UNIVERSITY OF EDUCATION, WINNEBA

AN ASSESSMENT OF GROSS MOTOR DEVELOPMENT OF KINDERGARTEN PUPILS AT AKYEMANSA DISTRICT IN THE EASTERN REGION, GHANA

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DECLARATION

STUDENT'S DECLARATION

I, PAUL-ANTHONY KWEKU SOMIAH, hereby declare that except that references to other peoples work which have been duly cited, this research work was done in accordance with the guidance and supervision of research work laid down by the University of Education, Winneba and that it has neither in whole nor in part been presented elsewhere.

SIGNATURE: ……

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SUPERVISOR'S DECLARATION

This thesis work was supervised under my guidance in accordance with the lay down guidelines and supervision of the University of Education, Winneba on research supervision.

SUPERVISOR'S NAME: DR PHILIP O. OMOREGIE

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DEDICATION

I dedicate this Thesis to Antonio-Benedict Briandt-Somiah, Alvin-Jaden Briandt-Somiah and Brendan Yoofi Briandt-Somiah.

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ABSTRACT

Gross motor skills have been shown to influence motor development during childhood stage. The purpose of this study is to assess the gross motor development of kindergarten pupils at Akyemansa district in the Eastern Region, Ghana. Experimental design of pretest-posttest non-equivalent groups' method was adopted. The sample consists of eighty participants between ages 4 to7years.The participants were selected using simple random, purposive and stratified sampling techniques. Test of Gross Motor Development-2 (TGMD-2; Ulrich, 2000) was used as instrument for data collection. This yielded a reliability of 0.69 and 0.72 respectively. Four research questions were answered. Descriptive statistics of means and standard deviation was used to analyze the data for demographic and research questions.

The result showed that children within the kindergarten have established normal development of fundamental motor skills especially in catching (M = 2.80, SD = 1.55). The males showed greater proficiency in the locomotor skills (M = 5.65, SD = 3.03) whiles the females showed a greater proficiency in object control skills. (M = 10.73, SD = 3.31). The findings showed that there was significant differences in the gross motor skills of participants with locomotor skills (t = 17.93, df = 79, P <. 05) and object control skills (t = 24.76, df = 79, P <.05). It was revealed that the object control skills shows a better mean value (M = 9.96) than the locomotor skills (M = 5.40). Thus, was concluded that pupils gross motor skills have developed to some extent, hence need attention. It was recommended that intervention programme should be used by teachers to address the delayed skills. Also school administrators and kindergarten coordinators in the various district education directorates should monitor the pupils' motor development on regular basis to identify any developmental delays that might exist.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Childhood is a critical time for the development of fundamental gross motor skills. This period is considered to be a sensitive learning period for motor skill development because of the substantial neurological capacity available for learning fundamental skills. Fundamental motor skills might "just appear" but they do not refine by themselves. In order to master fundamental motor skills in proficient levels of performance children need to practice and receive appropriate instructions that would occur in preschool and elementary school (Barela, 2007).

The pre-school years are characterized by the appearance and mastery of a number of fundamental motor skills also known as "gross motor skills" These fundamental motor skills include body projection (locomotor skills), body manipulation (nonlocomotor actions) and object control or ball handling skills. Body projection or locomotor skills include running, jumping, hopping, skipping, galloping, leaping, and sliding. (Williams & Monsma, 2009).

This results in the acquisition of control and use of the large muscle masses of the body. A significant element characterizing kindergarten children in relation to their total development is fundamental motor movement. (Williams & Monsma, 2009) stated that the learning process in the early years is a physically active one, which often centres on play, physical activity and the use of variety of motor skills. There is also strong evidence that learning-related skills predict early academic achievement (McClelland, Adcock & Morrison, 2006). More so, Folio & Fewell,

(2000) stated that "three particular social skills that influence children's peer acceptance: play behavior, ability to enter play groups and communication skills".

The gross motor movements as a result of motor development involve a cumulative effort of larger muscle groups (Haywood & Getchell, 2010). This includes movement such as: running, jumping, throwing and catching. Throwing a ball for example is initially controlled by gross motor control and improves as fine motor control such as finger dexterity or control of the rotator cuff which allows for improved accuracy and precision (Cook, 2012). Amui, (2006) defined motor skills as an act or a task that has a goal and requires voluntary body or limb movement to be properly performed and thus referred to motor skills as "action verbs". This implies that motor skills involve movements.

Motor development refers to the gradual acquisition of control or use of the large and small muscles masses of the body (neuromuscular coordination). It is also often referred to as "perceptual-motor development" and "physical or motor coordination" in part because both the brain/nervous system and muscles interact in intricate ways to allow the child to move the body skillfully in manipulating objects and exploring the physical world around him/her. Motor development is known to be important dimension of child development and is a universally recognized means of assessing the overall rate and level of development of the child during the early months and years after birth. (Williams & Monsma, 2009).

The years from 2 years to 6 years are considered the "golden years" of motor development (Malhotra,2009). During this period most children acquire a basic repertoire of manipulative and locomotor skills, develop goal-oriented motor

behaviours and learn to put together two or three movement sequences to accomplish specific end goals. (William & Monsma, 2009). According to Gallahue, (2006) motor development refers to fundamental motor skills which are commonly classified into three categories as: Locomotor, object control and non-locomotor. These are the ABCs of motor the period of childhood. Goodway & Robinson (2010) in their own classified it into two categories of locomotor and manipulative skills. They referred to locomotive skills as moving the body from one point to another and manipulative skills as moving objects with the hands and feet.

The development of mature fundamental skills requires that children can be exposed to the opportunity, encouragement and environment so that the skills develop beyond elementary stage of performance (Ghaly, 2010). Although fundamental motor skills are considered as building block of later motor skills acquisition. (Clark, 2007). If these skills are not mastered early in life children may encounter difficulties when learning more complex motor skills and even not continue to pursue participation and progress in motor activity towards skillfulness (Barela, 2013). Barela, (2013) stated that proficiency has been suggested as an important aspect of motor skill development and fundamental motor patterns if not acquired early children would encounter difficulties which may result as proficiency barrier when trying to learn motor skills that would lead to skillfulness. More so, the maturation misconception that motor skills are acquired naturally as they appear seem also to pervade the ideals that these skills are mastered by the children as they play and move around by themselves. (Barela, 2013).

Issues in the appearance of these milestones often signal potential difficulty with continued development and acquisition of the fundamental motor skills. (Williams

& Monsma, 2009). Historically, kindergarten is a place where children meet to interact with their age mates for the first time in their school life and learn basic skills through play that focus on nurturing children's intellectual, moral and physical development. Hence the mandates of the kindergarten schools couple with the pre-exposure activities such as good tenderly care to pave way for formal education demands, thus call for attention to be given to kindergarteners because the period which begin from age 2 to 6 years considered as "golden years of motor development" (Malhotra,2009)

Under achievement in school, lack of concentration, low self-esteem, poor social competence and behavioural problems have all been linked to or associated with deficit in motor development in early and late years of childhood. For example, there is a greater incidence of difficulty in making appropriate social and emotional adjustments to both play and learning situations in children whose motor skills are less well developed than those other children from similar chronological age. Lack of physical or motor skill often prevent children from joining in group games and other sports that encourage social interaction and personal growth (Williams & Monsma, 2009). Evidence suggests that 57% of children born prematurely and who showed minor neurological impairment early in life continue to show deficit in motor functions (balance, gross motor coordination, etc.) as well as in other school related behaviours far into the preschool years. (Williams & Monsma,2009). Motor development delays frequently accompany a number of potentially serious health conditions such as childhood obesity, cardiovascular diseases, strokes and other health related diseases which are often associated with lack of integrity of neurological functioning (pre maturity, mental sub normality, emotional

disturbances cerebral palsy, etc.). These are all conditions that may require medical or other special professional attention thus motor development needs or difficulties accompanying these conditions need to be identified early. Therefore the study tends to investigate the gross motor development level of kindergarten pupils at the Akyemansa district in the Eastern region, Ghana.

1.2 Statement of the Problem

The development of gross motor skills which include fundamental motor skills is vital in the development of children especially kindergarten pupils. Adequate developments of these skills enable children to develop self-confidence to explore their environment and also go a long way to enhance cognitive and social development. Children especially kindergarteners need help to develop the habit of active life at the early stages of life based on the experiences of their level of gross motor development needed to maintain healthy hearts, lungs and muscles avoiding the consequences and effects of deformity or problems arising due to poor gross motor development proficiency at that stage. Adequate development of gross motor skills enables children to develop proficiency that enhances their growth, physical active life and good health.

Thus, under-development or poor development of these skills if not checked and assessed early in life lead to physical inactive, non-participation or limited participation in recreation/sports activities. This could mean more passive, less-fulfilling and less healthy lives (Portela, 2007). Therefore the study assessed the gross motor development levels of kindergarten pupils in Akyemansa district in the eastern region, Ghana.

1.3 Purpose of the Study

Children who experience poor motor development are more likely to display difficulties in adopting to both school and play environment. Information concerning the level of motor development is of vital importance for planning and development. Thus this study tends to assess the gross motor development of children between age four (4) to seven (7) year old in Akyemansa district in the eastern region, Ghana.

1.4 Objectives

The objectives of the research study are as follows; to:

1. Assess the locomotor skills level of kindergarten pupils in Akyemansa district.
2. Assess the object control skills level of kindergarten pupils in Akyemansa district.
3. Examine the differences between locomotor and object control development levels of Kindergarten pupils in Akyemansa district
4. Examine the relationship between the gross motor development levels based on gender.

1.5 Research Questions

The following research questions were given answers to:

1. What is the gross motor skill proficiency of kindergarten pupils based on locomotor and object control skills level?
2. Are there any gender significance differences in the gross motor (locomotor and object control) skills of kindergarten pupils?

3. What are the differences in locomotor and object control skills of kindergarten pupils in Akyemansa district?
4. What is the relationship between locomotor and object control skills of kindergarten pupils in Akyemansa district?

1.6 Significance of the Study

The development of gross motor skills which is also referred to as a fundamental motor skill is vital in the development of children especially pre-schools. Fundamental skills serve as the basis for learning more complex motor skills, when children develop these skills proficiently it lead to healthy growth and also encourage them to challenge and exercise their bodies thereby making them competent movers and as such would gradually keep moving and engage in activities such as dancing, jumping rope hanging and swinging on the playground thus enhancing concentration, motivation, promoting learning and well-being as well as learning social skills as they cooperate with one another. The study again is to make parents identify and track the development of their children in relation to gross motor development and seek for early diagnoses from the experts on anything they find developmentally inappropriate. The parents would also be well informed on the developmental stages of children for understanding so as to collaborate well with teachers and child experts on children developmental issues.

The outcome of this study would help the teachers realize the value of gross motor development in the children they teach especially at the kindergarten. When this is realized would assist and direct teachers to plan intervention programmes to help the children improve upon it hence helping the schools in the future to get more pupils

participating in the recreational and sporting activities to bring honour to themselves, their school, their communities and the entire country.

The findings of the study would aid children to be active movers so as to establish social relations with others and develop confidence in themselves since poor movement habit tend to remain from childhood into adulthood resulting to physically inactive child to grow up to an inactive adult.

Finally, children by nature thrive and learn best in an environment which is warm, nurturing and in caring hands of adults who ensure that children grow and develop healthily feeling safe. The study would enable teachers and practitioners to plan appropriate physical spaces and provide interesting and developmentally appropriate materials to support learning through play at the different stages of development.

1.7 Delimitation of the Study

The study was delimited to public kindergarten pupils in Akyemansa district in the Eastern region, Ghana. The sample focused on four selected public kindergarten schools in the district. The reseacher delimited the study to 4-7 year olds kindergarten pupils which are permit based on the construct of the instrument developers thus the reseacher did not obtain information on the kindergarten pupils below and above the age range (3,8,9 and10) year olds specified by the instrument. The instrument used for the data collection was adopted due the peculiar characteristics of the participants.

1.8. Limitation of the Study

There was no intervention strategy put in place to improve pupils' performance within the two weeks interval but only assessed the potential level. There was the problem of voluntary withdrawal of participants from participation.

1.9. Operational Definitions

The following definitions were used in this study:

Development: as used in this study refers to skill.

Object control skills: are limited to the use of the hand, the foot and the other body parts in controlling games or sporting objects, as balls and bats.

Locomotor skills: are skills limited to the body while moving in space either linear, multi-linear, or vertical directions.

Gross motor skills: as used in the study mean the same skills the use of large body muscles to move our whole body, arms & legs in running, jumping, walking & balance.

