

**EFFECTIVENESS OF AN EIGHT-WEEK FUNDAMENTAL SKILLS
INTERVENTION PROGRAMME ON THE MOTOR SKILLS OF CHILDREN
WITH VISUAL IMPAIRMENT IN NAIROBI COUNTY, KENYA**

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UNIVERSITY**

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DECLARATION

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

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DEDICATION

My wonderful parents, Elizabeth and Patrick Githinji, who kept their promise to support me in achieving the greatest levels of education, deserve all the credit for this work. To my dear sisters Esther Wanjiku, Deborah Kabura and Milliam Wanjiru who have assisted me immensely throughout this journey. Thank you and I love you.

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ABBREVIATION AND ACRONYMS

ADHD:	Attention Deficit Hyperactivity Disorder
CEU:	Council of European Union
CFA:	Confirmatory Factor Analysis
FMS:	Fundamental Motor Skills
IBM	International Business Machines Corporation
IBSA:	International Blind Sports Association
MS:	Motor Skills
MVPA:	Moderate to Vigorous Physical Activity
PA:	Physical Activity
SPSS	Statistical Packages of Social Science
TGMD2:	Test of Gross Motor Development
USDHHS:	United States Department of Health and Human Services
VI:	Visual Impairment
WHO:	World Health Organisation

OPERATIONAL DEFINITION OF TERMS

- B1: Visual acuity:** vision category where children with visual impairment have no light perception in both eyes and cannot recognise shapes from any distance.
- B2: Visual acuity:** vision category where children with visual impairment have the ability to recognise shapes up to a distance of 2 metres
- B3: Visual acuity:** vision category where children with visual impairment can recognise objects that are between 2-6 metres away
- Children:** human beings aged six to eleven year old
- Constraints:** any environmental, task or individual factor that affects the outcome of motor performance
- Locomotor skills:** fundamental movements that propel a body from one place to another as seen when leaping, running, sliding, hopping, and jumping
- Motor skills:** the ability of muscles to perform different types of movement such as locomotor skills and manipulative skills
- Object control skill:** the ability of a person to propel or receive or manipulate an object with accuracy and control as seen in activities such as dribbling, catching, throwing and kicking
- Physical activity:** any physical movement requiring energy dissipation that is caused by the contraction of skeletal muscles.
- Visually impaired:** persons with decreased ability to see and cannot be corrected to normal level

ABSTRACT

Physical activity has been included in early intervention programmes involving fundamental motor skills among children with differing abilities. Though research has documented improved motor skills performance generally, few have focused on intervention programmes as a means towards improving motor skill performance in children with visual impairment. This study sought to bridge this gap by determining the effectiveness of an eight-week fundamental skills intervention programme on motor skills among children with visual impairment in Nairobi County, Kenya. The variables investigated included hopping, running, leaping, horizontal jumping, sliding, kicking, stationary dribbling, catching, overhand throwing, and underhand rolling. The study utilised one group pre and post-test quasi-experimental design. The study targeted children aged six to 11 years with visual impairment. Kilimani Primary School was purposively selected because it has an exclusive special unit for children with visual impairment. Purposive sampling was done in grades one and two because most children aged between six to 11 years are in these grades. Twelve out of the 20 targeted children with visual impairment in grade one and two met the inclusion criteria representing a sample size of 60%. Out of these, twelve children (100%) successfully completed the eight-week fundamental motor skill intervention programme. A pre-test was conducted to determine the base motor skill performance levels of the group. A post-test was administered after the eight-week intervention programme to determine the effects. The TGMD2 (Test of Gross Motor Development) tool was used as the main instrument for data collection. A reliability index of 0.78 was obtained using Cronbach's Coefficient Alpha. Data collected was cleaned and coded for analysis using Statistics Packages for Social Sciences (SPSS) version 22.0. Descriptive analysis was used to describe the measures of central tendency, variability and frequency of the score. Paired sample t-test was used to determine the influence of the intervention programme, independent t-test was used to compare group means and Spearman's rank correlation was utilised to determine relation between visual acuity and motor skills. The significance level was set at 0.05. The results revealed significant difference in locomotor skills $t(11) = 5.40, p < 0.01$ and object control skills $t(11) = 5.38, p < 0.01$ after intervention. Independent t-test showed no statistically significant difference in performance of motor skills between boys and girls in locomotor skills at $t(10) = -1.5343, p = 0.156$; and in object control skills at $t(10) = 0.1656, p = 0.872$. Among the children with visual impairment in both, locomotor skills $t(10) = 0.810, p = 0.437$ and object control skills, $t(10) = 0.810, p = 0.764$. There was no significant difference in performance of motor skills among younger children aged 9 years and below and older children aged 10 years and above. At $t(10) = -2.82, p < 0.017$. There was no significant relationship between motor skill performance and visual acuity in both, locomotor and object control $r_s(10) = -0.470, p = 0.123$ and $r_s(10) = 0.074, p = 0.820$ respectively. It was concluded that the fundamental motor skills intervention programme improved the motor skills of children with visual impairment. It is strongly recommended that fundamental motor skill intervention be started early enough for children with visual impairment in school setting. The study, therefore, recommends development of more motor skills intervention programmes among children with visual impairment.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Fundamental motor skills (FMS) are the basis of many specific motor skills performed in games and leisure activities. Fundamental motor skills are also deemed prerequisite for active participation in sports (Haegele et al., 2015). A child's level of motor proficiency, between three and eight years of age, is reflected by their competence in fundamental motor skills (Robinson et al., 2015).

Developing high competence in fundamental motor skills early in life is important because they have been linked to increased physical activity (Robinson et al., 2015), cardiorespiratory fitness (Vlahov et al., 2014), and decrease in the number of overweight and obese persons (O'Brien et al., 2016; Mwangi, 2016). Unfortunately, children with visual impairment (VI), concomitant with their poor motor skill performance are at increased risk of sedentary behaviour (Magalhaes et al., 2014). As a result, physical activity-related health benefits are compromised, and the gap between children with and those without visual impairment in terms of motor skill development widens (Haegele & Porretta, 2015).

Despite extensive research documenting benefits of motor skills to children with or without disabilities, children with VI are falling behind their peers with vision in motor skills (Abdallah et al., 2014; Favazza et al., 2015; Lemmink et al., 2009). This may be attributed to complete or severe loss of sight that affects every aspect of development of persons with VI (Lemmink et al., 2009) including motor skill acquisition. For instance, children with VI have no incentive to move towards the unknown as this lack of vision forces them to anticipate danger. This fear of the unknown limits movement to familiar places or situations (Lemmink et al., 2009).

Due to the aforementioned consequences of low vision or lack thereof, children with VI may have fewer chances to exercise their motor skills (Morelli et al., 2016).

Depending on the degree of the visual impairment, children with total/partial vision loss may experience different effects on their motor skills (Haibach et al., 2014). Persons with VI categorised as B2 and B3 have low vision. This level of vision allows children with VI to outline objects from a distance of two-six metres away. On the other hand, B1 individuals, have little to no vision thus they cannot identify objects at any distance. Haibach et al. (2014) noted that the degree of visual impairment plays a major role in performance of motor skills, especially for children in B1 category compared to the children in B2 and B3 category. The children in B1 category performed significantly lower than B2 and B3 category in almost all motor skills. Children in B2 and B3 performed similarly in all motor skills except in running, throwing and catching (Haibach et al., 2014).

Typically, under normal circumstance children's motor development improves with increasing age (Vandendriessche et al., 2015). There are no significant age and gender differences in the performance of motor skills among children with visual impairment (Magalhaes et al., 2014). However, expected normal motor skill acquisition may be delayed among children with visual impairment as a result of limited exposure and experiences (Haibach et al., 2014). With regard to gender, Haibach et al. (2014) opined no gender difference in motor skill development and performance. This study allowed the investigation of potential differences in motor skills development, learning and improvement between males and females as well as across different age group among children with visual impairment in Kenya.

Fundamental motor skills are a prerequisite for active participation in meaningful physical activities (Haegele et al., 2015). Mogaka et al (2017) revealed that persons with visual impairment in Kenya do not meet the recommended 60 minutes of physical activity daily. This may be because children with less developed motor skills face greater challenges during physical activities compared to those with better developed motor skills (Williams et al., 2012). Regrettably children with visual impairment demonstrate lower motor skills compared to their sighted peers (Porretta, and Cervantes, 2013). Mogaka et al. (2017) recommended the introduction of intervention programmes tailor made for persons with visual impairment in Kenya to improve motor skills.

Porretta and Cervantes (2013) strongly support the suggestion that children with visual impairment have the potential to perform motor skills just as well as their sighted peers. Lieberman et al. (2014) go on to add that skills need to be developed through specific instruction and practice because, as argued by Morgan et al. (2013) mature patterns of motor skills do not develop naturally. Effective and well-planned physical activity programmes, especially in early life, improve physical activity engagement, help to acquire motor skills, increase social skills and develop physiological systems of children with visual impairment (Lieberman, Robinson & Rollheiser, 2016).

Positive experiences, provided by instructors who are well-versed in modifying equipment and adapting appropriate activities for motor skill development during early years, are more likely to result in motor competence later in life among children with visual impairment (Lieberman & McHugh, 2017; Lieberman et al. 2014). In cognizance of the above revelations, this study aimed to determine the effectiveness

of an eight-week intervention programme on the motor skills of children with visual impairment in Nairobi County, Kenya.

1.2 Statement of the Problem

Research conducted on motor skills performance has concluded that generally, children with visual impairment(VI) are less skilled in motor skill activities than their sighted peers (Porretta & Cervantes, 2013). Research has also demonstrated that children with VI experience delay in acquisition of gross motor skills such as walking independently from an early age, which in turn, affects their future acquisition of motor skills (Hallemans, 2016). A study conducted by Mogaka et al., revealed that children with visual impairment in Kenya do not meet the recommended 60 minutes of physical activity daily. Low physical activity has been associated to poor development of motor skills (Porretta & Cervantes, 2013). Though lack of vision affects every aspect of development in individuals with visual impairment, children with VI have the potential to perform motor skills just as well as their sighted peers (Visscher et al., 2009). Morgan et al, 2013 and Mogaka et al., (2017) were explicit that, since mature patterns in motor skills do not develop naturally, there was need for the development of an appropriate early intervention programme using specific fundamental motor skills instructions, modified and adapted to suit the needs of children with visual impairment.

Therefore, children without vision need more encouragement, direction and specific instructions to develop movement skills. This should start at an early age when children are willing to practice and before poor technique has developed. Haegele, Brian & Goodway, (2015) showed that very few studies have focused on intervention

programmes as means for improving performance of motor skill in children with visual impairment. Thus, this study sought to bridge this gap.

Most research around the world in this area focuses on comparisons of motor skill performance and development of VI children with other sighted children of the same age (Lemmink et al., 2009; Haibach et al., 2014). Unfortunately, in Kenya, literature regarding motor skills among children with visual impairment is limited. Therefore, the pre-test in this study could be used as the baseline information concerning the performance of motor skills among children with VI in Nairobi County, Kenya. Consequently, this study sought to determine the effectiveness of an eight-week fundamental intervention programme on motor skill of children with visual impairment in Nairobi County.

