, 2014; Hales, Carrol, Fryar & Ogden, 2017; Chebet et al., 2014; Muthuri, Wachira, Leblanc, et al., 2014; Onywera et al., 2016). Meeting these guidelines has become a challenge since PA is rapidly being replaced by sedentary activities such as the use of motorized transport, passive leisure time activities and mechanization/automation of household chores (Carlsson & Akerstedt, 2018; Christensen et al., 2014; Gebel et al., 2015; Torun, Gokçe, Aydın & Cesur, 2014; Peer, 2015). The engineering of streets/roads

has not been friendly to walking/cycling, and the neighbourhoods have also become unsafe or unconducive for children to play unsupervised (Wolch, Byrne & Newell, 2014; Bhurosy & Jeewon, 2014; Haregu et al., 2016; Child et al., 2014). Children spend most of their day in school, thus rendering the school environment an ideal place for children to meet the daily PA targets through physical education (PE) lessons. However, Moderate to Vigorous Physical Activity (MVPA) in PE classes alone has been found not to meet the recommended daily PA for health (Chow et al., 2015; Brusseau & Burns, 2015).

The number of overweight or obese infants and children has increased from 32 million globally in 1990 to 41 million in 2016. Obese children are likely to carry this condition into adulthood if no intervention is done (WHO, 2019). Furthermore, obesity has been associated with the risk of developing diseases and complications including cardiovascular disease, colon cancer, diabetes, hypertension, kidney disease among others (Fischer, 2016; Crossman, 2015; Powers & Dodd, 2017). Currently, overweight and obesity are linked to more deaths worldwide than underweight (WHO, 2020). The cost of treating and managing conditions associated with overweight and obesity has imposed a tremendous economic burden on individuals and countries. In 2014 the global economic impact of obesity was estimated to be US $2.0 trillion or 2.8% of the global gross domestic product (GDP) (Dobbs et al., 2014). Obesity has also imposed other costs in the form of lost productivity and foregone economic growth because of lost workdays, lower productivity at work, mortality and permanent disability (Tremmel, Gerdtham, Nilsson & Saha, 2017).

WHO (2019) reported that a vast majority of overweight or obese children live in developing countries, where the rate of increase has been more than 30% higher than that

of developed countries. In Africa, it has been reported that the number of overweight children under 5years has increased by nearly 24% since 2000 (WHO, 2020). This finding has been confirmed by a research by Muthuri (2014) which reported lower levels of PA and higher levels of sedentary behaviour among school-aged children in sub-Saharan Africa and linked this to Higher Socioeconomic Status (HSES) and urban living. There is growing evidence that there is a decrease in participation in PA among Kenyan children primarily due to urbanization (Muthuri, Wachira, Leblanc, et al., 2014; Onywera et al., 2016; Chebet, Nsibambi, Otala & Goon, 2014). In Nairobi, children from HSES were found to be engaging more in sedentary and low-intensity PA, both at home and school, compared to children from LSES (Tremblay et al., 2016; Muthuri, 2014; Onywera et al., 2016). The documented trend recommends that Kenya's children need PA intervention measures to ensure that they meet the daily PA dose.

Since children spend most of their awake hours in schools, a school environment is the most ideal, safe, and convenient place for PA intervention (Belton, O'Brien, Meegan, Woods & Issartel, 2014). Schools should have scheduled time for PE just like any other subject, facilities and equipment, and employ qualified/trained health and physical education teachers to teach developmentally-appropriate PA and concepts to the students for lifetime health/wellness (Holt, Hale, & Hall, 2016). There is, however, a growing global concern that curricular time allocated to PE is not sufficient to meet the PA dosage required (Pawlowski, Andersen, Troelsen & Schipperijn, 2016; Belton et al., 2014). In most Kenyan schools, even though PE lessons are not offered daily, teachers often use PE periods to teach other examinable subjects (Zuraikat & Dugan, 2015). In addition, the quality of instruction has been compromised due to lack of adequate and trained PE

teachers (Kamenju, Rintaugu & Mwangi, 2016; Edward, 2015). The challenges facing availability and quality of PE programs in schools can be partially resolved by utilizing recess, the only consistent time across all schools when children can be physically active within the school environment (Zavacky & Michael, 2017). Recess is one or more breaks from academic work during a typical school day. During recess, students are provided with discretionary time and opportunities to engage in PA (Pasquale, 2014).

Several studies have highlighted interventions that have been adapted to make the children more active during recess. A study by Hynynen et al. (2016) recommended that the school environment should be made more activity-friendly for the children to have abundant opportunities to engage in quality PA during recess. Additional studies have also advocated for spacious environments to trigger students' participation (De Meester et al., 2014; Hyndman, 2017; Burji, 2019), fewer pupils per square meter on the playground (Reunamo et al., 2014), and offering diverse and movable equipment instead of fixed equipment (Escalante, Garcia-Hermoso, Backx & Saavedra, 2014; Nardo et al., 2016; Woods, Graber, Daum & Gentry, 2015; Black et al., 2015).

There is a paucity of data assessing the quality and quantity of PA during recess in Kenyan schools. Thus, there is not much known about the potential of recess in alleviating the deficiency of PA among school going children. Schools must be encouraged to provide as many opportunities as possible to children to partake PA. To this effect, this study aimed at evaluating PA participation during recess among grade/class five pupils enrolled in public and private schools in Westlands Constituency of the Nairobi City County. It sought to assess differences in PA participation during

recess between long and short recess periods, between boys and girls and between children in LSES and HSES.

1.2 Statement of the Problem

There is documented evidence that obesity is on the rise globally and in Kenya, primarily due to lifestyle factors that include insufficient PA and obesogenic nutrition (Kamau, Wanderi, Njororai, & Wamukoya, 2011; Muthuri, Wachira, Onywera, & Tremblay, 2014; Wachira, Muthuri, Ochola, Onywera, & Tremblay, 2018). Schools being the primary residence of most children during school days' waking hours have been unable to sufficiently offer PA opportunities through structured PE classes. Structural and environmental constraints have challenged opportunities to participate in PA during and after school. Schools remain prime locations for students to engage in meaningful and quality PA during recess breaks. Recess breaks are a common factor across all schools, private or public, allowing children of all socioeconomic backgrounds to remain active for health. Recess can be both a substitute and complementary intervention to PE in providing daily PA opportunities at school. While there is documented evidence on the role of recess in improving PA behaviour (Ridgers, Salmon, Parrish, Stanley, & Okely, 2012), there is a paucity of knowledge with respect to Kenyan schools (Muthuri, Francis, Wachira, et al., 2014). Amid the current health challenges in Kenya, there is a need for data to support the role of recess in enabling Kenya's children to meet the recommended levels of PA for health and wellbeing. This study sought to assess PA participation of children during recess and to determine whether there is a difference in PA participation between genders, socio-economic statuses, and duration of the recess. The study also

investigated the effect of providing facilities and equipment to children during recess, how teacher supervision affected PA participation and the preferred activities by boys and girls during recess.

1.3 Purpose of the Study

The purpose of the study was to evaluate PA participation of grade/class five pupils during recess in selected public and private primary schools in Westlands Constituency, Nairobi City County. This was achieved by counting steps taken during recess using a pedometer. The study aimed to understand whether the PA behavior is affected by factors such as gender, socioeconomic status, and duration of recess. Furthermore, it sought to investigate; activities which are most preferred by boys and girls during recess, the impact of providing facilities and equipment to children during recess and, the effect of teachers' supervision during recess.

1.4 Objectives of the Study

The objectives of the study were to:

1. Assess activity levels of children during recess in selected public and private primary schools in Westlands Constituency, Nairobi City County.
2. Compare PA participation during recess between children in HSES and LSES primary schools in Westlands Constituency, Nairobi City County
3. Compare PA participation during recess between boys and girls in selected private and public primary schools in Westlands Constituency, Nairobi City County

4. Compare children's PA participation between long and short recess periods in selected private and public primary schools in Westlands Constituency, Nairobi City County.
5. Determine the effect of teachers' supervision and provision of facilities/equipment on physical activity participation by children in selected private and public primary schools in Westlands Constituency, Nairobi City County.

1.5 Research Questions

1. What is the activity level of children during recess in public and private primary schools in Westlands Constituency, Nairobi City County?
2. What is the effect of providing facilities and equipment on PA behaviour of children during recess in public and private primary schools in Westlands Constituency, Nairobi City County?
3. What is the effect of teachers' supervision on PA behaviour of children during recess in public and private primary schools in Westlands Constituency, Nairobi City County?

1.6 Hypotheses

H_{O1} There is no significant difference in mean three-day steps (activity levels) during recess between children schooling in high socio-economic status schools and low socio-economic status schools (represented by public and private schools) as measured by piezo-electric pedometers in selected private and public primary schools in Westlands Constituency, Nairobi City County.

H_{O2} There is no significant difference in mean three-day steps (activity levels) during recess as measured by piezo-electric pedometers between male and female students in selected private and public primary schools in Westlands Constituency, Nairobi City County.

H_{O3} There is no significant difference in mean three-day steps (activity levels) during recess as measured by piezo-electric pedometers between short and long recess periods by students in selected private and public primary schools in Westlands Constituency, Nairobi City County.

1.7 Significance of the Study

The findings of the current research provided data and shed light on the current state of children's PA participation during recess at selected private and public primary schools in Westlands Constituency, Nairobi City County. The findings may offer a blueprint for policy development and interventions by departments of Health and Physical Education to promote PA in their school environment. The findings can assist schools in developing frameworks to train teachers on how to effectively supervise recess periods for safety and encouragement for PA participation. Finally, the study adds to the body of research on the level of PA and relevant overweight/obesity intervention efforts in Kenya and Africa at large.

1.8 Delimitations of the Study

The study was delimited to the evaluation of PA participation during recess by 10-year-old (class/grade 5) students who attend mixed day primary schools in Westlands Constituency, Nairobi City County. It was also delimited to use of pedometers to count

steps and to collect data during the recess periods which were determined by the selected schools (time of the day and duration).

1.9 Limitations of the Study

The study took place in four schools (two public and two private). The two sub-set of schools represented typical socioeconomic demographic characteristics of urban schools in the country, and the sample was large enough to be inferred to the population of urban schools in Kenya. The pedometer measured steps taken but not the intensity of the PA.

1.10 Assumptions of the Study

The study was guided by the assumption that the observed PA participation during school recess reflected what happens on a typical school day during recesses. It was also assumed that the participants were healthy and able to take part in moderate to vigorous physical activities each of the days' data was being collected. The researcher assumed individual schools did not alter the environment (e.g. providing additional equipment or supervision) in any way in response to the study design.

1.11 Theoretical Framework

The study was based on the Social Cognitive Theory (SCT) (Bandura 1977; 1986), which was developed to explain the acquisition of a social behaviour. The theory emphasizes that learning occurs in a social context, and much of what is learned is gained through observation (Denler, Wolters, & Benzon, 2014). One central theme of the SCT is the triadic reciprocity between the individual, the environment and behaviour. This is the view that personal, behavioural, and environmental factors influence one another in a bidirectional, reciprocal fashion (Denler, Wolters, & Benzon, 2014). Which means a

person's behaviour influences or can be influenced by individual and environmental factors. Dornyei (2014) stated that the individual factors include one's thoughts, attitudes, emotions, expectations, beliefs, and goals. Behaviour is conceptualized as a person's skills, and actions and the environment is considered to be a person's social and physical surroundings (Cherry, 2014).

The triadic reciprocity can be used to explain the determinants of PA and participation in PA by students during recess. The hypotheses for the study were entrenched in the framework in that; participation in PA (behaviour) will be dependent on personal (gender and age) and environmental determinants of PA (HSES or LSES-represented by private and public schools, teachers' supervision and duration of recess). Wang (2018) reiterated that opportunities for children to engage in daily PA are dependent on several socioeconomic, personal, and environmental factors. In Kenya, there is a significant disparity between the HSES and the LSES. As such, the factors that affect PA participation during recess vary between children from the two groups. Unlike the public schools, private schools can offer a variety of facilities, equipment, and physical activities (Onywera et al, 2016). Research has singled out differences in activeness during recess between boys and girls (Jaunzarins et al., 2014; Hyndman, 2015; Zerger, Miller, Valbuena & Miltenberger, 2017) and this research sought to assess the same in Kenya. The participants of the current study were 10-year-old pupils (class/grade 5). The age of 10 years is critical because researchers have concluded that at that age, there is a significant chance that obese children stand a risk of transferring obesity to adulthood (Trost, Sundal, Foster, Lent & Vojta, 2014).