TGMD-2: Test of Gross Motor Development Second Edition.

CHAPTER TWO

LITERATURE REVIEW

This chapter examines research works that have been done regarding fundamental motor skill related to the study under discussion. The related literature reviewed on this study

Specifically focused on the following sub-headings

1. Theoretical framework of Gross motor skills and fundamental motor skills
2. Conceptual framework of fundamental motor skills and Gross motor skills
3. Concept of Motor Development
4. Motor Development theories : Early and Modern
5. Development of Motor Patterns in Children
6. Gross Motor Skill Development
7. Early Motor Skill Screening and Early Detection of Development Difficulties.
8. Fundamental Motor Skills and Gender
9. Relative influence of Locomotor and Object control skills
10. Summary of Related Literature Reviewed

2.1 Theoretical framework of Gross Motor and Fundamental Motor Skills

The process of motor development reveals itself basically through changes in movement behaviour over time. Infants, children, adolescents and adults are constantly involved in the lifelong process of learning how to move with control and competence in response to challenges we face daily in our constantly changing environment. Gallahue & Ozmun, (2006).

Prior to the 1980s, interest in motor development primarily dealt with describing and cataloging of data with little interest in developmental models that lead to the theoretical explanations of behaviours across the life span today. During that period only a limited number of comprehensive models of motor development existed until scholars in motor development which included gross motor and fundamental motor skills such as Gallahue & Ozmun,(2006) re-examined their works towards the establishment of a comprehensive theoretical model of motor development that integrated the existing facts and encircled the area of study. Based on that specific theoretical viewpoint: *descriptive* phase stage theory and *explanatory* dynamic systems theory came out. These two theories were presented in the form of an hourglass accompanied by an overlapping inverted triangle to visually represent and conceptualize both the descriptive products (hourglass) and explanatory processes (inverted triangle) of motor development as it typically unfolds across the life span. This has thus served as the basis by many for better understanding of *what* is occurring and *why* it is occurring in this amazing process that we call motor development.

The basic means by which motor development may be observed is through studying changes in movement behaviour throughout the life cycle. Alternatively, a "window" to the process of motor development is provided through an individual's observable movement behaviour which provides us with clues to underlying motor processes and that the process of motor development may be viewed as *phase-like* and *stage-like* (Gallahue & Ozmun, 2006)

The observable movement may be organized into three functional categories according to their purpose across all the phases of motor development: stabilizing

movement tasks, locomotor movement tasks and manipulative movement tasks or combinations of the three. Stability movement is any movement in which some degree of balance or posture is required which virtually include all gross motor activity and both non-locomotor and non-manipulative activities. The category suitably incorporates movements such as twisting, turning, pushing and pulling that cannot be classified as locomotor or manipulative. The *stability movement* category further refers to any movement that grounds on gaining and maintaining one's equilibrium in relation to the force of gravity and axial movements commonly used for nonlocomotor movements as well as inverted and body rolling postures.

The *locomotor movement* category deals with movements that involve a change in location of the body relative to a fixed point on the surface. To transport oneself from point A to point B by walking, running, hopping, jumping or skipping is to perform a locomotor task. In that case, activities such as forward roll and backward roll may be considered both locomotor and stability movements because the body moves from point to point and stability because of the high quality of maintaining equilibrium in an unusual balancing situation.

The *manipulative movement* category refers to both gross and fine motor manipulation. Gross motor manipulation involves imparting force to and or receiving force from, objects. The tasks of throw in catching, kicking and striking an object as well as trapping and volleying are gross motor manipulative movements. Fine motor manipulation involves intricate use of the muscles of the hand and wrist. Sewing, cutting with scissors and typing are fine motor manipulative movements.

Phases of Motor Development (gross motor and fundamental motor skills)

The researchers in their quest to make movement serve as a window to the process of development came out with four phases of motor development. According to the researchers the phases appear in sequential progression of movement skills and within each phase there are stages to follow throughout the entire life span.

Reflexive Movement Phase

The researchers posited that Reflexes are the first forms of human movement and because they are not learned are considered to be "abilities" rather than "skills (Gallahue & Ozmun, 2006) that the first movements the fetus makes are reflexive. Reflexes are involuntary sub cortically controlled movements that form the basis for the phases of motor development. Through reflex activities the infant gains information about the immediate environment. The infant's reactions to touch, light, sounds and changes in pressure trigger involuntary movement activity. These involuntary movements coupled with increasing cortical sophistication in the early months of post-natal life play an important role in helping the child learn more about his or her body and the outside world.

Primitive reflexes may be classified as information-gathering, nourishment-seeking and protective responses. They are information-gathering in sense that they help stimulate cortical activity and development. They are nourishment-seeking and protective because there is considerable evidence that they are phylogenetic in nature. Primitive reflexes such as the rooting and sucking reflexes are thought to be primitive survival mechanisms. Without these the newborn would be unable to obtain nourishment.

Postural reflexes are the second form of involuntary movement. They are remarkably similar in appearance to later voluntary behaviors but are entirely involuntary. These reflexes seem to serve as neuro-motor testing devices for stability, locomotor and manipulative mechanisms that will be used later with conscious control. The primary stepping reflex and the crawling reflex, for example, closely resemble later voluntary walking and crawling behaviours. The palmar grasping reflex is closely related to later voluntary grasping and releasing behaviors. The labyrinthine righting reflex and the propping reflexes are related to later balancing abilities. The reflexive phase of motor development may be divided into two overlapping stages.

Information Encoding Stage

The information encoding or the information gathering stage of the reflexive movement phase is characterized by observable involuntary movement activity during the fetal period until about the fourth month of infancy. At that stage the centre of the lower brain become more developed than the motor cortex and are essentially in command of fetal and neo-natal movement. These brain centres become capable to cause involuntary reactions to a variety of stimuli of varying intensity and duration. Reflexes during that period serve as the primary means by which the infant is able to gather information, seek nourishment and find protection through movement.

Information Decoding Stage

The information decoding or the processing stage of the reflex phase begins around the fourth month. At that time of the infant's life there is gradual inhibition of many reflexes as the higher brain centres continue to develop during the lower brain

centres gradually relinquish control over skeletal movements and are replaced by voluntary movement activity mediated by the motor area of the cerebral cortex. The decoding stage replaces sensorimotor activity with perceptual-motor ability. That is the infant's development of voluntary control of skeletal movements involves processing sensory stimuli with stored information not merely reacting to stimuli.

Rudimentary Movement Phase

This phase first marks the beginning of the voluntary movement stage. This phase manifests in the infants from birth to about age 2 years. The rudimentary movement phase is marked by maturity and characterized by predictable sequence of appearance. The sequence under this phase is resistant to change under normal conditions. The rate at which these abilities appear vary from child to child and depends on biological, environmental and task factors. The ***rudimentary movement phase abilities*** of the infant at this phase represent the basic forms of maturationally dependent voluntary movement required for survival. They involve stability movements such as gaining control of the head, neck and muscles of the trunk; the manipulative tasks of reaching, grasping and releasing; and the locomotor movements of creeping, crawling and walking.

The rudimentary movement phase of development is further subdivided into two stages that represent progressively higher orders of motor control and that the sequence of movement skill acquisition during the rudimentary movement phase is generally fixed but the rate is variable.(Charitou, Asonitou & Koutsouki,2010)

Reflex Inhibition Stage

The reflex inhibition stage of the rudimentary movement phase begins at birth. During birth and thereafter, reflexes dominate the infant's movement repertoire. Subsequently, the infant's movements are more influenced by the developing cortex. The development of the cortex and lessening of certain environmental constraints cause several reflexes to be inhibited and gradually disappear. Primitive and postural reflexes are replaced by voluntary movement behaviours. At the reflex inhibition stage voluntary movement is poorly differentiated and integrated because the neuro motor apparatus of the infant is still at a rudimentary stage of development. Movements at this stage though purposeful appear uncontrolled and unrefined. If the infant wishes to make contact with an object, there will be global activity of the entire hand, wrist, arm, shoulder and even trunk. The process of moving the hand into contact with object although voluntary lack control.

Pre-control Stage

At about 1 year, children begin to gain greater precision and control to their movements.

The process of differentiation between sensory and motor systems and the integrating perceptual and motor information into a more meaningful and congruent whole takes place. The rapid development of higher cognitive processes and motor processes encourage rapid gains in rudimentary movement abilities during this stage. During the pre-control stage, children learn to gain and maintain their equilibrium, to manipulate

Objects and to locomotor throughout the environment with an amazing degree of proficiency and control considering the short time they have had to develop these

abilities. The maturational process may partially explain the rapidity and extent of development of movement control during this phase but the growth of motor proficiency is no less amazing.

Fundamental Movement Phase

The ***fundamental movement skills*** of early childhood are an outgrowth of the rudimentary movement phase of infancy. This phase of motor development represents a time in which young children are actively involved in exploring and experimenting with the movement potential of their bodies. This phase is the period where children discover how to perform variety of stabilizing locomotor and manipulative movements first in isolation and then in combination with one another. Children developing fundamental patterns of movement are learn how to respond with motor control and movement competence to a variety of stimuli. Children gain increased control in the performance of discrete, serial and continuous movements as evidenced by their ability to accept changes in the task requirements. Fundamental movement patterns are basic observable patterns of behaviour. Locomotor activities such as running and jumping manipulative activities such as throwing and catching and stability activities such as the beam walk and one-foot balance are examples of fundamental movements that should be developed during the early childhood years.

Stages of fundamental motor skills

The fundamental movement phase of manifest in series of identifiable sequential stages as follows.

Initial Stage

The initial stage of a fundamental movement phase represents the child's first goal-oriented attempts at performing a fundamental skill. Movement at this stage is characterized by missing or improperly sequenced parts markedly restricted or exaggerated use of the body, poor rhythmical flow and coordination. The spatial and temporal integration of movement is poor. Distinctively, the locomotor, manipulative and stability movements of the 2–3-year-olds are at the initial level. Some children at this stage may be beyond this level in the performance of some patterns of movement but most are at the initial stage.

Emerging Elementary Stages

The emerging elementary stages, this stage may be several and involve the child gaining greater motor control and rhythmical coordination of fundamental movement skills. The synchronization of the temporal and spatial elements of movement is improved at stage but patterns of movement during these stages are yet become generally restricted or exaggerated although better coordinated. Children of normal intelligence and physical functioning tend to advance to the emerging elementary stages primarily through the process of maturation. Typically observing a developing 3 to 5 year-old child reveals a variety of fundamental movement skills that are emerging in a series of sometimes distinct and sometimes overlapping elementary stages. Several individual children as well as adults fail to get beyond these emerging elementary stages in one or more fundamental movement skills.

Proficient Stage

The proficient stage of the fundamental movement phase is characterized by mechanically efficient coordinated and controlled performances. Proficient

fundamental movement skills are mature in these three process aspects. Continuous opportunities for practice, encouragement and instruction to children at this stage will continue to improve in terms of the product components of how far, how fast, how many and how accurately. A great number of available data on the acquisition of fundamental movement skills suggests that children can and should be at the proficient stage by age 5 or 6 in most fundamental skills. Manipulative skills that require visually tracking and intercepting moving objects (catching, striking, volleying) tend to develop somewhat later because of the sophisticated visual-motor requirements of these tasks. A casual glance at the movements of children and adults reveals that a great many have not developed their fundamental movement skills to a proficient level. Although some children may reach

this stage primarily through maturation and with a minimum of environmental influences, the vast majority require some combination of opportunities for practice, encouragement and instruction in an environment that fosters learning. Failure to offer such opportunities to children at this phase makes it exceedingly difficult for children to achieve proficiency in fundamental movement skills and will inhibit further application and development in the specialized movement phase that follows (O'Keeffe, 2001). Reutzel, (2014), the first researcher to appropriately refer to this as a "proficiency barrier" between fundamental movement skills and their companion specialized sport skills. Clark & Metcalfe, (2002) in recent times suggested that fundamental motor skills provided the "base camp" to the mountain of motor development leading to motor skillfulness.