1.3 Purpose of the Study

This study's purpose was to determine the effectiveness of an eight-week fundamental motor skills intervention programme on motor skills of children with visual impairment in Nairobi County, Kenya.

1.4 Study Objectives

The objectives that guided this study were:

- a) Determination of the effectiveness of an eight-week fundamental skills intervention programme on:
 - i) Locomotor skills among children with VI in Nairobi County, Kenya and
 - ii) Object manipulation skills among children with VI in Nairobi County, Kenya.
- b) Determination of the effectiveness of an eight-week fundamental skills intervention programme on locomotor and object manipulation skill based on:

- i) Age of children with visual impairment in Nairobi County, Kenya
- ii) Gender of children with visual impairment in Nairobi County, Kenya
- c) Establishment of relationship between visual acuity and performance of motor skills subsequent to an eight-week fundamental skills intervention programme among children with VI in Nairobi County, Kenya.

1.5 Hypotheses

This study was guided by the following hypotheses:

H₀₁: There is no significant effect of an eight-week intervention programme on:

- (i) Locomotor skills among children with VI in Nairobi County, Kenya and
- (ii) Object manipulation skills among children with VI in Nairobi County, Kenya

H₀₂: There are no significant differences in locomotor and object manipulation skills after an eight-week fundamental skill intervention programme in based on:

- (i) Age of the children with VI in Nairobi County, Kenya.
- (ii) Gender of the children with VI in Nairobi County, Kenya.

H₀₃: There is no significant relationship between visual acuity and the performance of motor skills subsequent to an eight-week fundamental skills intervention programme, among children with VI in Nairobi County, Kenya.

1.6 Significance of the Study

This research set out to determine the effectiveness of an eight-week fundamental skill intervention programme on motor skills of children with visual impairment in

Nairobi County, Kenya. The results of this study may provide physical educators, education policy makers and persons developing exercise programmes with an approach for improving the motor skills of children who are partially or completely visually impaired. In addition, this study may help improve the engagement in physical activities of children with visual impairment with an aim to reducing sedentary behaviour. Further, findings from this study could motivate other physical educators and researchers to design additional programmes that could enhance motor skills of this population.

1.7 Limitation

The study involved a small number of children with visual impairment at Kilimani Primary School. The finding therefore, may not be generalised to a larger population.

1.8 Delimitations

The study involved children with VI in Kilimani Primary School. This school had been selected because the institution has a special school unit which caters exclusively for children with vision impairment. With the varied visual acuities, the institution provided a wide range of data. While conducting the study, focus was on the locomotor skills of leaping running, sliding, hopping, jumping; and object control skills of dribbling, catching, throwing and kicking to allow more time for practice.

1.9 Assumption of the Study

The assumption of the study was that the physical education classes and school physical activities programmes that the children with visual impairment were engaged in did not affect the outcome of the study.

1.10 Conceptual Framework

Motor skills, regarded the foundation for more complex movements, and are deemed prerequisite for active participation in sports (Abernethy et al., 2017). Newell's, (1986) model explains that motor skill performance is as a result of interaction among three primary constraints of the individual, the environment and the task at any given time. Newell, (1986) defines constraints as any environment, task or individual factor that affects the outcome of the motor performance observed. Constraints can therefore, encourage or discourage movement (Trana et al., 2017).

Individual constraints which include attributes such as visual ability, gender and age, are defined as conditions found within the subject. Environmental constraints are factors outside the individual's body or control. They include ambient light, physical education programmes, teacher's experience and opportunities available to learn and practice. Lastly, task constraints refer to specific, intentional motor activities. The tasks have predetermined set of rules, equipment and goal.

Children with vision-related impairments find it difficult to develop their motor abilities due to personal limitations like vision. As explained by Lemmink et al. (2009) vision assists in providing feedback of movement, direction of movement, motivation for a child to move, anticipating danger and in imitating movement. Vision though is not the sole cause of inferior motor skills, other individual constraints such as age, gender and onset age of sight impairment interact with one another to either inhibit or encourage movement.

Environmental constraints, such as intervention programmes, involve essential structured settings in which children with visual impairment (VI) practice and grow

their motor skills (Lemmink et al., 2009). The Morgan., et al. (2013) review shows that school-based intervention programmes that develop fundamental motor skill have reported significant improvement. Subsequently, they enhance physical activity levels and fitness among the participants. Children with VI are unable to grasp the FMS and experience difficulties with their motor skills. They participate less frequently in sports and other activities (Hardy et al., 2016). Intervention programmes for children with VI are greatly beneficial and should therefore, be adapted and tailored to meet their specific needs (Cervantes & Porretta, 2013).

School based interventions offer children with VI an opportunity to practice their motor skills which do not develop automatically (Hardy et al., 2016), and because they have less opportunities of engaging in physical activities compared to their peers with sight (Hardy et al., 2016). Scarcity of opportunity may be attributed to other environmental constraints such as lack of knowledge about curricular modification by their teachers, lack of suitable facilities and equipment, and lack of resources and understanding of physical activity (British Blind Sport, 2017).

Figure 1.1 illustrates the integration of various constraints in influencing movement of children with visual impairment.

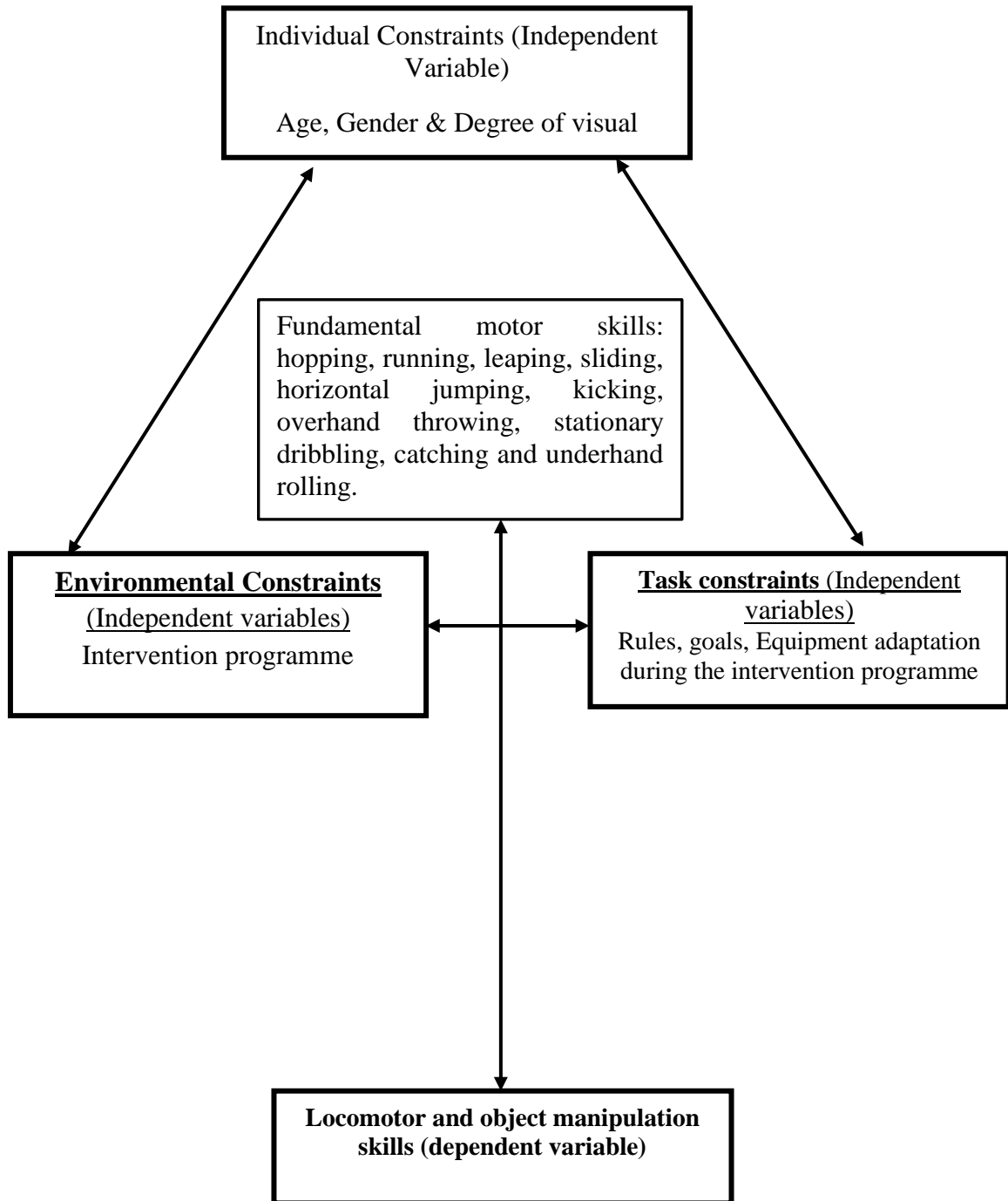


Figure 1.1 Newell's Model of Constraints as it Pertains to Motor Skills Performance among Children with Visual Impairment Adapted from Hamilton et al. (2012)

In Figure 1.1 above, the task constraints relate to specific rules, goals and equipment. During physical education classes, the teacher should consider modifying the equipment and rules to encourage participation. The physical instructor can use bright coloured, sound emitting equipment, and modify tasks such as throwing speed, number of participants and reduced the rules to suit children with visual impairment. At any given time, the three constraints reciprocally interact with one another to affect movement (Hamilton et al., 2012). In a movement skill such as throwing, the individual factor such as lack of vision could interact with task factor such as speed of the throw and with environmental factor such as outdoor lighting, to influence the performance of the skill. Over time, the interdependent relationship among these three constraints will influence motor performance changes (Newell, 1986).

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviewed literature related to the study. The literature involved children with visual impairment and motor skills, characteristics of visual impairment and motor skill performance, intervention programmes and motor skills, and finally summary of the reviewed literature.

2.2 Visual Impairment

The World Health Organization (WHO) explains that a person has Visual Impairment when the vision in both eyes with correction is equal to visual acuity of 0.3. On the other hand, when the sum value of both eyes equals 0.1, that person is considered to be in a state of blindness.