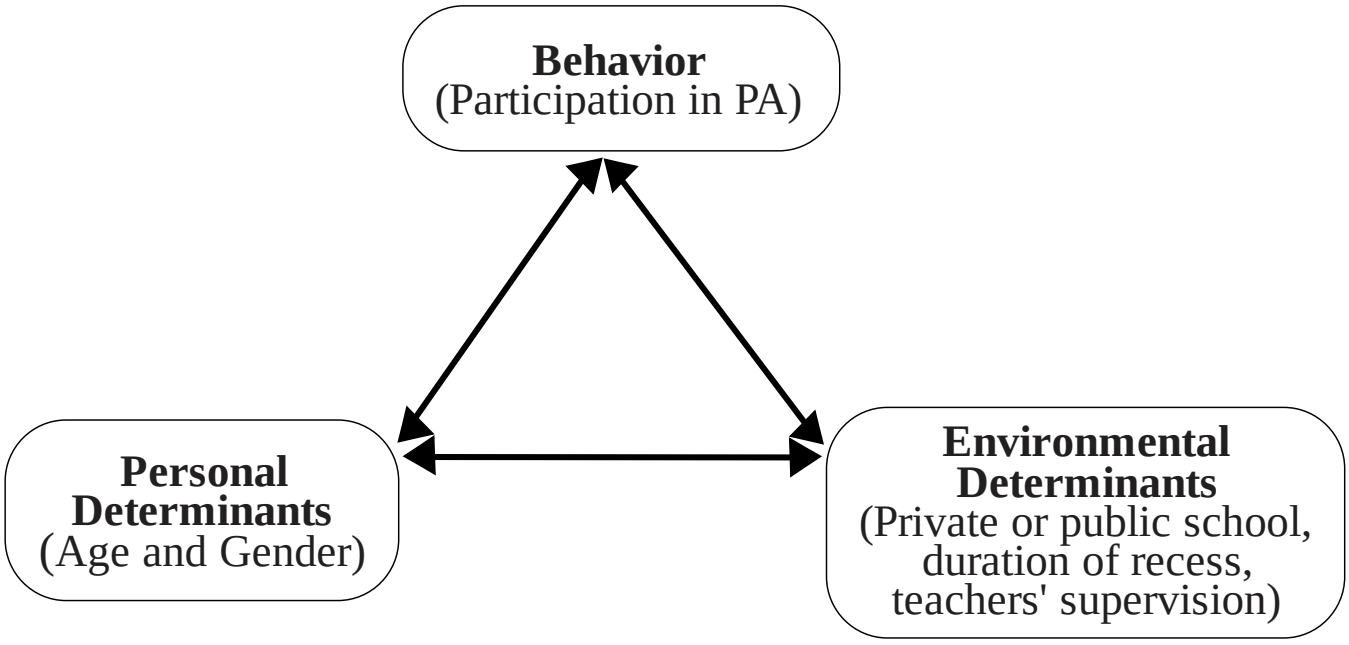

Figure 1. 1: Factors Affecting Children Participation in PA (Developed by the researcher with guidance from supervisors and in-line with existing literature.

CHAPTER TWO: LITERATURE REVIEW

2.1 Health implications of Overweight and Obesity

Body composition refers to "the relative amount of fat and fat-free tissues such as bone, muscle, and internal organs in the body" (Powers & Dodd, 2017, p. 156). The two major types of fat include (1) essential fat, which is approximately 3-5% of total body weight in mean and 8-12% in women and is essential for body functions (Crossman, 2015). An individual is considered overweight when the total body weight is above recommended range. An individual is classified as obese due to having high percentage of body fat (over 25% for men and over 35% for women), which can result into health complications (Powers & Dodd, 2017). According to Chebet et al. (2014), overweight and obesity stem from the imbalance created when energy intake exceeds energy expenditure. Obesity has been associated with the risk of developing at least 26 diseases and complications including cardiovascular disease, colon cancer, diabetes, hypertension, colon cancer, kidney disease among others (Fischer, 2016; Crossman, 2015; Powers & Dodd, 2017). According to Crossman (2015), obese individuals have a mortality rate twice that of non-obese individuals and their life expectancy is reduced by 10-20 years.

Obese population in any country has additional consequences beyond personal health and productivity of citizens. Comprehensive data on the cost of obesity to healthcare is mostly available from the United States of America (U.S.A) and United Kingdom (U.K). According to Marihart and Geraci (2015), U.S.A spent about $150 billion in treating obesity in the year 2013. Marihart and Geraci (2015) projected that this cost was likely to

increase by around 10% in 34 states and more than 20% in nine states over a 20-year period. Lubbe (2018) observed that "the combined medical cost associated with treatment of preventable obesity related diseases are estimated to increase by 48-66 billion US dollars per year in the Americas, and by 2 billion pounds per year in the UK by 2030" (p. 24). Despite lack of comprehensive date on the cost of treating obesity-related diseases in Kenya or Africa at large, various authors have concluded that obesity cases in Kenya are on the rise, especially due to urbanization, adaptation of Western lifestyle, lack of physical activity among others (Chebet et al., 2014; Muthuri, Wachira, Leblanc, et al., 2014; Onywera et al., 2016).

Several factors have been linked to excess body fat (Crossman, 2015; Powers & Dodd, 2017). Crossman (2015) observed that genetics account for 25-40% of an individual's body fat and that about 600 genes have been linked to obesity. Powers and Dodd (2017) concluded genes are responsible for about 40-70% of how and why people store body fat. Physiological factors include resting metabolic rate (RMR), hormones, and fact cells (number and distribution). Lifestyle factors include eating habits (type, quantity, and frequency of eating), physical activity, psychosocial factors (for example emotions and stress), socioeconomic status, family and cultures. The authors (Crossman, 2015 and Powers & Dodd, 2017) agreed that the current obesity epidemic can be largely attributed to lifestyle factors.

According to the CDC (2019), children affected by obesity has tripled since 1970 with one in five school children (ages 6 to 19 years) being obese (Fryar et al., 2014; Hales et al., 2017). Factors cited as contributors to childhood obesity included genetics, metabolism, eating and physical activity behaviors, community and neighborhood design

and safety (home and schools), short sleep hours, and negative childhood events (Elsenburg, van Wijk, Liefbroer, & Smidt, 2017; Fatima, Doi, & Mamun, 2015).

Physical activity as a means of modifying body weight has been greatly explored as a way of modifying behavior so as to alleviate the obesity crisis (Lugend, 2015). Although healthy eating and engaging in PA are identified as effective ways of preventing childhood obesity (Baidal et al., 2016), some research conclusions have indicated that diet is not a strong determinant of overweight among children (Visscher, Heitmann, Rissanen, Lahti-Koski & Lissner, 2015). Substantial evidence has proven the heritability of obesity. According to some authors (Singh, Kumar & Mahalingam, 2017), it may be that the 'obesity promoting' environment has triggered the major healthcare problem associated with obesity, but acting to reveal a sub-population with a pre-existing genetic predisposition to excess adiposity. However, with the dramatic increase in obesity, Carson et al. (2016) observed that modifiable factors (e.g. declines in PA) are more important determinants of obesity than non-modifiable factors (e.g. genetics).

Ecological models suggest that weight status should be determined by both individual and environmental characteristics (Johnson, 2014). Existing evidence suggested that demographic characteristics (e.g. school size and school socioeconomic status) are a significant determinant of weight status (Colapinto, Rossiter, Khan, Kirk & Veugelers, 2014). Research conclusions have pointed out that students' activity levels differ across schools, due to the different school characteristics that offer students different PA environments (Leatherdale, 2014; Watts, Masse & Naylor, 2014). Such research conclusions are illustrations that a school environment holds great potential in preventing overweight/obesity.

In the exploratory study on Kenyan children aged 10 to 15 years in Kenya, Muthuri (2014) found that out of the 1,478 students in private schools, 103 (6.9%) were categorized as obese while 245 (16.7%) were categorized as overweight. In public schools, out of the sampled 3,846 students, 62 (1.6%) were categorized as obese compared to 220 (5.7%) that were categorized as overweight. The results further showed that out of the 2,620 male students, 67 (2.6%) were categorized as obese compared to 170 (6.5%) that were categorized as overweight. Lastly, in a sample of 2,760 female students, 98 (3.6%) were categorized as obese compared to 295 (10.9%) that were categorized as overweight. The authors recommended "studies focusing on the major factors influencing overweight and obesity among children in Nairobi to be assessed so as to form basis for prevention and management of overweight and obesity" (p. 312).

2.2 Benefits of physical activity

Crossman (2015) defines physical fitness as the body's ability to respond or adapt to the demands and stress of physical effort, and physical activity as any body movement carried out by the skeletal muscles and requiring energy. Physical activity and exercise are often used interchangeably, Crossman (2015) clarifies that exercise is rather a subset of physical activity that is planned, structured, and involves repetitive body movements. The overall goal of engaging in physical activity is to achieve physical fitness (health-related). The five components of health-related physical fitness include cardiovascular endurance, muscular strength, muscular endurance, flexibility, and body composition. Overall benefits of physical activity participation includes disease prevention and management (e.g. cardiovascular diseases, cancer, osteoporosis, and diabetes, improved immune function and injury prevention) and improved psychological and emotional

wellness (e.g. reduced anxiety and depression, improved mood, sleep, self-esteem, self-confidence, creativity, intellectual functioning, social interaction, and work productivity), all of which are important for a healthy lifestyle (Fischer, 2016; Crossman, 2015; Lacy & Williams, 2018; Powers & Dodd, 2017; Thomson et al., 2015).

The CDC and the Department of Health and Human Services (DHHS) physical activity guidelines recommends that adults do at least 150 minutes per week of moderate-intensity aerobic physical activity or at least 75 minutes of vigorous-intensity aerobic activity (CDC, 2019; Crossman, 2015). Moderate-intensity aerobic physical activity examples include brisk walking, gardening, and shooting a basketball while vigorous activities include running, swimming laps, stair walking, and playing all types of sports (Crossman, 2015; Thomson et al., 2015). A number of authors have evidently equated recommended physical activity minutes to daily steps (Poirier et al., 2016; Tudor-Locke et al., 2018). According to Poirier et al. (2016), an individual accumulating less than 5,000 steps a day can be categorized as sedentary, 5,000-9,999 steps a day as low to somewhat active, and those accumulating 10,000 steps or more per day can be categorized as active or highly active. It is recommended that school aged youth (6 through 17 years) engage in moderate to vigorous-intensity aerobic PA (MVPA) and muscle/bone strengthening PA for periods that add up to at least 60 minutes each day, or 12,000 steps to acquire the health benefits associated with the PA participation (CDC, 2019; Chiarlitti & Kolen, 2018; Jaunzarins et al., 2014; Morera et al., 2014).

In addition to the overall benefits of engaging in PA, such as disease prevention and management and improved psychological and emotional wellness, various studies have outlined additional benefits accrued by children while engaging in PA. Multiple authors

have explored the relationship between PA and academic performance. According to Donnelly et al. (2016) and Sember, Morrison, Jurak, Kovac and Starc (2018), there is conclusive evidence that children who perform well in physical activities also post good grades in school. The authors attributed the academic improvement to the positive effect of PA on concentration/alertness, memory, mental health (reduced anxiety and stress) and on classroom behaviour. Students who were regularly participating in PA accrued better academic performance, despite the fact that part of the student's study time is taken up by PA (Tremblay, Barnes & Bonne, 2014). PA has also been linked to positive psychosocial outcomes such as school satisfaction and a sense of belonging (Camacho & Fuligni, 2015). Engaging in team activities including team sports, teaches children values like self–discipline, teamwork and leadership, creativity, and social skills, thus necessitating the promotion of regular PA to children as a public health priority (Chiarlitti & Kolen, 2018).

