UNIVERSITY OF CAPE COAST

IMPACT OF DEVELOPMENTAL GAMES ON MOTOR SKILL DEVELOPMENT OF SCHOOL CHILDREN IN THE CAPE COAST METROPOLIS

BY

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Thesis submitted to the Department of Health Physical Education and Recreation of the Faculty of Science and Technology Education, College of Education Studies, University of Cape Coast, in partial fulfilment of the requirements for the award of Doctor of Philosophy Degree in Physical Education (Curriculum and Pedagogy)

JULY 2019

DECLARATION

Candidates Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

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Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

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ABSTRACT

The purpose of the current study was to examine the impact of some selected existing developmental games on the motor skill (balance, coordination and agility) development of children aged between 10 to 12 years, in the Cape Coast Metropolis in the Central Region of Ghana. Quasi-experimental design was employed in the study. Thirty school children were randomly sampled for the study. The children included five boys and five girls from each of the age groups of 10, 11, and 12. This sample was selected to meet the demands for the test battery (i.e.Bruininks-Oseretsky Test of Motor Proficiency-2 (BOT-2) (Bruininks & Bruininks, 2005), which takes 15-20 minutes to test each participant). The group participated in a 12-week motor skills development programme designed for this study. The pupils' levels of balance, coordination and agility were assessed with BOT-2 battery test using a single group pretest-posttest design. Four hypotheses were formulated and tested, hypotheses one, two and three were tested using repeated measure ANOVA, while hypothesis 4 was tested with a repeated factorial ANOVA. The main findings showed that the developmental games were effective tools that could be utilized in improving balance, agility and coordination among the children aged between 10-12 years, especially if the children are given about three months interval to practice. Thus, using these available developmental games can reduce the effects limited resources have on the teaching and learning of Physical Education (PE) and the general development and elevation of sports in the country. PE teachers are encouraged to use these developmental games to help children to improve their motor skills, in the resource constraint environment.

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DEDICATION

To the honour and memory of my late friend and mentor, Professor Joseph K. Ogah.

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CHAPTER ONE

INTRODUCTION

Background to the Study

Individuals are born with genetic codes that make them who they are. This code is also referred to as a person's nature. Nature is defined as the potential each individual is born with to achieve his or her optimal physical structure and level of skill (Faure & Richardson, 2011). However, when an individual is born with, for example, the potential for music intelligence but is never exposed to a musical instrument, that potential will never be realized. Thus, it is nurture, also known as the environment in which humans develop, that determines the extent to which each individual fulfils his/her optimal developmental potential (Faure & Richardson). The first two years of a baby's life are filled with countless opportunities for movement and play to ensure the optimal development. This includes the development of the brain, limbs, senses, reflexes, social and language skills, feelings and thought processes (De Jager, 2009).

According to De Jager (2009), the brain of a baby in uterus is developed well enough to survive within the safe and nourishing environment of the womb. However, after birth, the baby's brain is not developed sufficiently enough to survive and function in a meaningful manner in the real world. Therefore, these skills need to be taught and developed. A similarity lies between a new-born animal and a baby in their struggle to get up and start moving. It is in this struggle to get up that they develop all the necessary skills and abilities that enable them to survive outside the safe environment of their mother's womb that they have known for approximately the past nine months.

Humans differ from other species in various ways. These differences manifest at the spiritual, intellectual and physical levels. Within the physical level, there are four specific developmental areas that distinguish human beings from other species. These physical developmental areas involve; gross motor, fine motor, language and social and emotional developments (Faure & Richardson, 2011). Human beings are the only species that use the upright standing posture as their primary position for any interaction with their environment and the rest of the outside world. The development and maintenance of this upright posture greatly require gross motor development. The term gross motor development is used to describe the large movements performed by the body. During the first year of a baby's life, the primary goal of the gross motor system is to achieve successful control against the pull of gravity, transforming the baby from a helpless, curled-up bundle through the stages of rolling, sitting and crawling, to the mobile toddler after approximately one year (Faure & Richardson). A child experiencing gross motor difficulties may appear to be clumsy or have difficulty with tasks such as walking, running or riding a bicycle (Bizos, 2009).

Similarly, when observing fine motor development, humans have wonderfully and uniquely designed hands that enable the precise manipulation of objects of varying shapes and sizes. Furthermore, humans possess the ability to coordinate their hands and eyes (i.e. eye-hand coordination) for precise tasks such as writing. This requires the development of fine motor skills which include refining the movements of the arms, hands and fingers (Faure & Richardson, 2011). A child with fine motor difficulty may struggle to perform tasks such as completing puzzles, cutting out with scissors or building blocks. Writing is especially a problem for these children as they may not always be able to write as fast as they think. They may also experience difficulty holding the pen in the correct position or producing letters in the correct manner. Children with fine motor problems easily feel exhausted as they struggle with further aspects such as shapes, spacing and position. A child experiencing visual-motor difficulties struggle with tasks such as; catching a ball or hitting a nail with a hammer (Bizos, 2009), that requires the eyes- hands to accomplish.

Pienaar (2009) argues that physical development, including motor development, is crucial for the total development and well-being of all children. Thus, it is vital that physical development, more specifically motor development, is addressed during the early years of development, given that "Babies can only learn what they have experienced" (De Jager, 2009, P. 23). Previous theorists suggest that the way individuals learn and develop is influenced by everything that happens to them. Harcombe (2009), posits that children develop differently according to their differing experiences.

Infancy and childhood are regarded as and defined by dynamic periods of growth and change. Neurodevelopment and physical growth occur in an orderly and predictable fashion that is intrinsically determined (Gerber, Wilks, & Erdie-Lalena, 2010). Motor skills progress from cephalic to caudal; from proximal to distal; and from generalized, stimulus-based reflexes to specific, goal-orientated reactions that gradually become more precise as the child grows and develops (Gerber et al.). The order and duration of all the developmental phases are crucial to every individual's future performance (De Jager, 2009). The environment, however, may cause many challenges to the physical and motor skill development of children as seen, especially, in the diversity of the Sub-Saharan African living conditions. These challenges may include poor socio-economic outcomes such as malnutrition, over feeding, disease, trauma and violence (Pienaar, 2009).

These neurodevelopment sequences often are described in terms of developmental milestones. Milestones are used to provide a general framework for observing and monitoring a child over a period of time. Milestones should be observed and analysed within the determining context of a child's history, growth and a physical examination to identify a child that may be at risk for developmental delays. A thorough understanding of the normal or typical sequence of development in all domains (i.e. gross motor, fine motor, problem-solving, receptive language, expressive language and social-emotional) allows the experts to formulate accurate overall impressions of a child's true developmental status. However, no expert should solely rely on his/her knowledge of milestones to identify children who have developmental deficits. Every child is a unique individual and will not develop at the precise rate as another child of a similar age. Thus, milestones should be regarded as guidelines and not as the sole assessment of the physical and motor skill development status in babies (Gerber et al., 2010).

The development and refinement of motor skills are regarded as extremely important as they determine the level of motor control and integration within each child. These aspects later affect each individual's ability to concentrate, delay gratification, plan and complete tasks (De Jager, 2009), leading to the future learning and development of new skills. The role that motor ability plays in the total development of children has been considered very imperative by previous researchers that many of them have developed and designed programmes to improve the motor ability of children. These programmes arguably; enhance the learning experience and subsequently development of children. Some researchers (e.g. Derbyshire, 2001), therefore, assumed that a child's motor ability forms the foundation for all types of learning encountered in life.

Statement of the Problem

Children do not develop motor skills naturally through innate maturational processes. They rather learn, practice and reinforce them from their early ages (De Jager, 2009). The teaching of Physical Education (PE) at the basic level of education requires the use of equipment and materials. Gerber et al (2010) opined that the availability of learning materials in schools are very important in executing successfully programmed activities. Pienaar (2009) asserts that learning takes place better when learners are fully involved in the process through the use of proper variety of instructional materials in teaching. A report by Curriculum Research Development Division (C R D D.) and Ghana Education Service (G E S) Inspectorate Division in 2008 in Ghana revealed that most teachers in the basic school level do not teach Physical Education. Another report by the G E S Inspectorate Division in 2015 indicated that the situation still persists in schools. Several reasons including unavailability of equipment and materials were mentioned by the teachers as factors responsible for non-teaching of PE. Pate, Trost, Levin and Dowda (2000), pointed out that it might be impossible to achieve satisfactory results from students whose training facilities and equipment are inadequate or sub-standard.

It is also noted that most of students who engage in Physical Education, lack exposure to modern sophisticated infrastructural facilities and equipment for training. Bunker (2001), noted that the lack of instructional materials in participation is a significant problem in the education system especially at the basic level. Research indicates that motor skill interventions are found to be effective in the improvement of motor skills in children. Logan, Robinson, Wilson and Lucas (2011), also intimated that there is a need for research to understand the effectiveness of motor skill interventions, more specifically to determine the overall effect of motor skill intervention programmes on the improvement of motor skill competence in children. This is a challenge to researchers and countries such as Ghana, confronted with the problem of inadequate resources to teach children. Altinkök (2016) emphasized that it is when original materials are not available for use in teaching and learning that other types and forms of instructions can be applied. It is noted that countries such as Israel, Nigeria, Kenya, and South Africa, adopted appropriate motor skills developmental interventions to augment the inadequate resources (De Jager, 2009; Altinkök, 2016).

However, there is no evidence to that effect in Ghana. Research findings confirm that motor skill development is on the decline due to several factors including decline in accidental play among children which complement motor skill development, increase in television watching and extra classes (Ogah, 2010). Recent findings by Bortsie, Sorkpor and Ampiah (2018), further attest that the attitude of parents not encouraging their children to engage in meaningful physical activities towards motor development compared with television viewing is on the ascendancy. The trend, if not checked might be detrimental to the holistic development of children in the country. According to Frimpong (2016), a renowned Ghanaian heart surgeon, preventable diseases are on the increase among Ghanaians including children. He added that lack of well programmed routine physical exercise by individuals is contributing to this alarming situation in the country and this must be addressed.

However, in Ghana despite the challenges of limited equipment, facilities and materials hampering the effective teaching of PE in our schools, there is no evidence in literature to show the effectiveness of various developmental games played with few or no equipment or materials as interventional tool in the development of motor skills of our school children. Lack of such developmentally appropriate games can lead to a rise in preventable diseases, poor motor skill development and skill performance among our children in the country.

Purpose of the Study

The purpose of the current study was to examine the impact of some selected developmental games on the motor skill (balance, coordination and agility) development of children aged between the ages of 10 and 12 years in the Cape Coast Metropolis of the Central Region, Ghana.

Major Hypothesis

There will be significant improvement in the motor skill (balance, coordination and agility) level of male and female school children aged between 10 to 12 years in the Cape Coast Metropolis after participating in the selected developmental games for 12 weeks.

Sub-Hypotheses

1. School children aged between 10 to 12 years in the Cape Coast Metropolis will significantly improve in their balance abilities after participating in selected developmental games for 12 weeks.
2. School children aged between 10 to 12 years in the Cape Coast Metropolis will significantly improve in their agility after participating in selected developmental games for 12 weeks.

3. School children aged between 10 to 12 years in the Cape Coast Metropolis will significantly improve in their coordination abilities after participating in selected developmental games for 12 weeks.
4. There will be significant gender interaction effect on the improvement of motor skill levels of school children aged between 10 to 12 years after participating in selected developmental games for 12 weeks in the Cape Coast Metropolis.

Significance of the Study

The findings of the study would guide teachers in the teaching and learning of Physical Education in the Basic Schools with much emphasis on motor skills development of the children. The findings of this study would further guide policy formulation that would drive curriculum change and laying much emphasis on using developmental games in motor skills development at the basic level of education. Furthermore, this study would add additional knowledge to the existing knowledge of motor skills development and serves as a source of reference in teaching motor skills development.

Delimitation

1. It was delimited to children in class 5 at St Francis primary school, Cape Coast.
2. The study was delimited to quasi experimental design using one group (a double) pretest-posttest design
3. The study was delimited to only the following motor skills;
   - i) Balance
   - ii) Coordination
   - iii) Agility
4. It was further delimited to the following developmental games.

i) Balance (Lorry tyre games)

ii) Coordination (skipping/jumping rope)

iii) Agility (squirrel in the forest)

Limitation

Results cannot be entirely generalized to other schools' populations in the selected age bracket though both probability (random) and non-probability sampling technique (purposive sampling) was used.

Definition of Terms

Coordinated movements - the ability to coordinate the hands and feet in Simultaneous or sequential movement patterns.

Gross motor speed - the ability to maintain a high degree of speed during a brief shuttle run.

Motor performance - the observable attempt of an individual to produce a voluntary action. The level of a person's performance is susceptible to fluctuations in temporary factors such as motivation, arousal, fatigue and physical condition.

Motor proficiency - is the specific abilities measured by tests of running speed and agility, balance, bilateral coordination, strength, upper-limb coordination, response speed, visual-motor control, and upper-limb-speed and dexterity.

Performance balance - the ability to maintain body equilibrium while moving.

Static balance - the ability to maintain body equilibrium while stationary.

Strength - the ability to perform tasks requiring the use of certain arm, leg and abdominal muscles.

Organisation of the Study

The rest of the study was organized in four chapters. Chapter two concentrated on the review of literature related to the present study. Topics such as: Concept of motor skills development, factors responsible for motor skills development, relationship between motor skills and physical activity participation, overview of motor skill assessment, motor skill development programme, theories of developmental games and motor skill development, theoretical model of motor skills development and conceptual framework, were discussed. The third chapter discussed the procedures and methods that were followed to conduct the research. The research design, population, sample and sampling procedure, instrument, and data collection and analysis procedures were discussed. Chapter four focused on the results and discussion of the collected data. Summary, conclusions and recommendations were captured in chapter five. In addition, suggestions for further research were covered in this chapter.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This study generally examines the impact of selected developmental games on motor skill level of school children in the Cape Coast Metropolis. This chapter, therefore, presents a review of related literature that guided the study. The review of related literature was organized under the following sub-headings:

1. Concept of Motor Skills Development
2. Factors responsible for Motor Skills Development
3. Relationship between Motor Skills and Physical Activity Participation.
4. Overview of Motor Skill Assessment.
5. Motor Skill Development Programme.
6. Theories of Developmental Games and Motor Skill Development
7. Theoretical Model of Motor Skills Development
8. Conceptual Framework
9. Summary.