2.3 Children with Visual Impairment and Motor Skills

Motor skill is physical activity involving muscle movement with the intention of performing a specific action. The underlying development and acquisition of complex motor skills are greatly influenced by fundamental motor skills, though for persons with visual impairment, chances to move for enjoyment or for sports are severely limited (Haibach et al., 2014). This is because vision plays a vital role in motor skill performance as it motivates a child to move, provides information about direction and distance of objects, helps to detect and anticipate dangerous situations and also provides feedback on movement (Houwen et al., 2009). Therefore, children with visual impairment suffer from motor dysfunction since monitoring and control of movement is dependent on visual information. It is impossible to fully compensate for whole or partial visual loss with other senses (kinesthesia, touch, or hearing). Therefore, it is conceivable that those with decreased vision will experience motor

challenges (Brambring, 2016). Hence, children with VI show adaptation in their gait patterns during locomotion to allow for more stability. They exhibit a shorter stride length, slower walking pace and take longer duration in stance stage of gait. This study concentrated on practical methods of learning and exercising specific motor skills, as opposed to the previous study's concentration on the motor development patterns of children with visual impairment. As confirmed in numerous studies (Morelli et al., 2016; Brambring, 2016; Cervantes & Porretta, 2013), children with total or partial vision loss exhibit poor motor skills compared to their sighted peers, However, as noted by Haegele, Brian and Goodway, (2015) very few studies focus on intervention programme to enhance the fundamental motor skills of school aged children with sight impairment. Hence, there is need for a fundamental motor skill intervention programme to bridge this gap. This study establishes a baseline for the motor skills of visually impaired children in Nairobi County in the absence of adequate data that can be used to compare other studies. The study sought to determine the effectiveness of an eight week intervention programme on motor skills among VI children.

2.4 Characteristics of VI and Motor Skill Performance

2.4.1 Motor Skill Performance and Visual Acuity

According to the International Blind Sport Association (IBSA), visual impairment is categorised in the three groups of; (i) B1 are those who have no light perception in both eyes and cannot recognise shapes from any distance, (ii) B2 are those who have the ability to recognise shapes up to a distance of 2 metres and (iii) B3 are those who can recognise objects that are between 2-6 metres away. The performance of motor skill is a result of interaction between children's characteristics, individual abilities, task objective and the environmental conditions (Haibach et al., 2014). Lack of / poor

vision can therefore act as constraint slowing down motor skill acquisition and development. Several studies have shown that children with visual impairment lag behind their sighted peers in both, locomotor and object control skills studies (Morelli et al., 2016; Haibach et al., 2014; Houwenet al., 2009). Since visual information is important for orientation, motion, location and updating representation of the body (Morelli et al., 2016), lack of vision could contribute to the poor performance of motor skills among children with visual impairment. If children with visual impairment cannot accurately use visual information, one expects that the greater the visual impairment the worse the motor performance. Opinions are divided about the relationship between impairment severity and the skill acquisition of individuals with visual impairment. According to some scholars, there is no discernible association between motor skill performance amongst children with various degrees of visual impairment (Mattern et al., 2015; Visscher et al., 2009). Other authors found that there is a relationship between degree of vision and motor skill performance (Halleman, 2016). Therefore, this study's objective was to ascertain if there are any significant relationship between persons with different visual acuity and motor skill performance.

The study sought to establish the relationship between visual acuity and motor skills performance after participating in an eight weeks physical activity programme modified for children with varied VI levels.

2.4.2 Gender Differences and Motor Skill Performance

The effects of a fundamental motor skill intervention among pre-schoolers according to Bardid et al. (2018) appear to be gender specific. Bardid,et al. (2018) explains that both girls and boys showed similar improvement in locomotor skills but in object

control skills only the girls benefited after the intervention programme. Girls gain more in object control skills during an intervention as they have little experience with the related activities during free play. Houwen et al. (2009) confirm gender related differences among children with visual impairment with boys outperforming girls in object control skills. While some studies show gender differences in the effect of motor skills intervention programmes Bardid., et al. (2018); Houwen et al., (2009) disagree. The Haibach et al. (2014) study shows that there are no gender differences among children with visual impairment in motor performance of most skills except in throwing, striking and dribbling, in which, the boys outperform the girls. The current research could provide empirical data which might inform professionals in the field of education, sports and rehabilitation on the development and implementation of a motor skill intervention programme for children with visual impairment in Kenya based on the identified needs. This study, therefore, sought to determine the locomotor and object manipulation skill differences in the effectiveness of an eight-week fundamental skill intervention programme on gender among children with visual impairment in Nairobi County, Kenya.

2.4.3 Age Differences and Motor Skill Performance

Fundamental motor skills are the building blocks of more complex movements used in sports and games (Haegele, Brian & Goodway, 2015). Early childhood plays an important role in the learning of motor skills (Hallemans, 2016). Children, who do not learn fundamental movement skills at an early age, show developmental delay in gross motor skills and have difficulties in attempting to learn motor skills later in life (Haegele & Porretta, 2015; Hallemans, 2016). Under normal circumstances, motor skill development improves with increasing age. Bardid et al. (2016) studied the effectiveness of a community based fundamental motor skill intervention in children

aged 3-8 years. Their results revealed that as age increases, both, locomotor and object control skills increases. Unfortunately, this may not occur for children with visual impairment because they tend to acquire motor skills later in life compared to their sighted peers (Brian et al., 2017). According to Bardida et al. (2016) and Brian et al. (2019), there are no differences in motor skill performance between younger and older children with visual impairment aged between 6-13 years. On the other hand, Brian et al. (2017) found better performances among older children aged between 12 and 14 years compared to younger children aged between eight to 10 years.

Haibach et al. (2014) revealed that age of the children had no significant difference between six to nine-year olds and 10-12 year olds in locomotor skills except in dribbling, where the older children out-performed the younger children with visual impairment. However, according to Haibach et al. (2014) found that in object control skills, the older 10 – 12 year old children performed significantly better than the six to nine year olds. The above studies show inconsistent results in relation to the effect of fundamental motor skill intervention programme on age of children with visual impairment. The current study, therefore, sought to investigate potential age differences in motor skills acquisition among children with visual impairment in Nairobi, Kenya.

2.5 Intervention Programmes and Motor Skills

Stodden et al. (2014) investigated the impact of motor skill instructions on fundamental motor skill development among pre-schoolers aged 3-5 years and whether any of them were in danger of developmental delay. Their findings showed significant change in both object control skills and locomotor skills. Bellows and Anderson (2013) determined the effectiveness of physical activity intervention in

giving pre-schoolers a head-start on gross motor skills performance, physical activity and weight status. Like the Stodden et al. (2014) study, Bellows and Anderson (2013) found that the children who received the treatment improved their gross motor skills significantly.

Additionally, Bishop and Pangelinan (2018) assessed 21 motor skill intervention studies for children with physical and mental impairments and found that 95% of the studies examined reported remarkable enhancement in locomotor and object control skills following the intervention. Abbey, Broderic et al., (2017) also reviewed interventions studies that aimed to enhance basic motor skills in pre-school aged children. They determined that there was a significant moderate improvement on motor skill after physical activity interventions.

Using a PRISMA-SCR design, Van der Walt, Plastow & Unger (2020) identified 45 eligible studies to review motor skill interventions for pre-school children. All the studies examined motor skill interventions with clearly defined outcome measures for children between the ages of 4 years and 7 years who had motor skill challenges. Fifteen interventional approaches were identified from the studies. Results from the studies indicated that the intervention programmes had a significant effect on the motor skill performance of the children. Mwangi, (2016) drew similar conclusions subsequent to examining the physical and psychological advantages of parental involvement in structured physical activities for children aged 4 – 6 years. The fundamental motor skills of children with intellectual disabilities improved after the intervention and the researcher further noted that there was potential for more improvement in motor skills if children were given an opportunity to be part of early motor skill intervention programme.

Based on literature that has used physical activity intervention programmes among varied groups, it would appear that interventions do have positive effect on motor skills of the different groups (Bellows & Anderson, 2013; Stodden et al., 2014). Considering the deleterious effect of visual impairment on motor skill acquisition, this study sought to establish whether the current eight-week fundamental skills intervention programme had any effects on children with visual impairment.

The Haegele et al. (2015) review spanning 32 years from 1982 – 2014 on fundamental motor skills revealed that out of the 11 articles that met the necessary criteria, six were comparatives, two were correlation, two were validation, and one was descriptive. None of them was an intervention study. Therefore, this study sought to implement an eight weeks intervention programme and assess the effects on motor abilities among children with vision impairment.

2.6 Summary of the Reviewed Literature

Most studies considered by this study showed that children with VI suffer from motor dysfunction due to lack of visual perception. Therefore, children with VI show adaptation in their gait pattern during movement for stability. The current study focussed on specific motor skill instruction to curb the adapted gait patterns and also enhance motor skills of children with partial/total vision loss as they exhibit poor motor skills. This study set out to determine whether there was a substantial influence on the motor skill performance of children with VI because previous research on the subject had produced inconsistent results. The relationship between impairment severity and skill acquisition in individuals with visual impairment remains a complex and debated topic. While some studies suggest no significant association others indicate a relationship between the degree of vision and motor skill performance. This

study sought to get a better understanding of the relationship among children with visual impairment in Kenya. A study investigated the difference in locomotor and object control skills among different categories of children with VI aged 6-12 years in New York. There is a geographical gap since the study was conducted in New York while the current study sampled a population of children from Nairobi County, Kenya aged between 6 to 11 years. There are conflicting data on gender differences in motor skill performance among children with VI. While one study suggests shows that the gender of children with VI does not determine motor performance in most skills another study reveals gender differences in performance of motor skill among children with visual impairment. This study therefore, sought to determine gender differences in performance of motor skill intervention programme among children with VI in Kenya. In addition, there are few studies relating gender and motor performance of children with visual impairment. This study also sought to add more data for future reference. Fundamental skill intervention programmes conducted by various researchers reported significant improvement on motor skills after an eight-week programme. While the researches were relevant to this study, they did not study the effect of a fundamental skill intervention programme on children with VI aged between 6 and 11 years, the age period considered the most significant period for rapid motor skill development among children. Consequently, this study sought to bridge that gap by determining the effectiveness of an eight-week fundamental skills intervention programme on motor skills of children with visual impairment in Nairobi County, Kenya.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter includes the research design, measurement of variables, study location, target population, inclusion criteria, exclusion criteria, sampling procedure and sample size, research instruments, reliability, validity, data collection procedures, methods of data analysis, and logistical and ethical considerations.

3.2 Research Design

The study utilised a one group pre-test post-test quasi experimental design. This design was deemed appropriate for showing effects between a pre and post intervention experiment (Page, 2012). The study did not have a control group and the sample group was chosen purposively. As suggested by White and Shagun (2014), when it is not possible to randomize individuals and groups to treatment and control, one may use the quasi experimental research design. The sample size was derived from the number of children with VI who were willing to participate in grade one and two. The group was pre-tested to establish a baseline. Subsequently, the same group was exposed to an eight-week fundamental motor skills intervention programme. At the end of the eight-week programme, the same motor skills were assessed again to determine changes that may have occurred.

3.3 Measurement of Variables

Independent variables in the study included visual acuity, age and gender of the children. These are the demographic characteristics of children with VI that the researcher examined in relation to performance of locomotors and object manipulation skills subsequent to the intervention. The level of measurement of visual acuity and age is ratio while that of gender is nominal.

Dependent variables according to the study were the motor skills of children with visual impairment which include hopping, running, leaping, sliding, horizontal jumping, kicking and object manipulation skills assessed as overhand throwing, stationary dribbling, catching and underhand rolling. The study measured the outcome of these motor skills subsequent to the eight- week intervention programme using the Tgmd2 tool. The level of measurement of both the object manipulation skills and locomotor skills was ratio.