Specialized Movement Phase

Specialized movement skills are an outgrowth of the fundamental movement phase. During the specialized phase, movement becomes a tool applied to a variety of complex movement activities for daily living, recreation and sport pursuits. This is a period when fundamental stability, locomotor and manipulative skills are progressively refined, combined and elaborated upon for use in increasingly demanding situations. The fundamental movements of hopping and jumping for example, may now be applied to rope- jumping activities to performing folk dances and to performing the triple jump (hop-step-jump) in track and field. O'Keeffe, (2001) studied the relationship between fundamental movement skills and sport-specific skills in a test of the Triangulated Hourglass Model of motor development. The results of the investigation conclude that "this study provides empirical evidence in support of Gallahue's theoretical model with respect to the relationship between fundamental skill and sport-specific skill phases and also for dynamical systems theory to explain the learning process" (O'Keeffe, 2001,abstract). In other words, the patterns of movement contained within a fundamental movement skill are the same movement patterns upon which sport-specific skills are based. Therefore, it can be concluded that mastering fundamental skills leads to easier learning of specific skills. The onset and extent of skill development within the specialized movement phase depends on a variety of task, individual and environmental factors. Reaction time and movement speed, coordination, body type, height and weight, customs, culture, peer pressure and emotional makeup are but a few of these constraining factors and thus progress through the specialized movement skill phase depends on mature fundamental movement skill development. The specialized movement phase has three stages.

Transitional Stage

This stage manifests around the seventh or eighth year of children which leads to the transitional movement skill stage. During the transitional period the individual begins to combine and apply fundamental movement skills to the performance of specialized skills in sport and recreational settings. Walking on a rope bridge, jumping rope and playing kickball are examples of common transitional skills. Transitional movement skills contain the same elements as fundamental movements with greater form, accuracy and control. Fundamental movement skills developed and refined during the previous stage are applied to play, game and daily living situations. Transitional skills are applications of fundamental movement patterns in somewhat more complex and specific forms.

The transitional stage characterized with an exciting time for the parent, teacher as well as the child. Children at this stage become actively involved in discovering and combining numerous movement patterns and are often thrilled by their rapidly expanding movement abilities. The goal to be concerned with by parents, teachers and youth sport coaches during this stage should be to help children increase their motor control and movement competence in a wide variety of activities. Care must be taken not to cause the child to specialize or restrict his or her activity involvement. Limiting children to few skills during this stage is likely to have undesirable effects on the last two stages of the specialized movement phase.

Application Stage

Beginning 11 years of age to age 13 normally considered the middle school years the skill application stage take place in place in the development of the children. During the previous stage, the child's limited cognitive abilities, affective abilities

and experiences combined with a natural eagerness to be active, caused the normal focus without adult interference on movement to be broad and generalized to "all" activity. In the application stage, increased cognitive sophistication and a broadened experience base enable the individual to make numerous learning and participation decisions based on a variety of task, individual, and environmental factors. Children begin to make conscious decisions for or against participation in certain activities. The decisions during this stage are based in large portion on how the child perceives the factors within the task and the environment to either enhance or inhibit chances for enjoyment and success.

This self-examination of strengths and weaknesses, opportunities and restrictions, narrows the choices and children at this application stage begin to seek out or avoid participation in specific activities. An upsurge skill development is concentrated on form, skill, accuracy and the quantitative aspects of movement performance. This stage becomes and ample time for more complex skills to be refined and used in advanced games, lead-up activities and selected sports.

Lifelong Utilization Stage

The lifelong utilization stage is a skill specialized phase of motor development that emerges around age 14 and continues through adulthood. The lifelong utilization stage represents the summit of the process of motor development and is characterized by the use of one's acquired movement repertoire throughout life. The interests, competencies and choices made during the previous stage are carried over and become further refined and applied to a lifetime daily living, recreational and sports-related activities. Factors such as available time and money, equipment, facilities, physical and mental limitations affect this stage. Among other things,

one's level of activity participation will depend on talent, opportunities, physical condition, and personal motivation. An individual's lifetime performance level may range anywhere from professional status and the Olympics; to intercollegiate and interscholastic competition; to participation in organized or unorganized competitive or cooperative, recreational sports and simple daily living skills. The lifelong utilization stage signifies the climax of all the preceding stages and phases. This stage therefore can be viewed as a continuation of a lifetime process. The specialized skills development that manifest during this stage can and should play a role in our lives, but it is unfair to require children to specialize in one or two skill areas at the expense of developing their movement repertoire in an appreciation for many other areas. The researchers however put forward that the primary goal of a person's motor development and movement education is to accept the challenge of change in the continuous process of gaining and maintaining motor control and movement competence throughout a lifetime. Gallahue & Ozmun, (2006).A number of different factors combine to influence the speed and quality of motor development in each child (Gaul,2014) and that genetic or inherited traits can impact upon strength, agility or general talent for physical challenges, for example making shorter children less likely to become as proficient as taller peers at basketball.

Gallahue & Ozmun, (2006) in proposing a life span theoretical model: ***the triangulated hourglass*** posited that individuals often function at different phases depending on their experiential backgrounds and genetic makeups hence the age ranges for each phase of motor development should be viewed as general guidelines and should be illustrative only of the broad concept of age appropriateness.

The triangulated hourglass

The theoretical model though presented is not a comprehensive theory of motor development. It is a **heuristic** device that is a conceptual metaphor, or model, of motor development that provides us with general guidelines for describing and explaining motor behaviour. Heuristics differ from algorithms in one important way. Whereas an **algorithm** is a procedure or set of rules guaranteed if followed to lead to solution of a given kind of problem, heuristics are rules of thumb giving one clues for how to search for answers to given problems. In the study of development many theories use heuristic devices that researchers hope will eventually lead to algorithms. The **hourglass heuristic** device as described gives the impression that development is an orderly and continuous process.

Summary of theoretical framework of fundamental motor and gross motor skills

The acquisition of competency in movement is an extensive process beginning with the early reflexive movements of the newborn and continuing throughout life. The process by which an individual progresses from the reflexive movement phase through the rudimentary, fundamental movement phases and finally to the specialized movements skill phase of development is influenced by factors within tasks, the individual and the environment.

Reflexes and rudimentary movement abilities are largely based on maturation. Reflexes appear and disappear in a fairly rigid sequence. Rudimentary movements phase form the important bases upon which fundamental movement skills are developed. Fundamental movement skills are basic movement patterns that begin developing around the same time that the child is able to walk independently and move freely through his or her environment. These basic locomotor, manipulative

and stability skills go through a definite observable process from immaturity to maturity. Stages within this phase include the initial, emerging elementary and proficient stages. Attainment of the mature stage is influenced greatly by opportunities for practice, encouragement and instruction in an environment that fosters learning. Under the proper circumstances, children are capable of performing at the mature stage in the vast majority of fundamental movement patterns by age 6. The fundamental movement skills of children entering school are too often incompletely developed. Therefore, the primary grades offer an excellent opportunity to develop fundamental movement skills to their proficient levels. These same fundamental skills will be enhanced and refined to form the specialized movement skills so highly valued for recreational, competitive and daily living tasks.

The specialized movement skill phase of development is in essence an elaboration of the fundamental phase Specialized skills are more precise than fundamental skills. They often involve a combination of fundamental movement skills and require a greater degree of precision. Specialized skills involve three related stages. The transitional stage is typically the level of the child in grades three through five. At this level, children are involved in their first real applications of fundamental movements to sport. If the fundamental skills used in a particular sport activity are not at the mature level, the child will resort to less proficient or elementary patterns of movement.

Involving children in sport skill refinement before children reach proficient levels of ability in prerequisite fundamentals is unwise. When this happens, the less proficient movements found in the basic patterns are carried over to the related sport skills.

The child will regress to his or her characteristic pattern. It is important that sensitive teaching and coaching be incorporated at this point. Looking at the process of motor development researchers and teachers need to look at it first from a theoretical perspective. Each of us needs to have a theoretical framework to use as the basis for our actions. Gallahue & Ozmun, (2006)

2.2 Conceptual framework of fundamental motor skills and Gross motor skills.

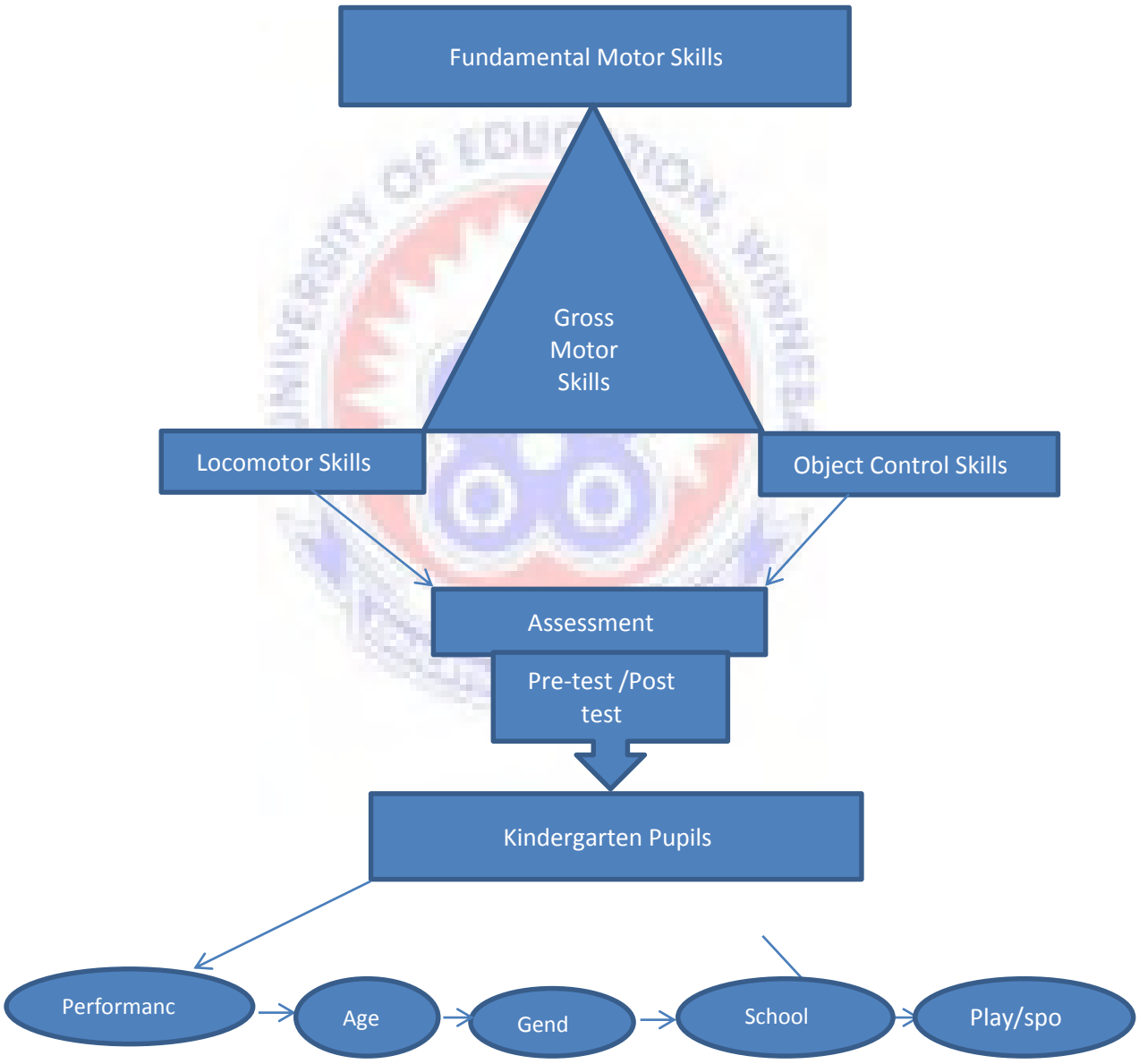

Figure: 2.2.1: Relationship of theory and experiences of learning in fundamental motor skills to kindergarteners and their environment.

The study was carried out through an assessment of gross motor skills which is found in fundamental motor skills. Fundamental motor skills which includes gross motor skills has been identified to be critical for all children to learn more complex skills for play and social adjustment. Gross motor skills a critical feature which appears in object control and locomotor skills involve the use large muscles of the body in performing activities cannot be overlooked when it comes to child development. The study curried out a pre-test post-test assessment of gross motor skills in object control and locomotor skills on kindergarten pupils aged (4-7) in the Akyemansa district in relation to their performance, age, gender, school life as well as play and sports.

2.3 Concept of Motor Development

As children grow their nervous system become more matured as such children are capable of performing increasing complex actions. A study by (Haywood & Getchell, 2010.) found out that development at the early stage of life is a rapid one for this reason the process of change is observable in motor behaviours in the early years of growth and maturation.

In a research study came out that it is through movement that an infant can explore and interact with the environment around them hence children shape their perceptual and cognitive development in that regard preschool and early elementary years gross motor capabilities are refined such that the nervous system is capable of integrating the neuromuscular patterns required for skillful execution of motor skills. Schmidt & Lee, (2005) also found that motor development goes beyond just the use of muscles, joints and limbs as such the term "motor development'' on which development of movement abilities explores the developmental changes in movements as well as the

factors underlying those changes such as the interacting constraints (or factors) in the individual environment and task that drive these changes.