A variety of overall hindrances to quality physical activity includes lack of sufficient knowledge on existence or importance of PA, failure to plan time to exercise, lack of equipment/facility, lack of motivation/social support among others (Bredland, Soderstrom, & Vik, 2018; Powers & Dodd, 2017). Various authors have explored the challenges to the provision of quality physical activity to children. Muthuri, Wachira, Leblanc, et al. (2014) concluded that in Kenya, urban schools were restricted in terms of facilities and opportunities to engage in PA compared to rural schools. According to the Kenya's 2016 report card on PA for children and youth (Onywera et al., 2016), none of the indicators of PA participation received a grade of "A". According to the report, the involvement of family/peers and community and the built environments received a grade

of “D” while schools, organized sports participation, government strategies and investments, and overall, PA levels received a grade of “C”. In a study by Muthuri, Wachira, Onywera, and Tremblay (2015), the authors concluded that overweight/obese children “reported less time spent outside after school and a lower proportion reportedly met the sedentary behaviour guidelines or reported using active transport to/from school” (p. 244).

2.3 Physical Education in Schools

Globally, school-aged children spend most of their waking hours in a school environment throughout the year with abundant opportunities to participate in structured PA through physical education and unstructured PA through recess (Belton et al., 2014) where they are given opportunities to participate in P.A through PE lessons and during recess. It is expected that schools will allocate time (PE lessons), facilities and equipment, and qualified/trained health and physical education teachers to teach developmentally appropriate physical activities and concepts to the students for lifetime health/wellness. In Kenya, the first physical education curriculum was developed by the Ministry of Education (MOE) in 1967 (Kamenju et al., 2016). Thirteen years later, in 1980, PE as a subject became a compulsory subject in primary schools with the objectives to (Kamenju et al., 2016):

1. Derive enjoyment from participation in physical education activities.
2. Acquire and develop skills for appropriate application.
3. Develop mental and physical coordination
4. Acquire self-discipline.

5. Develop positive group participation and sportsmanship.
6. Improve and maintain bodily health and fitness.
7. Develop and promote individual talent.
8. Develop an interest for/in leisure time activities.
9. Appreciate aesthetic qualities.
10. Develop creativity in various physical activities.
11. Become self-reliant.
12. Appreciate all that the natural environment provides.
13. Develop safety skills and promote individual and collective safety awareness. (Kamenju et al., 2016).

The thirteen objectives clearly had the intentions to help a student reap the benefits associated with participation in physical activities. Despite the clear intentions, according to Kamenju et al. (2016), PE as a subject was never fully implemented due to lack of enough trained PE teachers, exponential establishment of schools, and inadequate facilities.

In addition to the challenges pointed out by Muthuri Wachira, Leblanc, et al. (2014), the latest challenge, especially in public schools is the free primary education in 2003 and subsequent free secondary education in 2018. Free primary and secondary education programs resulted in overpopulated classrooms, inadequate space (including playgrounds), shortage of teachers, inadequate budget among other challenges (Ngumbi & Maithy, 2016; Hungi et al., 2014). Despite evidence that more time in PA does not negatively affect academic performance (Donnelly et al., 2016), in Kenya, time allocated for PE has often been used to teach other examinable subjects (Zuraikat & Dugan, 2015).

Research recommends that students should spend at least 50% of a PE lesson engaged in MVPA for health (Holt/Hale & Hall, 2016; Brusseau & Burns, 2015). Various researchers have measured the quality of physical activity during PE lessons. Chow et al. (2015) and Brusseau and Burns (2015) concluded that elementary and middle school students on average accumulated at least 82 steps per minute during MVPA. In a typical lesson of 40 minutes, this translates into 3,280 steps or 4,920 steps during a 60-minute lesson. In their cross-sectional study to monitor PA using 10 years old in a fifth grade PE lesson, Mooses, Oja, Reisberg, Vilo, & Kull (2018), concluded that student obtained MVPA for 15 minutes of a 45-minutes lesson culminating into an average of 2,000 steps.

Analyzed literature suggested that children can significantly benefit from a sufficient quantity of a quality PE program (Webster, Beets, Weaver, Vazou & Russ, 2015; Belton et al., 2014). In an effort to salvage PE, Johnston, Matteson and Finegood (2014) recommended to the local governments, to come up with policies and guidelines on the minimum levels of play space, equipment for physical activity and duration of play in schools. This is to ensure that schools offer sufficient PE not only to maintain but also enhance a child's physical fitness (Belton et al., 2014). When schools choose to redirect PE time to teach other examinable subjects, they are possibly robbing the children off a healthy future. Research findings have revealed that a physically active day at school results in more PA after school (Pagels, 2017). In contrast, Romani (2014) reported that children compensate for low activity levels in school by becoming increasingly active out of school.

2.4 Recess in Schools

Recess is a break during a school day when students can get out of their classroom to the playground/field to be active and spend time with their friends (Zavacky & Michael, 2017). Recess can be used as an opportunity to complement PE (Pawlowski et al., 2016), promote MVPA and significantly contribute to children's PA levels, especially for girls (Anthamatten et al., 2014). According to Metzler (2017), school recess should be provided for at least 20 minutes every day. The 20-minute recommendation by Watson, Timperio, Brown, Best and Hesketh (2017), now being observed as a daily break of 15 minutes or more in the school day, has a positive effect on learning, social development, and health among the elementary school children.

Different interventions have been adapted to make the children more active during recess. Making the school environment more activity-friendly for the children has proven to be a significant determinant to PA participation during recess (Hynynen et al, 2016). Spacious environments trigger children's interest in PA during recess (Burji, 2019; De Meester et al., 2014; Hyndman, 2017). Reunamo et al. (2014) observed that having fewer children per square meter was associated with higher step counts per minute in both boys and girls. Additional interventions such as painting of the playground, playground markings, offering children structured fitness breaks, and designating playing zones during recess have also been found to improve the quality of PA (Brusseau & Burns, 2015). The type of playground equipment has a strong influence on where children played. Nardo et al. (2016), Woods et al. (2015), and Black et al. (2015) observed that more children engaged in vigorous PA when movable equipment (e.g. balls, bats, jump ropes) and permanent activity structures (e.g., basketball hoops) were available. These findings suggested that providing movable equipment and facilities that students can create and play games with,

instead of fixed equipment (e.g. swings) during recess periods can result in an increase in children's PA levels. However, if school grounds are to realize their potential to promote physical activity, they must offer opportunities for a variety of active play that appeal more broadly to children of varying interests and abilities (Hyndman, Benson & Telford, 2014). Without the ability to choose activities based on personal preferences, children may participate in PA in as little as 20% of their recess time (Nardo et al., 2016).

Various authors have measured the quality of PA during recess. Jaunzarins et al. (2014) evaluated the step count of 3rd third and 5th grade pupils during recess (two daily recess periods, 20 minutes each) using pedometers. The study findings indicated that average steps were higher during fall season compared to the winter season and that boys on average accumulated more steps than girls. On average, students in Jaunzarins et al. (2014) accumulated 2,767 steps during recess, which was almost half of the average daily steps by the participants during a typical school day. No significant differences were found in total steps for grades three or four, or for AM or PM recesses for either of the grades. Zerger et al. (2017) evaluated step count of students aged 9 to 12 years (N = 16) in a playground setting during recess (one recess period, 29 minutes long) at an American school using pedometers. The study findings indicated that on average, students accumulated between 94 to 99 steps per minutes (2,726 steps and 2,871 steps, respectively). The average step counts were very similar to those observed by Jaunzarins et al. (2014). It is, however, important to note that in Jaunzarins et al. (2014), the total recess time was 40 minutes without intervention while Zerger et al. (2017) study, total recess time was 29 minutes but with intervention (student pairing and encouraging step count improvement in self-selected activities).

Despite recess being a period of free-play, there is a need for adult supervision to ensure that the equipment and environment are safe and that the students are safe while engaging in PA. Recess supervision, especially at elementary level focuses mostly on ensuring that students' behaviour and safety are observed (Lewis, Mitchell, Trussell & Newcomer, 2014). Since recess supervision is a duty for all teachers regardless of the subject they teach, school policies such as employing certified PE teachers, training recess supervisors, and sharing school facilities with the community among others have been put in place for access and safety of all students (Lounsbery, 2017).

It has also been reported that longer recess length result in increased children's MVPA engagement (Hyndman, 2015). It has also been hypothesized that longer periods of recess time may enable children to become habituated to the activity opportunities on offer in the playground (Burji, 2019). However, a previous study reported conflicting findings. Hesketh et al. (2017) reported that preschoolers' PA declined as recess time elapsed. These findings were attributed to the fact that when children are released for recess, they engage in vigorous activity but get tired or bored after some time. Reunamo et al. (2014) noted that active supervision, which involved teachers playing with the children or encouraging them to be active, resulted in increased PA levels during recess, especially for girls. It would seem necessary to incorporate PA promotion in the training of preschool teachers to enable them to have a positive impact on PA participation among children.

2.5 Opportunities for physical activity outside of school

Despite PA opportunities being offered in schools through structured PE classes and recess, most, if not all students still are not able to get the required 60 minutes of MVPA

in a typical school setting. Jaunzarins et al. (2014) study found that students accumulated an average of 2,767 steps during two recess periods, and an average of 5,899 steps the entire school day. This fell short of the required at least 12,000 steps.

The mechanization and automation of home devices and the use of automobiles has cut down on the human energy needed for household work and to run errands (Gebel et al, 2015; Torun et al., 2014). Household chores and related activities contribute significantly to the daily physical activity target recommendations for a healthy living. Furthermore, the exponential growth in dependency of automobiles for transport has also contributed to the development of roadways that often ignore sidewalks and bike lanes, further discouraging active transport, especially for children. Having to cross many roads to get to a play area and higher levels of traffic density within a local area has been associated with lower rates of walking and cycling among children (Villanueva et al., 2014).

Hinckson et al. (2014) and Villanueva et al. (2014) noted that children are more likely to be physically active if the parks and playgrounds are near their home. Well maintained parks within safe neighbourhoods attract the public (Cook, Li & Heinrich, 2015; Veitch et al, 2016; Echeverria, Kang, Isasi, Johnson-Dias & Pacquiao, 2014; Pabayo, Molnar, Cradock & Kawachi, 2014). It has been noted that the availability and distribution of parks across communities is not uniform. In some countries such as the United States, low-income populations and some racial/ethnic minority populations do not have access to public resources such as parks, trails and playgrounds (Wolch et al., 2014; Bhurosy & Jeewon, 2014; Child et al., 2014). In Kenya, especially in Nairobi, a significant population of the residents reside in informal settlements (slums), or densely populated areas with lack of recreational parks or even built infrastructure to encourage physical

activity (Haregu et al., 2016). It is therefore apparent that some section of the population is denied a chance to be physically active in their neighbourhoods.

Since the distribution of P.A facilities and opportunities do not favor children living in the rural setting or LSES, school programming can play a major role in bridging the gap (Bhurosy & Jeewon, 2014; Umstattd et al., 2016). A student attending a school that provides recreation facilities and opportunities is likely to be more physically active than a similar student in a school with no PA facilities/opportunities. It has also been noted that children in LSES spend significantly more time in higher levels of PA than those from HSES (Onywera et al, 2016). Children who live near schools within neighborhoods with sidewalks and traffic control methods are more likely to walk/cycle to school (Hoelscher et al, 2016; Hinckson et al., 2014). Schools can promote active transport to and from school by providing additional supervision and/or safe routes to and from school. This could result to substantial impact on physical activity participation of children especially considering that the more the kilometers a child walks (at least 2 kilometers), the lesser the likelihood of becoming obese (Chiu et al., 2015). It is possible that PA interventions within the school environment can provide the scope for promotion of PA while at the same time giving children the freedom to choose their leisure time activities (Wang, 2018).