Concept of Motor Skills Development

Once a child can sit, stand and walk, adults take for granted that he/she has the motor development necessary to function in school and everyday activities. However, it is important stop and take a closer look at the child (Cheatum & Hammond, 2000).

Movement is such a natural part of a human's daily life that the importance thereof is often overlooked. Infact, it is vital for the development of a child's physical, cognitive and social characteristics (Cools, De Martelaar, Samaey & Andries, 2009). Many children who appear to be normal at first sight may experience complications with the acquisition and performance of motor skills. These children may often be described as clumsy (Smyth, 2002) and the cause of the impaired motor performance is usually ascribed to an underlying problem that is not always easy to notice. According to Taras (2005), a major concern is that the youth of today live increasingly more sedentary lifestyles, which may contribute to the underlying problems that are causing complications to motor skill development and performance. Several studies have shown that children may even be less physically active than formerly suspected (Jackson et al., 2003: Kelly et al., 2004; Reilly, Jackson & Montgomery, 2004).

Technological pastimes, including watching television, using computers, surfing the internet and using mobile phones, are mostly of a sedentary nature and may seriously impede physical and motor development of children during the early years (Pienaar, 2009). Increased television viewing is regarded as a reflection of an unhealthy lifestyle, leading to the reduction of physical activity as well as incorrect dietary choices (Grund, Krause, Siewers, Rieckert & Mueller, 2001). According to Steyn (2007), 33% of South African adolescent boys and 42% of girls had a sedentary lifestyle and 22% of boys and 27% of girls spend more than three hours of their day watching television. Other than television, the fascination and interest in computers and electronic games has led to an increase in the time children dedicate to sedentary activities (Andersen, Crespo, Bartlett, Cheskin & Pratt 2008; Hill & Peters, 2008; Sallis & Patrick, 2009). Modern developments and improvements seen in technology and transportation today lead to a decreased need for daily physical activity (Hill & Peters, 2008; Piek et al., 2010). Due to the increased dependency on cars and other modes of public transport, populations show low levels of walking and consequently, decreased physical activity levels (Lumsdon & Mitchel, 2009). Decreased physical activity is associated with decreased daily energy requirements, which eventually lead to obesity (Hill & Peters, 2008; Piek et al., 2010). Obesity is regarded as a serious condition of being overweight due to high levels of excess body fat. When ingesting more kilojoules than the body needs, all excessive foods are stored as fat. Obesity is, therefore, regarded as a form of malnutrition and can be prevented by consuming the correct amounts of nutritional foods and performing adequate amounts of physical exercise (Smith, 2001).

According to Pienaar (2009), it appears children have limited control over their own activity habits than before. Traffic and stranger danger are some of the environmental factors that limit the freedom of children to play outside and function independently outside their family home (Hillman, Adams & Whitelegg, 2001). Violent crimes and a decline in safe playing areas reduce the opportunity and motivation for children, especially girls, to be physically active. (Princeton Survey Research Associates- PSRA, 1994; Gómez, Johnson, Selva & Sallis, 2004; Carver, Timperio & Crawford, 2008; Lopez, 2011). Studies (e.g.Cradock et al., 2005; Lopez, 2011) suggest that proximity (distance) concerns and safety from crime or potential injuries determine how public physical activity areas such as parks and playgrounds are utilised. A further major concern is the limited access to physical activity facilities for those who fall in a lower socio-economic bracket (Cradock et al., 2005; Gordon-Larsen, Nelson, Page, & Popkin, 2006; Lopez, 2011).

Children that come from a low socio-economic background are reported to perform worse in motor activities such as coordination, balance, speed, and power and this may be attributed to malnutrition and decreased physical activity (Mészáros, Szmodis, Pampakas, Osvath & Volgyi, 2008). Failing to include physical activity into children's daily lives and not being able to master motor skills may hinder the participation in physical activity. More importantly, this failure will prevent children from obtaining the recommended levels of physical activity that is required to achieve and maintain good health (Van Beurden et al., 2003). According to Strong et al. (2005) and the World Health Organisation [WHO] (2010), children between the ages of five and 17 years should accumulate at least 60 minutes of moderate to vigorous physical activity every day. This is the recommended daily amount of physical activity required for health. Physical activity include sport, play, games, recreation, transportation (walking, running, etc), and Physical education (PE) or planned exercise programmes.

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. Rhythm and coordination are evident in performance (Sherrill, 2006). However, motor proficiency is not the same thing as motor performance. The best definition of motor proficiency is the specific abilities measured by tests of running speed and agility, balance, bilateral coordination, strength, upper-limb coordination, response speed, visual-motor control and upper-limb-speed and dexterity (Sherrill, 2004). When evaluating a child's level of motor proficiency, selected tasks are judged to be significant indicators of the level of development of these abilities. 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 is a critical factor that must be tested in order to assess any individual's level of motor proficiency.

Factors Responsible for Motor Skills Development

As humans, we learn to exist within our environment. Throughout our life span, we constantly develop or adapt our abilities and skills to live 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. These changes are driven by two factors namely biological factors which include; genetics, gender and maturation; and environmental factors which include experience, opportunity, encouragement, demographics and social factors (Gallahue, 1982; Thomas, 2001).

According to Newell (1986), the ability to perform a motor skill depends on the interaction between the learner and the environment. More so the personal characteristics of the child, motivation and previous motor skill experience, also influence motor skill performance. Newell further 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. 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 (Edward & Finn-Stevensen, 2007).

Biological Factors

There are several factors that affect motor skill development in children (e.g. gender, age, genetics and maturation). These factors have been discussed below.

a. Gender Differences

Prior to puberty, gender differences in motor proficiency of children are generally minimal. These differences tend to increase across the high school years. These slight differences favour boys in direct and straight forward shows 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 (Bouchard, Shehard & Stephens, 2004). 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. Studies (e.g. Bouchard et al.). suggest 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 whilst boys are encouraged to participate in more vigorous movement activities such as running, chasing and jumping (Bouchard et al.).

Govatos (1999) and Krombholz (2001) show 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. 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. In terms of specific skills, significant relationships exist between specific physical skills, such as the 40-meter dash, standing broad jump and throwing distance and various growth measurements such as height, weight and carpal development of children in the primary grades (Govatos, 1999). In terms of developmental sequences regarding the specific action of throwing, it has been shown that boys achieve mature throwing patterns at an earlier age compared to girls (Butterfield & Loovis, 2003).

b. 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 (Rarick, 2000). Rudisill, Lawrence, Goodway and Walls (2002) note that motor activity, defined as a combination of perceptions in new motor patterns, is often influenced by intellectual, affective and cultural factors and also vary 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. It is established that children of the same age grow at different rates. However, it is also reported that 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 (Edward & Finn-Stevensen, 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 (Encyclopedia of Nursing and Allied Health, n.d.). Krombholz (2001) study 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.

c. Genetics and Maturation

Genetics and maturation contribute infuence 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). Thomas (2001), states 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.

Environmental Factors

Another group of factors that affect motor skill development is environmental in nature and these include; expertise, physical factors, demographics, social factors, psychological factors, leisure time activities and physical education presented at school. Each of these factors has been discussed below.

a. Expertise

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 (McPherson & Thomas, 2009). Thomas and Thomas (2008) prove that practice alone does not assure expertise and that the quality of practice is what is essential. They encourage children to practice the right things, practice a lot and practice as they will perform.

b. 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 (Cintas, 2005). 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 (Loucaides, Chrdzoy & Bennett, 2004). 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 increase again during the spring season (Kohll & Hobbs, 2008). 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 (Loucaides et al., 2004).

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 (Loucaides et al., 2004).

c. Demographics

There are a number of environmental differences between urban and rural schools which are determinants of motor proficiency. Research by Loucaides et al., (2004) shows 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 neighborhood 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 (Loucaides et al.).

d. 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 (Kohll & Hobbs, 2008). 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 (Kohll & Hobbs.).

Increased proficiency in skill performance is enjoyable and rewarding in itself 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 (Kohll & Hobbs, 2008).

e. Psychological Factors

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, unfavourable 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 (Kohll & Hobbs, 2008).

f. Leisure Time Activities

A frequently cited determinant of physical activity and motor proficiency is the amount of time children spend watching television and playing video games. Although the hours of viewing per week have not been shown specifically to be related to decreased levels of physical activity, these viewing hours certainly reduce the opportunity to be active. Leisure time variables such as participation in sports clubs and availability of exercise equipment at home have also been found to be significant correlates of physical activity and motor proficiency (Kohll & Hobbs, 2008). A study by Graft et al. (2004), involving an analysis of children's leisure behaviour showed that children who are more active (either in organized extramural activities and/or on a regular basis) do have better gross motor development. Similar findings have been reported in research by Krombholz (2001). The study by Graft et al. (2004) also showed that children with a higher weekly television viewing frequency, tended to demonstrate poorer gross motor development.

g. Physical Education Presented at School

Nearly all children attend school; therefore school can play a noteworthy role in increasing a child's physical activity level and promote a healthy fitness behaviour. According to the National Youth Fitness Study (NYFS [Kohll & Hobbs, 2008]), first to fourth grade children, showed that the frequency with which schools conduct physical education classes is related inversely to the amount of time children are given for recess. This suggests that schools use recess to substitute rather than supplement physical activity. In this study (NYFS) it was stated that, 76% of the children never saw a classroom or an appropriately qualified teacher for physical education (Kohll & Hobbs, 2008).

How Children Develop Motor Skills

The term motor skills, is used to refer to both fundamental movement skills and also basic sports skills (Graham, 2007). Motor skills are deliberate and controlled movements requiring both muscle development and maturation of the central nervous system. The skeletal system too, needs to be strong enough to maintain the movement and weight involved in any new activity, once these conditions are met, children are able to learn new physical skills by practicing them until each skill is mastered (Encyclopedia of Nursing and Allied Health, n.d.: 1). The development of motor skills is important for our daily living, and is a process that involves both inherent abilities and considerable practice during childhood and adolescence. Self-selected, unplanned play is important for acquiring motor skill abilities, as well as structured movement instruction. Without this formalized learning, movement performance and improvement are really left to chance. In an article by Smith and O'Keefe (2001), they purport that, this factor is often not recognized and even some professional educators assume that such essential skills will emerge automatically. However, with many skills, young children need to learn and practice these skills until they can proficiently participate in a variety of games and sports. Findings show that when teaching interventions are applied for the learning of fundamental motor skills, children aged four to six years are able to achieve full proficiency (Smith & O'keefe, 2001). Literature shows that movement skills may be defined as identifiable movement patterns, which are used to accomplish certain tasks. These skills can be categorized into a four-level developmental hierarchy. Level one, is made up of the rudimentary skills of sitting, crawling, creeping, standing and walking. Level two, consists of what is usually called fundamental motor skills, which emerge from birth to the end of about six or seven years of age.

Level three, represents loco-motor skills, such as running, jumping, hopping, galloping, skipping, and object control skills, such as throwing, catching, striking, kicking, and dribbling. These fundamental motor skills provide the foundation for the learning of other more specialized movement skills. Level four is at the top of the hierarchy of specialized movement skills; these are referred to as ontogenic (development of an individual) skills, and specific to the needs and interests of a particular person (Burton, 2002).

Rudimentary Motor Skills

During early childhood, discovering and exploring movement, provides children with many exciting and thoughtful learning experiences. Young children are delighted with their emerging capabilities and find opportunities to learn play and practice. It is during this age bracket that children develop a foundation for body management abilities, needed in games, recreational activities and for sport specific skills. Research also shows that early and appropriate movement experiences help to create and extend neural networks in the developing brain. Constructive and well planned lessons are required to enhance these areas and others like the cognitive, social and emotional aspects (Carson, 2001). A child's motor development depends on its total physical development. In order to crawl, walk, climb and grasp, the infant must first have reached a certain level of skeletal, neural and muscular development (Louw, 2005). At birth, infants have a repertoire of movements that can be used in their new environment. The collection of movement responses, exhibited by the infant and young child are used to build later movement patterns. When a child starts to be mobile, they go through a series of movement patterns performed with al/ limbs. They will typically progress from homologous to homolateral movements and then to cross-lateral patterns during creeping and crawling (Louw, 2005).

Fundamental Movement Skills

Fundamental motor skills are the ABCs of movement. These basic skills are divided into two categories: locomotive skills, which involve moving the body from one point to another and manipulative skills, which involve moving objects with hands and feet (Goodway & Robinson, 2006). Fundamental skills are those that involve the projection and reception of the body and are used during both work and leisure activities by most individuals. They are seen as universal in the motor pattern range. These skills include basic movements such as walking, running, hopping, twisting, throwing, catching and striking an object. Walking and running retain their importance in the achievement and continuation of physical fitness throughout life. Other skills, such as skipping and rolling also have a significant contribution during childhood. Development of such skills is emphasized during elementary school (Seefeldt, 2004). Fundamental motor skills are prerequisites to the learning of sport specific skills such as the skills used in soccer, basketball, hockey, etc. Balance, is considered to be a fundamental gross motor skill, since all gross motor skills require some element of balance. Proper development of static and dynamic balance skills is thus considered as essential in the development of gross motor skills (Du Toit & Pienaar, 2001).To define dynamic and static balance, Knight and Rizzuto (2003: p.1296), offer the following; "Dynamic Balance: The ability to maintain a balanced position, while moving through space -the centre of gravity is shifting constantly to remain inside the base of support." "Static Balance: The ability to maintain a stationary position, for a specified period of time -the centre of gravity remains the base of support".

Locomotor and Non-locomotor Skills

Locomotor skills are used to move the body from one place to another or to project the body upward, as in jumping and hopping. These skills form the foundation of gross motor coordination and involve large muscle movement (Goodway & Robinson, 2006). Non-locomotor skills are performed without appreciable movement from place to place. These skills are not as well defined as locomotor skills. They include bending and stretching, pushing and pulling, raising and lowering, twisting and turning, shaking, bouncing and circling (Goodway & Robinson, 2010).

Specific Movement Skills

Specific skills are those used in various sports and in other areas of physical education including apparatus activities, tumbling, dance, and specific games. In developing specific skills, progression is attained through planned instruction and drills. Specific skills are usually a combination of locomotor, non-locomotor, and manipulative skills. They are situation-specific and involve a high level of refinement. Basic sports skills are a combination of the fundamental skills such as throwing a ball in a game of cricket, dribbling a ball in a game of soccer or running and jumping such as in gymnastics (Graham, 2007). These sport specific skills are composed of variations of these fundamental skills. Thus, it is difficult to achieve proficiency of such skills unless the fundamental skills are mastered (Smith & O'Keefe, 2001).