3.4 Location of the Study

Kilimani Primary School in Nairobi County had been identified as the location for the study. It is a day and boarding public primary school that integrates children with visual impairment. It has a special unit that is specifically dedicated to children with visual impairment. In Nairobi County, there are only two integrated primary school that have a special unit for visually impaired children only; Kilimani Primary and Muthaiga Primary. Since Kilimani primary school has the highest number of children with visual impairment in Nairobi County (Ministry of Education, 2019) and also has suitable environment and facilities for children with visual impairment (VI) to engage in physical activities it was purposively chosen.

3.5 Target Population

Ngechu (2004) defines a target population as a collection of people, services, elements, things, or houses that are the focus of a research. Nairobi County has two visually impaired integrated public school, Kilimani Primary and Muthaiga Primary School. Kilimani Primary has a total of 55 children with visual impairment while Muthaiga Primary has a total population of 30. Since Kilimani Primary had the highest number of the targeted population it was purposively chosen.

The total number of children with visual impairment (VI) between the ages of 6 and 11 years at Kilimani Primary School in Nairobi County, Kenya made up the study's target population. There were 20 children with visual impairment aged between 6 and 11 years registered in Kilimani Primary School. It is deemed appropriate to select children with VI aged between 6 and 11 years because is it the stage when children acquire and develop skills rapidly. As explained by Cervantes & Porretta (2013), learning of motor skills is rapid in the early years of life; as children approach adolescence, their acquisition of new skills is prone to poor technique.

3.6 Inclusion Criteria

Inclusion criteria are the traits that a targeted subject must possess to be included in a particular study.

This study included only those children aged between 6 to 11 years, with total or partial visual impairment since motor learning and development is rapid within this age bracket. Those who were declared medically fit to participate in the eight-week intervention programme by the School Health Practitioner at the Kilimani Primary School were included. The children also had to be willing to participate and had parental consent.

3.7 Exclusion Criteria

Exclusion criteria are those traits that disqualify a subject from participating in the study. Children with multiple disabilities such as hearing and any mental challenge had difficulty in communicating and following instructions. Such children were excluded and did not participate in the study. Children with visual impairment (VI) aged 12 years and above on 1st January 2021 were excluded. In addition, children

with VI without assent of the parents or not willing to participate were left out of the study.

3.8 Sampling Procedure

Given the small number of the study population, a census method was utilized by the study to select the sample size. Mugenda and Mugenda (2003) assert that the census method is suitable when the study population is small. Expert advice that a sample size of 12 children is adequate for an intervention programme (Dobbins et al., 2013). Kilimani primary school has a population of 55 children with visual impairment. Out of the 55, only 20 children with visual impairment were within the acceptable age range of six to eleven years. The study targeted all the 20 six to 11 year old VI children at Kilimani Primary School as the sample size but 8 of them did not meet the study inclusion criteria. Of the eight VI children that did not meet the inclusion criteria, five had no parental consent while three had multiple disabilities therefore were not included in the study. Hence, the sample size was 12 six to 11 year old children registered in grade one and two at Kilimani Primary School who met the inclusion criteria.

Table 3. 1: Sample Size of Children with Visual Impairment at Kilimani Primary School

Population	Female	Male	Total Number	Aged between 6 to 11 years	Aged between 6 to 11 years who participated
School	32	23	55		
Class 1	5	7	12	11	8
Class 2	5	3	8	6	4

3.9 Research Instruments

3.9.1 Test of Gross Motor Development (TGMD2)

The tool for the Test of Gross Motor Development (TGMD2) was modified (see Appendix E). The equipment used were brighter to offer high contrast to their environment and bigger to assist children with VI visualise the equipment used during play. The tool has been used successfully by other researcher to test the gross motor development of children aged 3-11 years with partial/total vision loss. When used to assess the gross motor abilities of children with sight impairment, it has also been validated and assessed for reliability at coefficient indices of 0.88 for object manipulation scores and 0.85 for locomotor subset scores (Houwen et al., 2013). Test of Gross Motor Development (TGMD₂) tool was developed by Dale A. Ulrich in 2002. It is frequently used to evaluate the gross motor abilities of kids between the ages of 3 and 11 years old.

The instrument has been used by psychologists, general and special teachers and physical therapist children who are considerable behind their peers in gross motor development. In all, it evaluates 12 motor skills, broken down into six locomotor skills and six object manipulative skills. The instrument has comprehensive illustrations and descriptions for the gross motor skills as well as a simplified scoring system of TGMD₂ (see Appendix E). This allowed the researcher to administer the test within 20 minutes for each individual (Ulrich, 2000)

Table 3. 2 Test of Gross Motor Development (TGMD2)**Test of Gross Motor Development (TGMD₂)**

Name/Code..... Male..... Female.....
 Date of Testing Date of Birth.....
 Class Level Actual Age.....
 Category of Vision Visual Loss Onset.....
 Testers Name..... Date of Testing.....
 Site Name.....

Table 3. 3: Test of Gross motor Development

SUBSET SCORE	SKILL PERFORMANCE	RAW SCORE
	Run	...../4
	Hop	...../5
	Leap	..... /3
Locomotor skills	Horizontal jump	...../4
	Slide	..... /4
	Gallop	...../4
	Total score	..... /24
	Stationary Dribble	...../4
	Catch	...../3
Object manipulation skills	Kick	...../4
	Overhead throw	...../4
	Underhand roll	...../4
	Striking a ball	...../4
	Total score	...../24

3.10 Training Research Assistants

The researcher and the two class teachers (1&2) involved in teaching underwent training by an expert in the administration of the TGMD2 tool. During the training, items in the research tool were thoroughly scrutinized and understood and the procedures clarified theoretically and practically. The two class teachers assisted in data collection and implementation of the intervention programme.

3.11 Pretesting Research Tools

The TGMD2 tool has previously been used to a less extent among population with visual impairment in Nairobi County. Therefore, a pre-test of the TGMD2 tool was conducted to determine its accuracy and reliability, familiarize the researcher and the assistants with the tool, and identify the challenges they may encounter. The pre-test involved five children with visual impairment aged 6 to 12 years at Kilimani Primary School who did not participate in the final study. Ngeti (2017) considered between 1 and 10% of the total sample to be a suitable representative size for a pre-test for determining reliability. Pretesting helped enhance the reliability of the TGMD2 tool by removing any ambiguities found in it. According to Houwen et al. (2009) the ideal reliability index should be between 0.75 - 0.80. The pre-test reliability index of 0.78 placed the test in the satisfactorily acceptable category.

3.12 Reliability

Reliability is the degree to which a research tool generates steady and consistent results after numerous trials (Chakrabartty, 2013). The TGMD2 tool has been used internationally with typically developing children with a coefficient index of .82 (Ulrich, 2000). The tool had not been tested for reliability among visually impaired children in Kenya and had few adaptations such as making wider markings, increasing operational spaces and objects were brightly coloured as well as being

bigger in size. The adaptation was carefully done not to affect the actual performance of motor skills. Therefore, the tool subsequently underwent an assessment for reliability. Five children with visual impairment in Kilimani Primary School were used in the test retest of the adapted TGMD2 tool. The test was administered twice, such that there was an interval of two weeks between the first test t-test and the retest. The learners involved in the testing for reliability were not included in the main study. Cronbach's Coefficient Alpha was utilized to generate the coefficient so as to estimate the reliability of the tool. A reliability index of 0.78 was recorded, indicating a satisfactory measure. The acceptable reliability coefficient range is between (0.75 - 0.80) (Hartman et al., 2013).

3.13 Validity

This refers to how accurately a method measures the thing it is supposed to measure. Content validity measures how well each idea being measured is adequately covered by the research tool being used. Content validity refers to whether an instrument provides adequate coverage of the concept being measured. Experts in this area scrutinized the adapted tool to ensure relevance and language clarity. Their comments were considered in the final version of the adapted test instrument.

Construct validity is used to determine how accurately a tool measures what it is intended to measure. TGMD2 construct validity had been verified in different nations like China, Belgium and United States. For the sake of the Kenyan population among children with visual impairment construct validity was measured using (CFA) Confirmatory Factor Analysis (R.Anthony, B.Timothy, 2019). All motor skills exhibited satisfactory correlation with the corresponding

subset (locomotor; leap, jump, run, hop, slide, and gallop, Object control skills; dribble, kick, throw, strike, catch and roll a ball).

3.14 Data Collection Procedure

TGMD₂ tool was used to collect data. The motor skill items were distributed between two stations: **Station 1** included locomotor skills of leaping, running, sliding, hopping, and horizontal jumping; and **Station 2** included the object control skills of stationary dribbling, catching, kicking, underhand rolling and throwing (See appendix H). The participants were given a full explanation, oral and tactile demonstration (where necessary) by the researcher before the first attempt. The participants were allowed two practice trials. After that, two test trials were administered in the presence of the assistant teachers for encouragement. A score of 0 (zero) was awarded for a component that was either poorly performed or not present; and a score of 1 (one) will be awarded for each successfully completed motor skill as shown in Table 3.4 and 3.5 respectively.

Table 3. 4: Locomotor Subtest**Station 1: LOCOMOTOR SUBTEST**

Preferred hand	Right	Left	Not established
Preferred foot	Right	Left	Not established

Skills	Materials	Performance Criteria	Trial 1	Trial 2	Score
Run	18m of clear space	1.Arms move in opposition to legs, elbow bent	1	1	2
	Portable sound	2. Just a moment when both feet are elevated.	1	1	2
	Two cones	3. Placing the foot narrowly and landing on the toe or heel (i.e., not flat footed).	1	1	2
	Optional: Sighted guide/ 20 m guided wire	4. Suitable 90-degree flexion of the non-support leg (i.e. close to the buttocks).	1	1	2
	4m loop rope,				
				Skill Score	8

Table 3. 5: Object Control Subtest**Station 2: OBJECT CONTROL SUBTEST**

Preferred hand	Right	Left	Not established
Preferred foot	Right	Left	Not established

Skills	Materials	Performance Criteria	Trial 1	Trial 2	Score
Stationary dribble	Bright colored beach balls or sound emitting ball that bounces hard, flat surface	1.Contacts ball with one hand at about belt level	1	1	2
		2. pushes the ball with finger tips(not slaps)	1	1	2
		3. Ball contacts surface in front of or next to foot surface on the preferred side.	1	1	2
		4. Keep the ball under control on four successive bounces without needing to move your feet to get it.	1	1	2
				Skill Score	8

3.15 Methods of Data Analysis

Statistical Package for Social Science (SPSS) - version 22.0 was used to organize the data for analysis. SPSS version 22.0 is a data management software tool developed by the International Business Machines Corporation (IBM). Descriptive statistics were used to describe variability, the measures of central tendency, and frequency of the scores. A paired sample t-test was used to assess the effectiveness of the FMS intervention program on motor skill performance after the intervention. Independent t-test was employed to establish gender mean differences between boys and girls motor skills performance after intervention, determine age related differences effect on motor skills of children with visual impairment (VI) and Spearman's rank order correlation was used to determine any significant relationship between visual acuity and motor skill performance of children with vision impairment.