Various researchers have analyzed the quality of physical activity by school-going children outside school, and during a typical school period. Duncan et al. (2016) conducted a study on the e transport and quality of physical activity using a sample of 596 participants aged 5 to 16 years in New Zealand. The participants traveled a distance of 1.4 to 1.53 km from home to school for five days. Male participants on average

accumulated significantly more steps (11,000) compared to female participants (9,040). Vander Ploeg et al. (2014) compared PA among Canadian 5th grade students during school days and non-school days and found that on average, students accumulated more steps during school days (*boys* = 13, 476; *girls* = 11,436) than non-school days (*boys* = 11, 009; *girls* = 10,256). The researchers concluded that "PA levels of children are below Canadian recommended levels for optimal growth and health. Health promotion should emphasize PA particularly among girls, outside school hours, and weekends" (p. 1138).

2.6 Use of activity monitors to measure physical activity

Pedometers and accelerometers are the most used motion sensor activity trackers for assessing step count. Pedometers rely on mechanical force or single-axis body tilt side to side to measure movement. They are typically worn on the belt or waist band and respond to vertical acceleration of the hip during gait cycles (Gibson, Wagner & Heyward, 2018; Alahmari et al., 2014). Accelerometers are more improved activity trackers (mostly wearables and included in modern cellphones/smart watches) that electromechanically sense and convert even slight body acceleration (movement) every minute into approximate energy expenditure or metabolic equivalents (METS) (Wallen, Dohrn, Stahle, Franzen & Hagstromer, 2014; De Meester et al., 2014). The significant difference between accelerometers and pedometers is that accelerometers use 3-axis (upside down, sideways and backwards) body motion analysis eliminating the restriction of where and how they should be worn (De Meester et al., 2014). The use of pedometers has become a popular way of promoting physical activity. The attractiveness of the use of pedometers is compounded by the fact that they are low-cost, simple to use, and are readily available (Tudor-Locke et al., 2018).

Several studies have been done to assess the accuracy and reliability of the various commercially available pedometer brands (Webber, Magill, Schafer & Wilson, 2014; Alahmari et al., 2014; Montoye, Mitrzyk & Molesky, 2017). According to Kooiman et al. (2015), the reliability and validity of most activity trackers for measuring step count has been established. The review of these studies has revealed that the Piezo-electric pedometers are sensitive at low speed and the horizontal tilt of the pedometer does not throw off the accuracy of the pedometer except at the slowest speed of below 2mph.

NL-800 is highly accurate in high and low speeds, its cover protects the buttons from inadvertent resets and is accurate in accounting steps for the overweight/obese individual.

It stores step totals for 7 days and automatically resets daily totals thus making it an appealing option for researchers who want to eliminate the potential bias of subjects recording their own data (Alahmari et al., 2014). Sigmunda and Sigmundova (2014) stated that an ideal and objective data collection instrument is one that is low in cost, easy to administer to large groups, unobtrusive to the subject and accurate. Pedometers meet these criteria. Alahmari et al. (2014) found the NL pedometer accurate to within ±3% of the actual steps taken, 95% of the time and therefore recommended them for use in research studies.

2.7 Summary of Literature Review

There is evidence that most of the youth are not getting the recommended amount of physical activity for optimal health (Crossman, 2015; Muthuri, 2014; Muthuri, Francis, Wachira, et al., 2014; Katzmarzyk, et al., 2013). Lack of adequate physical activity has been identified as the contributing factor to childhood overweight/obesity (Elsenburg et al., 2017; Fatima et al., 2015; Lugend, 2015). The impact of overweight/obesity goes

beyond individual child's health but also affects the economy of a country through medical costs associated with treating complications associated with it (Lubbe, 2018; Marihart & Geraci, 2015; Onywera, 2010). In Kenya, there is evidence that there is a significant number of school-aged children that are categorized as overweight/obese (Muthuri, 2014; Muthuri, Wachira, Leblanc, et al., 2014; Onywera et al., 2016).

The benefits of physical activity go beyond the prevention of chronic diseases associated with overweight/obesity. Several authors have correlated PA to improved psychological and emotional wellness (Fischer, 2016; Crossman, 2015, 2012; Lacy & Williams, 2018; Powers & Dodd, 2017; Thomson et al., 2015). There has been proven positive relationship between PA and academic achievement (Sember et al., 2018; Donnelly et al., 2016), school satisfaction and sense of belonging (Camacho & Fuligni, 2015) and acquisition of self-discipline, leadership, creativity, and social skills (Chiarlitti & Kolen, 2018).

Students spend most of their waking hours in schools and thus it is expected that they should be able to get most of the required PA through structured PE classes. Studies have however challenged this notion, attributing the failure to deliver quality PA through PE lessons to the exponential establishment of schools, inadequately trained teachers and inadequate facilities (Hungi et al., 2014; Ngumbi & Maithy, 2016; Kamenju et al., 2016), and use of PE lessons to teach other examinable subjects (Zuraikat & Dugan, 2015). Various researchers have also concluded that MVPA in PE classes alone cannot meet the recommended daily PA for health (Chow et al., 2015; Brusseau & Burns, 2015). Despite opportunities for students to supplement their PA levels through activities outside schools, several authors have pointed out substantiated barriers: automation and

mechanization of home devices and automobiles (Gebel et al, 2015; Torun et al., 2014) and poorly built neighborhoods that discourage walking and bicycling or accessing parks/playgrounds (Wolch et al., 2014; Bhurosy & Jeewon, 2014; Haregu et al., 2016; Child et al., 2014; Villanueva et al., 2014).

School-aged youth (6 through 17 years) are recommended to engage in MVPA and muscle/bone strengthening PA for periods that add up to at least 60 minutes each day, or 12,000 steps to acquire the health benefits associated with the PA participation (CDC, 2019; Chiarlitti & Kolen, 2018; Jaunzarins et al., 2014; Morera et al., 2014). Previous research on PA levels among Kenya's children has recommended more PA intervention to alleviate the health complications preventable through adequate PA (Muthuri, 2014; Muthuri et al., 2015; Onywera et al., 2016). Recess in schools has been proven as a significant period when children can be active and therefore supplementing PE and after-school activities in meeting the recommended daily PA for health purposes (Reunamo et al., 2014; Jaunzarins et al., 2014; Anthamatten et al., 2014; Pawlowski et al., 2016; Zerger et al., 2017). From the summary above, there are several gaps in the number and types of cohorts used, duration of studies, points of comparison among others that the current study will fill.

CHAPTER THREE: METHODOLOGY

3.1 Research Design

The study adopted the Cross-Sectional Analytical Design to evaluate PA participation during recess by children in selected primary schools in Westlands Constituency, Nairobi City County. Due to varying climatic conditions and diversity in the choice of physical activities by children, the design was appropriate to objectively measure the quantity of PA over time, during separate days of the week (Sarkar et al., 2018). Quantitative data (total steps) was obtained from the participants twice a day for three days. Observation method of data collection was also used to gather additional information such as the type of activities preferred by the children, duration of recess, supervision during recess and provision of mobile or fixed playing equipment by the school. Observation tool was used to record the data collected.

3.2 Measurement of Variables

The dependent variable was the average steps collected twice a day for three days using a pedometer. The independent variables were the socioeconomic status of schools (private and public schools), gender (male and female) and the duration of recess (short and long).

To support the findings, the researcher also gathered data on preferred activities, facilities and equipment, and supervision.

3.3 Location of the Study

The location of the study was Westlands Constituency, Nairobi City County, Kenya. Westlands Constituency was purposely selected because it has adequate schools of varying socioeconomic statuses (low cost/public and high cost/private schools).

3.4 Target Population

The study targeted children aged 10 years (class/grade 5) attending mixed day private and public primary schools in Westlands Constituency, Nairobi City County. The age and date of birth of the participants was captured in the Parent's Consent Form (Appendix B). Trost et al. (2014) observed that chances of children growing into obese adults increases significantly at the age of 10 years.

The two selected private schools had an average of three (3) classrooms per grade, and each classroom had an average of 25 students. The target population from the selected private schools was $N = 150$. The two selected public schools had an average of three (3) classrooms per grade, and each classroom had an average of 50 students. The target population from the selected public schools was $N = 300$. The researcher targeted a combined population of $N = 500$ to accommodate any additional enrollment at the time of conducting the study. A large sample size was significant so that the results obtained can be a true reflection of the primary schools in Nairobi.

3.5 Sample Size and Sampling Technique

The study sample included 10-year-old (class/grade 5) boys and girls from two (2) selected private schools, and two (2) selected public schools. The schools were purposively selected due to various factors; (1) the convenient location of both private and public schools, (2) availability of respondents, and (3) accessibility by the researcher. According to Gratton and Jones (2014), in a population of 500, a sample of 222 is considered appropriate at sampling error of 5%. The researcher used stratified random sampling procedure to divide the population of 10-year-old (grade/class 5) boys and girls into two strata (boys and girls). Simple random sampling was carried out within a stratum, and a sample of 262 participants was drawn. The boys and girls who were older or younger than 10 years old were excluded from the study as well as students who had conditions that prohibited them from taking part in physical activity such as physical or mental disability.

3.6 Research Instruments

Numerous research have supported the use of the simple and inexpensive pedometer for assessing physical activity in research (Hajna et al., 2015; Shiroma et al., 2015; Hubbard-Turner & Turner, 2015). Data for the current study (total steps) was collected using the belt clip piezo-electric pedometers model NL-800 (© 2005 New-Lifestyles, Inc.). The reliability and validity of piezo-electric pedometer has been evaluated using adults in various environments, such as walking/running on a treadmill, front-back-side-side stepping, elliptical machine, stair climbing/descending, and ballroom dancing (Montoye et al., 2017). Sixty (60) adults were used to evaluate the validity and reliability of the instrument while wearing other five different sets of devices. The participants completed five (5) 100-step trials while walking on an outdoor track. The results for each trial were

correlated with the hand-tally counter. The step data (pedometer values) was converted into percentages of the actual tally counter steps. Piezo-electric pedometer yielded 100% results in all trials compared to three other pedometers (Montoye et al., 2017). The instrument was most valid at various walking speeds when clipped at the waist or in the backpack, but not when in the pants pockets. The authors concluded that piezo-electric pedometer "is a valid device for step counting, when used for continuous bouts of walking and running at speeds ranging from two to eight mph" (p. 1020).

The reliability of the instrument was further evaluated in the current study using the test-retest method at the pilot stage. According to Stewart, Turner and Miller (2014) reliability index of 0.70 or better is an acceptable indicator of the reliability when using the test-retest method. The instrument yielded an Intraclass Correlation Coefficient (ICC) of .84, indicating a good reliability. The pedometer reading was recorded in the data collection form (Appendix E). The form was also used to collect additional data on available equipment and facilities, supervision, duration of recess periods and the activities preferred by the children during recess. This information was used to support the study findings.

3.7 Instruments Pre-testing

A sample of Twenty-five (25) participants (male $n = 14$; female $n = 11$) from one public school in Westlands Constituency, Nairobi City County was used for the pre-test prior to the main study. The pre-test was used to mainly test the reliability of the instrument, identify, and eliminate data collection challenges, and to allow the researcher to make the necessary revision before collecting data for the main study. The data for reliability test was collected on two separate recess periods, three days apart. The test-retest method was

used to test for reliability of the instrument. The instrument yielded an Intraclass Correlation Coefficient (ICC) of .84, indicating a good reliability (Kooiman et al., 2015; Stewart et al., 2014). The 95% confidence interval ranged between .46 and .93 (Table 3.1). The school that participated in the pre-test was excluded from the main study.

Table 3. 1: Intraclass Correlation between Test 1 and Test 2 of the Pilot Study

Intraclass Correlation Coefficient	95% Confidence Interval
.84*	0.46-0.93

Note: *P<0.01

3.8 Data Collection Procedures

Prior to conducting the study, the headteachers/principals of the selected schools were sent a letter of permission/consent to conduct research (Appendix A). The letter introduced the researcher, explained the purpose of the study, the procedures to be followed, the risks and benefits of the study. The administrators were informed that permission was to be sought from the parents to allow students to participate in the study, and no student was to be allowed to participate in the study without signed parental

consent. A similar letter of consent was also sent to the parents of the selected schools/grades requesting for permission of their children to participate in the study (Appendix B). Since minors have a right to decline to participate in a study despite a consent from the parents, each pupil consented through their parents to participate in the study was issued with an assent form with a chance to agree or decline to participate in the study (Appendix C). Since the study involved research assistants, a letter introducing each assistant was sent to the headteachers/principals of the selected schools with complete names and identification details of each research assistant (Appendix D). The research assistants were trained on how to operate pedometers, read, and record data prior to, and during the piloting stage. The administrators, parents, and students were informed that participation of their respective schools and children was voluntary and that they could withdraw from participating in the study at any time.