Movement Awareness

Carson (2001) identified four categories of awareness which constitute a child's movement awareness. These categories refer to a knowledge base that allows the child to select movements that meet a respective demand of a specific task or circumstance. The four categories of movement awareness are: action awareness, effort awareness, space awareness and relational awareness.

Action awareness comprises three categories of movement actions that a child is able to do with his/her body. They are traveling, manipulating and stabilizing. Initially, children should be allowed maximum time to practice basic components of awareness, commonly known as fundamental skills. These are the foundation for more complex specialized skills like those needed in games and sports. Most skills develop in a predictable developmental sequence, and competence of such ability is dependent on maximum appropriate practice of basic skills and actions. There are an infinite number of possibilities of how movement concepts can adjust actions and as a result, action or movement awareness is developed (Graham, 2007). Various practice opportunities allow children an opportunity to master basic skills and then refine and combine these skills into specialized actions (Carson, 2001). Effort awareness is an understanding of how the body moves, and that muscular effort is required to produce, maintain, stop and regulate movement. A time component of "effort awareness" is related to the speed and rhythm of a particular movement. Therefore, children need to be able to control the speed of a specific movement, including acceleration and deceleration. A second component of effort awareness is force, (i.e. the amount of muscular effort and energy required to perform a task). The categories of a creating force and an absorbing force allow children to recognize how much muscle tension is needed to start, maintain or stop various movements. The absorbing force is what happens when one catches a ball and how muscles react to the receiving force. The last component of effort awareness is control or the coordination of movement, which is essential in learning how to regulate a movement (Carson, 2001).

Space awareness is the understanding of where the body can move, and knowing how it should move (Carson, 2001). Lastly, relational awareness understands the relationship your body creates. The relationship created by the body to either its segments or to other movers or objects (Carson, 2001).

Motor Skills that Lay a Foundation for Learning

a. Body Awareness

Body awareness skills such as rope climbing facilitate the understanding of one's own body and its parts, and how it works. Body awareness is the root skill of organisation. It affects how a child organizes himself, his belongings and his thoughts. Children who have difficulty getting projects or tasks started without assistance, generally reflect disorganization (Smith & O'Keefe, 2001).

b. Spatial Awareness

Spatial awareness is the ability to work within one's own space - an area one arm's length around in all directions. This skill affects handwriting and all graph and fine motor work. It combines with eye-hand coordination and centre-line skills to influence all copy work (Graham, 2007).

c. Balance

Balance is the ability to control your body when it is in contact with Mother Earth or one of her substitutes. Long term memory grows out of balance (Gallahue & Ozmun, 1998).

d. Dynamic Balance

Short term memory skills flow out of dynamic balance. How one controls one's body when suspended in the air for any length of time affects the proficiency of dynamic balance. Children who have difficulty following a series of directions tend to be weak in this skill area (Gallahue & Ozmun, 1998).

e. Laterality

The ability to use one side of the body smoothly and evenly and to distinguish between the left and right sides of the body. Laterality affects the ability to understand words (Gallahue & Ozmun, 1998).

f. Bi-laterality

The ability to use the upper and lower parts of the body independently. Bilaterality affects the ability to conceptualize ideas (Gallahue & Ozmun, 1998).

g. Cross laterality

The ability to use opposite sides of the body at the same time in a smooth, rhythmic manner. Cross-laterality affects the ability to read, sequence and prioritize items (Gallahue & Ozmun, 1998).

h. Tracking

Tracking is the ability to deal with objects and people outside of our own space. Tracking affects copying information from outside one's own space. It allows for the transfer of information from far to near (Gallahue & Ozmun, 1998).

i. Centre-line

This is the ability to perform tasks directly centred on our mid-line. It is the ability to work efficiently from left to right, such as reading test questions and writing the answers on an answer sheet (Gallahue & Ozmun, 1998).

j. Eye-foot coordination

Eye-foot coordination requires that the eyes and feet work together to achieve a given result. It works best when the focus eye (the dominant eye) matches the dominant foot, so that the eye and foot can work together to accomplish a given task (Gallahue & Ozmun, 1998).

Importance of Motor Proficiency

It is established that about 6% of all school age children are described by experts and parents as uncoordinated in their fine and gross motor skills' (American Psychiatric Association, 1994). Each milestone achieved by the child in terms of motor skills has implications for other developmental domains. Motor skills and "play" are important precursors of the more formal and stylized elements of what are referred to as cognitive or intellectual development (Wade, 1992). For many years, researchers have established a link between movement and successful learning (Fredericks, Kokot & Krog, 2006). Theorists believe that movement reflects neural organization and provides stimulation to the neurological systems necessary for their development and optimal functioning.

These views are reflected in studies by Pica (1998) and De Jager (2001), who agree in considering the brain and body as a united whole. Interplay of the human brain and body allows us to clearly see that movement is an integral part of all mental processing, and that every movement is a sensory-motor experience which is linked to our understanding and interpretation of our physical world from which all our learning originates (Fredericks et al., 2006). Furthermore, movement remains a significant medium for cognitive, social, emotional and motor development through the child's pre-school and early primary school years (Luebke, 1981). Goddard-Blyth (2000) suggests that agility, balance and coordination constitute the stability skills upon which all other motor skill depend. If these skills are not developed at the time that children enter school, children run the risk of later developing specific learning difficulties, not only because they lack intelligence, but because the basic systems fundamental to learning are not fully developed when these children start school. The development of these fundamental skills plays an important role in a child's school readiness development since a child's gross motor skills are closely related to his/her fine motor, cognitive and perceptual development (Gallahue & Ozmun, 1998). Thus, movement which is meaningful for development will ensure that these skills develop in the holistic growth of a child.

Perceptual motor skill development is directly related to the central nervous system and the processing of information received via the sensory organs. There are four areas within perceptual motor development that are supportive to the complete development of a child. These are bilateral proficiency, throwing and catching, balance, acceleration and deceleration. Bilateral proficiency is trained through cross lateral activities, while catching helps children to practice reacting to information provided by proprioceptive organs and the eyes (Gallahue & Ozmun, 1998).

The skill of acceleration and deceleration teaches a child the principles of motion and the inter-relationship that exists between stability and mobility (Gallahue & Ozmun). Spatial awareness earlier referred to as a motor skill which lays a foundation for learning, is reported by Corso (1993), to be reliant on a healthy gross motor development and movement awareness. Spatial awareness is the term given to a person's conscious awareness of their place in time. However, without balance, spatial awareness is impossible. Children need to first have gained experience and practice in orientating their bodies in space, by moving up, under, over and in front of objects, in order to attain spatial and directional awareness (Gallahue & Ozmun, 1998). Until then, they may experience difficulty dealing with letter identification and the orientation of symbols on a page (Olds, 1994). Memory has been shown to be correlated to positive movement skills (Hager, 2000). It is concluded that movement is necessary to stimulate the ability of the brain, to perceive, process and store information appropriately. Therefore, movement is seen as essential in strengthening both long- and short-term memory (Hager, 2000).

Motor development is a fundamental aspect in the course of human ontogeny. "In later childhood, motor skills play an important role in establishing the child's reputation among peers and the development of self-esteem" (Krombholz, 2007:18). This statement by Krombholz shows that children who are commonly labeled as clumsy experience tremendous difficulties in developing adequate movement skills. These problems occur in the absence of general sensory and intellectual impairments and without signs of neurological damage. Children with this kind of problem are less likely to seek out new and exciting experiences because of an associated repeated failure in the movement domain. Usually, their interactions in the playground are limited. Consequently, they normally have a poor knowledge of evaluating, understanding and elaborating information related to movement.

On the other hand, children who are successful at movement patterns are more likely to become willing learners, motivated by curiosity to find pleasure in participating. Poorly coordinated children perceive a lowered competence in the motor domain; have reduced social support and interaction from peers, and develop higher levels of anxiety. Consequently, they are less likely to investigate situations for building movement patterns. These children also lack interest in physical activity and perseverance in challenging situations (Krombholz, 2007). According to the competence motivation theory, children who are successful at movement will be intrinsically or self-motivated in the motor field. However, children's self-motivation is likely to be reduced if they repeatedly fail at movement tasks (Graham, 2007). The focus on fundamental motor skill also has implications for health. Many modern-day diseases are at least in part due to lack of physical activity. Research shows that physical activity patterns developed in childhood tend to last throughout adulthood and people are more likely to take up or continue sports or some kind of physical activity if they are proficient in the required degree of skill (Smith & O'Keefe, 2001; Kelly et al., 2004).

Physical Activity and Physical Education

Physical activity is any bodily movement produced by the contraction of skeletal muscle which increases energy expenditure in the body (Kohl & Hobbs, 2008). Schools use physical education lessons, together with play, to promote physical activity in the school curricula. Physical education (PE) is an integral part of the complete education of every child, and aims to increase physical competence, health related fitness, self-responsibility and enjoyment of physical activity for all learners (Buncker, 2001).

Physical education and youth sport provide opportunities for children to acquire skills, and to test their abilities. Physical education is designed to develop each child's capacity to function at an optimal level, and by this, children must develop sound body movement skills and good basic skills which produce efficient conscious movements (Bunker, 2001). It plays a significant role in the pre-school years. Seefeldt (2004) discussed fundamental motor skills versus fitness in pre-school years, and it was evident that the rudimentary skills which make up the components for our games and sports can be learned by children in an enriched environment before they are six years of age. These early childhood years are the most opportune time for perfecting the motor skills basic to all subsequent locomotion sports skills and aerobic activities. Studies conducted by Saakslahti et al. (1999), Thomas (2001) and Rudisill et al. (2002)

revealed that a physical activity and a pre-school skill development programme has a dramatic influence on participants' loco-motor skill and coordination performance such that a lack of such a programme, could negatively influence motor development. Infact, minimal instruction time of a development specific programme has shown significant changes to motor performance. Thus, children who do not have experience of or sufficient exposure to such programmes may not develop their loco-motor skills before starting school.

This assertion was confirmed by Goodway and Branta (2003) in their study. Graham (2007) purports that there appears to be a false assumption in believing that students learn motor skills by playing games. This may be true when children play one particular game continuously. But there are limited period scheduled for physical education which can be devoted to playing one particular game. With this restriction in mind, motor skill acquisition should be considered an essential goal in a physical education programme.

A study by Housner, Carson, Hawkins and Wiegand, (2006) compared the effects of a year-long-daily versus a one-day-a-week physical education programme on the proficiency and acquisition of fitness and gross motor skills in K-2 elementary school children. Analysis of gain scores showed a remarkable advantage to the daily physical education lesson in improvements of motor skills and fitness. One, however, could question the influence of such a time loss to physical education classes on the academic timetable and academic progress. Research by Shephard (2007), states that when a substantial portion of curricular time (14-26%) is allocated to physical education, learning seems to proceed more rapidly per unit time. Children who received additional physical education classes showed acceleration in their psychomotor development, which ultimately resulted in improved academic skills. These learners showed no reductions in their grades and standard test scores. Thus, physical education can be introduced without compromising academic performance. Black, (2005) reports that good physical education programmes can boost academic achievement and that children may be learning more in physical education lessons than ever imagined. Black concludes that schools which require children to sit all day long deny children an important connection between movement and learning.

Physical Activity Guidelines for Children

In 1998, physical activity guidelines for children (ages 5-12) were developed by both the National Association for Sport and Physical Education (NASPE) and the Health Education Authority in the United Kingdom. In 2004, the NASPE physical activity guidelines for children were revised. These guidelines indicate that children should complete at least 60 minutes up to several hours of moderate to vigorous physical activity a day. Depending on developmental needs, this activity should be characterized as intermittent rather than continuous in nature. Accordingly, the 60-minute standard is a minimum, and for children to achieve the multiple benefits, it would require physical activity exceeding this minimum; thus the stated need for up to several hours of activity per day. Based on patterns of activity for youth, it is apparent that without bouts of activity such as physical education, breaks or sports, children are unlikely to meet activity guidelines. (Corbin, Pangrazi & Le Masurier, 2004).

1. Children should accumulate at least 60 minutes, and up to several hours of age appropriate physical activity on most if not all days of the week. This daily accumulation should include moderate and vigorous physical activity with the majority of the time being spent in activity that is intermittent in nature.

2. Children should participate in several bouts of physical activities lasting 15 minutes minimum daily.

3. Children should participate each day in a variety 01 age appropriate physical activities designed to achieve optimal health, wellness, fitness, and performance benefits.

4. Extended periods of inactivity (periods of two or more hours) are discouraged for children, especially during the daytime hours.

Physical Education: Influence on Low Motor Skill Acquisition

Poor motor proficiency and skill acquisition may be a consequence of the factors which influence physical activity. Graham (2007) in his study, identified five possible reasons for low motor skill acquisition can be related to physical education.

Time spent performing physical activity. Numerous studies have shown how educators use their time during a physical education lesson, and that children spend a substantial amount of time listening to the teacher talk, or engaging in management activities, or waiting. Ultimately, on average, children will spend only a third of the lesson engaged in specific physical activity. Thus, learners don't have many opportunities to learn, practice or play (Graham, 2007).

Directing tasks at refining a motor skill; Qualitative studies of motor skills have identified that children are not performing the skill correctly, which may be because of educators not emphasizing these quality aspects but rather providing a variety of tasks (Graham, 2007). Providing positive feedback; several studies have shown that educators do not provide positive feedback but rather general comments. When learners are given specific guidelines, in terms of feedback, learning takes place better (Graham, 2007).

Playing appropriate developmental games; Research by Ross and Gilbert (2005) has shown that children play more games than actually learning and practicing motor skills. Motor skills may be learnt from playing games, but learners would have to play hours and hours of one game, which is obviously not feasible in a child's learning programme. Games also allow only a few children the majority of opportunities (Graham, 2007).

Developmentally oriented transitional skill teaching: Many children are taught gross motor skills as if they were a closed skill, which occurs in a predictable, static environment, when actually the skill should be used in an open, dynamic environment such as a sport game (Graham, 2007).