3.16 Logistical and Ethical Considerations

The researcher obtained permission from Graduate School of Kenyatta University to conduct the study. The researcher's attempt at seeking ethical approval from the Kenyatta University Ethics Review Committee was granted. The National Commission for Science, Technology, and Innovation (NACOSTI) gave a research permit to conduct the research. A request to conduct the research from at the Kilimani Primary School was approved and granted by its administration. Since the participants were below the age of 18 years, consent was sought from the teacher in charge of children with visual impairment unit. The teacher in charge gave consent on behalf of the parent after seeking approval from the parent. Every student, whose parent or guardian had given consent, underwent a medical clearance by the School Health Practitioner. Only those cleared were considered for the study. To enhance confidentiality and to protect the identity of the participants, each participant was

allocated a code number, and the name was never used during data collection; neither was any video or photography allowed during the intervention programme nor during testing. Only the researcher knew the identity of the code number

CHAPTER FOUR: FINDINGS

4.1: Introduction

The purpose of the study was to determine the effectiveness of an eight-week fundamental motor skills intervention programme on motor skills of children with visual impairment in Nairobi County, Kenya. The Test of Gross Motor Development (TGMD2) tool was used to measure the motor skills of children with visual impairment before the start of the eight-week fundamental skills programme to set the base-line levels, and after the eight-week intervention programme to determine the effectiveness of an eight-week fundamental motor skills intervention programme.

Statistical tools were utilised to test the research hypothesis; while descriptive method was used to answer some research questions. Statistical Packages for the Social Science (SPSS)-version 22.0 was used to analyse data. Statistical tests of independent t-test, Spearman's rank correlation and paired sample t-test were used to test hypotheses at a significant level of 0.05. The data was then presented in tables in accordance with the study objectives.

Demographic attributes of the children with visual impairment involved in the study were noted by the researcher to satisfy the study objectives. The demographic information that was relevant for the study included gender, age and the visual category. This is presented in Table 4.1

Table 4.1: Demographic Information Regarding Age, Gender, Visual Acuity of Children Who Participated with Visual Impairment

Age range of VI children who took part in the study		
Age	Sample group (n= 12)	Percentage (%)
9 and below	7	58.33
10 and above	5	41.67
Total	12	100

Gender of Children with VI who participated in the Study		
Gender	Sample group (n=12)	Percentage (%)
Male	6	50
Female	6	50

Category of Vision of Children with VI		
Vision category	Sample group (n=12)	Percentage (%)
B1	7	58.3
B2	5	41.7
Total	12	100

4.2: Motor Skills Performance Before and After an Eight-Week Fundamental Intervention Programme

The study's primary goal was to ascertain the effectiveness of an eight-week fundamental skills intervention programme on the locomotor and object manipulation skills among children with VI in Nairobi County. The Test of Gross Motor Development (TGMD2) tool was adapted to test object control skills and locomotor skills of the children with visual impairment.

Table 4. 2: Motor skills performance before and after the Intervention

Motor Skills	Test Nature	Mean	SD	95% Confidence Interval		T	Sig. (2 tailed)
				Lower	Upper		
Locomotor	Pre- test	20.3	11.78				
	Post-test	23.8	12.13	2.02	4.81	5.40	.001
Percentage difference		17.2%					
Object Manipulation	Pre-test	21.3	5.7				
	Post-test	29.1	7.32	4.58	10.92	5.38	.001
Percentage difference		36.6%					

Significant $p < 0.05$: $df = 11$ (depending on statistical outcome)

The study used the mean differences of the group pre-test and post-test to establish the effects of the intervention programme. A sample paired t-test was employed to test whether there was a statistically significant mean difference in the motor skill performance of the VI children tested before and after the intervention.

Table 4.2 shows a higher mean score for locomotor skills after intervention with a measure of 23.8 ± 12.13 compared to 20.3 ± 11.78 before intervention, a statistically significant increase was recorded at $t(11) = 5.40$, $p < 0.001$. Similarly, object manipulation recorded a higher mean score after intervention measuring 29.9 ± 7.32 compared to 21.3 ± 5.7 before intervention. A statistically significant increase was revealed at $t(11) = 5.38$, $p < 0.001$. There was a high level of significance in both, locomotor and object manipulation skills.

This implied that participation in the fundamental motor skill intervention programme resulted in improved motor skill performance among the VI children. Therefore, the hypothesis (H_{02}) that had not expected any significant difference between the locomotor and object manipulation skills after an eight-week intervention programme among children with VI in Nairobi County was rejected.

4.3 Motor Skill Performance Differences According to Age and Gender After The Intervention Programme

The study sought to establish whether there were any significant age and gender differences in object control and locomotor skills among children with visual impairment in Nairobi County subsequent to an eight-week fundamental skills intervention programme. The mean score of the group was established after participating in the intervention programme and independent t-test done to determine if the results were statistically significant. First, the study sought to determine if there were gender differences in the effectiveness of an eight-week fundamental skills intervention programme on the locomotor and object manipulation skills among children with VI in Nairobi County.

Table 4.3: Age, Gender Motor Skill Performance

Motor skills	Demographic Factor	Gender	N	Mean	Sd	T	Sig.(2tailed)																																
Locomotor Diff mean Post- pre	Gender	F	6	2.50	2.00	-1.5343	0.156																																
		M	6	4.33	4.50			Object Manipulation Diff mean Post-pre	Age	F	6	8.00	9.50	0.1656	0.872	M	6	7.50	7.00	Locomotion Diff mean Post-pre	Age	9 and below	7	3.86	2.41	0.810	0.437	10 and above	5	2.80	1.92	Object Manipulation Diff mean Post-pre	Age	9 and below	7	8.14	4.22	0.309	0.764
Object Manipulation Diff mean Post-pre	Age	F	6	8.00	9.50	0.1656	0.872																																
		M	6	7.50	7.00			Locomotion Diff mean Post-pre	Age	9 and below	7	3.86	2.41	0.810	0.437	10 and above	5	2.80	1.92	Object Manipulation Diff mean Post-pre	Age	9 and below	7	8.14	4.22	0.309	0.764	10 and above	5	7.20	6.42								
Locomotion Diff mean Post-pre	Age	9 and below	7	3.86	2.41	0.810	0.437																																
		10 and above	5	2.80	1.92			Object Manipulation Diff mean Post-pre	Age	9 and below	7	8.14	4.22	0.309	0.764	10 and above	5	7.20	6.42																				
Object Manipulation Diff mean Post-pre	Age	9 and below	7	8.14	4.22	0.309	0.764																																
		10 and above	5	7.20	6.42																																		

Significant $p < 0.05$: $df = 10$ (depending on statistical outcome)

Table 4.3 shows that boys, with a mean score of 4.33 ± 4.50 performed better than girls with a lower mean score of 2.50 ± 2.00 in the locomotor skills. Independent t-test results revealed there was no statistically significant difference at $t(10) = -1.5343$ $p=0.156$. On the other hand, girls scored higher in object manipulation skills with a mean score of 8 ± 9.50 compared to boys with a mean score of 7.50 ± 7.00 ; although statistically, it was not significant at $t(10) = 0.1656$, $p=0.872$. This implies that there was no gender difference in performance of motor skills. The boys performed better than the girls at locomotor skills while the girls outperformed boys in object control skills, though in both cases the differences were not significant.

An objective of the study was to determine any significant age differences in the effectiveness of an eight-week fundamental skills intervention programme on the locomotor and object manipulation skills among children with VI in Nairobi County. Table 4.3 indicates that the data for locomotor skills among children aged 9 years and below revealed a higher mean score of 3.86 ± 2.41 compared to a mean score of children with VI aged 10 years and above of 2.80 ± 1.92 . Statistically, at $t(10) = 0.810$, $p = 0.437$ after independent t-test, the data did not reveal any significant differences. Similarly, in the object manipulation category, the mean score of children with visual impairment aged 9 years and below was higher at a measure of 8.14 ± 4.22 compared to children aged 10 years and above with a measure of 7.20 ± 6.42 . At $t(10) = 0.810$, $p = 0.764$, no change that could be considered significant was seen. This data implies that the younger children aged 9 years and below outshined the older children aged 10 years and above in both object control and locomotor skills mean score; though the differences were not significant.

Therefore, in both, age and gender there were no significant differences in the performance of the motor skills among children with visual impairment. Hence, the hypothesis (H_{03}) that had not expected any significant age and gender differences following an eight-week fundamental skills intervention programme among children with VI in Nairobi County was not rejected.

4.4: Relationship between Visual Acuity and Performance of Motor Skills after Intervention Programme

As noted by Haibach, Wagner & Lieberman (2014), the degree of vision impairment affects every aspect of a person's life making it a very critical factor in the performance of motor skills. The last objective aimed to forge a relationship between

visual acuity and performance of motor skills subsequent to an eight-week fundamental skills intervention programme among children with VI in Nairobi County. The spearman's rank order correlation coefficient was utilised to assess if there is any significant relationship between visual acuity and performance of motor skill after the intervention programme. Spearman's rank order correlation is a measure of strength and direction of association between two variables.

Table 4.4: Performance of Motor Skills in Relation to Visual Acuity

		Visual Acuity	Locomotor
Locomotor	N	12	
	r_s	-0.470	
	Sig(2 tailed)	0.123	
Visual acuity	N		12
	r_s		-0.470
	Sig(2 tailed)		0.123
		Visual Acuity	Object Control
Object Control	N	12	
	r_s	0.074	
	Sig(2 tailed)	0.820	
Visual Acuity	N		12
	r_s		0.074
	Sig(2 tailed)		0.820

Significant $p < 0.05$: $df=10$ (depending on statistical outcome)

Table 4.4 shows there was no correlation between visual acuity and locomotor skill after the intervention programme at $r_s (10) = -0.470$, $p=0.123$. Statistically, there is no significant relationship between the locomotor skills and visual acuity. In addition, the Table 4.4 shows there was no statistically significant correlation between visual acuity and object control skills after the intervention programme at $r_s (10)=0.074$,

$p=0.820$. These results indicate no significant relationship between object control skills and visual acuity. These results imply that there is no significant relationship between motor skill performance and visual acuity.

Hence, the hypothesis (H_{03}) that had not expected any significant relationship between visual acuity and the performance of motor skills subsequent to an eight-week fundamental skills intervention programme among children with VI in Nairobi County was not rejected.

CHAPTER FIVE: DISCUSSION

5.1 Introduction

This chapter discusses the study's findings. The results are evaluated in light of the study's objectives and in comparison to other related studies.

5.2 Motor Skill Performance before and after an Eight-Week Fundamental Intervention Programme

The study's primary objective was to ascertain the effectiveness of an eight-week fundamental skills intervention programme on the object control and locomotor skills among children with VI in Nairobi County. The outcome, in Table 4.2 showed significant improvement in both, the locomotor ($t(11) = 5.40, p < 0.001$) and object control skills ($t(11) = 5.38, p < 0.001$) among children with vision impairment after the intervention programme and thus, the null hypothesis was rejected.