During the early years of children, the mastery of gross motor skills is necessary for progression into more complex games, physical activities and sport form (Ulrich, 2000). Moreover, Haywood & Getchell, (2009) posted that development in relation to human as a useful manner to explain how a child can show a different motor performance rather than one another to deal with several underlying characteristics and that motor development is a continuous process of change in functional capacity such as the capability to exist, live, move and work within the real world and is a cumulative process. Living organisms are always developing but the amount of change may be more noticeable or less noticeable at various points in the life span and that it is related to but not dependent on age. As age advances development proceeds. More so, development can be faster or slower at different times and the rates of development can differ among individuals of the same age. Individuals do not necessarily advance in age and advance in development at the same rate. Further, development does not stop at a particular age but continues throughout life and it involves sequential changes. One step leads to the next step in an orderly and irreversible fashion. This change results from interactions both within the individual and between the individual and the environment.

In humans one part does not develop and leave the other, all the parts develop along the same line because of the interconnectivity of the organs and systems. Coinciding with motor development in the developmental path is motor learning. In defining motor learning Schmidt & Lee, (2005) stated that "motor learning" is the relatively permanent gains in motor skill capability associated with practice or experience.

2.4 Motor Development Theories

Over the years scientist and clinicians have not found a common ground to agree on movement theories about how movement develops or how movement is controlled but much has been written about the developmental schedule of motor skills in infancy and early childhood. Little is known about how motor skills emerge or the process that drives this change. (Shumway-Cook & Woollacott, 2001). Reviewing literature regarding this, the researcher looked at the early and modern motor theories on which motor development and control thrive.

2.4.1 Early motor theories

A study by Shumway-cook & Woollacott, (2001) came out with motor theories in times past came out with two different theories. Sherrington came out with the reflex theory and Schaltenbrand, the hierarchical theory. These theories claim that reflexes are the building blocks of complex behaviour and that the nervous system is organized in a hierarchical fashion. These two theories gave rise to the neuromaturational model of motor development which many consider to be a classical theory of motor development. The model proposed that motor skills emerge in a predictable sequence driven by the maturation of the central nervous system (CNS) and that instruction for development is "hardwired in the brain. Further, the theories stated that the environment plays a secondary role in the emergence of motor skills meaning that the neuromaturational model is grounded basically in a medical model in conjunction with neuromaturational norms that have traditionally been used as a basis for understanding signs of abnormal motor development which has guided the selection and interpretation of assessment tools. Shumway-Cook & Woollacott,(2001);Ulrich,(2000) contended that the sequence of motor development

is consistent and predictable that infants acquire skills at different ages as such indicated that there is large variability in motor scores within individual infants, among infants and across developmental domains on motor testing fine motor and gross motor skills appeared particularly develop independently.

2.4.2 Modern theories

The modern motor theories take into account the relationship of the environment and the individual's experience in the development of motor skills.For the purposes of this study the researcher placed emphasis on the ecological perspective or motor program theory and the dynamic systems theories.

Ecological perspective

A new perspective on development appeared during the 1980s and has become increasingly dominant as the theoretical perspective used by motor development researchers today. This approach has broadly been termed the ecological perspective because it stresses the interrelationships between the individual, the environment and the task. The ecological perspective take into account many constraints or systems that exist both within the body (E.g. cardiovascular, muscular) and outside the body (e.g. ecosystem related, social, and cultural) when observing the development of motor skills across the life span. Haywood & Getchell, (2009) agreed that the perspective is really important to describe, explain and predict motor development. Haywood & Getchell, (2009) again posted that although one constraint or system may be more important or may cast a larger influence at any given time all systems play a role in the resultant movement as such at any given moment, the body and the environment interplay the complex role of internal and external constraints.

Dynamical systems approach

A branch of the ecological systems perspective is called the dynamical systems approach, as an alternative to existing motor control and coordination theories. The dynamical systems theory of motor development emerged from a "systems theory" approach developed in physics and biology which sought to explain the interaction of multiple subsystems. Fundamentally, these multiple cooperative systems make up the developing child and their interaction with the task and the constraints of the environment**.**

Shumway-Cook & Woollacott, (2001) posted that movement results from the interaction of both physical and neural components and unlike the maturational and information processing perspectives, the dynamical systems approach suggests that coordinated behaviour is "softly assembled" rather than hardwired, meaning that the interacting constraints within our body act together as a functional unit to enable us for instance, to walk when we need to (Haywood & Getchell, 2009). By not having hard-wired plan, we have greater flexibility in walking which allows us to adapt our walk to many different situations. This process is called spontaneous self-organization of body systems (Haywood & Getchell, 2009). Therefore movement emerges from the interaction between constraints individual, environmental, task and the resultant behaviour emerges or self-organizes from these interrelationships and thus the concept of constraints within the dynamical systems approach. Another important motor development concept produced by the dynamical systems approach is the notion of rate limiters or controllers: the body's systems do not develop at the same rate; rather, some might mature quickly and others more slowly and each system should be considered a constraint (Haywood & Getchell, 2009). An

individual might begin to perform a new skill, such as walking, only when the slowest of the necessary systems for that skill reaches a certain point. In other words, the system acts as a constraint that discourages the motor skill until the system reaches a specific, critical level (Haywood & Getchell, 2009).

Newell's model

The ability to move the body and control the movement to solve problems depends on several factors. Movements arise from the interactions of the organism (or the individual) the environment in which the movement occurs and the task to be undertaken. If any of these three factors change the resultant movement changes. Portela,(2007) came that to understand movement we must consider the relationships between the characteristics of the individual mover, his surroundings and the purpose or reasons for his moving. From the interaction of all these characteristics, specific movements emerge. If we think about the different ways in which individuals can walk, for example, a toddler taking his first steps, a child walking in deep sand, an adult moving across an icy patch, or an older adult trying to catch a bus. In each example, the individual must modify his or her walking pattern in some way. These examples illustrate that changing one of the factors often results in a change in the interaction with one or both of the other factors, and a different way of walking arises from the interaction. For example whether an individual is barefoot or wearing rubber-soled shoes might not make a difference in his walking across a dry tile floor, but his walk might change notably if the floor were wet and slippery. The interaction of individual task and environment changes the movement and over time patterns of interactions lead to changes in motor development. The model is helpful in studying motor development because it

reflects the dynamic constantly changing interactions in motor development. It allows us to look at the individual at the many different body systems that constantly undergo age-related changes. At the same time the model emphasizes the influence of where the individual moves in environment and what the individual does (task) on individual movements. Changes in the individual lead to changes in his or her interaction with the environment and task and subsequently change the way the individual moves. Moreover, the individual, environment and task influence are influenced by each other. These three factors: individual, environment and task are called by Newell "constraints". A constraint limits or discourages, in this case, movement, but at the same time it permits or encourages other movements. It is important not to consider constraints as negative or bad. Constraints simply provide channels from which movements most easily emerge. Portela, (200) described three types of constraints: organismic constraints (including neurological integrity, biomechanical factors, muscle strength), environmental constraints (including gravity, lighting), and task constraints (including the goal of the task, rules, implements available Individual constraints are a person's unique physical and mental characteristics. For example, height, limb length, strength, and motivation can all influence the way an individual moves. Individual constraints are either structural or functional. Structural constraints relate to the individual's body structure. They change with growth and aging; however, they tend to change slowly over time. Examples include height, weight, muscles mass, and leg length. Functional constraints relate not to structure but to behavioural function. Examples include motivation, fear, experiences and attention focus and such constraints can change over a much shorter period of time. Environmental constraints exist outside the body as a property of the world around us. They are global, not task specific and

can be physical or sociocultural. Physical environmental constraints are characteristics of the environment, such as temperature, amount of light, humidity, gravity, and the surfaces of floors and walls. Socio-cultural environment can also be a strong force in encouraging or discouraging behaviours, including movement behaviours. Task constraints are also external to the body. They include the goals of a movement or activity, the rule structure surrounding that movement or activity and choices of equipment. It can be finally agreed that the model guides us in identifying the developmental factors affecting movements, helps us create developmentally appropriate tasks and environments and helps us understand individual movers as different from group norms or averages. The above mentioned theories all deal with motor control and the way it develops in order to give researchers and clinicians a rationale to treat movement co-ordination deficits. The movement coordination deficit emphasized in this dissertation and extensively discussed within the next section is called Developmental Coordination Disorder (DCD).

2.5 The Role of Movement in Children's Development

Movement and touch are the first sources of play and learning that caregivers provide for infants. As infants and toddlers grow, they learn to move with greater skill. They develop skills in jumping, leaping, hopping, galloping, skipping, sliding, throwing, catching and striking (Gallahue & Ozmun, 2006). To facilitate development, caregivers can encourage children to discover and extend this impulse to move by recognizing and appreciating each child's unique individuality and by providing activities and materials that are personally interesting and challenging to that child. Although it is commonly believed that children automatically acquire motor skills as their bodies develop, normal maturation only means that the child

will be able to execute most movement skills at a low performance level. Continuous practice and instruction are required if the child's performance level and movement repertoire are to increase (Gallahue, 2009). Pica, (2008) contended that once a child is able to creep and walk, gross motor skills should be taught, just as other abilities are taught. Failure to develop and refine fundamental and specialized movement skills during the crucial preschool years olden leads children to frustration and failure during adolescence and adulthood.

2.6 Development of Motor Patterns in Children

During the process of motor development children change in size, shape and maturity and these changes appear in a patterns without gaps in between them as one pattern ends another begins. The development at that stage is a rapid process of change that is observable in motor behaviours and mostly appears during the early years of growth and maturation. (Haywood & Getchell, 2010) More so, during early infancy involuntary reflexes set a foundation of motor behaviour and these reflexes are vital for infant survival and successful acquisition of voluntary motor control (Haywood & Getchell, 2010). Over the first year of life, sub cortical reflexes are replaced with increased voluntary control or cerebral cortical motor control, dictated by neural development. On the other hand comparing the brain a fully developed brain to an infant's brain (Haywood & Getchell, 2010) stated that an infant's brain is approximately 25% of the size of adults reaching 80% by 4 years of age and that coincides with the rapid cerebral development and the increase in the number of dendrites per neuron, myelination and development of neuromuscular synapses (Haywood & Getchell, 2010); these changes allow for improved motor coordination. The enhanced nerve conduction rates following myelination also increases the

ability of individuals to voluntarily control motor responses (McArdle, Katch & Katch, 2001).

During preschool and early elementary years, gross motor capabilities are refined. It is during these years the nervous system is initially capable of integrating the neuromuscular patterns required for skillful execution of motor skills. The span of development during elementary school years is very important for motor development. During these years mastery of gross motor skills is necessary for progression into more complex games, physical activities and sport form (Ulrich, 2000). The researcher cited from Cook, (2005) the following expected details in motor development of both object control and locomotor capabilities.

2.7 Motor proficiency

The promotion of motor proficiency even in fundamental motor skills should be emphasized in early ages in that motor proficiency is multidimensional and is based upon the performance of flexion, extension and rotational movements that lead to the successful performance of loco-motor, balance and manipulative skills. Barnett, Cliff, Cohen, Morgan, Okely, Scott, (2013). Came out that children's FMS proficiency is low in a number of countries with many children entering adolescence having not mastered these basic movement skills. This is of particular concern, as a recent systematic review of the health benefits of FMS proficiency found consistent and positive associations between FMS proficiency and physical activity and fitness levels and an inverse association with weight status. There is also longitudinal evidence that motor skills track through childhood and into adolescence. FMS proficiency has been associated with subsequent physical activity and also with change in physical activity over time, highlighting that children with high FMS

proficiency show little decline in physical activity. In addition, positive associations have been established between FMS proficiency and objectively measured physical activity in overweight children. Although a variety of movement abilities have been proposed to be fundamental to motor skill performance there is general agreement in the literature that the ability to exhibit speed, precision, strength, balance and coordination are critical factors that must be tested in order to assess any individual's level of motor proficiency factors that influence motor proficiency. Throughout our life span we constantly develop or adapt our abilities and skills to live our lives in a satisfying and meaningful manner. The capacity to exist within the environment is influenced by our ability to function and the quality of our functional ability is related to all aspects of development during the process of motor development children change in size, shape, maturity, physical activity and motor proficiency. Portela, (2007) came out that the ability to perform a motor skill depends on the interaction between the learner and the environment. The personal characteristics of the child, motivation and previous motor skill experiences all influence motor skill performance. Also states that motor skill ability also depends on physical characteristics such as body size, strength, balance and brain maturation. The extent, to which children develop their genetic potential for motor skills, depends on temperament and personality factors such as energy levels, adventuresome-ness, aggressiveness and persistence. As well as their attitude towards their body, their build and their eagerness to participate in group activities and competition. Shy children or children with low self-esteem will have difficulty competing with other children and since motor skills are developed primarily in the context of the peer group these children will miss out on the opportunity to acquire and develop such skills. The factors as cited in Portela, (2007).