Physical Education in the African Schools Curriculum

During the colonial and post-colonial period of African transformation and reform, physical education found itself as a subject without its own identity. It now functions as only one of the learning outcomes of life orientation (Hendricks, 2004). The majority of schools with this transformation have shifted to more classroom-based and academic-based educational content, which has led to a respective lack of creative and activity-based learning. Generally, there are two schools of thought on the status of physical education. The first is that physical education should be an essential part of the core curriculum and the second being physical education, while important to a child's development, is regarded as being of secondary importance to the core academic curriculum (Gabbard, 2000). As stated by Hendricks, the life orientation focus, and the area of the physical education curriculum is divided into three phases; the Foundation Phase, the Intermediate Phase, and the Senior Phase. In the Foundation Phase (Grade R to 3) of the physical education curriculum, learning focuses on children discovering, exploring and experimenting with movement patterns with the aim of stimulating gross motor development and physiological growth (Sitzer, 2003). Examples of the physical education focus in this foundation phase include learners participating in free play, demonstrations of specific skills using a combination of body parts, performing basic movements in a sequence or pattern, and exploring expressive movements using contrasts of speed, direction, body shape and position (Gabbard, 2000). The benefits of physical education include muscular strength, flexibility and respiratory endurance. Regular movement activities improve motor skills and coordination. Collectively these benefits lead to an improved self confidence in one's abilities; an increased enthusiasm to participate in varied physical activities (Hendricks, 2004).

Motor Development

Pienaar (2009) states that physical development, including motor development, is the key aspect of children's total development and well-being and must be addressed during the early years of development. Early childhood is described as a unique period in a child's life as it is seen as a period when children develop physically, emotionally, intellectually and socially (Garcia, Garcia, Floyd & Lawson, 2002). Development is defined by several characteristics. First, it is a continuous process of change in functional capacity which involves capability to exist (i.e. to live, move, and work) within the real world. This 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" (Haywood & Getchell, 2009:123).

The term development usually refers to attaining and transitioning through a series of stages, more commonly known as milestones, developmental milestones or stages of development (Cheatum & Hammond, 2000). Children generally progress through an orderly, predictable sequence of development and one stage in the sequence leads to another (Cheatum & Hammond, 2000; Wait, 2005; Davids, Button & Bennet, 2008; Haywood & Getchell, 2009) in an orderly and irreversible fashion (Wait, 2005; Haywood & Getchell, 2009). According to De Jager (2009), it is fascinating to observe how consistently each developmental stage or milestone emerges from the preceding one, and how development in all children occurs according to the same basic laws, regardless of individual, ethnic and gender differences. Milestones are the basic building blocks of all learning later in school, thus, the sequence of the development is crucial to optimal functioning.

According to Erasmus (2009), development takes place along a timeline between birth and adulthood and specific developmental process can only take place during particular sensitive periods in the brain development. Thus, a developmental process that should occur during a specific developmental stage will not occur in the same manner or to the same degree during a later developmental stage. After birth, the different stages of development occur in a sequence that follows a head-to-toe progression (De Jager, 2009).

Developmental changes result from the interactions within the individual as well as between the individual and his or her environment (Davids et al., 2008; Haywood & Getchell, 2009). It is, however, very important to remember that every child is unique and that each child will progress through each developmental stage at an age that is right for him or her (Cheatum & Hammond, 2000; Haywood & Getchell, 2009). It is evident that development is related to, but not entirely dependent on, age. It does, however, proceed as age increases. The rate of development may be slower or faster at different times and may differ between children of the same age (Haywood & Getchell, 2009).

One child may reach a specific milestone early and another child may reach the same milestone at a later stage, yet both children may fall within a normal range. Each child has his/her own rhythm of development and will only progress from one stage to the next when he/she is ready (Cheatum & Hammond, 2000; De Jager, 2009).

Development continues throughout life and will not stop at a particular age (Haywood & Getchell, 2009). Developmental milestones or stages should thus only be used as a framework of guidelines when investigating the development of a child. (Cheatum & Hammond, 2000; Gerber et al., 2010). Cheatum and Hammond (2000) posit that most children progress through a sequence of movement stages as seen as follows; moving all four limbs (both arms and both legs) in the same manner at the same time, moving both arms together in the same manner, moving one arm separately from the other, moving one leg separately from the other, moving an arm on one side of the body with a leg on the same side in the same manner, and moving an arm on one side of the body with the opposite leg side and vice versa (Cheatum, & Hammond, 2000).

The term motor development refers to the development of a person's movement abilities. It is a continuous and age-related process of change in movement. This process is influenced by interacting constraints or factors in the individual, environment and task that drives these changes in movement (Haywood & Getchell, 2009; Pienaar, 2012). The first aspect that any movement specialist should be knowledgeable about regarding motor development is that it consists of different phases occurring from birth until adulthood, as shown in Figure 1. The diagram depicts a framework of the different phases and stages of motor development that a child progresses through from birth to adulthood. This framework may serve as an important guideline when planning the content of movement programmes for children of different ages and different developmental stages (Gallahue & Ozman, 2002; Pienaar, 2012)

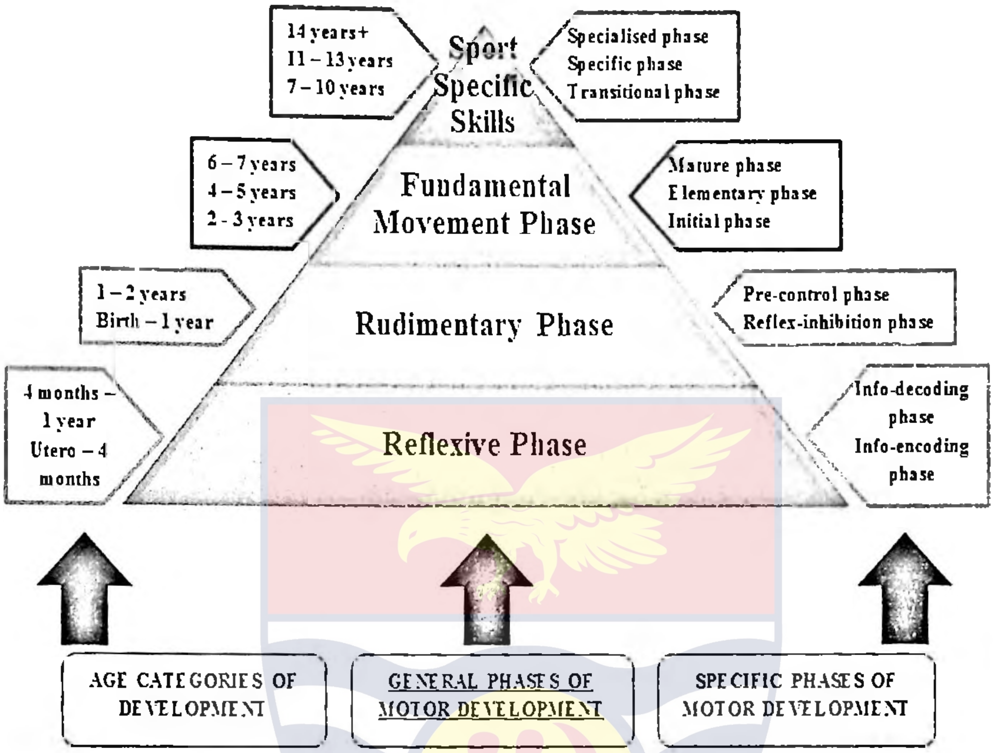

Figure 1. Phases of Motor Development (Gallahue & Ozmun, 2002; Pienaar, 2012).

The first phase of motor development as can be seen from Figure 1 is the reflexive phase (Gallahue & Donnely, 2003; Pienaar, 2012). This phase begins during foetal development, also known as the prenatal stage, and continues until after birth. Babies are born with an intrinsic need for movement and sensory functions that are ready to be used. At this stage of development all movements occur as reflexes and are controlled subconsciously. Examples of movements during this phase include sucking and motor-reflex (Pienaar, 2012).

The reflexive phase develops simultaneously with the first phase of movement, or rudimentary phase (Pienaar, 2012). These phases are characteristic of infancy and toddlerhood (Gallahue & Donnely, 2003). Various exercises and activities can stimulate babies to control their movements and to learn from their environment. These activities also stimulate the central nervous system and other important bodily functions. It is important to remember that during this developmental phase, progressions of stimulation exercises are based on the developmental level of the baby and not on their age. A person can determine the developmental level of a baby by playing with him or her and then be able to select the most appropriate stimulation activities and exercises. A person may also be able to identify any developmental deficits or inappropriate behaviour whilst establishing the developmental level (Pienaar, 2012).

The second phase of motor development is known as the first phase of movement or the rudimentary phase. This phase begins shortly after birth and continues up to the age of approximately two years-old. Locomotor skills, such as crawling and walking; manipulative skills, such as reaching and grabbing; and stability skills, such as controlling the head, neck and torso during sitting and/or standing activities, then begin to develop. Babies have very little, if any, control over fine motor movements during this phase even if they already possess many of the components that later develop into finely coordinated arm, hand and finger movements. Babies and toddlers initially display uneven shoulder and elbow movements that later develop into wrist movements, hand rotations and the coordination of the thumbs and forefingers. Maturation of hand-eye coordination is thus, accordingly reflected in the improvement of fine motor skills (Pienaar, 2012). The reflexive and rudimentary phases are characteristic of the baby- and toddler years and are critical to the foundation of the fundamental and more specialized movement phases that occur during the toddler and early childhood years (Gallahue & Donnely, 2003; Pienaar, 2012).

Motor skills are learnt in a general to specific order. General movements such as random arm waving are learnt before specific movements, such as reaching for an object, rolling over or hitting a ball. Development of the nervous system determines the order of skill development. A child is neurologically ready for gross motor activities before fine motor tasks or specific skills. Thus, gross motor skills develop before fine motor skills. This explains why young children and especially those with motor difficulties usually prefer participating in gross motor activities. Gross motor skills are executed using the large muscle groups and include activities such as throwing, hitting, striking, walking, running, leaping, jumping and climbing. Fine motor skills are performed using the small muscle groups and include activities such as drawing, colouring, cutting with scissors, writing, stringing beads, building blocks and putting together toys such as Legos, using mainly the fingers and wrists (Cheatum & Hammond, 2000; De Jager, 2009).

The fundamental movement phase is the third phase of motor development and occurs between the early childhood years of two and seven. This period is a very critical phase for the mastery of basic motor skills. Stability, locomotor, and manipulative skills are the three categories used to define fundamental motor skills and originate during the first two years of life. These skills are developed and refined during the fundamental movement phase (Gallahue & Donnely, 2003; Pienaar, 2012). Stability skills, one of the fundamental motor skills, placed emphasis on maintaining balance (body control), which include bending, stretching, turning, swinging, rolling, holding positions (standing on toes), stopping, starting, dodging, balancing. More so, locomotor skill involves movements in a forward motion with an upward or forward direction. Examples are walking, running, jumping, hopping, galloping, skipping, gliding and climbing (combinations). Finally, manipulative skill concerns manipulation of objects such as balls, bats and other equipment. This skill encompasses throwing, kicking, hitting, bouncing, rolling, dribbling, catching, blocking (Pienaar, 2012).

The performance of fundamental motor skills can be further subdivided into three phases, including an initial, elementary and mature phase (Gallahue & Donnely, 2003; Pienaar, 2012). The initial phase is between 2 – 3 years and during this period, movements are relatively crude and uncoordinated. Between 4-5 years is regarded as the elementary phase which experiences improved rhythmic and coordinated movements. The mature phase is between 6-7 years and is a period where automatic coordinated movements are experienced (Gallahue, & Donnely, 2003; Pienaar, 2012).

Fundamental motor skills that develop during the rudimentary phase continue to develop during the subsequent phases as the child matures. These motor skills can be developed into sport specific skills as soon as they meet all the criteria of the mature phase of development. The development of mature movement patterns forms the basis of all sport skills. Therefore, if movement patterns are not developed to a mature stage, the ability to develop specialized movement skills later in life will be inhibited. Research shows that the motor skill development of many children does not reach the mature phase and that obstacles such as safety, the mechanical and technological age, television viewing and computer usage further inhibit the development of motor skills (Pienaar, 2012).

The fourth and final phase of motor development is the specialized movement or sport related movement phase when motor skills become sport specific. This phase is subdivided into three further stages, which include the general or transitional stage, the specific or application movement stage and the specialization or lifelong utilization stage (Gallahue & Donnely, 2003; Pienaar, 2012). Children that are in Grade 1, 2 and 3 (class 2, 3 and 4) or between the ages of seven and ten years-old are likely to fall in the transitional stage. This phase is characterized by the further development and refinement of motor skills. Children start showing increasing interest in different types of sport and their own level of physical performance start competing with friends and no longer feel limited by physiological, anatomical or environmental factors. Skilled performance is still limited during this stage seeing they are only now starting to develop an idea of the performance of specific movements. Presenters of movement programmes now start to look at the accuracy and skill refinement during the child's performance of certain sport skills. The nature of the development of motor skills is at such a level that it can be applied in relevant sport specific games such as refining the skill of hitting a ball with a stick, bat or racquet. The development of specialized movements is, however, greatly dependent on the experience, encouragement and quality of teaching or coaching (Gallahue & Donnely, 2003; Pienaar, 2012).

During the late childhood years and early adolescence, approximately between the ages of 11 and 13, children move into the application or specific movement stage (Figure 1). The child is now regarded as more mature in terms of neurological and physical development and he or she is now able to overcome the physiological and psychological demands placed on the body easily. The child now starts to discover and realize his or her physiological and personality restrictions as well as specific personal strengths and weaknesses he or she might possess and accordingly focuses more on specific types of sport. Improvements in skill, technique and style occur during this stage and focus is placed on the improvement of specific skills through repetitive practice. More complex skills that can be applied in official sports are thus refined during this stage (Gallahue & Donnely, 2003; Pienaar, 2012).

Finally, the specialization of lifelong utilization stage may occur from the approximate age of 14 years (high school years) and onwards (Figure 1). However, moving into this stage is highly dependent on the previous sport and fundamental skill stages. The child now applies the skills and techniques that he or she mastered during the previous phases of development in recreational, performance orientated or daily activities. This is ultimately the phase where sport specialization according to ability, interest, availability of coaching and facilities, previous experience and ambition can take place. Further refinements of specific techniques occur during this stage. The development of specialized movement skills is highly dependent on experience, encouragement and the quality of instruction (Gallahue & Donnely, 2003; Pienaar, 2012).