Results of this study concurred with a review that examined twenty-one studies concerning motor skill interventions among children with disabilities (Bishop & Pangelinan, 2018). Among the twenty-one studies conducted, twenty reported positive significant interventions' effects. Thus, providing support for fundamental motor skill interventions among children with disabilities. Similar outcomes were observed by Ketcheson et al. (2017) who investigated the effects of an early motor skill intervention on the motor skills levels of physical activity in young children with autistic spectrum. Following the intervention, the findings demonstrated a statistically significant increase in both object control and locomotor skills. The research emphasised the importance of early motor skill intervention in preventing poor motor skill development. Bellows and Anderson (2013) sought to determine the effectiveness of physical activity intervention in giving pre-schoolers a head-start on

gross motor skills performance, physical activity and weight status. The Bellows and Anderson (2013) findings augmented the notion that children who received the treatment improved their gross motor skills significantly. The current study recorded similar results which showed improved motor skill performance after the intervention programme which concurs with the above studies. Robinson et al. (2015) stated that fundamental motor skills intervention programmes are essential as they lead to improved motor skills proficiency which is linked to increase in physical activities.

Enhanced motor skill performance can be attributed to intervention programmes being specifically designed for children with visual impairment targeting their motor skills. Lieberman et al. (2014) reported that an effective and well-planned physical activity programme improves motor skills competence; while Cervantes and Poretta (2013) noted that modification of physical activity programmes can enhance motor skills performance among children with visual impairment.

Lieberman et al. (2014) emphasized that children with visual impairment cannot develop motor skills automatically. As explained by Morgan et al. (2013) motor skills need to be developed through specific instruction and practice because mature patterns of motor skills do not develop naturally. The intervention program gave children with visual impairment the chance to improve and hone their motor skills. The ability to adapt positive experiences of motor skill development carried out by someone who has the knowledge of how to use modified equipment and adapt activities appropriately are more likely to lead to motor competence (Lieberman et al., 2014).

The study makes a contribution to the literature as there are few motor skill interventions among children with visual impairment in Nairobi County. It also shows

the positive effects of fundamental motor skills intervention programmes among children with visual impairment.

5.3 Motor Skill Performance Differences According to Age and Gender after the Intervention Programme

The study set out to ascertain the age and gender differences in the effectiveness of an eight-week fundamental skills intervention programme on the locomotor and object manipulation skills among children with VI in Nairobi County. The current study did not find any statistically significant age and gender differences in performance of motor skills after the intervention. Hence, the null hypothesis was accepted. This implied that there was no difference in performance of motor skills among children with visual impairment in relation to age and gender after the intervention programme. These results agree with those of Haibach et al. (2014) who sought the determinants of gross motor skill performance in children with visual impairments. These authors found that apart from boys outperforming girls in dribbling, striking, and throwing, there was no significant gender difference in performance of motor skills.

The current study, however, looked into object control skills and locomotor cumulatively and found that whereas boys outshone the mean score of girls in locomotor skills, girls performed better than boys in object control skills. However, in neither case were the differences significant. Early disparities in motor performance between boys and girls are typically small to moderate, but this change when boys begin to perform better than girls later in life (Morgan et al., 2013) . The findings of the studies mentioned confirmed there is no gender difference in performance of motor skills among children with visual impairment.

The current study found no statistically significant age differences in effects of motor skill performance after the intervention (Table 4.3). However, the mean score indicated the children aged nine years and below performed better than the older children aged 10 years and above in both, the locomotor and object control skills. This result appears to correspond with those of Haibach et al. (2014) whose investigation into the determinants of gross motor skills among children with visual impairment found no statistically significant difference between performance of motor skills between younger and older children. The ages of the children between six to nine year olds and 10-12-year olds showed no significant differences in locomotor skills (Haibach et al., 2014). However, the older 10-12 years old children performed significantly better than those aged six to nine in object control skills. The current study differs with the expectation that the performance of motor skills improves with age, experience and maturation (Gallahue & Ozmun, 2016). The finding that there was no significant age difference in performance of motor skills among children with visual impairments contradicts normal gross motor development. Age is a key factor in motor skill competence throughout the early years of life (Butterfield et al., 2012; Ulrich, 2000; Vandorpe et al., 2011). Children who are older normally have better motor proficiency than younger children with visual impairment.

The current study's inconsistent findings may be explained by the study sample's differences in visual impairment severity, the variety of motor skills examined, and task experience, all of which interfere with age-related improvements in motor skill performance among children with visual impairment (Houwen et al., 2014). Additionally, the lack of age-related variations in the children with visual impairment is probably explained by reduced experience (Haibach et al., 2014).

5.4 Relationship between Visual Acuity and Performance of Motor Skills after Intervention Programme

Lastly, the study aimed to determine relationship between visual acuity and performance of motor skills subsequent to an eight-week fundamental skills intervention programme among children with VI in Nairobi County. The study results revealed no significant correlation between motor skills performance and degree of visual impairment among the children. Therefore, the null hypothesis was not rejected.

Houwen et al. (2009) examined gross motor skills and sports participation among children with visual impairment and concluded that there was no significant difference in performance of motor skills amongst children with different visual acuity. Similar conclusions were reached when the association between children with and without visual impairment's motor skills, physical fitness, and body composition was examined (Houwen, Esther & Hartman, 2016). The researchers stated that the degree of visual impairment did not change the statistical significance or magnitude of motor skills performance among children with visual impairment.

The results of the current study concurs with the assessment of gross motor skills development among children with sight impairment that found that degree of visual impairment was not associated with motor skills performance. This result may suggest that even though vision plays a vital role in motor skill performance, it is not the only factor that affects acquisition of motor skills. Children with visual impairment have the potential to perform motor skills just as well as their sighted peers (Porretta & Cervantes, 2013). Skills need to be developed through specific instruction and

practice to achieve this (Lieberman et al., 2014) because mature patterns of motor skills do not develop naturally (Morgan et al., 2013).

On the other hand, Haibach et al., (2014) found that the degree of the visual impairment was a key factor in the performance of motor skills examined, especially among the children in the B2 or B3 vision category in compared to those children in B1 vision category. Compared to either of these groups, B1 children dramatically underperformed in practically every motor skill. Except for the three motor ability skills of catching, running and throwing that were evaluated, children in the B2 and B3 levels did equally well (Haibach et al., 2014). Therefore, there exists a need for more studies that can shed light on the significance of vision in performance of motor skills.

CHAPTER SIX: SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

The primary aim of the study was to establish the effectiveness of an eight-week fundamental skills intervention programme among children with visual impairment in Nairobi County. The Test of Gross Motor Development, second edition (TGMD2) was the tool used to determine the effects. Specifically, the study examined the independent variables of fundamental motor skill activities in the intervention programme, against the performance of the dependent motor skill variables of hopping, running, leaping, sliding, horizontal jumping, kicking, stationary dribbling, catching, overhand throwing and underhand rolling that were assessed to determine the effects of the programme. The study targeted visually impaired children aged 6-11 years because rapid motor skill development occurs within this period. The study results implied that performance of motor skills among children with VI can be improved using fundamental motor skill-based interventions.

Summary of the major findings, conclusions and recommendations are presented in this chapter. The chapter also recommends areas for further studies.

6.2 Summary of the Findings

6.2.1 Effectiveness of an Eight-Week Fundamental Intervention Programme on Locomotor and Object Manipulation Skills

The mean scores in both, the object control and locomotor skills among children with VI showed improvement after the intervention programme was conducted. The t-test results indicated there was statistically significant growth in motor skills performance after the intervention. The results correspond to other studies which investigated the

effects of motor skills intervention programme among children with or without visual impairment. The growth of motor skill may be attributed to intervention programme design which modified the activities to cater for the needs of children with visual impairment, well planned and executed programme and the opportunity provided by the intervention programme to practice and develop the motor skills.

The study helped to bridge the information-gap in motor skill performance among children with visual impairment as they perform poorly compared to their sighted peers. It also contributes to the published literature on motor skill performance among children with total/partial vision loss.

6.2.2 Motor Skill Performance Differences According to Age and Gender after the Intervention Programme

The study revealed that statistically, there were no significant age differences in performance of motor skill among children with visual impairment. The mean score however, shows that the younger children performed better than the older children in both the object control and locomotor skills. The outcome shows a deviation from the norm that states that the performance of motor skills improves with age, experience and maturation. This could be attributed to the study sample which varied in degree of visual acuity, different motor skills investigated and task experience.

The t-test with regard to gender did not reveal any significant differences between the boys and the girls. Therefore, there was no gender difference in the performance of motor skills among children with visual impairment. Nevertheless, when comparing mean scores, boys performed better in locomotor skills and girls performed better than boys in object control skills. The results are consistent with the anticipated growth trend because only minor to moderate differences in motor skill between boys

and girls during childhood are expected. Currently, there is paucity of the evidence for the existence of gender differences in motor skill performance among young children with visual impairment exist. Consequently, as a result this study adds to the body of research.

6.2.3 Relationship between Visual Acuity and Performance of Motor Skills after Intervention Programme

With regard to the relationship between severity of vision and performance in motor skills, the study showed no significant association. The degree of vision did not influence the performance of motor skills among children with visual impairment. Though loss of vision plays a major role in motor skill performance, it is not the only factor. With specific instruction and practice children with visual impairment can perform motor skills better.

6.3 Conclusions of the Study

In light of the findings, the study drew the following conclusions:

1. There was significant improvement in both, the locomotor and object control skills after the eight-week fundamental skill intervention programme among children with visual impairment aged 6 – 11 years.
2. There were no age and gender differences in performance of motor skills among children with visual impairment aged 6 – 11 years after the intervention programme.
3. There is no significant relation between motor skill performance and severity of vision among children with visual impairment aged 6 – 11 years.

6.4 Recommendations

Based on the research's findings, the following recommendations for developing policies and conducting additional research were made:

6.4.1 Recommendations for Policy

1. Based on the present research, children with visual impairment benefited from the eight-week motor skill-based intervention programme. This is evident by the improvement of their motor skill performance after participating in the intervention programme. As a result, the research suggests that organizations like Special Olympics, Nairobi County and the National Council for Persons with Disabilities launch more early intervention programmes using motor skill activities at the school level.
2. The findings show that the mean scores for both object control and locomotor skills of younger children was higher than that of the older children. Therefore, the Ministry of Education in conjunction with children with visual impairment sports educators should develop an Adapted Physical and Health education curriculum that targets motor skill development across all ages to prevent stagnation in the growth of motor skills among older children.

6.4.2 Recommendation for Practice

1. The study found benefits associated with motor skill intervention programmes. Therefore, the school should provide movement intervention regularly to improve their performance.
2. Though the current results showed no relationship between the degree of vision impairment and motor skill performance, literature suggests otherwise. Consequently, it is critical to motivate children with vision impairment to engage in more activities that improve their motor skills.