In private schools, a total of 150 consent forms for parents were issued, and 110 (73%) forms were signed and returned. All 110 consented students assented to participate in the study. During the study, about nine students (8.2%) missed school and therefore, were excluded from the study and about three students (2.7%) either lost or spoilt the pedometer consequently they could not continue with the study. In public schools, a total of 250 consent forms for parents were issued, and 176 (70.4%) forms were signed and returned. All 176 consented students assented to participate in the study. During the study, about nine students (5.1%) missed school. They, therefore, were excluded from the research and about three students (1.7%) either lost or spoilt the pedometer, consequently, they could not continue with the study.

The researcher and assistants agreed with school heads or representatives on the best days that did not conflict with school functions to collect data. The participants were taught how to properly handle the pedometers to avoid damage, misplacement or tampering with the gadgets during data collection. Based on previous reliability and validity studies (Kooiman et al., 2015; Montoye et al., 2017), the pedometers were clipped on the belt or waistband for the accuracy of the step counts. Data was collected from each selected school twice a day, three days a week, for two weeks. During a typical testing day, research assistants assisted each participant to wear a pedometer securely and ensured that each pedometer reading was set to zero before the start of recess. After-recess readings of each pedometer was recorded. The participants were 'blinded' to their scores during recess by sealing the pedometer readings to avoid tampering with the scores or to avoid testing-induced performance. The raw data included total steps for morning and afternoon recesses, mean morning and afternoon recesses steps, mean daily steps.

3.9 Data Analysis and Presentation

Data was coded and analysis using IBM statistics SPSS version 24. Independent-Samples *t-Tests* were conducted to test the first two hypotheses associated with the study with a confidence level set at alpha = .05. The test compared mean three-day steps (activity levels) during recess between *public* and *private* primary school students and mean three-day steps (activity levels) during recess between *male* and *female* students in primary schools in Westlands Constituency, Nairobi City County. The third hypothesis was tested using Paired-Samples *t-Test*. It was conducted to test the mean three-day steps (activity levels) during recess between *short* and *long* recess periods by students in Westlands

Constituency, Nairobi City County and confidence level set at $p<0.05$. The results were presented in tables, figures, and charts.

Before conducting the Independent-Samples and Paired-Samples *t-Tests*, the data was screened for basic assumptions underlying Independent-Samples and Paired-Samples *t-Tests*. The dependent variable (mean 3-day steps) was screened for normality across levels of the independent variables –socioeconomic status and gender. Shapiro-Wilk test of normality was used to test if the sample is normally distributed. The results presented in Table 3.2 showed no significant difference from a normal distribution for public schools' male (p = .06) and female (p = .29) participants, and across private schools' male (p = .18) and female (p = .05) participants.

Table 3. 2: Test for Normality across Independent Variables using Shapiro-Wilk

Socioeconomic Status	Gender	Statistic	*Df*	*P*
Public	Male	.971	83	.060
	Female	.981	81	.289
Private	Male	.969	54	.179

3.10 Logistical and Ethical Considerations

Firstly, the current research was authorized by Kenyatta University's Graduate School (Appendix F) following the review of the study's proposal. Secondly, the researcher obtained permission to conduct the study from Kenyatta University's Ethics Review

Committee (Appendix G). Finally, a research permit was obtained from the Ministry of Education's National Commission for Science, Technology and Innovation (NACOSTI) (Appendix H). The researcher sent all the documents explained under the procedures (Section 3.8) to the administrators of the selected schools, parents, and students. The letters and consent forms introduced the researcher, explained the purpose and potential benefits of the study, and requested permission to conduct the study with the students within their schools. Following the approval from administrators, parents received a letter of introduction/consent form detailing the purpose of the research and seeking permission of their child (children) to participate in the study. Students were also given a chance to assent to the study with an option of opting out. The researcher explained to the administrators, parents and students that their data was to be kept confidential, their names were not required anywhere on the data collection sheet (Appendix E), their participation was voluntary, and that they could withdraw from participating in the study at any time. The results of the study were not associated with any identifiable name but pseudonyms for confidentiality purposes. All data sheets and consent forms related to the study were locked in a safe place after the analyses by the researcher and will be destroyed after three years.

CHAPTER FOUR: RESULTS AND INTERPRETATION

4.1 Introduction

This chapter will present the results and interpretation of the results in line with the objectives of this study. It will present descriptive and demographic results, the difference in mean steps between socioeconomic status, gender difference in recess PA and the difference in PA between long and short recess durations. It will also present the implications of these results.

4.2 Descriptive and Demographic Results

To effectively evaluate the quantity of physical activity participation during recess, the demographic data sought included the socioeconomic status of the school (private and public schools), gender (male and female), recess duration (short and long), preferred activities during recess by boys and girls, the type of facilities and equipment available during recess, and the effect of supervision during recess. These descriptive demographic results are presented in the following sub-sections:

4.2.1 Gender by Socioeconomic Status of Schools

The respondents included 10-year-old grade/class five pupils (N = 262) from two public and two private primary schools in Westlands Constituency, Nairobi City County (Table 4.1). Male participants were 52.3%, and female participants were 47.7%. Participants from public schools were 62.6% while participants from private schools 37.4

Table 4. 1: Demographic Characteristics (N = 262)

Variable	Public		Private		Total	
	n	%	*n*	%	*n*	%
Gender						
Male	83	31.7%	54	20.6%	137	52.3%
Female	81	30.9%	44	16.8%	125	47.7%
Total	164	62.6%	98	37.4%	262	100.0%

4.2 Mean Daily Step Count by Socioeconomic Status of Schools and Gender

Data was collected twice a day during short and long recesses for three days. The mean daily steps were computed for public and private schools (Table 4.2). The participants from public schools accumulated more steps in each of the three days (*Day 1* = 4,633.10; *Day 2* = 4,836.59; *Day 3* = 4,141.10) compared to private schools (*Day 1* = 4,392.76; *Day 2* = 4,427.01; *Day 3* = 4,107.98). The participants from public schools on average had more average cumulative steps (*M* = 4,536.93; *SD* = 1,350.01) compared to participants from private schools (*M* = 4,309.25; *SD* = 828.69).

Male participants accumulated more steps in each of the three days (*Day 1* = 4,804.10; *Day 2* = 5,023.62; *Day 3* = 4,497.85) compared to female participants (*Day 1* = 4,257.25; *Day 2* = 4,310.49; *Day 3* = 3,724.14) (Table 2). Male participants on average had more average cumulative steps (*M* = 4,775.19; *SD* = 1,208.88) compared to female participants (*M* = 4,097.29; *SD* = 1,055.24).

Table 4. 2: Mean Daily Steps by Socioeconomic Status of Schools and Gender (N = 262)

Variable	Day 1 Steps		Day 2 Steps		Day 3 Steps		AVG Total	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Status								
Public	4633.10	1428.86	4836.59	1582.81	4141.10	1623.42	4536.93	1350.01
Private	4392.76	944.46	4427.01	1201.85	4107.98	1111.73	4309.25	828.69
AVG Total	4543.20	1272.85	4683.39	1463.17	4128.71	1451.04	4451.77	1185.58
Gender								
Male	4804.10	1259.52	5023.62	1534.43	4497.85	1559.32	4775.19	1208.88
Female	4257.25	1229.87	4310.49	1286.77	3724.14	1203.93	4097.29	1055.24
AVG Total	4543.20	1272.85	4683.39	1463.17	4128.71	1451.04	4451.77	1185.58

4.2.3 Mean Daily Step Count by Recess Duration

The average duration of the short recess was 26.25 minutes, and the average duration of long recess was 50 minutes in the selected private and public schools. The mean cumulative steps were computed for short and long recess periods (Table 4.3). The participants from public schools accumulated more steps in each of the two recess periods (*Short Recess* = 1,801.49; *Long Recess* = 2,735.44) compared to private schools (*Short Recess* = 1,645.85; *Long Recess* = 2,663.40). Male participants accumulated more steps in both short and long recess periods (*Short Recess* = 1,822.31; *Long Recess* =

2,952.88) compared to female participants (*Short Recess* = 1,656.65; *Long Recess* = 2,440.64). On average, the participants accumulated more steps during long recess (*M* = 2,708.49; *SD* = 834.15) compared to the short recess periods (*M* = 1,743.27; *SD* = 484.09).

Table 4. 3: Mean Short and Long Recesses Steps by Socioeconomic Status of Schools and Gender (N = 262)

Variable	**Short Recess**		**Long Recess**	
	M	***SEM***	***M***	***SEM***
Status				
Public	1801.49	45.04	2735.44	68.27
Private	1645.85	23.96	2663.40	77.22
AVG Total	1743.27	29.91	2708.49	51.53
Gender				
Male	1822.31	40.88	2952.88	74.77
Female	1656.65	42.68	2440.64	62.36
AVG Total	1743.27	29.91	2708.49	51.53

4.2.4 Provision of Equipment and Facilities

It was observed that there was a disparity in equipment and facility provision for recess between private and public schools (Table 4.4). In both private and public schools, there were 13 observed facilities and equipment available for students to utilize during recess. Observed facilities and equipment in private schools accounted for nine (69.2%) compared to only four (30.8%) in public schools.

Table 4. 4: List of Observed Facilities and Equipment in Private and Public Schools

School Status	Facilities and Equipment Present
Private Schools	1. Playing field/playground 2. Marked football field with goal posts 3. Paved and marked basketball courts 4. Paved and marked tennis courts 5. Paved and marked netball courts 6. Indoor hall/gymnasium with marked badminton courts 7. Footballs (students' and school-owned) 8. Basketballs (students' and school-owned) 9. Tennis balls (students')
Public Schools	1. Playing field/playground with football goal posts 2. Basketball courts 3. Volleyball posts 4. Footballs (mostly improvised from polythene bags or worn out pieces of clothes such as pair of socks)

In private schools, facilities and equipment were relatively better maintained and diverse, ranging from paved outdoor courts (tennis, basketball, and netball) to indoor facilities (badminton). Paved outdoor facilities enabled students to utilize them during rainy/wet days and with minimal risks of injuries compared to the slippery and muddy outdoor grass fields. Indoor facilities enabled students to engage in physical activities during extreme weather. Students could afford to bring their own standard playing equipment and supplies such as footballs, basketballs, and tennis balls. Free play in private schools

was hindered in two ways; first, it was observed that in some instances, students were prohibited from using personal equipment due to fear of injuries incurred during unsupervised play. Second, physical education teachers were reluctant to issue equipment to the student during recess due to fear of liability because of injuries caused during unsupervised play.

In public schools, facilities and equipment were not in usable shape and diverse compared to private schools. The volleyball posts and basketball courts particularly appeared rundown to the extent of being a source of injury to the students. Students used worn-out balls or had to improvise, especially footballs using socks and polythene bags. Compared to private schools, students were freely allowed to play with the equipment they had improvised, without much afterthought regarding the associated liability. Due to the lack of indoor facilities, during extreme weather, students remained in class during recess or physical education lessons to avoid getting wet and muddy.

4.2.5 Preferred Activities during Recess

Students in both private and public schools had very similar preferences for physical activities. It was however distinctively clear in terms of preference between boys and girls across both socioeconomic spectrums. Most boys in both private and public schools (69.93%) preferred playing football during recess (Figure 4.1). This preference was augmented by the observation that boys brought standard or improvised footballs for a chance to play the sport during recess. It was also clear that football goalposts were a common playground/field facility in both private and public schools. The second most preferred activity by boys included unorganized play such as racing/chasing each other

across the field (13.99%), followed by basketball (9.1%), and sitting down with friends (6.99%).