The Relationship between Motor Skills and Physical Activity Participation

The foundation for future movement skills is the development of motor skills (Seefeldt, 2004; Clark & Metcalfe, 2002). Motor skills are regarded as a requirement and foundation of certain skills practiced in adult physical activity (Payne & Isaacs, 2008). Therefore, a relationship may exist between physical activity participation and mastery of motor skills (Okely, Booth & Patterson 2001). Caspersen, Powel and Christensen (1985) describes physical activity as any bodily movement that is caused by skeletal muscles and that leads to the output of energy. The fundamental motor skills consist of stability skills, object control skills (catching, throwing, object manipulation with hands and feet) and locomotor skills (running, jumping and moving your body through space) (Payne & Isaacs, 2008).

The performance of motor skills is generally broken down into three parts or phases: the preparation phase, the execution or force phase and the follow-through or recovery phase. When looking at jumping as an example, critical performance cues involve preparing the body by contracting and bending it to gather energy with the arms held low at the sides. The arms swing vigorously from low to high during the force phase and the legs straighten or bend depending on the type of jump. During the recovery phase, the landing should be on two feet simultaneously, with knees bent to absorb the force and arms lowered again for balance (Gallahue & Donnelly, 2003). Proficiency in motor skill performance is considered to be a very crucial aspect of participation in physical activity among the youth (Corbin, 1980; De Oreo & Keogh, 1980). Fisher et al. (2005), report that children who devote more time to moderate-to-vigorous physical activity are more likely to have higher levels of motor proficiency.

It has been stressed that motor proficiency also plays an important part in the participation in physical activity later in life (Seefeldt, 2004; Clark & Metcalfe, 2002; Gallahue & Ozman, 2006; Stodden et al., 2008; Barnett et al., 2010). This supports the general belief that motor skills are related to habitual physical activity during childhood and adolescence (Fulton, Burgeson & Perry, 2001; McKenzie et al., 2004; Okely et al., 2004; Raudsepp & Päll, 2006). Accordingly, it is evident that children who are physically active are more likely to be physically active adults, thus enhancing their health throughout their lifespan (Kuth & Cooper, 1992; Glenmark, Hedberg & Jansson, 1994; McKenzie et al., 2004). Not only does childhood participation in physical activity play an important role in future adult participation, the enjoyment thereof may also lead to increased adult participation (Sallis & Patrick, 2009; Martens, 1996).

Pre-school and early elementary school years are suggested to be the best period to aspire towards motor skill improvements. This may be due to the possibility that children have not yet developed bad physical activity habits; they are not as self- conscious about performing poorly and not too scared of injuries or being teased and laughed at by their peers. It is also very important that enough time and resources are devoted for optimal skill development during this period. This period is also known as a "window of opportunity" as the speed and ease of learning new skills are maximized (Gallahue & Donnely, 2003). It is during this critical period or window of opportunity that the brain is most receptive to appropriate stimulation compared to any other given time during development (Chugani, 1998). Thus, implementing an intervention programme during this period may produce more significant results than at a later developmental stage. According to De Jager (2009), a window of opportunity is the crucial time or milestones that define a child's developmental progress. For example, motor skills are seen to progress rapidly during the first eighteen months after birth and the window for learning language occurs during the first six years of a child's life. The developmental process after birth comprises four major windows of opportunity including:

1. the opportunity to develop the body (neurochemical networks, muscle strength, muscle coordination, balance and the senses);
2. the opportunity to develop feelings and emotions;
3. the opportunity to develop language;
4. the opportunity to develop thinking.

It is important to note that the first window of opportunity for a baby is to discover his or her own body as a fixed point of reference (De Jager, 2009).

Chapey (1986), refers to pre-school years as "the wonder years" and also opines that they are the most important years in the child's life, when great changes occur regarding all aspects of growth and development. The pre-school years also play a significant role in the gradual preparation of the child for entry into the school environment. School readiness preparation already commences at birth (Derbyshire, 2001).

Phases of Development before School Entry

Physical activity has the ability to promote being physically active during adulthood and physical fitness will only be maintained if the child remains physically active. Hence, promoting lifetime physical activity has become the most important role of physical education (Meredith & Welk, 2007). This importance of promoting lifetime physical activity should be the pre-occupation of all practitioners in the field of physical education all over the world including Ghana.

When promoting lifetime physical activity among children, it is important to provide the appropriate instruction and reinforcement directly to the behaviour of the child and not on the intended outcome. Physical activity guidelines are designed to provide behavioural targets that may assist children in the adoption of healthy and active lifestyles. The guidelines for children and those for adults differ due to the simple fact that children are different from adults. The daily amount of physical activity recommended for children (60 minutes per day) is greater than for adults (30 minutes per day) as children have more time available in the day. There is also a greater need to establish physical activity patterns and promote the development of motor skills early in a child's life. Increased inactivity leads to obesity and inhibits opportunities for children to be physically active. This decreases the levels of physical inactivity which is also considered in physical activity guidelines. These guidelines recognize that physical activity of a moderate intensity can provide significant health benefits even when performed intermittently throughout the day. Research reports have indicated that the physical activity levels of children decline sharply during the adolescent years as children start to take on adult responsibilities and adopt adult lifestyle patterns. As a result, maintaining a child's natural interest in physical activity has become an evident challenge for physical education teachers (Meredith & Welk, 2007).

According to the Curriculum and Assessment Policy Statement (CAPS [DBE, 2011]), PE in schools focuses on physical growth and development, perceptual motor development, games, sport and also play. All these aspects contribute to the development and promotion of a healthy and active lifestyle. PE aims to develop children's knowledge regarding movement and safety, and to improve their physical well-being. Thus, PE will accordingly help children to cultivate positive values and attitudes that help them to be physically fit, mentally alert, socially well-adjusted, mentally balanced, spiritually uplifted and morally true. The time allocated for PE in the Intermediate phase (Grade 4 to 6) is only 90 minutes per week (DBE, 2011).

The most important goal of past and present PE programmes has always been to obtain and develop motor skills (Siedentop, 2001). Many schools believe that removing PE from the curriculum and allocating this time to academic work would improve academic performance. Research has, however, proven this belief to be false (e.g. Dwyer et al., 2001; Shephard et al., 2006; Dwyer, Sallis, Blizzard, Lazarus & Dean, 2001; Shephard, 2007; Sallis et al., 1999; Coe, Pivarnik, Womack, Reeves & Malina, 2006; Ahmed et al., 2007). Thus, removing PE to increase time in the classroom does not improve academic performance (Trost, 2007). Evidence also suggests that increase in time devoted to PE and physical activity during school hours maintains or even improves grades and standardized test scores (Trost, 2007), and will not negatively affect academic performance. A positive correlation is evident between physical activity and academic performance. Indeed, it is established that physical activity has a positive effect on concentration, memory and classroom behaviour (Shephard, 1997; Pellegrini & Smith, 1998; Sibley & Etnier, 2003; Tomporowski, 2003; Strong et al., 2005). Consequently, children who are more physically active seem to perform better academically (Schurr & Brookover, 1970; Williams, 1988; Fejgin, 1994; Pate et al., 2000; Dwyer et al., 2001; Field, Diego & Sanders, 2001; Taras, 2005; Coe et al., 2006; Nelson & Gordon-Larson, 2006; Trost, 2007), especially those who are physically fit (Knight & Rizzuto, 2003; Dwyer et al., 2001; Kim et al., 2003; Castelli, Hillman, Buck & Erwin, 2007; Trost, 2007). Research also suggests that small activity breaks should be taken during the school day as it can improve the cognitive performance, concentration and behaviour of students in the classroom (Gabbard & Barton, 1979; Raviv & Low, 1990; McNaughten & Gabbard, 1993; Caterino & Polak, 1999; Mahar, Murphy, Rowe, Shields & Raedke, 2006; Trost, 2007). The school environment serves as an excellent setting to provide children with daily opportunities to be physically active to educate children on the importance of daily physical activity for health, and to build skills that support an active lifestyle (Trost, 2007). There are, however, currently very few schools that offer PE to children (Pienaar, 2009) and most children will get little or no regular physical activity during their school years (Trost, 2007). Many schools also do not have qualified PE teachers, implicating prominence especially in the growth and proper development of children (Van Deventer, 2009). Furthermore, according to results found by Van Deventer (2012), it seems that most secondary schools experience difficulties relating to the availability of sufficient facilities and equipment to present PE, sport and recreation. This was also reported by foundation teachers in most schools in Ghana and other countries in Africa (Van Deventer, Fourie, Van Gent & Africa 2010).

Influencing Factors of Physical Activity Participation

Man is a unique individual and various factors help to make him what he is. He is not merely the product of his hereditary biological composition as the naturalists believe. Neither is he merely the product of his environment. Both hereditary factors and environmental influences play a great role in man's personality development and his general development (Botha, 1991).

Factors such as gender, environmental factors and opportunities to be physically active are only a few of the many factors that are considered to influence motor skill development and performance (Langendorfer & Roberton, 2002; Goodway & Branta, 2003). It is very important that each of these factors are considered in the assessment of motor development status, motor skill performance and the design and implementation of developmentally appropriate programmes (Barnett et al., 2009; Barnett et al., 2010). For an intervention programme to produce successful results, it is critical that the researcher understands the current status of motor development within the chosen population. This will also assist in determining and meeting the specific needs of the population (Goodway, Robinson & Crowe, 2010). Even the smallest improvements in the motor skill performance of children may lead to increased physical activity participation (Okely et al., 2001).

Overview of Motor Skill Assessment

"Any assessment of movement skill must begin with the question, why? Not why does a person move in a particular way, but why do we assess movement skill in the first place?" (Burton & Miller, 1998:82). The purpose of assessment must be clearly specified before a test is selected and administered (Burton & Miller). Across the professional areas involved in the assessment of movement skills, there are at least five major groupings of purposes: (a) to categorize or identify, (b) to plan treatment or instructional strategies, (c) to evaluate change over time, (d) to provide feedback to the performer or to some other concerned party, or (e) to predict (Burton & Miller).

Early researchers viewed motor skills as extensions, combinations and refinements of rudimentary movements. They strongly believed that motor behaviours originated due to the interaction between the maturation and experience of a child. Due to this early research, the first assessment instruments of motor development emerged (Folio & Fewell, 2000).

Screening tools and test batteries investigating motor proficiency may be very useful in determining the level of motor skills of each child and where he or she might be experiencing difficulty. Screening tools can be used as a means of early identification, which leads to early intervention and aids in prevention of the development of secondary academic, emotional and social problems (Larkin & Rose, 2005; Rosenblum, 2006). Screening tools such as questionnaires are good methods to gather information regarding motor skill deficits such as coordination problems, and to identify children predisposed to physical disorders such as Developmental Coordination Disorder (DCD) (Schoemaker, Flapper, Reinders-Messelink & Kloet, 2008). Screening tools such as self-report instruments are advantageous as they can be administered to groups of people in relatively short periods of time (Hay, 1992).

The tools can be very useful in the school setting as teachers possess great opportunity to observe daily motor behaviour in the classroom and on the playground (Larkin & Rose, 2005). Due to this opportunity available to teachers, a number of teacher questionnaires have been designed to identify children at the risk of developing DCD. The most popular example is the Movement Assessment Battery for Children-2 (MABC-2) Checklist (Henderson, Sudgen & Barnett, 2007). The Teen Risk Screen (TRS) is another screening tool that aims to provide an easy-administered screening checklist to determine children's motor proficiency in a school setting and is a useful tool designed especially for teachers (Africa & Kidd, 2012). According to Cliff, Okely, Smith and Mckeen (2009), it is important that future research using validated screening checklists is conducted in conjunction with validated movement skill assessment tools.

Numerous motor skill test batteries are currently available (Cools et al., 2009). There is, however, no "gold standard" assessment tool when determining motor impairments. Motor impairment can include various problems such as difficulties in balance, locomotion on objects such as bicycles and with manual dexterity skills such as writing or using cutlery (Branter, Piek & Smith, 2009). The Peabody Developmental Motor Scales-2 (PDMS-2) is designed to assess the movement skills of an individual child between birth and five years of age and includes gross and fine motor movement subtests. This test also aims to distinguish motor development delays and disorders (Folio & Fewell, 2000; Cools et al., 2009). The Test of Gross Motor Development-2 (TGMD-2) assesses the gross motor performance of locomotion and object control skills of children between the ages of three and 10 years old. The assessment is based on qualitative movement skill criteria and can be used to identify children who are significantly developmentally delayed when compared to their peers (Ulrich, 2000; Cools et al., 2009). The Movement Assessment Battery for Children-2 (MABC-2) is a revision of the MABC and it is used to identify and describe motor performance impairments in children between the ages of three to sixteen. This assessment tool is one of the most widely used by occupational therapists, physiotherapists, psychologists, kinderkineticists and educational professionals (Henderson et al., 2007).

The test battery used during this study to assess the motor skills of children is the Bruininks-Oseretsky Test of Motor Proficiency-2 (BOT-2) (Bruininks & Bruininks, 2005). Studies indicate that this test battery has been used widely in school environments (Plimpton & Regimbal, 1992; Hay & Missiuna, 1998; Reeves et al., 1999; Piek et al., 2010; Gupta, Bhamini & Kumara, 2011) and its use is recommended for instances where a brief, screening picture of the level of motor proficiency is needed (Bruininks & Bruininks, 2005; Cools et al., 2009). The BOT-2 is often used in occupational therapy, physical therapy and adapted PE (Burton & Miller, 1998). The recommended uses of this test battery include: the diagnosis of motor impairment; screening; placement decisions; development and evaluation of motor training programmes and supporting research goals (Cools et al., 2009).

The BOT-2 is an established and tested motor skills test battery. It is also one of the most popular test batteries for children (Burton & Miller, 1998). This tool assesses fine and gross motor skill development, and identifies mild to moderate motor coordination deficits in children between the ages of four and 21 years of age (Cools et al., 2009). The Short Form comprises four motor composites: fine manual control; manual coordination; body coordination; and strength and agility (Bruininks & Bruininks, 2005). The composites are further subdivided into eight subtests that include: fine motor precision; fine motor integration; manual dexterity; bilateral coordination; balance; running speed and agility; upper-limb coordination and strength (Bruininks & Bruininks, 2005; Cools et al., 2009). Compared to the 53 items of the Long Form, the Short Form consists of 14 items in total that provide a brief overview of a child's motor proficiency (Cools et al., 2009; Venetsanou et al., 2009). This test has an internal consistency of $r \geq .80$, an inter-rater reliability of $r \geq .90$ and a test-retest reliability of $r \geq .80$ (Deitz et al., 2007). Construct validity of this test is also good, $r=0.78$.