3. The Ministry of Education should organize seminars and forums for teachers and educators in all schools with visually impaired children. Such seminars and forums should emphasize not only the tremendous benefits but also the importance of learner involvement in movement activities in motor development.

6.4.3 Recommendation for Further Studies/Investigation

1. There is a need to replicate this study in other visually impaired primary schools in Nairobi County. This will help to broaden the knowledge and effectiveness of motor skills intervention programmes for visually impaired children.
2. The current study looked into effects of fundamental motor skills intervention programme among visually impaired children. Further studies could be conducted to establish the fundamental motor skill development among visually impaired children in Nairobi County
3. Further study involving a wider population is recommended. Findings of the current study involving a small sample of just 12 visually impaired children may not be generalized.
4. According to the results of the current study, younger children performed better than older children with visual impairment in both the locomotor and object control skills. Although the difference was not significant, this trend warrants further investigation involving a larger population.
5. The motor skill assessment tool used in this study (Tgmd2) was designed for normally developing children. The creation of an evaluation tool tailored to the requirements of children who are visually impaired is necessary.

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APPENDICES

APPENDIX A: Research Authorization from Kenyatta University Ethical Review Board



Kenyatta University
P.O Box 43844-00100
Nairobi-Kenya

REF: KU/ERC/APPROVAL/VOL1/1

Date: 28th September, 2020

Githinji Judy Muthoni
P.O Box 43844-00100
NAIROBI

Dear Ms. Muthoni,

**APPLICATION NUMBER: PKU/2134/I1278 EFFECTS OF AN EIGHT WEEK
FUNDAMENTAL SKILLS INTERVENTION PROGRAM ON THE MOTOR SKILLS
OF CHILDREN WITH VISUAL IMPAIRMENT IN KENYA**

This is to inform you that *KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE* has reviewed and approved your above research proposal. Your application approval number is PKU/2134/I1278. The approval period is 28th September, 2020 – 28th September, 2021.

This approval is subject to compliance with the following requirements;

- i. Only approved documents including (informed consents, study instruments, MTA) will be used
- ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by *KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE*.
- iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to *KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE* within 72 hours of notification
- iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to *KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE* within 72 hours
- v. Clearance for export of biological specimens must be obtained from relevant institutions.
- vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
- vii. Submission of an executive summary report within 90 days upon completion of the study to *KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE*.

APPENDIX B: Research Authorization from Kenyatta University

**KENYATTA UNIVERSITY
GRADUATE SCHOOL**

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

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

Internal Memo

FROM: Dean, Graduate School	DATE: 2 nd June, 2020
TO: Ms. Githinji J. Muthoni C/o Department of Physical Education, Exer. & Sports Sci. <u>KENYATTA UNIVERSITY</u>	REF: H68/OL/CTY/39520/16
SUBJECT: APPROVAL OF RESEARCH PROPOSAL	

This is to inform you that the Graduate School Board at its meeting 20th May, 2020 approved your M.P.H. Research Proposal entitled "Effects of an Eight-Week Fundamental Skills Intervention Programme on the Motor Skills of Children with Visual Impairment in Kenya".

You may now proceed with your Data collection, subject to clearance with the Director General, National Commission for Science, Technology & Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed supervision Tracking and Progress Report Forms. The Forms are available at the University's Website under Graduate School webpage downloads.

Thank you.

**JULIA GITU
FOR: DEAN, GRADUATE SCHOOL**


c.c. Registrar (Academics) Att: Mrs Lucy Njenga
 Chairman, Department of Physical Education, Exer. & Sports Sci.


Supervisors

1. Dr. Jane Mwangi
Department of Phy. Education, Exer. & Sports Sci.
Kenyatta University
2. Dr. Goodwin Yasmin
C/o Department of Phy. Education, Exer. & Sports Sci.
Kenyatta University

JG/cao


APPENDIX C: Research Authorization from National Commission for Science, Technology and Innovation (NACOSTI)


REPUBLIC OF KENYA


NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY & INNOVATION

Ref No: 770679 Date of Issue: 08/July/2021


RESEARCH LICENSE




This is to Certify that Miss. Judy Muthoni Githinji of Kenyatta University, has been licensed to conduct research in Nairobi on the topic: EFFECTS OF AN EIGHT-WEEK FUNDAMENTAL SKILLS INTERVENTION PROGRAMME ON THE MOTOR SKILLS OF CHILDREN WITH VISUAL IMPAIRMENT IN KENYA for the period ending : 08/July/2022.

License No: NACOSTI/P/21/8384

770679
Applicant Identification Number


Director General
NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY &
INNOVATION

Verification QR Code



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Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) <https://oris.nacosti.go.ke> and also obtain other clearances needed.

Yours sincerely



Prof. Judith Kimiywe

CHAIRPERSON- KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE.

APPENDIX D: Letters of Approval and Permissions

GITHINJI JUDY MUTHONI

Date.....

To The Principal,

Kilimani Primary School

P.O Box 704-01000,

Kilimani

Dear Madam,

REF: REQUEST TO CONDUCT RESEARCH IN YOUR SCHOOL.

At Kenyatta University, I am currently enrolled in the Master of Science programme. All participants in the program are required to complete a full thesis after conducting in-depth research on a subject that has been accepted by the university.

Kenyatta University has granted me permission to look at:

Effectiveness of an eight-Week Fundamental Skills Intervention Programme on Motor Skills of Children with visual impairment in Nairobi County

The programme will include learning the basic motor skills of hopping, leaping, horizontal jumping, stationary dribbling, catching, kicking, overhand throwing, underhand rolling and fun games.

I am seeking to recruit both male and female visually impaired kids between the ages of 6 and 11. Before the collection of data can start, students who choose to participate and express interest will get a consent form that must be completed by the parent or legal guardian and returned. The study's chosen participants will be everyone who receives approval.

Prior to the start of the intervention programme, all selected participants will undergo a motor skills assessment. The selected participants will be randomly assigned to either the experimental or the control group. Initially, the experimental group will

undergo the intervention programme. After the end of the eight-week programme, to give the control group exposure and for parity the control group will undergo the programme.

The data gathered will only be utilized for academic study. It will not be discussed publicly.

The cost of this study will not be borne by the school.

We would appreciate your consent to carry out this study at your school.

If you have any queries or concerns, please call me at 0721583196

Please sign below if you agree:

Yours sincerely,
Judy Muthoni Githinji
Kenyatta University

Approved by

Name:

Signature:

Date:

APPENDIX E: Informed Consent Form

Date.....

Study Title: Effectiveness of an eight-Week Fundamental Motor Skills Intervention

Programme on Motor Skills of Children with visual impairment in Nairobi County.

Researcher: Githinji Judy Muthoni

Study location: Kilimani Primary School, Nairobi County, Nairobi County.

Introduction: I, Judy Muthoni Githinji, will carry out research on:

Effectiveness of an eight-Week Fundamental Skills Intervention Programme on Motor Skill of Children with visual impairment in Nairobi County

The eight-week intervention programme will involve children between aged six to 11 years old. The physical activity programme will include walking, running, hopping, and jumping, leaping, and dribbling, catching, throwing, kicking and fun games such as goalball.

It is requested that you, as the parent or legal guardian, sign this consent form before your child can take part in this study. Please carefully read the form to understand the purpose of the study, potential benefits, and associated risks before allowing your child to participate. The study will include assessment, teaching and observation of motor skill level of your child. The school will be requested to provide the researcher personal information about your child's visual category, the age when your child experienced loss of vision and your child's current age.

Participant selection: I have visited Kilimani Primary School, where your child goes to school, to seek permission from the school to train students between age six and 11 years. The students will participate on a voluntary basis in a three times a week eight-week fundamental skills intervention programme. Whether or not the child will participate is entirely up to the parent or legal guardian.

Study procedures: Your child will be expected to attend every session of the programme three times a week for eight-week. Each session will be 35minutes. The physical activity program will involve games and learning activities including walking, running, jumping, hopping, dribbling, catching, throwing, and kicking. Your child's motor skill level will be assessed twice during this study – once, at the beginning and once, at the end through observation. A teacher from Kilimani Primary School will be present all times during this study because the teacher will be recruited as a Research Assistant. The researcher will make sure the child will be supervised all the time, the surrounding environment is safe and the physical activities given will be simple and easy for the child to perform.

Risks

There are no anticipated dangers or uncomfortable side effects from taking part in this study. A certified coach will lead the physical exercise program. The coach is a certified first responder in the event of an injury.

Benefits or reimbursements

For taking part in this study, your child will not receive any cash or prizes. Participation by her/him is purely voluntary. The researcher however, hopes the physical activities given will improve the motor skills of your child, and increase his/her participation in sports.

Confidentiality

The data gathered for this study will be kept private and confidential. Only the name and personal information on the consent form will be utilized. Your child will be issued a code number while the data is being gathered in order to maintain privacy. The researcher will be the only one having access to the data, which will only be used for academic purposes. The information gathered may also be used by other physical educators to come up with more physical activities programmes that are suitable for children with visual impairment. This will increase their physical activities, which in turn will reduce the effects of sedentary lifestyle.

Person to get in touch with if there are any issues or any queries

Contact Judy Muthoni Githinji at 0721583196 or the Kenyatta University Ethical and Review Committee through email at kurec@ku.ac.ke if you have any inquiries regarding this research or general inquiries about the research.

Statement of Consent and Signatures

I attest that I have either read or been read the material above. Additionally, I have received satisfactory responses to the queries I have posed. I thus voluntarily consent for my child to take part in this study.

Participants names parents.....

Thumb print

Child's name.....

Signature of parents.....

Date.....

APPENDIX F: Child Assent Form /Form For Participation In Research

Date.....

Study Title: Effectiveness of an eight-Week Fundamental Motor Skills Intervention Programme on Motor Skill of Children with visual impairment in Nairobi County.

Researcher: Githinji Judy Muthoni

Study location: Kilimani Primary School, Nairobi County, Nairobi County.

My name is Judy Githinji from Kenyatta University. I am conducting research to determine how a Motor Skill programme can improve the movement skills of children with visual impairment. As a child between the ages of 6 and 11, I am requesting you to participate in this study by volunteering. If you agree to be in the study, you will be attending a physical activity programme three times a week, which will last 35 minutes only over the eight-weeks of the programme. You will learn the following skills: walking, running, hopping, jumping, leaping, dribbling, catching, throwing, kicking and fun games. Before you start the programme, you will do a motor skill (movement) test and repeat another one at the end of the programme. This will help me know where you are in your movement skill and whether you improved after the eight-week intervention programme

Being in the study may improve your movement skills and may also increase your participation in sports. I also hope to learn something that may help other people to come up with more programmes that help children with visual impairment become more active in sports. Participation in the programme will not cause you any harm, but you may feel a little tired after playing.

You do not have to be in the study if you do not want to. You will not be in trouble with the teacher or your guardian. Even if you say “yes” now you can still say “no”

later, if you want to stop doing the programme. I have asked your guardian for permission for you to do this, but it is your choice to join the programme. If your guardian say “yes “you can choose to say “no” and no one will punish you. Remember you can stop coming to the programme at any time.