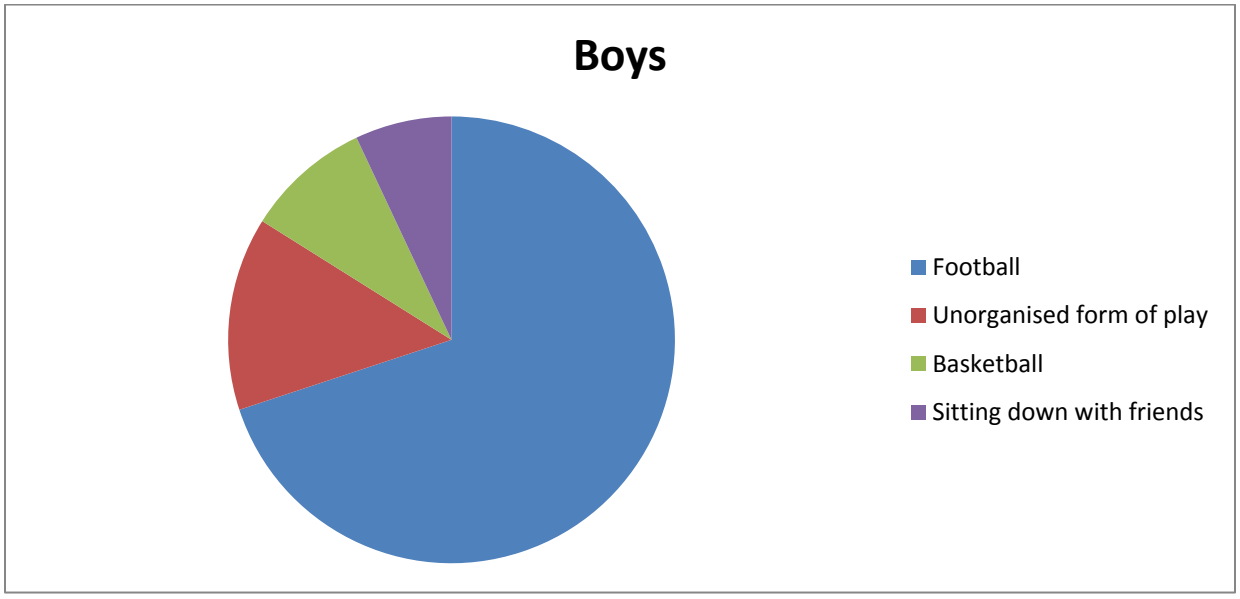

Figure 4. 1: Activities Preferred by Boys:

Most girls in both private and public schools (56.72%) preferred passively sitting down with friends (Figure 4.2). The second most preferred activity by girls included unorganized play such as racing/chasing each other across the field (23.13%), followed by hop-scotch (5.97%), taking a walk with friends (5.22%), playing football (5.22%) and playing tag (3.73%).

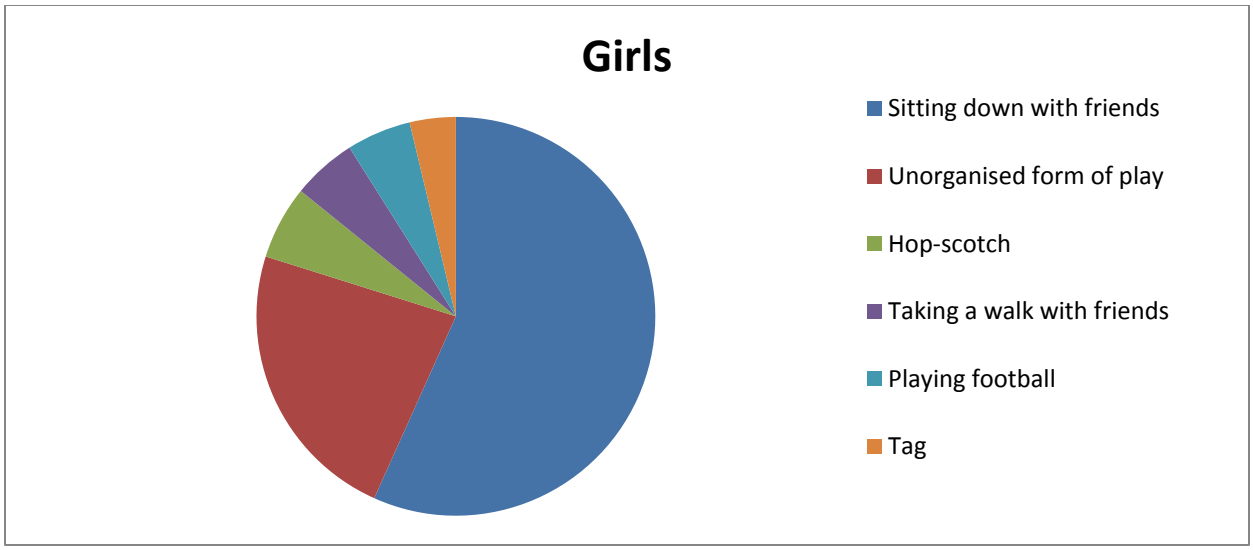

Figure 4. 2: Activities Preferred by Girls

Some of the school routines during recess periods to some extent, limited the quality of physical activities by limiting students' mobility, especially in private schools. It was observed that during morning recess, students in private school could have their packed snacks. Most students had packed snacks, and they spent a substantial amount of time sitting while snacking. The opposite was observed in public schools, where most of the children did not carry morning snacks. As such, they were able to engage in quality physical activity during the morning recess without distractions.

4.2.6 Supervision

In private schools, it was observed that there was organized and structured supervision of recess periods. Teachers were assigned duties on the playground/field and promptly reported to their respective duties. The main concern for the supervision at private schools was to prevent or report injuries that would have occurred. There was an average of two (2) teachers on the playground/field during both short and long recesses. Teachers

on duty did not in any way influence the choice, or pattern of physical activities; students engaged in unstructured play. The students did not seem to notice the presence of teachers, and therefore not disrupting recess activities.

In public schools, there was no organized or structured supervision of recess periods. No teacher was present on the playground/field for supervision purposes during recess, just like in private schools, students engaged in unstructured and self-determined physical activities.

4.3 The Difference in Mean Steps between Socioeconomic Status (LSES and HSES)

An Independent-Samples *t-Test* was conducted to determine if there was a significant difference in mean three-day steps during recess in LSES schools (public schools) and HSES schools (private schools). The test showed that the difference was not statistically significant (t (260) = 1.69, p = 0.09). The null hypothesis that there would be no significant difference in mean three-day steps during recess as measured by piezo-electric pedometers (Model NL-800; © 2005 New-Lifestyles, Inc.) between public school and private primary school children in Westlands Constituency, Nairobi City County was therefore accepted.

Table 4. 5: Independent-Samples t-Tests Comparing Mean Steps for Public and Private Schools (N = 262)

Status	*M*	*SEM*	*t*	*Df*	*p*
Public	4536.93	105.42	1.69	259.79	.092
Private	4309.25	83.71			

4.4 Gender Difference in Recess Physical Activity

The difference in PA levels between boys and girls during recess was determined by an Independent-Samples *t*-Test between the mean of three-day steps during recess between male and female students (Table 4.6). The test results showed that male students had more steps (*M* = 4775.19, *SEM* =103.28) compared to female students (*M* = 4097.29, *SEM*= 94.38) and that the difference was statistically significant (*t* (262) = 4.85, *p* = 0.001(Table 4.6). The test was significant, *t* (259.50) = 4.85, *p* = .001. The null hypothesis that there will be no significant difference in mean three-day steps during recess as measured by piezo-electric pedometers (Model NL-800; © 2005 New-Lifestyles, Inc.) between male and female students in primary schools in Westlands Constituency, Nairobi City County was therefore not accepted. This implies that boys were more physically active than girls during recess.

Table 4. 6: Independent-Samples t-Tests Comparing Mean Steps for Male and Female Participants (N = 262)

Gender	*M*	*SEM*	*t*	*Df*	*P*
Male	4775.19	103.28	4.85	259.50	.001
Female	4097.29	94.38			

4.5 Difference in Physical Activity Between Long and Short Recess Durations

A Paired-Samples *t-Test* was conducted to determine the difference in PA levels between long and short recess periods. Results indicated that the mean of steps accumulated

between long and short recess was statistically different (t (1, 261) = 23.17, p = .001). During long recess, students accumulated more steps (M = 2708.49, SEM = 51.53), compared to steps accumulated during short recess (M = 1743.27, SEM =29.91) (Table 4.7). The null hypothesis that there would be no significant difference in mean three-day steps during recess as measured by piezo-electric pedometers (Model NL-800; © 2005 New-Lifestyles, Inc.) between short and long recess periods in primary schools in Westlands Constituency, Nairobi City County was therefore rejected. This indicates that the students had opportunities for more PA during long recess compared to the short recess. Figure 4.7 shows the mean 3-day steps by duration of recess periods.

Table 4. 7: Paired-Samples t-Tests Comparing Mean Steps for Short and Long Recesses (N = 262)

Duration	*M*	*SEM*	*t*	*Df*	*P*
Short Recess	1743.27	29.91	23.17	261	.001
Long Recess	2708.49	51.53			

CHAPTER FIVE: DISCUSSION

5.1 Step Count and Quality Physical Activity

In the current study, there was significant difference in mean steps for short and long recess periods, t (261) = 23.17, p = .001 (Table 4.7). On average, the participants accumulated more steps during long recess (M = 2708.49; SEM = 51.53) compared to short recess periods (M = 1743.27; SEM = 29.91) (Table 4.3, p. 38). This represented a daily total of 4,451.76 steps just from recess. The two recesses lasted for a combined 76 minutes, meaning the students were stepping at an approximate rate of 57 steps per minute. The step rate was less compared to a similar study by Jaunzarins et al. (2014), where the step rate was approximately 69 steps per minute during recess. The step rate for the current study was also low compared to a study in a PE setting where Chow et al. (2015) and Brusseau and Burns (2015) observed that the step rate was 82 steps per minute during MVPA. As observed in the current study, at a step rate of 57 steps per minute, students will need approximately 211 minutes, or about 3.5 hours of PA to meet the required 12,000 steps. This approximation is consistent with the study by Ghose (2015) where 916 Portuguese preschoolers accumulated about 9,099 steps after three hours of PA. In another study using 535 Flemish preschoolers, the students accumulated from 4,653 to 13,326 steps after 180 minutes (3 hours) of daily PA (Ghose, 2015).

The observed step count during recess for the current study represented approximately 37% of the recommended daily step count for health. This is very good considering that there are two more avenues, PE classes and active transport or after school PA, where the students have a chance to meet the required step count. This is consistent with the observation from Dr. Stephen Daniels, the chief pediatrician at the Children's Hospital

Colorado, Denver when he said that even though children are required to get 60 minutes (or 12,000 steps) a day of MVPA, it was fine if the activity was broken up throughout the day (Ghose, 2015). In the study, Ghose (2015) reiterated that recess is a crucial component of a Comprehensive School Physical Activity Program (CSPAP). In their study students accumulated approximately 1,268 and 914 steps for boys and girls, respectively, within a 15-minute time period. The researchers observed that recess accounted for 17% to 44% of school-day step counts.

It is recommended that children engage in up to 60 minutes of MVPA every day, or a minimum of 12,000 steps to meet the standards of healthy living (CDC, 2019; Chiarlitti & Kolen, 2018; Colley, Janssen & Trembley, 2012; Jaunzarins et al., 2014; Morera et al., 2014). Many public health organizations suggest that preschoolers engage in about three hours of low, moderate or vigorous PA (Ghose, 2015).

5.2 Gender Differences in Physical Activity Participation

In the current study, there was a significant difference in mean three-day steps during recess between male and female students, t (259.50) = 4.85, p = .001 (Table 4.6). Male participants accumulated more daily and cumulative three-day steps (M = 4775.19; *SEM* = 103.28) compared to female participants ((M = 4097.29; *SEM* = 94.38) (Table 4.2). Male participants also accumulated more steps in both short and long recess periods (*Short Recess* = 1822.31; *Long Recess* = 2952.88) compared to female participants (*Short Recess* = 1656.65; *Long Recess* = 2440.64). It is however important to note that there were more male participants (n = 137; 52.3%) compared to female participants (n = 125; 47.7%). The level of participation by each gender could explain the disparity (Watson et

al., 2017). In their study, Watson et al., (2017) observed that during recess, boys spent 78% and girls spent 63% of their time engaged in PA and outside of school, girls spent 20%, and boys spent 25% of their time engaged in PA.