2.7.1 Biological factors

Before the emergence of puberty gender differences in motor proficiency of children are generally small. These differences tend to increase across the secondary school years. This slight difference favour boys in directly and show of power in tasks such as ball-throwing velocity and standing broad jump. Girls on the other hand sometimes excel in precise actions involving accurate hopping and balance. These differences may be caused by subtle contrasts in the rate of neurological maturation exhibited by the two genders, and by the accompanying attention difference this may bring about. Research suggests that the differences found are due to parents, peers, teachers and coaches, who provide opportunities and encourage girls and boys toward different activities. Girls are generally encouraged to play quietly and practice fine motor skills such as drawing and colouring in whilst boys are encouraged to participate in more vigorous movement activities such as running, chasing and jumping. (Portela, 2007)

Portela,(2007) stated that with respect to physical performance of motor skills significant differences are identified in the scores between girls and boys where boys exceeded on some items and girls on others. Fatemeh, Peyrovi & Isavi (2015) came out that boys has a better performance in gross motor skills whether in motion and in the object control as a result, gross motor skills were considerable in boys than girls. In addition, the sociocultural factors make boys more participate in sports activities than girls, resulting in better performance and in sprint there were increases on a regular basis and to the same value in girls and boys with a slight increase in boys during the mid and late childhood. In a study conducted by Gallahue & Ozmun, (2010) concluded that boys and girls of similar growth status

seemed to be equally effective in activities involving running and jumping. However, boys appear to excel more than girls in throwing and kicking and in terms of specific skills significant relationships exist between specific physical skills such as the 40-yard dash, standing broad jump and throwing distance and various growth measurements such as height, weight and carpal development of children in the primary grades (Portela, 2007).

2.7.2 Age

The shaping of human development is demonstrated by an orderly sequence of events which occur throughout an individual's development process. Muscular strength and the proficiency of gross motor skills improve with advancing chronological age throughout childhood and adolescence with the gender difference in performance tending to favour that of males (Portela, 2007). Portela, (2007) again indicated that motor activity is defined as a combination of perceptions in new motor patterns and is often influenced by intellectual, affective, cultural factors and also varies with age. It is recognized that with a steady and sustained growth an increased ability to execute motor skills and master more complex and elaborate motor tasks is very apparent. Not only do children of the same age grow at different rates children today are taller than they were in previous generations and they also mature at an earlier age a phenomenon known as the secular trend (Portela, 2007). School age children who are not going through the rapid growth spurts of childhood are quite skilled at controlling their body movements and coordination. They are also able to complete a wide variety of physical activities well although their ability varies according to their maturation level and physical stature. Portela, (20007) further indicated that an increase in physical growth increases physical

performance as well as cognitive performance. Measurements of physical fitness and body coordination also increased with increasing age.

2.7.3 Genetics and Maturation

Genetics and maturation contribute to and control the body's internal environment. The body's internal chemistry must be balanced to support growth, development and functional activities such as movement. Hormones play a major role in controlling physical growth, initiating puberty regulating the body's metabolism and the body's ability to utilize chemistry sources of energy for growth, maturation, adaptation and learning. Few maturation differences are observed between boys and girls before puberty. However, following puberty, girls are typically smaller and have less muscle than boys (characteristics that are likely to impact on motor and sport performance). Portela, (2007) posited that late maturing children, while not as large at the time (or often as skilled), will on average be larger than early maturing children. If early maturing children are selected for youth sport teams because of their size and skill, later maturing children often drop out even though their potential may be greater for high school sports.

Khalaji and colleagues, (2014), in an article entitled "comparing the motor development in girls and boys with parents-in-laws relative" concluded that the growth motor and manipulation skills of the girls with parents were higher than those with in-laws parents. It can be states that, parents married in relative may have an impact on motor development of children.

2.7.4 Environmental factors

The development of expertise goes hand in hand with the process of growth and maturation. Older children on an average perform motor skills better than younger children. However, practice to develop expertise has consistently been shown to overcome age with more expert younger children performing better than less experienced children. (Portela, 2007). Portela, (2007) lamented that practice alone does not assure expertise and suggests that the quality of practice is what is essential. They encourage children to practice correctly, practice the "right things practice a lot and practice as they will perform.

2.7.5 Physical factors

Malnutrition, season of birth and number of people living in a household are examples of physical factors that influence the motor development of young children (Portela, 2007). Malnutrition may affect motor development by affecting the stature or physical growth and energy levels of children. The season of birth may be associated with the onset of children's locomotion. It is hypothesized that heavier clothing or the absence of floor experience during the cold season may delay the onset of locomotion in some infants. In environments where chaotic or crowded conditions exist, opportunities for motor skills development may be restricted for the young child (Portela, 2007). Seasonal and geographical influences are also examples of physical environmental factors which influence motor proficiency. According to data from the National Children Youth and Fitness Study (NCYFS), physical activity levels are highest in summer, drop during the autumn to reach a lowest point during the winter months and increasing again during the spring season (Portela,2007). Geographical variations in physical activity are not available, but it

logically follows that children who reside in regions with a milder winter season can be more active during these months. The outdoor environment is closely related to physical activity, as this is where this behaviour needs to take place, in an appropriate setting with available space. The dependent nature of a child forces them to rely on their parents in terms of the exposure to a safe outdoor playing space within their home environment. Secondly, if a child does not have an outside garden or play area, he or she often has to rely upon an adult for transport to an area where they can be physically active. Research shows that a limited availability of outdoor playing areas during the after school hours, is related to children spending 72.4% of their time sitting or lying down and only 10.4% of their time being physically active (Portela, 2007).

2.7.6 Demographics

There are a number of environmental differences between urban and rural schools which are determinants of motor proficiency. Study by (Portela, 2007) showed that children who attend rural schools spend more time outside than those children who attend urban schools. This is possibly as a result of more space available outside in the garden and neighbourhood as well as the safety of the neighborhood as reported by parents. Furthermore, children attending urban schools were more likely to attend private lessons not related to physical activity and engaged in more time playing video games than rural school children (Portela, 2007).

2.7.7 Social factors

Children learn certain behaviours by observing others who serve as models and by internalizing those behaviours. Role models especially those significant to the child can encourage or discourage behaviours. This is done through the role model by

either engaging in certain activities or not or by how they label certain activities. The process of social learning extends throughout life as other people and situations influence individuals. Social learning involves many types of behaviour including; social skills, physical skills, traits, values, knowledge, attitudes and dispositions. Socialization is critical for motor development. Children who are socialized into motor experiences are more likely to learn motor skills. Increased proficiency in skill performance is enjoyable and rewarding in it and in turn promotes continued participation. Parents appear to be a strong social influence in physical activity this can either be via direct support encouragement and motivation or indirect through modeling or an interaction of the two. Children whose parents are physically active have been reported to be nearly six times more active than those children whose parents are inactive (Portela, 2007).

2.7.8 Psychological factors

In the world of sports psychology has great influence on individuals and groups when it comes to performance. In this regard for an individual to perform well in any activity there should be what is "termed self-efficacy". Self-efficacy is the confidence an individual has to change or maintain certain actions. Self- efficacy is closely linked to intention when describing factors which influence physical activity. However, it is not sufficient just for an individual to intend, but rather to believe that he or she has the capabilities to engage in physical activity. With self-efficacy and confidence come perceived barriers such as lack of time, lack of interest or desire unfavorable weather or access to equipment and facilities which become potential factors capable of influencing motor proficiency in children. Attitudes and knowledge are two additional avenues which have been tapped as psychological

determinants of physical activity. It is generally thought that children will participate in physical activities to which they have a positive attitude towards (Portela, 2007).

2.8 Fundamental Motor Skills (gross motor skills)

The mechanic of movement in humans largely rest on factors such as maturation and the development of large muscles in the human body which fall under gross motor skills. A classical definition of gross motor skills by (Portela, 2007) stated it as a skill which involves in its manifestation the mobilization of large muscular groups which produce chest, arms and legs strength. (Gallahue & Ozmun, 2009) also stated gross motor as the development of movements that use the large muscles of the body and this kind of skill is closely connected with several actions used on daily life such as running, jumping, trotting, and kicking among others. Motor development is classified into two types including fine and gross motor development. Fine motor development can be defined as development of precise movements that use the small muscles to control small movements of the hands, wrists, fingers, feet, toes, lips and tongue .These movements enable children to control their bodies and manipulate objects within the environment to form complex movements involved in dance, sports and other motor skill activities (Portela, 2007).

Gross motor development is important because it contributes to the involvement of children in sporting activities in the future (Garcia & Garcia, 2008). These skills are of important to be developed according to chronological age so that children will not fine difficult to engage in more complex motor behavior at a higher age. Deficits in the gross motor skill reflect in low proficiency in more refined motor tasks which require the combination of these essential movements in the trial to acquire more elaborated skills. Children who do not have competency in gross motor development

are unable to perform with efficiency. They are most likely to be held back in gross motor development (Gallahue, 2006). Measurement component of motor development is often used as a basis for assessing the progress of an individual based on chronological age.

Gross motor development has varied complexity, especially in terms of repetitive movements and sequential movement using gross motor skills of children. In addition, the development of gross motor skills for children progression building a logical foundation for the next skill and its Of extreme importance during the preschool and primary years is skill efficiency in the gross motor patterns of locomotion, posture and balance control, and object manipulation.

2.9 The potential influence of early motor skill screening and early detection of developmental difficulties

Both habitual physical activity and time spent in MVPA have been linked with childhood proficiency in fundamental motor skills. (Barnett et al., 2009) in a study stated that early motor screening may not only aid in the healthy development of fitness and enjoyment of physical activity, but also aid in detection of motor impairments. A common motor impairment is Developmental Coordination Disorder (DCD) a condition where children experience difficulties in motor tasks which are disproportionate to their general development with no known medical or neurological diagnosis (Alof, Hultsch, Meermann & Schott, 2007). Evidence to date indicates childhood impairments in proficiency of FMS will track throughout childhood into adolescence. Hands, (2008) investigated changes in both motor skill and fitness in 19 children with DCD. Over a period of five-years, Hands followed students with high-motor competence, and low-motor competence re-assessing each

child once per year for the duration of the 5-year study. Those with low motor competence were consistently worse than their peers with higher levels of motor proficiency in all measures of fitness (Hands, 2008). Hands reported slower run times, poorer balance, and lower cardio-respiratory endurance. Similarly, Schott et al. (2007) examined motor skill proficiency, measures of fitness, and body mass in children with DCD (ranging from moderate to severe diagnosis). Overall 40% of 4-6 year, and 50% of 12 year old children diagnosed as severe in DCD were overweight or obese. Hands, (2008) noted the largest differences in cardio- respiratory fitness levels were between students who had high and low levels of motor competence. Measures indicated that participants with low levels of motor competence had predicted aerobic power 5 ml/kg/min lower in year one and 13.39 ml/kg/min. in year 5. Hands suggested that the poorer fitness measures in adolescents with low motor competence might be the result of under- developed coordination capabilities, and the erratic movements may have negatively influenced performance. Based on the findings of the studies discussed above, in conjunction with the relationships discussed between FMS and physical activity, screening of motor capabilities during early childhood is important. Early detection of delayed development or motor impairment in conditions such as DCD, could aid in prescriptive physical education.

Development of walking, walking the pre-requisite skill to: running, jumping and skipping is a developmental process which begins between 9-17 months of age and matures over a period of 2-6 years (Payne & Isaacs, 2008). The most notable increase in walking capabilities is in the rapid increase in speed over the first 6 months of walking which has been associated with increases and proficiency in walking gait (Haywood & Getchell, 2010). Running the natural progression of

walking initially develops between 1.5-2.5 years of age with a large percentage of children acquiring a mature motor pattern (e.g. running) by age 10 (Haywood & Getchell, 2010).