Children are assessed according to test guidelines and the short form testing procedures take approximately 15-20 minutes per child. Administration guidelines include familiarization with and adherence to specified test equipment, scoring and administration rules. Emphasis should always be placed on proper form even if the task requires speed (Bruininks & Bruininks, 2005).

Balance

Balance is the ability of a human to maintain his or her equilibrium in relation to the force of gravity, whether the body is in a static posture or performing a dynamic activity, as well as the ability to make very small alterations in the body when placed in various positions. To be able to achieve balance, the line of gravity that passes through the centre of gravity must also lie within the base of support. If this line falls outside the base of support, one cannot maintain balance and will fall unless compensatory movements are made (Gallahue & Donnelly, 2003).

Balance involves motor control skills that are required for the maintenance of posture whilst standing, walking or other common tasks such as reaching for an object on a shelf (Bruininks & Bruininks, 2005). Balance is regarded as a complex part of a person's motor fitness that is affected by vision; the inner ear; the cerebellum; the proprioceptors (also known as nerve endings) in muscles, joints and tendons; and the skeletal muscles (Gallahue & Donnelly, 2003). Balance can be static (stationary) or dynamic movement and is seen to be influenced by factors such as the trunk stability, movement or stasis and the use of visual cues (Bruininks & Bruininks, 2005). Static balance is the ability to maintain equilibrium in a fixed position, such as standing on one foot or balancing on a balance board. Dynamic balance is the ability to maintain equilibrium while the body is moving, such as walking on a balance beam or jumping on a trampoline. It is evident that all movements involve an element of balance, whether static or dynamic, as balance is a basic aspect of all movement. Due to this, it is critical that children develop their ability to balance from an early age (Gallahue & Donnelly, 2003). The development of static and dynamic balance is briefly described as follows Static balance involves maintaining equilibrium while the centre of gravity remains stationary. Some activities perform by children during the early years include; pull to standing position, stand without handholds, stand alone, balance on one foot 3 to 5 seconds, support body in basic 3-point invert position (10 months to 6 years aged children). Dynamic balance involves maintaining equilibrium as the centre of gravity shifts. Selected activities undertaken by corresponding age children include; walks 2.54cm straight line, walk on low balance beam, stand on low balance beam, walk on 10.16cm wide beam for short distance for 2 years to 4 years aged children.

When balancing with a partner, one can perform two other types of balances. These include counterbalance and counter-tension. Counterbalancing occurs when weight and force are distributed inward or toward a partner. A popular example is performed from a standing position, with hands pressed against the hands of the partner. Different body parts may also be used, including the back, sides of the body, feet, shoulders and/or the bottom. Counter-tension is the complete opposite of counterbalance as the weight and force is distributed away from a partner. A common example is performed by holding hands and leaning away from a partner. The feet of both partners should be placed as close together as possible and the legs should be kept straight (Gallahue & Donnelly, 2003). Different forms of counter-tension can be achieved by using different body parts, levels and directions (Gallahue & Donnelly).

Balance is regarded as one of the performance-related components of physical fitness. Other components include coordination, agility, the speed of movement and power. Performance-related fitness is an aspect of physical fitness and is related to the quality of a person's movement skill when looking at improved performance in play, games and sport activities. Children who skillfully perform several activities such as bicycling, swimming, throwing catching and climbing are regarded as possessing good skill-related fitness. Balance is emphasized as the performance-related component to be developed first in children. Thus, activities promoting balance skills should be addressed first in developmentally based PE programmes (Gallahue & Donnelly, 2003).. This is due to the importance of developing movement control such as balance, coordination and agility, before developing force production for speed and power (Gallahue & Donnelly).

Common evaluation measures of balance as a performance-related fitness component include a beam walk (dynamic) and the stick balance or one-foot stand (static). It is reported that these balance measures show year-by-year improvements with an increase in age. Up to the age of eight-years-old, girls often outperform boys, especially during dynamic balance activities. However, after the age of eight, balance abilities appear to be similar between girls and boys (Gallahue & Donnelly, 2003).

The ability to maintain balance, also known as equilibrium, is dependent on the vestibular system. "The vestibular system is the sensory system considered to have the most important influence on the other sensory systems and on the ability to function in everyday life" (Cheatum & Hammond, 2000: 178). It is the unifying system in our brain that modifies and coordinates information received from the visual, proprioceptive, auditory, and tactile systems. The vestibular system functions like a traffic cop, telling each sensation where and when it should go or stop" (Cheatum & Hammond).

The vestibular system is critical in the maintenance of balance as this system informs the nervous system of where the body is in relationship to the pull of gravity. With the help of the visual- and proprioception system, the vestibular system is able to communicate to a person whether his or her body is upright, upside down or lying down, in motion or still, speeding up or slowing down. The vestibular system is located in the brain and the vestibular receptors are located in the inner ear. These vestibular receptors are also known as the balance sense organs. The role of these receptors is to inform the body of where it is located in space, and to maintain the correct posture and balance, allowing one to perform motor activities. When looking at activities such as walking or running, the body continuously moves forward and out of balance. The next foot must automatically move forward to prevent one from falling and maintain balance and movement. The vestibular system also plays a role in tonic muscle control. Tonic muscle control is required for a child to be able to keep his or her body still in various positions such at sitting at a desk or standing in a row or at a chalkboard. (Cheatum & Hammond, 2000).

The vestibular system provides the tonic muscle control that is required to hold the neck still and keep the eyes focused on a specific target or object, which is critical during reading and writing tasks (Cheatum & Hammond, 2000).

Children labeled as hypovestibular, who are subconsciously not aware of the pull of gravity on their bodies, experience problems with overall control of their bodies, and maintaining their balance. When these children experience a disturbance in balance, they are not able to execute sufficient postural muscle control to maintain their balance during everyday activities such as sitting, standing or moving. These children are unable to rely on their body's subconscious vestibular system functioning to sit still and must now consciously force themselves to focus all their attention to sitting still. This affects their ability to take in any new information given by the class teacher. Furthermore, if the child averts his attention back to the information provided by the teacher, he or she automatically loses balance and begins moving around in the chair. These children appear to be and are often incorrectly labeled as being hyperactive. Balance may also be affected by other factors including: vestibular viruses; whiplash; head trauma; inner ear infection and the long-term use of caffeine, alcohol and nicotine (Cheatum & Hammond, 2000). According to Gallahue and Donnelly (2003), Otitis media, or inflammation of the inner ear, commonly occurs among young children, as they are more sensitive to infections of the ear and this may influence their ability to perform balancing activities.

Bilateral Coordination

Bilateral coordination is the ability to use both arms and/or both legs together in a coordinated manner, and is also known as bilateral integration (Le Roux, 2011; Pienaar, 2012). It is vital to development as it lays the foundation for the establishment of hand dominance and is used in various daily tasks in the school and home environments. These daily tasks may include using eating utensils, tying shoelaces, washing dishes, ball skills or cutting with scissors. Bilateral coordination skills begin to emerge during the early baby years and consist of symmetrical and asymmetrical movements (Le Roux, 2011). Symmetrical movements occur when both arms and legs are moved together. Examples include jumping, clapping hands, rolling out dough or pastry with a rolling pin or pushing a large object such as a piece of furniture (Pienaar, 2012). Crawling helps a baby to learn how to use each side of his or her body in a rhythmical manner, one side at a time. This is also known as reciprocal movement. Crawling is, therefore, critical in the development of a child as it provides the opportunity to develop sufficient bilateral coordination and thus, the foundation for establishing hand and/or foot dominance.

Various reciprocal skills such as walking, running and climbing emerge during the development of a child. During these activities, both sides of the body are the same task, one side at a time. Examples of reciprocal bilateral coordination skills include pulling a rope (hands) and riding a bicycle (legs). Once reciprocal bilateral coordination has developed sufficiently, asymmetrical movements emerge. Both sides of the body work together but perform entirely different yet complementary tasks. Cutting with scissors is a good example of asymmetrical bilateral coordination (Le Roux, 2011). The child's one hand leads/cuts while the other only supports or assists/holds the paper during the activity. Other examples include drawing, threading beads, kicking a ball jumping on one foot and even the tennis serve (Pienaar, 2012). Alternating movements occur when one limb relieves the duty of another limb, using the same movement in a rhythmic and coordinated manner. Examples include running, crawling and climbing stairs.

Bilateral coordination involves tasks that require total body control as well as simultaneous and sequential coordination of the upper and lower limbs. Bilateral coordination has also been found to play an important role in the participation of various sports and recreational games (Bruininks & Bruininks, 2005).

Agility

Agility is defined as "a rapid whole-body movement with change of velocity or direction in response to a stimulus" (Sheppard & Young, 2006:184). It deals with the changes in direction and has been reported to be influenced by explosive strength, balance, muscular coordination, and flexibility, also with the ability to effectively couple eccentric and concentric actions in ballistic movements (Sahin, 2014). This implies that agility has relationships with trainable physical qualities such as strength, power and technique. Cognitive components such as visual scanning techniques, visual scanning speed and anticipation are also part of agility. Therefore, agility testing is generally confined to tests of physical components such as change of direction speed, or cognitive components such as anticipation and pattern recognition (Sheppard & Young). These factors have been elaborated in the Illinois Agility Test, which is a challenging 15-20 seconds test that requires the participant to run fast, stop quickly, change directions, and move the body from a laying position to a running stride as quickly as possible.

The aforementioned motor skills, including balance bilateral coordination and agility, formed part of the motor skills development programme compiled for this study. The ensuing section examines and describes motor skills development programme.

Motor Skills Development Programme

"Early detection of barriers to learning and development is desirable in order to obtain timeous and appropriate help for the child. The earlier the intervention, the better the outcome for the child's future" (Croock, 2009, P 83). As soon as a child experiencing problems is identified, remediation should follow immediately (Kapp, 1991). Researchers suggest that motor skills are improved through intervention (Folio & Fewell, 2000). The role played by motor ability in the total development of the child has been considered so important that numerous programmes have been designed to improve the motor ability of children (Derbyshire, 2001). These programmes attempt to increase the child's learning and subsequent development. Research also indicates that motor skills intervention programmes have been designed from the premise that motor ability forms the point of departure for all types of learning.

Hardy, King, Farrell, Macniven and Howlett (2010) assert that the mastery of motor skills is low in primary school children. They, therefore, stress the importance of early intervention programmes in the school environment, especially in pre-schools. Pre-school and other child care centres are regarded as the optimal setting for the implementation of motor skills development programmes. Grantham-McGreggor et al. (1999) reinforce this by stating that the early years of life is essential as the foundation for all future development.

When planning intervention programmes, it is crucial to take into account important aspects such as culture, ecology, language, and demographic factors, among others, in order to devise interventions that reflect these variables. Intervention programme facilitators should also be aware of and understand that many children with disabilities can respond productively to the same developmental interventions as children without disabilities and should be included in their intervention efforts (Grantham-McGregor et al., 1999). Movement programmes for young children should ideally include the following main aspects with appropriate age progressions as they get older (Pienaar, 2012).

Body awareness; knowledge of different body parts, control of different body parts, coordination of both sides of the body, as well as of the top and bottom parts of the body (bilateral coordination), relaxing of the entire body as well as selected parts of the body. Balance; Static and dynamic balance, involving balancing with or on top of objects. Locomotor skills; Those skills require the use of time, rhythm and energy, rolling, crawling, walking, running, jumping, hopping, galloping, skipping, animal walks, climbing, agility and flexibility activities. Spatial orientation; Laterality involving mapping activities of inner space and internal awareness of direction. Manipulation skills; Manipulation of objects can include contacts, sending away and absorbing objects. Example; throwing, catching, rolling, knocking, bouncing and hitting. Rhythm and timing; Can be included in the movement programme or practiced separately during a music activity (Pienaar, 2012).

Programme characteristics and content determine the outcome of motor skill interventions. Thus, aspects such as the timing, duration and frequency of an intervention regulate its effect. It has been suggested that the earlier and the longer the interventions, the larger the developmental benefits and outcomes. The more frequent the contact time and the more intense the intervention, the more likely it will be for children to benefit from it (Grantham-McGregor et al., 1999).

Furthermore, according to Pienaar (2012), the nature of equipment used during planned interventions and movement development programmes is also important and must be adaptable to body size and growth differences of all the participating children. One can follow a set of guidelines to maximize the equipment efficiency when considering or purchasing equipment for the use in movement development programmes as described as follows. Equipment must be adapted to conform to the size of the child, and increase in growth. The equipment providing information/feedback to the child regarding his or her motor performance must be very effective, in such a manner that it encourages the child to move mechanically correct. Furthermore, the equipment must be adaptive to and selected according to any visual and/or perceptual deficits any child may have. (Pienaar, 2012). Likewise, development of a normal posture must be encouraged during performance of any activity and the child must always be considered when designing, making and/or setting up equipment (Pienaar).

Early adolescence, approximately between the ages of 10 to 14, is a time of great change for young people. It is regarded as a time when many physical changes are occurring at an accelerated rate. As adolescents grow and develop, these young people are influenced by outside factors such as parents, peers, community, culture, religion, school, world events and the media. Girls are also seen to develop and physically mature faster than boys during this stage (Spano, 2004). Thus, in light of these factors, a motor skills development programme may prove to be beneficial and provide the needed opportunities for motor skill development if implemented correctly and efficiently by influential peers during this period.

Tober and Pollak (2005) posit that balance and bilateral coordination are regarded as very important motor skills that may play a role in the home- and school environment. Proficiency in these skills may also influence school children's participation in physical activity including sports. A study performed by Tober and Pollak, assessed and compared the motor proficiency of nine year-old children raised in orphanages before being adopted with the motor proficiency of their peers raised by their birth family and in a stable home environment. Results indicated that the children, from a previously disadvantaged background such as being raised in an orphanage, presented delayed balance and bilateral coordination and that these delays persisted over time. Therefore, one might expect to find similar delays in other children from previously disadvantaged schools and –backgrounds (Roeber, Tobber, Bolt & Pollak, 2012). Roeber et al. argued that children from a previously disadvantaged background do not simply benefit from environment enrichment and that this is not beneficial for the correction of delays in motor skills. Roeber et al. further noted that previously disadvantaged children may benefit from early identification as well as a specific and targeted intervention programme. Thus, balance and bilateral coordination were chosen as the focus of the motor skills development programme designed for the current study.