I will not use your name on this study or share your information with another person. I will use a secret number which only you and I will know. You can ask questions now or anytime you want.

If you want to know something more you can contact me on: Cell phone no.0721583196

Name of Child: _____ Parental Permission on File:

Yes No**

** (If "No," do not continue with the assent or research steps.)

By signing here, you confirm that you have read or have read the paper and that you want to participate in the study. Do not sign if you do not want to participate in the study.

Signature of Child: _____ Date: _____

(For Verbal Assent) Indicate the child's Willingness to Participate: Yes No

Researcher's signature: _____ Date: _____

Appendix G: Test of Gross Motor Development

Test of Gross Motor Development (TGMD₂)

Name/Code..... Male..... Female.....
 Date of Testing Date of Birth.....
 Class Level Actual Age.....
 Category of Vision Visual Loss Onset.....
 Testers Name..... Date of Testing.....
 Site Name.....

SUBSET SCORE	SKILL PERFORMANCE	RAW SCORE
Locomotor skills	Run	..... /4
	Hop	...../5
	Leap	..... /3
	Horizontal jump	...../4
	Slide	..... /4
	Gallop	...../4
	Total score	..... /24
Object manipulation skills	Stationary Dribble	...../4
	Catch	...../3
	Kick	...../4
	Overhead throw	...../4
	Underhand roll	...../4
	Striking a ball	...../4
	Total score	...../24

**APPENDIX H: A TGMD2 Tool Test for Visually Impaired Elementary Children
LOCOMOTOR SUBTEST**

Preferred hand	Right		Left		Not established
Preferred foot	Right		Left		Not established

Skills	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
Run	18m of clear space Portable sound source (clapper, etc.) Two cones Optional: Sighted guide Optional: 20m guidewire, 4m loop rope,	Two cones should be placed 16 meters apart, and there should be 3 meters of area free beyond the second cone for a secure stopping distance. At the far cone, position the portable sound source. Give a "set, go" signal. Give the child the direction of the beeping sound and tell them to run from one cone to the next. Instruct the child to sprint from one cone to the next in the direction of the beeping sound. Make a second attempt.	1. Arms move in opposition to legs, elbow bent			
			2. Just a moment when both feet are elevated.			
			3. Placing the foot narrowly and landing on the toe or heel (i.e., not flat footed).			
			4. Suitable 90-degree flexion of the nonsupport leg (i.e., close to the buttocks).			
				Skill score		

Skills	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
Hop	Clear space	Find out which foot the child prefers to use. Tell her to jump three times on her favoured foot before switching to the opposite foot. Make a second attempt.	Nonsupport leg swings forward in pendulum fashion to produce force			
			Foot of unsupported leg is still behind body.			
			To exert force, the arms flex and swing forward.			
			Three times takes off and lands on the favoured foot.			
			Sets off and lands three times in a row on an inappropriate foot.			
			Skill score			
Horizontal jump	10 feet of clear space Florescent tape	Create a beginning line on the ground by marking it off with a colorful tape. Put the child in the back of the line. When the beeping noise stops, tell the child to jump as far as they can. Retake the second test.	1. Both knees are flexed during the preparatory movement, and the arms are extended behind the torso.			
			2. Arms extended vigorously upward and forward until completely extended above the head.			
			3. Take off and land on both feet at the same time.			
			4. During landing, the arms are pushed downward.			
				Skill Score		

Skills	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
Slide	8m of clear space Two brightly coloured cones Florescent tape	Position the cones 8m apart along the tapeline. The child begins at one cone and proceeds to slide to the other cone along the line.	1. Shoulders lined up with the line on the floor with the body twisted to the side.			
			2. The leading foot takes a step to the side, then the trailing foot slides to a place next to the leading foot.			
			3. At least four uninterrupted step slides to the right.			
			4. Four continuous steps-and-slides to the left, minimum.			
				Skill score		
Skills	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
Leap	6m of clear space Brightly colored beanbag Florescent tape	Attach a piece of tape to the floor. Place a beanbag parallel to the tape and 3 meters away. The child jumps over the beanbag while standing on the tape and running to it. If the child has poor vision or none at all, use a cane as a directional signal by tapping it on the ground close to the beanbag. Remove the cane swiftly and shout "jump" just before the child reaches the beanbag. Repeat a second trial	1. Start with one foot and land on the other.			

Appendix I: A TGMD₂ Tool Test for Visually Impaired

ELEMENTARY CHILDREN OBJECT CONTROL SUBTEST

Preferred hand	Right		Left		Not established	
Preferred foot	Right		Left		Not established	

Skills	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
Stationary dribble	Bright colored beach balls or sound emitting ball that bounces hard, flat surface	Ask the child to dribble the ball with one hand for four dribbles while keeping both feet stationary before stopping by catching the ball. Repeat the second trial.	1. Contacts ball with one hand at about belt level			
			2. Pushes the ball with finger tips (not slap)			
			3. Ball contacts surface in front of or next to foot surface on the preferred side.			
			4. Keep the ball under control on four successive bounces without needing to move your feet to get it.			
				Skill Score		

Skills	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
Catch	Ball (sound adapted) 5m of clear space Florescent tape	Put two lines of tape 5 meters apart on the ground. The catcher (child) stands on one line, and the peer or instructor who tosses the ball stands on the other. The ball is thrown underhand and in a moderate arc by a peer or instructor toward the child's chest. Tell the child to use both hands when catching. Count only throws that land in the area between the child's shoulder and the belt. Make a second attempt.	1.Preparation phase where hands are in front of the body and elbows flexed			
			2. Arms extend while reaching for the ball as it arrives			
			3. Ball is only caught with the arms.			
				Skill score		

Skills	Materials	Directions	Performance Criteria	Trial 1	Trial 2	Score
Kick	Minimum 9m clear space with a wall Ball (bright color or sound adapted) Beanbag Florescent tape	Along the line closer to the wall, place a ball on top of a beanbag. Instruct the child to take a position on the opposing line. Place two lines of tape on the floor, six meters from one wall and nine meters from the other. It is crucial to position or position a child with no useable eyesight so that he is precisely behind the ball. Tell the kid to sprint to the ball and give it his best kick.	1. Continuously approaching the ball quickly.			
			2. A longer lead or stride just before or before contacting the ball.			
			3. Non-kicking foot positioned even with or just behind the ball.			
			4. kicks ball with preferred foot's instep (shoe laces) or toes.			
				Skill score		
Overhand throw	Minimum 6m clear space with a wall Brightly coloured balloon ball Sound source (beeper or clapper)	6 meters from the wall, attach a line of tape to the ground. Ask the child to stand behind the line. Position a sound source against a wall. Tell the child to fling the ball hard against the wall.	1. Hands/arms moving downward signal the start of the wind-up process.			
			2. Turn your hips and shoulders so that your throwing side is facing the wall.			

	Florescent tape Optional: Colorful streamer attached to ball					
			3. Stepping with the foot in opposition to the throwing hand helps transfer weight.			
			4. After the ball is released, carry on diagonally across your body to your non-preferred foot.			
				Skill score		
Underhand roll/throw	Minimum 4m clear space and a wall A beach brightly colored ball A stick or cane Florescent tape	Attach a line of tape to the floor 4m from a wall. Tell the child to take a position behind the line. One individual taps a stick against the wall while standing next to it. Instruct the child to throw the ball underhand and hit the wall.	1. Preferred hand swings down and back, reaching behind the trunk while chest faces cones			
			2. Stride forward with foot opposite the preferred hand towards the cones			
			3. Bend knees to lower body			
				Skill score		

APPENDIX J: The Eight-Week Fundamental Skills Intervention Programme for Children with Visual Impairment

WEEK	ACTIVITIES 35 MIN EACH	DEMONSTRATION	MATERIALS
1	Group Discussion and Pretesting		
2	Walking board	Walk forwards and backwards in a line Move forward, stoop down, and grab a bean bag.	Clear marked space Bean bags
	Walking board	Walk forwards, backwards, sideways with a bean bag on top of head	Bean bags Clear marked space
	Locomotor practice	Walk & run	Clear marked space
3	Locomotor practice	Run on their own with a guided rope	Clear marked space
	Stationary balance	Hop five times on one foot while balancing on one leg.	Clear marked space
	dynamic balance	Hop forward while standing on one leg, land, and maintain balance for five seconds before continuing.	Clear marked space
4	Object balance	Balance a bean bag on the head, other body parts, and both sitting and standing.	Clear marked space

WEEK	ACTIVITIES 35 MIN EACH	DEMONSTRATION	MATERIALS
	Jumping and sequencing direction	Jumping patterns: forward, backward, across, diagonally and repeat	Clear marked space
	Jumping over ropes	Lay the rope flat on the ground and hop, leap, and weave around it.	Bright coloured ropes, beeping sound source, clear marked space
5	Bean bag foot relay	Utilizing only their feet, they move the bean bag across the floor.	Clear marked space Bean bag
	Soccer kick for accuracy	Kick the ball through the different goals	Bright coloured cones, balls and clear marked space
	Soccer dribble with a sound emitting ball	With their insteps, soccer students dribble.	Bright coloured, sound emitting balls clear marked space
6	Circle “keep it in” game	The ball is kept inside the circle by the students' feet while they are seated in a circle.	Bright coloured, sound emitting balls and clear marked space
	Bean bag overhand throwing	Overhand throw for distance and accuracy to various sized target	Brightly coloured bean bags and a wall with brightly coloured targets
	Throwing and catching balls	Your partner should receive the ball. The ball is caught by the partner and returned to them. Repeat a few times.	Brightly coloured balls
7	Underhand tossing bean bag	Underhand throw for distance and accuracy to various sized targets	Bright coloured cones, balls and clear marked space
	Bowling with sound emitting balls	Students build a circle and then move the ball inside and outside of it.	Sound emitting balls

WEEK	ACTIVITIES 35 MIN EACH	DEMONSTRATION	MATERIALS
	Bowling with sound emitting balls and blocks	Students knock down a setup of blocks by rolling a ball	Sound emitting brightly coloured ball, bright coloured cones
8	Throwing and catching with a partner	Two hands underhanded, one hand underhanded, two hands bounced, one hand bounced.	Sound emitting brightly coloured ball, Clear marked space
	Dribbling	Bounce and catch with two hands	Sound emitting balls Clear marked space
	Drop and catch sound emitting balls	Stand outside a hula hoop and bounce and catch playground ball inside the hoop	Sound emitting brightly coloured ball, hula hoop, Clear marked space
9	Batting and hitting beach balls	Beach balls are batted or hit with the hand.	Sound emitting brightly coloured ball, Clear marked space
	Obstacle course activities	Make barriers that pupils can run around, crawl under, jump over, and crawl through.	hula hoop Clear marked space
	Rock, bridge, tree game	Each student is matched with a rock, bridge, tree, or other immovable object. The mover must pass the other student either over, beneath, or around.	
10	POST-TESTING		