***Development of jumping*,** jumping the upward propulsion of the body initially develops in the form of the standing long jump, between the ages of 1.5-2 years. Inexperienced jumpers lack an appropriate preparatory phase and display difficulty efficiently absorbing impact during landing (Payne & Isaacs, 2008). Improvements in jumping capabilities usually appear between 6-9.5 years of age in conjunction with greater muscular strength and coordination of both the upper and lower body. By 10 years, a mature pattern is typically achieved (Payne & Isaacs, 2008).

Development of hopping, the skill of hopping is the repeated upward propulsion of the body on one foot (Ulrich, 2000). Hopping is a more challenging variation of jumping due to the additional challenge of balance and leg strength. Hopping is most often accomplished in the advanced form by 5-7 years of age. Girls typically develop hopping capabilities approximately six months before of boys (Haywood & Getchell, 2010). This early skill development of girls has been speculated to be the result of environmental influence or socialization (Wrotniak, Epstein, Dorn, Jones & Kondilis, 2006 cited in Cook, (2005). Few children under age 3 years develop the capability to continually hop on one leg in one continuous bout. Hopping is a skill that develops during and past the kindergarten years (Haywood & Getchell, 2010).

Development of galloping, sliding, and skipping, galloping, sliding and skipping are asymmetric fundamental motor skills which consist of combinations of stepping, hopping or leaping (Payne & Isaacs, 2008). The gallop is often the first skill

attempted. Aspects of the gallop emerge shortly after running at approximately 2 years of age prior to the development of hopping ability at age 3-4, and shortly followed by sliding. Mastery of the gallop, hop and slide begins to develop in the dominant leg first, progressing into unilateral control (Haywood & Getchell, 2010). Skipping ability develops at approximately 4-7 years of age although challenges in the performance of skipping are commonly seen throughout the kindergarten years (Haywood & Getchell, 2010). The late development of skipping is most likely due to the required motor coordination and combination of a forward step and a hop on the same foot while alternating the lead foot (Haywood & Getchell, 2010).

Development of object control skills, object control skills begin to develop early in infancy. With the ability to walk upright and independently, manipulation skills begin to be refined as the hands become free to explore the surrounding environment. Early on in FMS development the skills of manipulation or object control develop with improvements in both eye-hand, and eye-foot coordination (Payne & Isaacs, 2008). Fundamental manipulative or object control skills include throwing, catching, striking, dribbling and kicking. The following sections will describe the development of object control motor skills measured in the TGMD-2 (Ulrich, 2000).

Development of throwing, throwing, the most complex of the skills listed, can be accomplished underhand, side arm, or overhand. Developmentally, the primary adaptations in ability involve a purposeful and coordinated preparatory phase (Payne & Isaacs, 2008). Initial attempts of throwing emerge between 1.5-3 years with mature capabilities developing by 5.5-8.5 years (Haywood & Getchell, 2010). As a child approaches a mature motor pattern an improved coordination between the back

swing, torso rotation and a progression from homo-lateral to an oppositional leg movement develops (Haywood & Getchell, 2010; Payne & Isaacs, 2008).

Development of catching, early attempts of catching occur between the ages of 1.5-3.5, with improvements occurring by 5 years of age and advanced patterns developing between 5.5-7 years (Haywood & Getchell, 2010). The most notable progression of catching is the ability to anticipate the objects trajectory, while maintaining control over the object as it enters the arms (Haywood & Getchell, 2010).

Development of striking and kicking, the skills of striking and kicking are fundamental movements which involve the projection of an object such as a ball with a part of the body or an external implement. The skill of kicking utilizes the lower leg to propel an object. The skill of striking utilizes an external implement such as baseball bat, or racquet to project another object. Striking capability usually begins between the ages of 2-3 years improving between 3-7 years, and advanced mature patterns developing between 7-9 years. The skill of kicking as measured by the TGMD-2 (Ulrich, 2000) is a coordinated skill of striking a ball with the foot and running. Kicking capabilities begin with initial attempts occurring between 1.5-4 years, and advanced mature patterns developing by the age of 6.5-8.5 (Payne & Isaacs, 2008). In the development of both kicking and striking, initial attempts are marked with ineffective preparatory back swings, and an absence of coordination between the upper and lower body (Haywood & Getchell, 2010).

Development of dribbling, dribbling, in the most advanced form, is accomplished with the ball being pushed with the hand, and the arm remaining out- stretched to

meet and absorb the ball on the return bounce (Payne & Isaacs, 2008). During inexperienced early attempts, between 5-8 years, the child strikes or slaps the ball instead of pushing the ball to the ground. The slapping pattern at the inexperienced level leads to an uncontrollable flight pattern of the ball and difficulties maintaining control (Payne & Isaacs, 2008).

2.10 Development of object control skills

As infants begin to move, stabilize and control their bodies their object control skills begin to develop and function smoothly as well. With the ability to walk upright and independently, manipulation skills begin to refine as the hands become free to explore the surrounding environment. Early in fundamental motor skills development the skills of manipulation or object control develop with improvements in both eye-hand and eye-foot coordination (Payne & Isaacs, 2008). Fundamental manipulative or object control skills include throwing, catching, striking, dribbling and kicking. The following sections will describe the development of object control motor skills measured in the TGMD-2 (Ulrich, 2000).

Development of throwing, throwing, the most complex of the skills listed can be accomplished underhand, side arm or overhand. Developmentally the primary adaptations in ability involve a purposeful and coordinated preparatory phase (Payne & Isaacs, 2008). Initial attempts of throwing emerge between 1.5-3 years with mature capabilities developing by 5.5-8.5 years (Haywood & Getchell, 2010). As a child approaches a mature motor pattern an improved coordination between the back swing, torso rotation and a progression from homo-lateral to an oppositional leg movement develops (Haywood & Getchell, 2010).

Development of catching, early attempts of catching occur between the ages of 1.5-3.5 with improvements occurring by 5 years of age and advanced patterns developing between 5.5-7 years (Haywood & Getchell, 2010). The most notable progression of catching is the ability to anticipate the objects trajectory while maintaining control over the object as it enters the arms (Haywood & Getchell, 2010).

Development of striking and kicking, these skills of striking and kicking are fundamental movements which involve the projection of an object such as a ball with a part of the body or an external implement. The skill of kicking utilizes the lower leg to propel an object. The skill of striking utilizes an external implement such as baseball bat or racquet to project another object. Striking capability usually begins between the ages of 2-3 years and improves between 3-7 years and advanced mature patterns developing between 7-9 years. The skill of kicking as measured by the TGMD-2 (Ulrich, 2000) is a coordinated skill of striking a ball with the foot and running. Kicking capabilities begin with initial attempts occurring between 1.5-4 years and advanced mature patterns developing by the age of 6.5-8.5 (Payne & Isaacs, 2008). In the development of both kicking and striking initial attempts are marked with ineffective preparatory back swings and an absence of coordination between the upper and lower body (Haywood & Getchell, 2010).

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level leads to an uncontrollable flight pattern of the ball and difficulties maintaining control (Payne & Isaacs, 2008).

2.11 Fundamental Motor Skills

Fundamental motor skills are the building blocks to more advanced level of movement activities that are necessary to engage in physical activities, games and sports (Hurmeric, 2010). The most common misunderstanding of FMS is that children just gain those skills as a result of their natural development. However, FMS should be taught in a developmentally appropriate way for children to gain a high level of proficiency in FMS. Fundamental motor skills are categorized into two groups listed as locomotor skills and object control skills (Payne & Isaacs, 2008). Locomotor skills are motor skills that children perform to move from one point to another point in physical environment. For example, locomotor skills are walking, running, jumping, leaping, skipping, galloping and hopping (Humeric,2010). Object control skills include throwing, catching, striking, kicking, rolling and dribbling and are motor skills in which a child manipulates an object (e.g. ball or a bean bag) by hands, and/or feet (Humeric,2010). Both locomotor and object control skills are vital in normal motor functioning. One might evaluate children motor development by observing those skills. In motor development literature, the role of FMS in motor development is described by various models. Each model has distinctive contributions to our understanding in terms of progressions and developmental mechanisms of FMS. (Hurmeric, 2010)

2.12 Stages of Fundamental Skill Development

Within the various categories, there is typically a developmental progression amongst the skills within each category and between the categories of skill

development. For example, children must master certain stability skills before they can progress onto locomotor skills while stability and locomotor skills often develop earlier than manipulative skills due to gross motor skills developing before fine motor skills. Individuals learn skills in progression. Often, children will start off with a rudimentary form of a skill. Given that children are not miniature adults, progression through the stages of skill development needs to take into consideration both an individual's biological make-up and their previous experience. For example, when learning the overhand throws, pre-school children will often have difficulty coordinating their body parts in a manner that would produce a mature, or the most advanced, pattern for this throw. The ability to take steps to develop momentum coordinate axial rotation of the hips, and sequence movement to form an efficient kinetic chain to accurately throw a ball for distance is developmentally inappropriate to expect from a two year old who is just entering the fundamental skill stage. As a result, skill acquisition is often broken down into sequential pattern or stages of skill development. Although the terminology is often different amongst experts in motor development, there is consensus that skills are developed in a sequential manner from basic rudimentary forms to efficient and mature patterns of a skill. The progression trough the various stages of skill development is often a factor of biological readiness to learn the skill, the environmental factors that facilitate the development of the skill, and the type of tasks that individuals use to practice the development of a skill. For example, teaching a five-year old to use an overhand throw for accuracy by asking him/her to stand meters away and throw a regulation size softball to a small target is a developmentally inappropriate task. Giving him/her a smaller ball, standing him/her closer to a larger target will result in not only more success, but the opportunity to teach better skill proficiency. This type of

approach to fostering effective skill progression is supported by Gallahue & Ozmun (2001) assessment of the following significant factors that contribute to fostering successful development of fundamental skills for children.

2.13 Fundamental motor skills and gender

Much has been said and researched in on gender by various researchers and that has gone long way in helping to understand how males and females differ when it come performance. Available literature has consistently demonstrated a gender-based difference in motor skill proficiency (Cook, 2005). Boys tend to have more developed object control skills than girls (Barnett, Morgan et al., 2008.). However, boys' locomotor proficiency has been reported as lower (Barnett, Morgan et al., 2008) equivalent to or higher (Robinson, 2010) than girls. For example, Van Beurden and colleagues, (2002) reported that boys in grades 2 and 3 significantly outperformed girls by 20% - 40% in the abilities of running, throwing, catching, kicking and striking. Most of these studies revealed gender differences in object control skills in favor of boys. (Hurmeric, 2010) in particular, considerable research had focused on throwing because of being a common sport skill in many sports, games and activities. A meta-analysis by Hurmeric, (2010) to examine the causes of gender differences in motor skill development. The study looked at biology, environment and their interaction effects on the motor skill development. The reseachers analyzed 63 studies including 31444 subjects and yielded 702 effect sizes. Gender differences in catch, balance, shuttle run and vertical jump were found as mostly related to environment prior to the puberty. However, throwing performance in boys and girls was more biological reported in 21 studies examining accuracy (5 studies), velocity (5 studies), and distance (11 studies). Effect sizes were

2.18 for throwing velocity and 1.98 for throwing distance. It was reported that boys had better scores than girls in terms of throwing velocity around 4 to 7 years old and throwing distance around 2 to 4 years old (Hurmeric, 2010) The findings from the meta-analysis was in line with an earlier research that examined changes in throwing performance of 100 kindergarten children (48 girls and 52 boys) over 3 years (Humeric,2010) The researchers reported that boys were more proficient in their throwing performance including throwing distance, differentiated rotation and taking opposite step. Gender differences in throwing have been also seen for different age groups. Recently, Lorson and Goodway (2008) found consistent findings with regard to gender differences in throwing for 124 first and second graders. Gender differences were seen at pretest for the throwing components of step, trunk and forearm in favor of boys (Lorson & Goodway, 2008). The involvement of females in organized physical activities during adolescence appear to be more closely related to proficiency levels of FMS than males (Okely, Booth & Patterson, (2001). When FMS skill was compared separately by gender and activity was categorized from very low to very high a significant relationship between mastery of FMS and participation in organized activity was found (Okely et al., 2001) that female adolescent that were rated as very low in FMS were significantly less active compared to adolescent males rated as high in skill level. The significant relationship between FMS skill level and physical activity was not a consistent trend. In the very low quintile, male's physical activity levels were greater than females by 50 minutes weekly. As female skill level increased, from medium and very high, female physical activity increased and in fact ranged from 50-100 minutes more per week than males (Okely et al., 2001).