Theories of Motor Skill Development

Dynamical systems theory is a framework that seeks to explain changes that occur during motor skill performance and the underlying factors that influence the skills (Magill, 2004; Newell, 1984; Thelen & Ulrich, 1991). Movement, according to this theory, is considered as deriving from a complex and multifaceted interaction among the individual, the task, and the environment (Newell, 1984). Fundamental motor development is influenced by the interaction of cooperating subsystems (Gallahue, 1987; Ulrich & Ulrich, 1993).

Dynamical Systems Theory

Dynamical systems theory considers the individual as a system comprising multiple interacting subsystems such as the individuals' experience, abilities, strength, and motivation, resulting in a product that is the result of the interaction of these subsystems (Gallahue & Ozmun, 2006; Ulrich & Ulrich, 1993). A change in one subsystem could influence the outcome of overall performance. Factors such as difficulty of task, the size and weight of equipment, the nature of playing area, and the individuals' skill level are examples of subsystems that influence performance (Newell, 1984). From the dynamical systems perspective, movement patterns do not develop in a series of highly predictable movements or levels, instead patterns may change over time with some probabilities (Clark & Philips, 1993; Garcia & Garcia, 2002).

Human movement involves many potential movement patterns, degrees of freedom, and these variables within the system are free to vary as movement occurs. Specific patterns are involved in developing specific motor skills. Degrees of freedom within a task subsystem must be reduced to offer stability to the movement. The stable pattern of behaviors that are observed across multiple trials and task conditions are called behavioral attractors (Clark & Philips, 1993; Langendorfer & Roberton, 2002). Behavioral attractors are common patterns of movement occurring under specific conditions (Clark & Phillips, 1993). The resulting stable behavior will be stable to the degree that the cooperating subsystems continue to act together (Thelen & Ulrich, 1991). Attractor pathways are the common patterns that change over time (Hamilton & Tate, 2002). Attractor states are not always stable and they may change with time due to changing relationships between subsystems or changes in constraints that also change with time (Hamilton & Tate, 2002).

Dynamical systems theory suggests that cooperating subsystems are driven to self-organize and reduce the degrees of freedom that result in a more stable movement. When the individual is driven to a new attractor state or movement pattern, a control parameter initiates a perturbation that prompts the individual to move from an old inefficient movement pattern to a more stable and efficient movement form (Thelen & Ulrich, 1991). Control parameters are physical variables within systems or subsystems. As these variables change with the system, the behavior of the system also changes. Examples are motivation experience gained from practice and strength. Dynamical systems theorists refer to this process as a phase shift. Phase shifts are the result of gradual or sudden changes in variables or subsystems that make the body move from one pattern to another. During the process of a phase shift, a lot of variability is observed in the individual's performance, but as the movement is stabilized into new patterns, performance changes. Sometimes a phase shift will bring about more efficient patterns of movement and in other situations phase shifts result in a regression in the movement pattern (Garcia & Garcia, 2002). For example, a child learning to catch may be scooping to catch balls tossed to him or her. But as the learner is continuously prompted to get the hand out in front, keep eyes on ball and catch with the hands within a few trials, the child starts to catch with the hands.

The control parameter in this instance is the act of the hand and tracking of the ball with the eyes. The child is now catching with the hands and this becomes the new attractor state. Control parameters are believed to be primarily responsible for the changes in movement performance. These could be variables, that when altered, allows the system to re-organize itself in a different way (Langendorfer & Roberton, 2002). Control parameters do not necessarily have to be task related but could be biomechanical or environmental factors. Parameters can be identified by determining the essential variables of a skill or task (Hamilton & Tate, 2002). Some examples are size and weight of equipment, degree of difficulty of task, and the environment in which the task will be performed. These may cause the individual to reorganize movement patterns when scaled to a critical value to achieve a stable movement pattern.

Constraints Model

Constraints are defined as boundaries, parameters, or features that limit motion and reduce the number of possible configurations of a system (Newell, 1984). These constraints, according to Newell (1984), can serve to promote or limit motor development. Newell (1984) identified three constraints (learner, task, and environment) that act upon the child, which go a long way to determine the acquisition of fundamental motor skills and movement patterns. Learner or organismic constraints can include factors such as body weight, strength, height, and balance (Garcia & Garcia, 2002; Hamilton & Tate, 2002). Task constraints can include the goal of the task, rules, and the equipment available. The environmental constraints are those that are external to the child, they include temperature, the surface of play area, indoor or outdoor facility (Newell, 1984). Newell explains that individuals' motor responses are results of the interaction of the constraints in a given context. Newell's constraints perspective provides a guide for teachers in developing instructional strategies in order to enhance the motor development of children. Although instruction was not clearly identified as a task or environmental constraint, teachers can manipulate the task constraints, clarify the task, and arrange the environment to be convenient for practice. The opportunities enable a child to practice a skill and the quality of the instruction that goes with it would be considered a constraint on the outcome of the movement.

For this study, instructional strategies were considered environmental constraints. Thus, the type of instruction, direct or mastery motivational climate, constrained the emergence of motor skills development. Task constraints were determined according to the activities for motor skills. A hierarchical instructional task analysis was used in developing tasks for the intervention and so the task constraint differed from task to task.

Theoretical Model of Motor Skills Development

Current literature in physical activity generally has not focused on the developmental nature of motor skill competence and its role in promoting physical activity across time (e.g. Haywood & Getchell, 2005). In essence, investigators have focused on measuring physical activity in children without understanding that learning to move is a necessary skill underlying physical activity. In the early childhood years, children begin to learn a group of motor skills known as fundamental motor skills (FMS). FMS are composed of locomotor skills and object control skills. Locomotor skills involve moving the body through space and include skills such as running, galloping, skipping, hopping, sliding, and leaping (Haywood & Getchell). Object control skills consist of manipulating and projecting objects and these involve skills such as throwing, catching, bouncing, kicking, striking, and rolling (Haywood & Getchell, 2005). These skills form the foundation for future movement and physical activity (Clark & Metcalfe, 2002; Seefeldt, 1980). In essence, these FMS, are the equivalent of the ABCs in the world of physical activity. With respect to the "fundamental patterns period" of development, Clark and

Metcalfe (2002) stated that "the overall goal of this period is to build a sufficiently diverse motor repertoire that will allow for later learning of adaptive, skilled actions that can be flexibly tailored to different and specific movement contexts" (Metcalfe, 2002, P. 86). If children cannot proficiently run, jump, catch, throw, etc., then they will have limited opportunities for engagement in physical activities later in their lives because they will not have the prerequisite skills to be active.

Two models of motor development have emphasized the importance of FMS in later physical activity (Clark & Metcalfe, 2002; Seefeldt, 1980). About two decades ago, Seefeldt suggested that competency in FMS was necessary to break through a hypothetical "proficiency barrier" that would allow individuals to apply these FMS, to sports and games. The researcher's experiences with children over the years have led to share Seefeldt's perspective, yet there is no empirical evidence to support this developmental view. More recently, Clark and Metcalfe (2002) spoke of the "mountain of motor development" and contended that FMS are precursors to context-specific and skillful movement. That is, to reach the "top of the mountain" of motor development and be physically skillful and active, children must first acquire competency in FMS to apply these skills in different contexts (e.g., sports and lifetime activities). Clearly, FMS are important stepping-stones to motor development, and, the researcher believes that lifelong physical activity hinges on it. Other comprehensive theoretical models have been proposed to address the determinants of physical activity, but these have focused more on social cognitive and/or expectancy-value-based approaches (Eccles & Harold, 1991; Harter, 1978; Trost, 2007).

Although these models have contributed greatly to the literature and provided a partial understanding of the underlying factors in physical activity, the focus of these models has been on the psychological dimension and children's perceptions of their motor competence, mastery attempts, and task persistence. Harter (1978) stressed that mastery engagement and attempts build a child's perception of his or her competence, which in turn, influence the child's persistence in a task (Harter, 1978, Harter & Connell, 1984). In essence, a child's perceptions of competence influence whether he/she will maintain engagement in an activity. Scholars (e.g. Eccles & Harold, 1991; Eccles & Wigfield, 2002; Eccles, Wigfield, & Schiefele, 1998) share a similar perspective by expressing perceptions of competence in relation to task difficulty influence involvement in an activity. The researcher values and supports this view. However, an underlying mechanism in these models, not adequately addressed, is the notion of actual motor competence. As the researcher shall discuss further, perceptions of competence are contextually situated. The researcher suggests that across developmental time, if a child does not have actual motor competence, perceptions of competence will drop when that child is better able to evaluate his or her competence level (Goodway & Rudisill, 1997).

A child's perceptions of competence are situated within the difficulty of the task. To use expectancy-value model-based terminology, expectancy-related beliefs and subjective task value influence a child's performance, effort, and persistence in a task (Eccles et al., 1983; Eccles & Wigfield, 2002; Eccles et al., 1998). The researcher believes that task difficulty is not just dependent on self-perceptions of ability rather, it is also linked to actual motor competence. A task is only difficult if the individual does not have the prerequisite skills to be successful in performing it. The researcher believes that the model is unique in that the researcher contended that actual motor competence interacts with other variables such as perceived competence and is one of the most powerful underlying mechanisms influencing engagement and persistence in physical activity.

One model by Welk (1999) has addressed the area of motor competence but different from the current proposed model. Welk (1999) categorized the five most commonly reported determinants/correlates of physical activity into (a) personal, (b) biological, (c) psychological, (d) social, and (e) environmental. Overall, the most common determinants of physical activity (summarized by Welk) have been self-efficacy, perceived competence, enjoyment, parental influence, and access to an appropriate environment. Welk's (1999) conceptual model holds that biological factors such as physical skills and fitness act as "enabling factors" that are promoted by physical activity with increased fitness and skillfulness leading to increased persistence in physical activity and enhancement of perceived competence and self-efficacy. However, Welk indicated that "while direct effects of biological factors are possible, indirect effects through the child's perception of competence are perhaps more likely" (p. 14). Furthermore, Welk stated, "with respect to competence, evidence shows that children's perceptions (of competence) may be more important than actual ability" (p. 15).

The current research believes that the development of motor skill competence is important in its own right, by either encouraging or discouraging (depending on the level of competence) individuals' physical activity levels. In addition, the researcher accepts that the emergent relationship between the development of motor skill competence and physical activity over time is mediated by other factors including perceived motor skill competence, physical fitness, and obesity. Thus, the researcher's view that developing motor competence or skillfulness is paramount to understanding why individuals choose to be either active or inactive.

A common misconception is that children "naturally" learn FMS; however, scholars maintain that many children do not obtain proficiency in FMS development (e.g. Goodway & Branta, 2003; Hamilton, Goodway, & Haubenstricker, 1999; Langendorfer & Roberton, 2002). Many of these children might not attain sufficient competence in FMS to be motorically competent as adults (Goodway & Branta, 2003; Goodway et al., 2003; Williams, Haywood, & VanSant, 1991). More recently, a disturbing trend has emerged revealing that low-income Hispanic and African American preschool children in urban Head Start centers start school developmentally delayed in FMS development (Goodway & Branta, 2003; Goodway & Rudisill, 1997; Goodway et al., 2003). It is noteworthy that national data on adolescent physical inactivity mirrors the data on early childhood FMS delays. That is, African American and Hispanic adolescents have lower physical activity than their White counterpart. Children raised in low-income environments have lower physical activity than children with higher incomes, and children in urban centers have lower activity levels than those in the suburbs (Malina, 1996). It has been suggested that children who participate in sport and achieve greater levels of motor skill competence during childhood and adolescence will remain active participants in physical activity into adulthood (Malina).

In fact, Tammelin, Nayha, Hills, and Jarvelin (2003) showed that participation in sport-related activities as an adolescent was a strong indicator of physical activity into adulthood. The information presented by Malina (1996) and Tammelin, et al. (2003) laid the foundation for hypothesizing the importance of developing motor skill competence as an important approach to impact physical activity and obesity.

It is interesting that even though Welk (1999) asserts that the importance of "actual" competence/skillfulness is overshadowed by an individual's "perceptions" of competence, he also states that children need to master a variety of physical skills to participate in different physical activities. "With a broader repertoire of physical skills, children will have a greater chance of finding activities that they can do well and enjoy" (p.17). Welk's comments reflect the basis for the current model and the general consensus of the motor development literature (Clarke & Metcalfe, 2002; Haywood & Getchell, 2005; Seefeldt, 1980) that motor skill competence is foundational to engagement in physical activity. Noting the general lack of importance placed on the development of motor skill competence in previous theoretical models pertaining to determinants of physical activity, the researcher has developed a heuristic model representing what the researcher believes are important concepts that have been identified in the literature but have not been integrated and systematically linked to the understanding of why so many individuals are physically inactive.

Conceptual Framework

At the heart of this conceptual model is a reciprocal and developmentally dynamic relationship between motor skill competence and physical activity. Motor skill competence is defined in terms of proficiency in common FMS including object control and locomotor skill development. The researcher believes that the relationship between motor skill competence and physical activity will strengthen over developmental time.