Similar studies showing increased PA for boys compared to girls included studies by Ridgers et al. (2018) and Lim (2019). Ridgers et al. (2018) concluded that boys were more active than girls during recess, girls engaged in more sedentary activity than boys, and that recess contributed 17.9% and 15.5% toward boys' and girls' school day moderate-to-vigorous physical activity, respectively. In their study of Hungarian children during recess, Ridgers, Salmon and Timperio (2018) concluded that recess contributed more moderate-to-vigorous physical activity towards weekday physical activity for boys (13.1%) than girls (10.8%). The authors also observed that boys engaged in significantly more light (30.6± 5.2%; 27.7± 5.1%), moderate-to-vigorous (24.9 ±8.9%; 17.5± 5.2%) and vigorous physical activity (7.6± 4.7%; 4.3± 2.9%) than girls during recess. Lastly, girls (54.8± 8.1%) engaged in more sedentary activity than boys (44.5± 10.2%).

According to multiple studies, male students demonstrated higher levels of PA compared to female students during PE (Mooses et al., 2018; Chow et al., 2015; Brusseau & Burns, 2015), recess (Jaunzarins et al., 2014; Zerger et al., 2017), and outside the school environment (Duncan et al., 2016; Vander Ploeg et al., 2014).

5.3 Effects of Socioeconomic Status on Participation in Physical Activities

In the current study, there were more participants from public schools (n = 164; 62.6%) compared to those enrolled in private schools (n = 98; 37.4%) (Table 4.1). The disparity in sample sizes was consistent with the conclusions by various authors (Ngumbi &

Maithy, 2016; Hungi et al., 2014) that public schools are overcrowded following the introduction of the free primary education. There was no significant difference in mean three-day steps during recess between public school and private school students, t (259.79) = 1.69, p = .09 (Table 4.6,). The participants from public schools on average had more average cumulative steps (M = 4536.93; SD = 1350.01) compared to participants from private schools (M = 4309.25; SD = 828.69) (Table 4.2). This observation was contrary to expectations of public and private schools based on the socioeconomic endowment of the two types of schools. It was observed that in private schools, students spent a considerable amount of recess time snacking, and the supervisors were more restrictive, especially on the use of personal equipment because of liability issues. In public schools, despite less equipment, the students did not have the luxury of bringing snacks to school, and students were allowed to use modified equipment to play with friends. The observation above was supported by the study findings by Chebet et al. (2014) where larger percentages of students in private schools were categorized as either obese (6.9%) or overweight (16.7%) compared to the students in public schools that were categorized as either obese (1.6%) or overweight (5.7%).

Socioeconomic status of a school relates to the amount of wealth and prestige the school possesses in regards to the provision of a standard facility, equipment, qualified teachers, meaningful curriculum, and opportunities for the students to succeed outside of the school (Xuan et al., 2019). Most schools in low-income areas tend to be public with limited PA supportive practices compared to schools in high-income areas that are mostly private with better PA supportive practices such as gymnasiums, adequate and qualified teachers (Carlson et al., 2014).

5.4 Recess Duration, Supervision, Facilities and Equipment and Physical Activity Levels

In the current study, the average duration of the short recess was 26.25 minutes, and the average duration of the long recess was 50 minutes in both private and public schools. This translated into a total of 76 minutes, which is way higher than the two studies above. Jaunzarins et al. (2014) also concluded that the step count for recess equaled 47% of the average daily step during a typical school day. In the current study, however, total steps during recess accounted for 37% of the recommended 12,000 steps, which was very impressive. There is a direct relationship between the time allocated to PA and total step count. It has been observed that the longer the recess duration, the more the chances are increased for MVPA (Hyndman, 2015). According to Metzler (2017), school recess should be provided for at least 20 minutes every day. In a Canadian setting, Jaunzarins et al. (2014) observed that the school had two recess periods per day, each lasting for 20 minutes (40 minutes' total recess time). Zenger et al. (2017) observed that the school in their study had only one recess break that lasted 29 minutes.

In the current study, there were two teachers on average supervising recess at private schools, but there was no supervision at public schools. Supervision during recess has been attributed to the concerns of students' behavior and safety (Lewis et al., 2014). A study by Zenger et al. (2017) concluded that in situations where supervisors intervene in the recess by encouraging students to perform better, there is a significant increase in step count. In the current study, however, supervising teachers in private schools were impartial, letting students engage in unstructured and self-determined physical activities, just like in public schools. Based on Zenger and colleagues' observation, if teachers in

private schools encouraged students to improve on PA levels, the step count gap witnessed between public and private schools could have been closed.

The availability and accessibility of various equipment and facilities in a school setting (during recess and PE) and outside school is significant in determining the quality of PA for health. Various researchers have concluded that having movable equipment instead of permanent activity structures sparked children's creativity in modifying games, thus increasing PA levels (Nardo et al., 2016; Woods et al., 2015; Black et al., 2015). Diversity of equipment was also translated to appealing to pupils of varying interests and abilities (Hyndman et al., 2014). In the current study, there were more equipment and facility for play observed in private schools (69.2%) compared to public schools (30.8%) (Table 4.4). Private schools had diverse and well-maintained equipment and facilities, including paved outdoor courts and indoor facilities. It was expected that the indoor facilities would significantly improve PA levels due to access during extreme weather, but that was not the case. A possible explanation for this could be that during the time of data collection, the weather did not necessitate the use of indoor facilities.

CHAPTER SIX: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary of the Findings

Most of the participants in this study were pupils in public schools compared to those enrolled in private schools. This is because public schools have a high enrolment because of introduction of free education. In addition, participants in public schools had more average cumulative steps than their counterparts in private schools. Irrespective of these facts, there was no significant difference in mean three-day steps during recess between public school and private primary school pupils.

There was a significant difference in mean three-day steps during recess between male and female pupils. Male participants, on average, had more average cumulative steps compared to female participants. This is because the boys spent their recess time engaging in active sports such as football, racing or chasing each other across the field and basketball. On the other hand, most girls preferred sitting down with friends.

The average duration of the short recess was 26.25 minutes, and the average duration of the long recess was 50 minutes in both private and public schools. The participants accumulated significantly more steps during long recess compared to the short recess periods and the total step count during recess contributed to 37% of the recommended 1200 steps per day.

Private schools had supervised recess by two teachers per recess period. However, the supervising teachers did not influence recess behavior in any way. There was no supervision in public schools and children engaged in unstructured play.

Private schools offered well-maintained, diverse, and indoor facilities for recess while the public school had limited outdoor facilities. However, this did not translate to more PA for the private schools.

6.2 Conclusions

In consideration to the study findings and the reviewed literature, the following are the conclusions of the study:

Compared to other schools in various parts of the world, schools in Westlands Constituency of Nairobi City County offer sufficient recess time for the students to significantly engage in quality PA as an addition to PA in other settings (PE classes and after school) to meet the required 60 minutes per day of PA or 12,200 steps.

The average step count observed during recess was sufficient for the allocated period and so participation in PA during recess by all students should be supported. Girls consistently had lower activity levels compared to boys in both public and private schools, and therefore encouragement is needed to help them participate more in PA during recess.

Private schools have more and better maintained facilities and equipment and the pupils in these schools should be encouraged to make better use of them through structured play during recess.

6.3 Recommendations to the Government, Schools and Parents/Guardians

Following the results of the study and the implications thereof, the study entrenches the following recommendations:

The administrators and PE teachers at private schools should take advantage of the ability of their students to bring personal movable equipment to school. Instead of discouraging the students from using personal and PE department's equipment due to fear of liability and loss/misuse of the equipment, more teachers should be added to supervise recess. Schools should offer longer recess periods since this study has revealed that pupils accumulated more steps during long recess periods than short recess periods.

Schools should discourage teachers from withholding pupils from recess time as a form of punishment. Structured and competitive play should be organized during recess to motivate the pupils to take part in PA during recess, especially the girls.

Parents need to encourage their children to participate in PA while in school (PE lessons and recess) by inquiring how much PA their child had every day after school, just like they check for learning in school subjects.

6.4 Recommendations for Further Research

From the results and conclusions of the study, and implications thereof, the following are recommendations made for further research:

There is a need to replicate the current research in more schools within Nairobi City County to establish whether the results obtained in this study are a true reflection of the whole population (urban schools).

The current study focused on urban public and private schools. A similar study could be conducted to establish the quality of recess in rural public schools.

The current study only evaluated the quality of PA during recess. A similar study could be conducted to assess the quality of PA during PE lessons, before/after school, and

during non-school days. This will give comprehensive PA trends of Kenya's school children.

The current study only focused on students in grade/class five. A similar study could be conducted to check for the quality of PA at staggered grades in elementary, middle, and high schools to have a clear PA continuum by grade level in the country.

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APPENDICES

APPENDIX A: PERMISSION TO CONDUCT RESEARCH

THE HEADTEACHER/PRINCIPAL,

……

……

Dear Sir/Madam,

RE: REQUEST FOR PERMISSION TO CARRY OUT RESEARCH IN YOUR SCHOOL.

Title of Research study: Evaluation of children participation in physical activities during recess in selected primary schools in Westlands Constituency, Nairobi City County, Kenya.

Researcher: Angela Wamucii Nduru- a student pursuing a Master of Science Degree in the department of Recreation Management and Exercise Science of Kenyatta University.

Purpose: As a partial fulfillment of the above mentioned degree course, I am required to evaluate children participation in physical activities during recess, its contribution on the levels and patterns of physical activity, in comparison to set international recommendations on physical activity levels.

Procedure to be followed: The participants in this study will be boys and girls aged 10 years old (class/grade 5). They will be required to wear pedometers during recess periods. Pedometers are a type of motion sensors which are clipped on the belt or waistband to count steps taken. The pedometers will be clipped on at the beginning of recess and unclipped at the end of recess. The readings will be recorded. Data collection will be done on three different days. It will not interfere with learning in the school.

Risks: There are no measurable risks or discomforts associated with this study.

Benefits: The findings of this study will provide information on the status of children's physical activity participation during recess, its contribution towards children achieving the set international recommendations on physical activity levels and its impact on the health of the children.

Confidentiality: The information provided will be held with utmost care and confidentiality and will be used only for the purpose of this research.

Medical History: If a participant has a medical/physical condition that may hinder him/her from participating in physical activity, he/she will be excluded from the study.

Voluntary participation: The participation of the school and the children is voluntary. Refusal to participate or withdrawal from participation at any stage will attract no penalty or any loss. If you have any questions you may contact the researcher; angelawamucii@gmail.com , mobile phone number; 0721614875 or Kenyatta University Ethical Review Committee Secretariat: kuerc.secretariat@ku.ac.ke; kuerc.chairman@ku.ac.ke;

Participant's statement: The above information regarding the mentioned school's participation in the study is clear to me. I have been given a chance to ask questions and my questions have been answered to my satisfaction. The schools' participation in this study is entirely voluntary. I understand that the records will be kept private and that the school can leave the study at any time without any penalty.

✂----------

Please put a tick in either of the boxes below as per your decision.

I……agree ☐ do not agree ☐ this study to be carried out in this school.

Head teacher/Principal Signature/thumbprint ……

Date……

APPENDIX B: PARENTS' LETTER OF CONSENT

Dear Parent/Guardian,

RE: PERMISSION TO PARTICIPATE IN A RESEARCH STUDY

I am a Master of Science Student in the department of Recreation Management and Exercise Science at Kenyatta University. As a partial fulfillment of the degree, I am required to carry out a research entitled 'Evaluation of Children participation in Physical Activity during recess in selected primary schools in Westlands Constituency, Nairobi City County, Kenya. 10-year-old (class/grade 5) boys and girls have been picked to be the subjects of this study. Therefore, your child qualifies for the study.

Procedure to be followed: Collection of data will involve your child wearing a pedometer during recess. Pedometers are a type of motion sensors. It will be clipped on your child's belt or waistband and will be used to count the number of steps taken. Your child will only wear it at the beginning of the recess period(s) and it will be unclipped at the end of recess and the readings recorded. This will be done on three different school days and will not interfere with the learning of your child.