Comparing male activity trends with females (Okely et al., 2001) in a study found that a significant difference existed between males participating in an organized physical activity and that the highly skilled and less skilled males physical activity levels increased as their skill rating increased. Contrarily, Okely et al., (2001) came out that male physical activity was continually lower when compared to equally skilled females. These findings suggest that skill does influence participation among both boys and girls. However, the findings again suggested that the influence is greater for adolescent females. If females are less active on average (Okely et al., 2001) and object control is a significant influence on continued participation in physical activity as reported by Barnett et al. then early emphasis and early screening of FMS proficiency may be an important pre-emptive measure? A close look at object control skills during early childhood may increase the likelihood of both sexes continuing to be active throughout childhood and adolescence. The mechanism for this effect is not well understood however.

2.14 Summary of literature Reviewed

This chapter examined the current research on children development in relation to gross motor skills. Gross motor skills, the main focus with links to fundamental motor skills, were examined. Research on the concept of motor development which examined how the nervous systems of children become matured and capable of performing increasing complex action was also reviewed. In addition to these, the models of motor development theories which looked into early and modern motor theories under which the ecological perspective, dynamical systems approach and the Newell's model emerged were addressed. Again, literature on motor development in children which delved into changes in childrens' growth pattern was

also reviewed. Review was also conducted on motor proficiency particularly in biological factors that influence skill proficiency in children such as age and gender. Further, investigations were conducted into the potential influence on early motor skill screening and detection of developmental difficulties that lead to the discovery of Developmental Coordination Disorder (DCD) and the subsequent difficulties children undergo in motor task. Finally, fundamental motor skills and gender looked at how gender influences performance and indicated that boys usually develop gross and manipulative motor skills earlier than girls and are more proficient in these motor skills through growth and maturation. Girls, however, tend to develop more proficiency in non-manipulative motor skills at an earlier age and relative influence of locomotor and object control skills on children's development in relation to their later active life were closely examined.

CHAPTER THREE

METHODOLOGY

This section presents the methods and procedures used to collect data for this study. These are listed under the following sub-headings.

1. Research Design
2. Population
3. Sample and Sampling techniques
4. Instrument
5. Validity and Reliability of the Instrument.
6. Field Testing of the Instrument
7. Data Collection Procedures
8. Method of Data Analysis

3.1 Research Design

The experimental research design of pre-test post-test non-equivalent groups method was used for this study. The design allow each participant's pre-test score to be subtracted from his or her post-test score, thus permitting analysis of "gain" or "change" (Fareankel & Wallen, 2008). This provides better control of the participant characteristics threats since it is the change in each participant that is analyzed, the amount of gain often depends on initial performance; that is the group scoring higher on the pre-test likely to improve more (or in some cases less)

Table 3.1: Showing the participant's Pre-test Post-test Design

Schools involved	Sampled	Locomotor			Object control		
		Pre-test		Post-test	Pre-test		Post-test
A	20	0	x	0	0	x	0
B	20	0	x	0	0	x	0
C	20	0	x	0	0	x	0
D	20	0	x	0	0	x	0
Total	**80**						

Data collection, (2015)

3.2 Population

The population for this study involved four to seven (4-7) year old kindergarten pupils in public schools at the Akyemansa district in the eastern region of Ghana.

3.3 Sample and Sampling Technique

A total of eighty (80) participants were sampled for the study in four (4) selected public kindergarten schools from a total of sixty-three (63) public kindergartens in Akyemansa district in the Eastern Region, Ghana. They were made up of forty (40) males and forty (40) females participants selected using multi-stage sampling techniques (simple random, purposive and stratified random sampling techniques) The simple random sampling technique was used to select the four (4) public kindergartens schools from a total of sixty-three (63) in the district, while the purposive sampling technique was used to select the participants based on the categories through the instrument modality; this allows participants to meet up the

criteria selection applied in the use of the instrument for such categories (Ulrich, 2000).

The stratified random sampling techniques was used to separate the population into the age strata from four years to seven year olds (4-7). This was done to ensure appropriate representation of the participants across strata.

3.4 Instrument

The instrument used for this study is an adopted Test of Gross Motor Development (TGDM-2) by (Ulrich, 2000). The test is a revised version of TGMD-2 (Ulrich, 1985).The test is a standardized test that measures gross motor abilities that develop early in life. The TGMD-2 is designed to assess the gross motor functioning in children aged 3 through 10 years. It is a 12 items scale assessment of gross motor skills which is divided into two sub-scales: locomotor skill with (6) items: (run, hop, gallop, leap, horizontal jump and slide) while six (6) object control skill items (striking stationary ball, stationary dribble, catch, kicking, overhead throw and underhand roll). It consists of forty-eight (48) item assessment based on two (2) trials test per each individual. The Gross Motor Quotient is the most useful value obtained from the TGMD-2 because it reflects the basic constructs built into the test that is highly reliable and a composite of both subtests. It is the best estimate of an individual's current gross motor development. High scores indicate well developed locomotor and object control skills. Low scores indicate weak locomotor and object control skills

Table 3.2: Showing the Rate of Scores Placement

Descriptive rating	GMQ standard score	Percentile score
Very superior	>130	99th
Superior	121-130	92-98th
Above average	111-120	76-91st
Average	90-110	25-75th
Below average	80-89	10-24th
Poor	70-79	2-8th
Very poor	<70	<1st

Source Ulrich, (2000)

3.5 Field Testing of the Instrument

Field-testing was conducted on twenty (20) pupils to assess the efficacy of the instrument. The researcher chose a public kindergarten school in the district which was not part of the selected schools and collected data on gross motor development level of the pupils. Prior to the testing and data collection two assistants were trained on the administration and scoring of the TGMD-2 based on the manual instructions. This was done to evaluate the scoring competency of the assistants. The test was administered twice within 2-weeks interval using test- retest method. The test was first conducted for all the twenty (20) selected participants as specified by the instrument modalities. The researcher first explained and demonstrated each of the skills performed by the participants thrice and offered assistance to participants who needed further help. Participants were made to have a feel of all the equipment used for the study thirty (30) minute before the test was conducted. On the test each participant was allowed three trials and

fifteen (15) minutes per trial per skill. The researcher and the assistants scored the best performance on the test instrument. After two (2) weeks the same test was conducted on the same participants using the same procedure.

The data was collected and scored following the standardized test procedures as provided in the test manual. (Ulrich, 2000).

3.6 Validity and Reliability of the Instrument

The validity of the instrument was tested in two ways. First by face validity by expert opinion about the items and content. Second through a pilot study on twenty (20) pupils who were not part of the study. The results was verified using Confirmatory Factor Analysis (CFA) and the results showed high when compared with the performance standards of the instrument manual. The scale of reliability coefficient was reported as .69 and .72 for locomotor and object control skills respectively which indicate a high reliability of the instrument on the two sub-scales involved.

3.7 Data Collection Procedure

The researcher obtained a letter of introduction from the head of department of Health, Physical Education, Recreation and Sports of University of Education, Winneba. For assistance and cooperation (Appendix A). The reseacher informed the head-teachers and staff about the purpose and safety measures of the study. After acceptance by the school authorities the researcher went ahead to obtain participants' information such their names and ages from the school register with the help from the kindergarten teachers. After, parents/guardians of the participants gave consent information about their children's participation in the

study. (Appendix B). All data collection was conducted in the selected schools using the TGMD-2 (Ulrich, 2000).

Preceding the assessment, the researcher gave an accurate demonstration and verbal description of the skills following TGMD-2 instructions (Ulrich, 2000). After the participants were given one practice trial each to ensure that the participants understood what they were to do. Participants that did not appear to have understood the task or had not performed correctly the practice trial additional demonstration and instructions were given by the researcher. Each participant then performed two trials for each gross motor development first all the locomotor subtest abilities and then all the object control abilities. In the final assessment all the participants were allowed 15 to 20 minutes each to perform. Four trained research assistants were used in the study. Two of the assistants did the scoring, one of them organized the participants in their respective groups and the fourth assistant made sure participants had their turns in the trials whiles the researcher supervised.

3.9 Data Analysis Procedure

The data collected were coded, calculated and analyzed using descriptive statistics of percentage mean and standard deviation on demographical information and research questions, while the inferential statistics of t-test (one-sample), one-way Analysis of variance (ANOVA) and Multivariate Analysis of Variance (MANOVA) were used to test the hypotheses set at .05 significant level.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSIONS

This chapter is focused on data analysis and discussion of finding based on the outcome of the results of the study. The results of the findings are discussed under the following: Demographic information.

Table 4.1: Showing the distribution by age and gender of participants.

Age	Gender		Total
	Male	Female	
4	10	10	20
5	10	10	20
6	10	10	20
7	10	10	20
Total	**40**	**40**	**80**

Source data collection, (2015).

The above table 4.1 showed distribution by age and gender of participants. Each age group had twenty (20) participants comprising ten (10) males and ten (10) females bringing the grand total of eighty (80) participants used for this study

Research Question 1:

What is the fundamental motor skill proficiency of kindergarten pupils based on locomotor and object control skills?

Table 4.2: Showing descriptive statistics (means & standard deviations) results for Fundamental Motor skill Proficiency of Participants

Variables	N	Mean	Std. Deviation
Run	80	.68	.94
Gallop	80	.61	.97
Hop	80	.88	1.00
Leap	80	1.8	1.61
Jump	80	.88	1.07
Slide	80	.55	.83
Striking stat. ball	80	1.44	1.33
Stationary Dribble	80	1.28	.80
Catch	80	2.80	1.55
Overhead throw	80	1.65	1.36
Kick	80	1.88	1.42
Underhand roll	80	1.92	1.31
Total	**80**		

The above table 4.2 showed results of participants based on fundamental motor skills proficiency. The results revealed that participant have a higher mean (M = 1.8, SD = 1.61) in leap than other skills in locomotor skills assessed and higher mean (M = 2.80, SD = 1.55) in catching than in object control skills. This showed participants performed better in fundamental motor skills development of leap and catch than other skills assessed. This means that situational inconsistency might have resulted in poor performance of other skills Moreover, participants might have exhibited normal form of their activity in daily life so they do not have much difficulty in performing the object control skills.

Research Question 2:

Are there any gender differences in the locomotor and object control skills of kindergarten pupils between ages 4-7 years?

Table 4.3: Showing descriptive statistics of gender on locomotor and object control skills

	Sex	N	Mean	Std. Deviation
LCS	Female	40	5.15	2.33
	Male	40	5.65	3.03
	Total	80	5.40	2.69
OCS	Female	40	10.73	3.31
	Male	40	9.20	3.75
	Total	**80**	**9.96**	**3.60**

Data collection, (2015).

The table 4.3 above showed the results for locomotor and objects control skills among kindergarten pupils. The results revealed that male participants have a better (M = 5.65, SD=3.03) performance than females counterparts in locomotor skills, while the female have better performance (M =10.73, SD=3.31) than the male counterparts in the object control skills. This showed that male participants performed in normal movement of their daily activities so they would not have much difficulty in performing locomotor skills, and exhibiting normal form of daily life activity in the form catching.

Research Question 3:

Are there significant differences in the gross motor skills of kindergarten pupils in Akyemansa district

Table 4.4: Showing one-sample t-test results on locomotor and object control skills

	N	Mean	Std .Dev.	Std. Err. Mean Inter.	t	df	Sig (2tailed)	mean Diff	95% Confidence. lower	upper
LCS	80	5.40	2.69	.30	17.93	79	.000	5.40	4.80	6.00
OCS	80	9.96	3.60	.40	24.76	79	. 000	9.96	9.16	10.76

Data collection, (2015)

The table above showed the results of locomotor and objects control skills among kindergarten pupils. The t-test results showed that there is significant in both the locomotor and object control skills scores among kindergarten pupils, LM (t= 17.93, p= .000 < .05) and OC (t = 24.76, p= .000<.05). Though, the object control skills shows better and higher mean value (m=9.96) than the locomotor skills. This shows that participants have greater development more on objects control skills due to the imaginative effect as a result of previous knowledge learning from environment where they stay.

Research Question 4:

Is there any relationship between the locomotor and object control skills of kindergarten pupils in Akyemansa district?

Table 4.5: Showing the Pearson Product-Moment Correlation on gross motor skills (locomotor & Object Control skills).

		Run	Gallop	Hop	Leap	Jump	Slide
Run	Pearson Correlation	1	.068	-.247*	.119	.286*	.152
	Sig. (2-tailed)		.548	.027	.295	.010	.178
Gallop	Pearson Correlation	.068	1	-.350**	-.168	.014	.017
	Sig. (2-tailed)	.548		.001	.136	.904	.88
Hop	Pearson Correlation	-.247*	-.350**	1	-.109	-.003	-.023
	Sig. (2-tailed)	.027	.001		.334	.979	.839
Leap	Pearson Correlation	.119	-.168	-.109	1	.067	.031
	Sig. (2-tailed)	.295	.136	.334		.555	.785
Jump	Pearson Correlation	286*	.014	-.003	.067	1	.236*
	Sig. (2-tailed)	.010	.904	.979	.56		.035
Slide	Pearson Correlation	.152	.017	-.023	.031	.236*	1
	Sig. (2-tailed)	.178	.88	.839	.79	.035	
Strike	Pearson Correlation	1	-.115	.214	-.026		
	Sig. (2-tailed)		.309	.056	.817		
Dribbling	Pearson Correlation	-.115	1	.025	.078		
	Sig. (2-tailed)	.309		.829	.489		
Catching	Pearson Correlation	.214	.025	1	.398**		
	Sig. (2-tailed)	.056	.829		.000		
Throwing	Pearson Correlation	-.026	.078	.398**	1		
	Sig. (2-tailed)	.817	.489	.000			
Kicking	Pearson Correlation	-.011	.087	-.126	.062		
	Sig. (2-tailed)	.923	.443	.264	.583		
Underhand roll	Pearson Correlation	.339**	.020	-.138	-.143		
	Sig. (2-tailed)	.002	.860	.222	.206		
	Total	**80**	**80**	**80**	**80**		

Data collection, (2015).

*Correlation is significant at 0.05 level (2-tailed) **Correlation is significant at 0.05 level (2-tailed)

The table 4.5 above showed the results of locomotor and objects control skills of kindergarten pupils. The results showed that significant relationship exist in locomotor skills .The results indicated strong correlation between Run and hop, (r =.247) hop and jump.(r =.286), slide and jump (r = .236) $P < .05$. This showed that proficiency in a skill is associated with performance in another skill. The results showed no correlation between the object control skills. The Pearson correlation revealed a weak correlation in dribbling, throwing, striking and kicking.

4.1 Discussion of Findings

The discussion of the finding of the study results was based on the research questions.

Research question one revealed that pupils' have low sliding skills than all the other locomotor skills observed, but different from catching which recorded a high mean value. This indicated that pupils have very limited movement based on splitting because of situational inconsistency which involve foot preference showing lack of established foot dominance but have established normal catching routines. The outcome of findings contrast with Haywood and Getchell, (2010) that came out that mastery of the gallop, hop and slide begins to develop in the dominant leg first and progress into unilateral control. Also the findings contrast with Barnett, Cliff, Cohen, Morgan, Okely and Scott, (2013) that children's FMS proficiency is low in a number of countries, with many children entering adolescence having not mastered these basic movement skills. The findings of this study indicated high proficiency in catching, underhand roll, kicking, throwing and strike in concord with Haywood and Getchell, (2010) that catching occur between the ages of 2 to 4- with improvements occurring at age 5 years with advanced patterns developing between 6 to 7 years.

Research question two indicated that male participants have a better performance than the female counterparts in locomotor skills, whiles the females have better performance on object control skills than male participants. This corroborated with Zagrodrik, (2007) who identified and summarized several gender differences in fundamental motor skill acquisition and showed that boys perform in a superior fashion to girls in manipulative skills such as throwing, kicking and catching.

However, Girls performed better than boys on non-manipulative skills, such as balancing, hopping and skipping and that girls often perform better at fine motor tasks while boys usually outperformed girls in gross motor skills. Also, supporting the findings Portela, (2007) posited that in terms of developmental sequence regarding the specific action of throwing evidence male achieved matured throwing pattern at an earlier age compared to girls. More so, Portela, (2007) concerted further with the findings in a study that identified the order and ages at which 60% of children were able to perform a series of fundamental movement skills concluded that boys first achieved running (4 years old) followed by throwing (5 years old), skipping (6.5 years old), catching (7 years old), kicking (7 years old), striking (7 years old), hopping (7.5 years old), and jumping (9.5 years old). Girls first achieved running at age 5 then skipping (6 years old), catching (6.5 years old), hopping (7 years old), kicking (8.5 years old), striking (8.5 years old) , throwing (8.5 years old), and jumping (10 years old). In laying further support Zagrodnik,(2007) also concluded that girls generally lag boys in motor skill development by about one year.

Furthermore the findings of this study agreed with Fatemeh, Peyrovi and Isavi, (2015) stating that boys have better performance in gross motor skills in motion and in object control, while Portela,(2007) contended that boys appear to excel more than girls in throwing and kicking. On the other hand Gallahue and Ozmun, (2006) posited that boys and girls of similar growth status seemed to be equally effective in activities involving running and jumping. Similarly, Haywood and Getchell, (2010) came out that girls typically develop hopping capabilities approximately six month before boys contrary to Beurden, Zask, Barnett and Dietrich, (2002) that stated that

boys tend to have more developed object control skills than girls. Zagrodrik,(2007) also revealed that girls perform better than boys on non-manipulative skills, such as balancing, hopping and skipping and that girls often perform better at fine motor tasks while boys typically outperform girls in gross motor skills.

On research question three, the results of the findings revealed that significant differences existed. The test results showed that there is a significant relationship between boys and girls among all aspects of the development of gross motor control object includes fixed with clubs hit the ball, dribbling in place, get up, kicking the ball over the shoulder and rolling down with 99% probability. This agreed Portela, (2007) who stated that with respect to physical performance of motor skills significance differences are identified in the scores between girls and boys. Also the findings corroborated with Okely, Booth and Patterson, (2001) that female participation in organized physical activity during adolescence appear to be more closely related to proficiency levels of FMS than males. Okely, et al (2001) comparing and categorizing gender and activity separately found very low to high significant relationship between mastery of FMS and participation in organized activity. Again, the findings fell in line with Nsw Spans (2004) which indicated that approximately 10% of boys in year 2 displayed mastery of the sprint run, with this proportion increasing to just under 40% among year 10 boys. Approximately 20% of boys in all years displayed near-mastery of the sprint run. Five per cent of girls in year 2 achieved mastery of the run increasing to 25% among year 10 girls

Research question four showed that significant relationships exist between locomotor and objects control skills of kindergarten pupils. The findings corroborated Ulrich, (2000) who reported that gross motor skills was significant

predictor of adaptive behaviour in daily living skills among children. More so, Flatter, Mushtaq, Hill, Holt, Wilkie and Mon-Williams (2014) made a case that a strong relationship existed between gross motor skills and that there is large age effect. The results further, fell in line with Fatemeh, Aliasghar and Rozhan, (2015) that significant relationship existed between boys and girls among all aspects of the development of gross motor movements such as running, galloping, spring, spring and jump over and slipping with 99% probability.

More so, similar research by Seefeldt and Haubenstricker (1982) in concert with the study findings identified the order and ages at which 60% of children were able to perform a series of fundamental movement skills. The outcome of the findings showed that boys first achieved running (4 years old) followed by throwing (5 years old), skipping (6.5 years old), catching (7 years old), kicking (7 years old), striking (7 years old), hopping (7.5 years old), and jumping (9.5 years old). On the hand girls first achieved running at age 5 then skipping (6 years old), catching (6.5 years old), hopping (7 years old), kicking (8.5 years old), striking (8.5 years old) , throwing (8.5 years old), and jumping (10 years old). In laying further support Zagrodnik, (2007) concluded that girls generally lag boys in motor skill development by about one year.

Similarly, Hurmeric, (2010) pointed in the same direction and stated that gender differences existed in motor skill development in relation to biology, environment and their interactive effects on motor skill development. The study showed gender differences in catch, balance, shuttle run and vertical jump were found mostly related to environment prior to the puberty. (Hurmeric,2010) again in a study that assessed throwing performance in boys and girls biologically in 21 studies to

examine accuracy in (5 studies), velocity (5 studies) and distance (11 studies) contended that boys had better scores than girls in terms of throwing velocity around 4 to 7 years old and throwing distance around 2 to 4 years old. This pointed in the same direction in an earlier research that examined changes in throwing performance of 100 kindergarten children (48 girls and 52 boys) over 3 years by (Humeric,2010) The researchers reported that boys were more proficient in their throwing performance including throwing distance, differentiated rotation and taking opposite step. Gender differences in throwing were also seen for different age groups that supported Lorson and Goodway,(2008) that found consistent findings with regard to gender differences in throwing for 124 first and second graders and indicated that gender differences were seen at pretest for the throwing components of step, trunk and forearm in favor of boys .A study which included females in organized physical activities during adolescence appeared that females were closely related to proficiency levels of FMS than males (Okely, Booth & Patterson, 2001).

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The aim of the study was to assess the gross motor development level of kindergarten pupils has developed to the appreciable level in line with their ages as compared with the developmental mile stone. The research was made of five main chapters. The first chapter dealt with background of the study which focused on the general information about the topic including the statement of the problem, purpose of the study, significance of the study, research questions, hypotheses, delimitation and operational definition of terms in the study.

The chapter two of the study focused on the review of related literature in which several findings were made by research about the topic of the study, some of whom suggested ways by which fundamental gross motor skills can be improved. Childhood is a period considered to be a sensitive learning period for motor skill development because of the substantial neurological capacity available for learning fundamental skills. Fundamental motor skills might "just appear" but they do not refine by themselves. In order to master fundamental motor skills in proficient levels of performance children need to practice and receive appropriate instructions that would occur in preschool and elementary school.

The chapter three of the study focused on the methodology which identified and described the population, target population, sample and sampling technique, instrumentation and methods used in collecting the data and the analysis of the data gathered. The our kindergarten schools purposively selected for the study were the

Akim-Adubiase D/A'B' kindergarten, Akim-Akokoaso Presbyterian kindergarten, Akim-Betenase D/A kindergarten and Akim-Brenase Presbyterian kindergarten. Two participants each were selected from the each of the schools in all totaling (80) participants for the study.

The instrument used for the study was an adapted instrument known as the Test of Gross Motor Development Second Edition (TGMD-2) Ulrich (2000).The instrument is specially designed to measure the locomotor and object control skills of children aged three (3) years through ten (10) years. The data was grouped as frequencies data after which the means and standard deviation for each of the data was analyzed. The means were used to determine the participants' average pre-test post-test scores in comparison with the TGMD-2 scores and the standard deviations were used to determine how spread out or closer the individual scores were around the mean. T-test, one way ANOVA and Multivariate test of comparison MANOVA were applied to determine whether there were significance differences between the locomotor, object control, age and gender.

The data was classified and presented using statistical tables to indicate the means and the standard deviations. The results of the t-test revealed that participants had greater development in locomotor skills than in object control skills while the results of the ANOVA showed that participants performed better in object control skills than in locomotor skills. The MANOVA results revealed that significant differences exist between the age categories when considered jointly on locomotor and objects control skills.

5.2. Conclusion

The findings of the study showed that 46% of kindergarten pupils have established normal development in some aspect of fundamental motor skills especially in catching and have normal daily activity without much difficulty in catching and 54% of the kindergarten pupils have inconsistency in other locomotor and objects control skills especially in slide, gallop, dribbling, hop and jump. The finding also showed that gender differences in motor proficiency scores were significant such that boys are no longer significantly stronger than girls in all motor skills and that girls showed strength in most of the objects control skills. More so the findings showed that increase in chronological age is associated with an improvement in gross motor performance.

On these bases the reseacher concluded that kindergarten pupils' in Akyemansa district gross motor have not developed up to level required. It is of great importance to have the gross motor skills of children developed because there has be several studies that support the development of fundamental motor skill development in which gross motor is embedded. For instance some studies found out those fundamental motor skills (FMS) are the primary skills in which individual's ages two (2) to seven (7) years should gain a proficient level of competency in order to apply them for lifelong physical activities, sports and games. It is evident from previous research findings that many children, youth and adults do not take part in regular physical activities that promotes healthy lifestyle. Several reasons may have accounted for this, but the main reason would be non-exposure to an early physical development activities.

However, should children at the early age in life be exposed to the various skills required in the games and motivated to learn from the beginning they will always possess the needed skills that would enable them participate in physical activities and games all the time.

5.3. Recommendations

Based on the findings of this study, the following recommendations are made: that

1. Teachers with requisite knowledge in physical education should be posted to the kindergartens
2. Intervention programme aimed at improving the gross motor skills of kindergarten pupils be designed and carry out by the teachers in the district.
3. Physical education lessons at the kindergarten should focus on locomotor skills.
4. Age related physical activities should be assigned to pupils during play time
5. Kindergarten teachers with little knowledge in fundamental motor skills should be taught the basic fundamental motor skills and how to teach them so as to find it easy teaching.

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