Benefits: The research findings will be used to assess physical activity participation of children during recess, its contribution towards children achieving the set international recommendations on physical activity levels and its impact on the health of the children.

Risks: This research will not pose any physical danger to your child.

Confidentiality: The information provided will be held with utmost care and confidentiality and will be used only for the purpose of this research.

Medical History: If a participant has a medical/physical condition that may hinder him/her from participating in physical activity, he/she will be excluded from the study.

Voluntary participation: The participation of your child is voluntary. Refusal to participate or withdrawal from participation at any stage will attract no penalty or any loss. If you have any questions you may contact the researcher; angelawamucii@gmail.com , mobile phone number; 0721614875 or Kenyatta University Ethical Review Committee Secretariat: kuerc.secretariat@ku.ac.ke; kuerc.chairman@ku.ac.ke;

Participant's statement: I understand that my child's participation in this study is entirely voluntary. I am free to ask any questions regarding the study through the contact information provided. I also understand that the information gathered will be kept private and that my child can leave the study at any time without any penalty.

✂----------

Please put a tick in either of the boxes below as per your decision.

I/we parent/guardian of……of class……have given ☐ not given ☐ my consent for him/her to take part in the study.

Signature……Date…….

Date of birth of your child……..

APPENDIX C: CHILD'S ASSENT FORM

Name of Study: "*EVALUATION OF CHILDREN PARTICIPATION IN PHYSICAL ACTIVITY DURING RECESS IN SELECTED PRIMARY SCHOOLS IN WESTLANDS CONSTITUENCY, NAIROBI CITY COUNTY, KENYA"*

Name of Researcher: Angela Wamucii Nduru

Telephone: 0721 614875

My name is Angela Wamucii Nduru. I am a student at Kenyatta University. As part of my course, I am required to carry out a research/study to find out the level of activity of children during recess.

Procedure: The study will involve you wearing a pedometer during recess. Pedometers are a type of motion sensors. It will be clipped on your belt or waistband and will be used to count the number of steps you will take. You will only be required to wear it at the beginning of the recess period(s) and it will be unclipped at the end of recess and the readings recorded. This will be done on three different school days and will not interfere with your learning. On the days that you will be wearing the pedomer, you will be required to act the way you do on the days when you are not wearing it.

Risks: This research will not pose any physical danger to you

Voluntary participation: Your participation in this study is voluntary. Your refusal to participate or withdrawal from participation at any stage will attract no penalty or any loss. If you have any questions you can ask your parents to contact the researcher; angelawamucii@gmail.com , mobile phone number; 0721614875 or Kenyatta University Ethical Review Committee Secretariat: kuerc.secretariat@ku.ac.ke; kuerc.chairman@ku.ac.ke;

Confidentiality: The information you will provide will be held with utmost care and confidentiality and will be used only for the purpose of this research.

Medical History: If a participant has a medical/physical condition that may hinder him/her from participating in physical activity, he/she will be excluded from the study.

Participant's statement: I have been asked to take part in a university project that wants to find out how much I participate in Physical Activity during recess. My parent (s) has said that it's okay for me to take part in it. I understand that I have the right to say 'yes' or 'no' to this. Even if I say 'yes' now, I can say 'no' later and I will not get in trouble.

✂----------

Please put a tick in either of the boxes below as per your decision.

I ……..AGREE ☐ DO NOT AGREE ☐

TO TAKE PART IN THIS PROJECT

Signature/thumbprint……...…….....

Date: ……..

Name and signature of Person Administering Informed Consent

Name …… ……

Signature….....Date……

APPENDIX D: INTRODUCTION OF RESEARCH ASSISTANTS

THE HEADTEACHER/PRINCIPAL,

……,

……,

……..

Dear Sir/Madam,

RE: INTRODUCTION OF RESEARCH ASSISTANTS.

Thank you for allowing me to carry out a research in your school entitled: Evaluation of children participation in physical activity during recess in selected primary schools in Westlands Constituency, Nairobi City County, Kenya.

The research requires the children to clip on pedometers on the hip during morning and afternoon recess periods. Pedometer readings will be recorded after each of these recess periods.

Due to the above-mentioned procedures, I have enlisted the help of four research assistants- two ladies and two gentlemen. The ladies will handle the girls while the gentlemen will handle the boys to allow the smooth running of the research.

Their information is included below.

Research assistant 1…… I.D number……..

Research assistant 2…… I.D number……..

Research assistant 3…… I.D number……..

Research assistant 4…… I.D number……..

Thank you, ones again for your assistance.

Yours faithfully,

Angela Wamucii Nduru

APPENDIX E: DATA COLLECTION AND OBSERVATION SHEET

Evaluation of Children Participation in Physical Activity During Recess in Selected Primary Schools in Westlands Constituency, Nairobi City County

Name of School…… Private ☐ Public ☐

Class: …….

Date: ……

From: …… To……

	First Name		**Gender**		**Pedometer reading Day 1**		**Pedometer reading Day 2**		**Pedometer reading Day 3**	
		CODE	**M**	**F**	**R1**	**R2**	**R1**	**R2**	**R1**	**R2**
1		001								
2		002								
3		003								
4		004								
5		005								
6		006								
7		007								
8		008								

9		009								
10		010								
11		011								
12		012								
13		013								
14		014								
15		015								
16		016								
17		017								
18		018								
19		019								
20		020								
21		021								
22		022								
23		023								
24		024								
25		025								

Number of supervisors: **Day 1**: **.....**

Day 2: **.....**

Day 3: .....

Recess times: **R1 -** From……..to ……....…

R2 - From ……..to…….

Preferred activities by boys……....

Preferred activities by girls……...

Available sports equipment…….

Available sports facilities……

Research assistant's name(s)

Day 1……. Sign……

Day 2……. Sign……

Day 3……..Sign……..

APPENDIX F: AUTHORIZATION LETTER FROM KENYATTA UNIVERSITY GRADUATE SCHOOL

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 810901 Ext. 57530

Internal Memo

Our Ref: H108/10484/08

DATE: 29th October, 2015

The Director, General
National Commission for Science and Technology,
P.O. Box 30040,
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION ANGELA WAMUCII NDURU – REG. NO.H108/10484/08

I write to introduce **Ms. Angela Wamucii Nduru** who is a Postgraduate Student of this University. She is registered for M.Sc degree programme in the **Department of Recreation and Management Science.**

Ms. Nduru intends to conduct research for a M.Sc proposal entitled, **"Evaluation of Children Participation in Physical Activities during Recess in Selected Primary Schools in Westlands Division, Nairobi Country, Kenya."**

Any assistance given will be highly appreciated.

Yours faithfully,

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

LNM/rwm

APPENDIX G: APPROVAL LETTER FROM KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE

KENYATTA UNIVERSITY
ETHICS REVIEW COMMITTEE

Fax: 8711242/8711575
Email: kuerc.chairman@ku.ac.ke
kuerc.secretary@ku.ac.ke
Website: www.ku.ac.ke

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

Our Ref: **KU/ERC/ APPROVAL/VOL.1** (150) Date: 16th August , 2018

Angela Wamucii Nduru
P.O Box 43844-00100,
Nairobi

Dear Angela,

APPLICATION NUMBER: PKU/550/1642 "EVALUATION OF CHILDREN PARTICIPATION IN PHYSICAL ACTIVITIES DURING RECESS IN SELECTED PRIMARY SCHOOLS IN WESTLANDS DIVISION, NAIROBI COUNTY, KENYA"

1. **IDENTIFICATION OF PROTOCOL**

The application before the committee is with a research topic "**Evaluation of Children Participation in Physical Activities during Recess in Selected Primary Schools in Westlands Division, Nairobi County, Kenya" "** received on 15th February, 2018 and discussed on 14th August, 2018

2. **APPLICANT**

Angela Wamucii Nduru

3. **SITE**

Westlands Division, Nairobi 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 14th August , 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.

21 AUG 2018

PROF. JUDITH KIMIYWE
CHAIRMAN ETHICS REVIEW COMMITTEE

I Angela W. Nduru ..... accept the advice given and will fulfill the conditions therein.

Signature..... Dated this day of 21/8/2018 ..... 2018.

cc.

DVC-Research Innovation and Outreach

APPENDIX H: PERMIT FROM NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION (NACOSTI)

THIS IS TO CERTIFY THAT:
MISS. ANGELA WAMUCII NDURU
of KENYATTA UNIVERSITY, 70665-400
NAIROBI,has been permitted to conduct
research in *Nairobi County*

on the topic: *EVALUATION OF CHILDREN PARTICIPATION IN PHYSICAL ACTIVITIES DURING RECESS IN SELECTED PRIMARY SCHOOLS IN WESTLANDS DIVISION, NAIROBI COUNTY, KENYA.*

for the period ending:
23rd July,2020

Permit No : NACOSTI/P/19/92310/30480
Date Of Issue : 24th July,2019
Fee Recieved :Ksh 1000

.....
Applicant's Signature

.....
Director General
National Commission for Science, Technology & Innovation

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013

The Grant of Research Licenses is guided by the Science, Technology and Innovation (Research Licensing) Regulations, 2014.

CONDITIONS

1. The License is valid for the proposed research, location and specified period.
2. The License and any rights thereunder are non-transferable.
3. The Licensee shall inform the County Governor before commencement of the research.
4. Excavation, filming and collection of specimens are subject to further necessary clearance from relevant Government Agencies.
5. The License does not give authority to transfer research materials.
6. NACOSTI may monitor and evaluate the licensed research project.
7. The Licensee shall submit one hard copy and upload a soft copy of their final report within one year of completion of the research.
8. NACOSTI reserves the right to modify the conditions of the License including cancellation without prior notice.

National Commission for Science, Technology and innovation
P.O. Box 30623 - 00100, Nairobi, Kenya
TEL: 020 400 7000, 0713 788787, 0735 404245
Email: dg@nacosti.go.ke, registry@nacosti.go.ke
Website: www.nacosti.go.ke

REPUBLIC OF KENYA

NACOSTI

National Commission for Science, Technology and Innovation

RESEARCH LICENSE

Serial No.A 25966

CONDITIONS: see back page

APPENDIX I: AUTHORIZATION LETTER FROM STATE DEPARTMENT OF EDUCATION

REPUBLIC OF KENYA

STATE DEPARTMENT EDUCATION

Telegrams: "**SCHOOLING**", Westlands
Telephone:
When replying please quote
Our Ref:

SUB-COUNTY EDUCATION OFFICE
WESTLANDS SUB-COUNTY
P.O BOX 13788-00800
NAIROBI.
16th AUGUST 2019

THE PRINCIPAL
PUBLIC PRIMARY SCHOOLS
WESTLANDS SUB-COUNTY

RE: RESEARCH AUTHORIZATION

The bearer of this Letter**: Angela Wamucii Nduru** a student at **Kenyatta University** has been authorized to carry out research on ***" Evaluation of children participation in physical activities during recess in selected primary schools in Westlands Division, Nairobi County, Kenya ."***

Authority is hereby granted for a period ending **24th July 2020**

Kindly accord her the necessary assistance.

FOR SUB COUNTY DIRECTOR
OF EDUCATION - WESTLANDS
Date: 16/8/2019
Sign:

PHILIP K. CHIRCHIR
SUB-COUNTY DIRECTOR OF EDUCATION
WESTLANDS

APPENDIX J: AUTHORIZATION LETTER FROM MINISTRY OF 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
cdenairobi@gmail.com

When replying please quote

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

Ref: RCE/NRB/GEN/VOL.1

DATE: 15th August, 2019

Angela Wamucii Nduru
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 *"Evaluation of children participation in physical activities during recess in selected primary schools in Westlands Division, Nairobi County, Kenya."*

This office has no objection and authority is hereby granted for a period ending **24th July, 2020** as indicated in the request letter.

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

REGIONAL DIRECTOR OF EDUCATION
NAIROBI
15 AUG 2019
MINISTRY OF EDUCATION
P.O. BOX 74629, NAIROBI

JAMES KIMOTHO
FOR: REGIONAL COORDINATOR OF EDUCATION
NAIROBI

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

ISO 9001 BUREAU VERITAS Certification