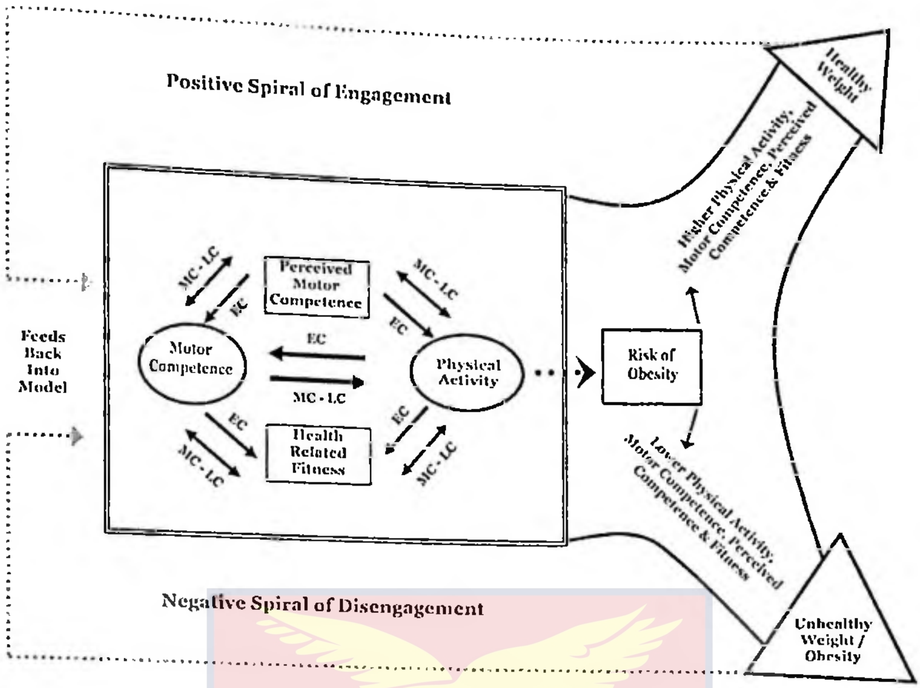

Figure 2. — Developmental mechanisms influencing physical activity (Seefeldt, 1980).

Seefeldt (1980) indicated there might be a "critical threshold" of motor skill competence, above which children will be active and successfully apply FMS competence to lifetime physical activities, but below which they would be less successful and ultimately drop out of physical activities at higher rates. The idea of this critical threshold of motor skill competency is yet to be investigated. In their analogy of the mountain of motor development, Clark and Metcalfe (2002) observed that FMS represent the "base camp" from which children will climb up the mountain of motor development to achieve context-specific motor skills (p. 176). During this time, Clarke and Metcalfe acknowledge that children will follow different "developmental trajectories" in climbing the motor development mountain based, in part, on individual constraints and environmental opportunities. The researcher supports this view in the current proposed model.

The researcher suggests that young (early childhood) children's physical activity might drive their development of motor skill competence. Increased physical activity provides more opportunities to promote neuromotor development, which in turn promotes FMS development (Fisher et al., 2005; Okely, Booth, & Patterson, 2001). Overall, young children demonstrate various levels of motor skill competence primarily because of differences in experience. These differences are the result of many factors including immediate environment, presence of structured physical education, socioeconomic status, parental influences, climate, etc (Goodway & Branta, 2003; DiLorenzo, Stucky-Ropp, Vander Wal, & Gotham, 1998; Sallis, Prochaska, & Taylor, 2000). Thus, the researcher hypothesizes that young children will demonstrate variable levels of physical activity and motor skill competence that are weakly related at this point in developmental time. As children transition to middle and late childhood, the current research hypothesizes that the relationship among levels of physical activity and measures of motor skill competence will strengthen. Thus, the individual and environmental constraints operating during early childhood will compound over time to result in a stronger relationship between physical activity and motor skill competence. In middle and later childhood, higher levels of motor skill competence will offer a greater motor repertoire to engage in various physical activities, sports, and games. At this time, the researcher expects that moderately to highly skilled children will self-select higher levels of physical activity, whereas children with less-proficient levels of motor skill competence will engage in lower levels of physical activity. At this point, the researcher believes that motor skill competence drives physical activity levels (Clark and Metcalfe, 2002).

The hypothesis that the relationship between motor skill competence and physical activity will strengthen over time is a novel concept that has not been addressed in literature. Studies have examined this relationship in various age groups from approximately 3 (Fisher et al., 2005; McKenzie et al., 2002; Sääkslahti et al., 1999) to 16 years (Okely et al., 2001) and into adulthood (Tammelin et al., 2003) with no acknowledgment that the relationships might differ across developmental time. However, results from previous studies have generally shown that the strength of the relationship between motor skill competence and physical activity in children, especially younger children, has been weak in comparison with the data on older children, adolescents, and adults (Tammelin et al.).

The researcher also believes there are additional factors that interact with the relationship between motor skill competence and physical activity as it strengthens over time. These dynamic interactions provide additional support for this novel developmental hypothesis. Previous investigations that have examined the relationship between motor skill competence and physical activity have generally failed to consider the critical role of mediating variables such as perceived motor skill competence, health-related physical fitness, and obesity, which might interact with and promote/demote this dynamic relationship between motor skill competence and physical activity (Tammelin et al., 2003).

Role of Perceived Motor Skill Competence in the Conceptual Model

A child's perception of his or her motor competence is a developmental phenomenon that changes across developmental time (Harter, 1999). In the early years, young children demonstrate limited accuracy in perceiving their motor skill competence and generally show inflated levels of perceived competence relative to their actual motor competence (Goodway & Rudisill, 1997 & Harter, 1978). Specifically, young children do not possess the cognitive skills to distinguish accurately between actual motor skill competence, ability, and effort (Nicholls, 1978). Young children under 7 years of age often perceive higher expenditure of effort or mastery attempts with greater levels of motor skill competence.

Their perceived competence is tied to mastery attempts and ultimately task persistence (Nichollas, 1978; Miller, 1995). A child might have low levels of actual motor competence but perceive her/himself to be highly skilled. As a result, the current research expects that perceived motor skill competence will not be strongly correlated to actual levels of motor skill competence nor physical activity during early childhood. In early childhood, however, the inflated perceived motor skill competence might be valuable to drive the acquisition of motor skill competence because children will continue to persist and engage in mastery attempts in activities in which they believe they are skillful.

The transition from early to middle childhood marks an important developmental time when the role of perceived motor skill competence begins to change in regard to the role it plays in the relationship between motor skill competence and physical activity. By middle childhood, children have shifted to higher levels of cognitive development and have a more sophisticated cognitive capacity to begin to accurately compare themselves to their peers. As a result, their perceived motor skill competence more closely approximates their actual motor skill competence (Harter & Connell, 1984). Consequently, less-skilled children will have lower perceived competence and perceive many tasks as more difficult and challenging. Correspondingly, more-skilled children will have higher perceived competence, perceive tasks as less difficult, and engage in more frequent mastery attempts. The researcher, therefore, expects to find stronger relationships between perceived motor skill competence, actual motor skill competence, and physical activity. In fact, Davison, Symons, and Birch (2006) examined the relationship between girls (ages 9–11) perceived competence and self-reported physical activity using a path analysis and found that perceived motor skill competence explained 27% of the variance in girls' physical activity. Unfortunately, they did not test the girls' actual motor skill competence.

The shift from early childhood to middle childhood marks the beginning of a period of vulnerability during which children who have lower actual motor skill competence correspondingly, demonstrate lower perceived motor skill competence and are less physically active. They usually opt out of physical activity because (a) they understand they are not as competent as peers (Goodway & Rudisill, 1997; Horn & Weiss, 1991); (b) they do not want to publicly display low motor skill competence, and (c) they have a limited motor repertoire and will be less motivated to participate in physical activities that demand high competence levels.

Generally, as these variables interact, a child who has low motor competence will find physical activity less enjoyable than their more advanced peers (Halliburton & Weiss, 2002). The researcher believes that most children and adolescents who perceive themselves as having low motor skill competence, and actually demonstrate low levels of motor skill competence, will be drawn into a negative spiral of disengagement (see Figure 2.) in which low levels of motor skill competence will be significantly related to lower perceived motor skill competence and, subsequently, lower levels of physical place these individuals at risk for being obese during later childhood, adolescence, and adulthood. Across developmental time, the negative spiral of disengagement compounds results in higher levels of physical inactivity and obesity.

The researcher hypothesizes that an opposite positive spiral of engagement will occur among moderately and highly skilled children. Children with higher perceived and actual motor skill competence will more likely persist in physical activities, especially those they perceive as fun and intrinsically rewarding (Fisher et al., 2005; Smith & O'keefe, 2001). A positive spiral of engagement results in greater physical activity for these higher-skilled children because (a) engagement in physical activity provides more opportunities to further develop their motor skill competence and motor repertoire, (b) engagement in physical activity leads to the development of higher and more accurate perceptions of motor skill competence, and (c) physical activity will be fun and rewarding. As children move from childhood to adolescence, an obvious and significant "physical activity divide" will occur between low-skilled, inactive children who perceive themselves as poorly skilled, and their higher skilled more active counterparts who find physical activity rewarding and fun.

A study conducted by Seefeldet (2004) examined the relationship between perceived motor skill competence, actual motor skill competence, and physical activity. Another study by Wrotniak, Epstein, Dorn, Jones, and Kondilis (2006) also examined the relationship among motor skill competence using the Bruininks-Oseretsky Test of Motor Proficiency (BOT), children's self-perceptions of adequacy in performing and desire to participate in physical activity, and physical activity (measured by an Actigraph accelerometer) in 8- to 10-year-old children. Motor skill competence was positively associated with physical activity and perceptions of adequacy in performing and inversely associated with sedentary activity. Southall, Okely, and Steele (2004) assessed the relationship between perceived motor skill competence and actual motor competence in fifth- and sixth-grade (mean age = 10.8 years) overweight and nonoverweight children. They reported that overweight children had significantly lower actual and perceived motor skill competence than nonoverweight children. Physical activity was not measured in their study. In contrast, Ulrich (2000) did not find a relationship between perceived motor skill competence and participation in sports in younger children, supporting the current research's contention that this relationship will be different in young children. These studies provide indirect support for the idea that perceived motor skill competence is a mediating variable that differentially influences the relationship between the development of actual motor skill competence and physical activity over time. The researcher believes, however, that actual motor skill competence is the limiting factor in our model in middle to late childhood because of the fact that perceived competence is, in effect, an indirect measure of actual motor skill competence in older children. Thus, the mediating effect of perceived motor skill competence on physical activity in middle to late childhood is primarily based on the actual level of motor skill competence.

Role of Health-Related Physical Fitness in the Conceptual Model

Health-related fitness might also play a mediating role in the emergent relationship between physical activity and motor skill competence. Infact, the acquisition of motor skill competence in FMS in early childhood (2–5 years of age) serves to promote physical fitness, because time spent initially developing these skills promotes increased physical activity and neuromotor development (Enoka, 2002; Fleisig, Barrentine, Zheng, Escamilla, & Andrews, 1999; Wrotniak et al., 2006). Again, because of the fact that children will demonstrate variable levels of motor skill competence in early childhood, the researcher does not believe there will be a strong relationship between fitness and motor skill competence or physical activity in early childhood.

As children move from early to middle childhood, those children with intermediate to high levels of motor skill competence, and correspondingly more physical activity, should demonstrate greater health-related fitness and higher performance scores. These relationships are arguably true because the development and performance of many FMS involve ballistic actions by the body, which place an increased demand on the neuromuscular system to generate and transfer momentum optimally through the kinetic link system. These skills require the manipulation of one's entire body mass against gravity with an increased demand for higher strength and power outputs.

Three fundamental aspects involved in the development of muscular strength include (a) the ability to effectively recruit motor units, (b) the ability to increase motor-unit firing rates, and (c) a decreased level of coactivation of muscle agonists and antagonists (i.e., coordinated muscle recruitment). All three of these factors are part of developmental neuromuscular adaptations that occur as children acquire FMS. These aspects of neuromuscular development are generally discussed in the realm of strength and resistance training but are also critical for the development of any goal-directed movements (i.e., motor skills).

In middle to late childhood, higher levels of motor skill competence in FMS allow individuals to persist in activities long enough to demonstrate more consistent improvement in motor skills and be more successful. Children who are more physically fit later in childhood will be more likely to maintain physical activity for longer periods of time and continue to improve motor skill competence (Pate, Trost, Levin, & Dowda, 2000). In effect, the relationship between motor skill competence and physical fitness becomes more reciprocal in nature during late childhood and adolescence. In later childhood and adolescence, during which the culture of sport becomes increasingly important for many individuals in most African countries including Ghana (Pate, Trost, Levin, & Dowda), more advanced levels of motor skill competence ought to be strongly related to greater health-related physical fitness and physical activity levels. In fact, persistence in sport activities that demand high levels of motor skill competence for successful participation during adolescence has actually been associated with high levels of adult physical activity (Tammelin et al., 2003).

Children who do not have adequate levels of motor skill competence will not continue to be physically active into middle and later childhood and, therefore, will not further develop or maintain aspects of health-related physical fitness. Low fitness levels will negatively influence a child's ability to persist in physical activities that require adequate levels of physical fitness and will limit further development of motor skill competence. Thus, physical fitness acts as a mediating variable with the relationship among physical fitness, motor skill competence, and physical activity, increasing in strength over developmental time.

Role of Obesity in the Conceptual Model

The relationship between physical inactivity and obesity is well established in the literature (e.g. Andersen, Crespo, Baetlett, Cheskin & Pratt, 2008; Freedman, Khan, Serdula, Galuska, & Dietz, 2002). What is not clear are the underlying mechanisms resulting in that relationship. Overweight children have greater difficulty performing motor skills, especially locomotor skills, because of their increased overall mass (Goodway & Branta, 2003). Indeed, higher mass results in lower locomotor competence. Consequently, they are less likely to be physically active throughout childhood (Berkey, Rocket, Gillman, & Colditz, 2003), and when they do attempt physical activities, they will experience less success. McKenzie et al. (2004), and Okely and Booth, (2004) found body composition to be significantly associated with motor skill competence levels. In addition, Okely et al. (2004) indicated that intervention strategies stressing increased motor skill proficiency (especially in locomotor skills) might be a key component to prevent "unhealthy" weight gain in children and adolescents.

As demonstrated in the current model, the researcher believes that there is a dynamic and reciprocal relationship between obesity and the four factors within the model (physical activity, motor skill competence, perceived motor competence, and physical fitness). Over time, there will be a positive spiral of engagement with high motor skill competence, higher perceptions of motor skill competence, greater physical activity, and higher levels of health-related physical fitness promoting a healthy weight status. Concurrently, there is a negative spiral of disengagement in physical activity with low motor skill competence, low perceptions of motor skill competence, less physical activity, and poor health-related physical fitness leading to increased weight and obesity. Increased obesity levels will then feed back into the model and continue to negatively load on these factors as part of the spiral of disengagement. Thus, obesity is both a product of the interaction of variables and a mediating variable in how it interacts within the model as described by the positive or negative spiral of engagement/disengagement. On the negative end, high levels of obesity will have a greater impact on the spiral of disengagement. These synergistic relationships compound over time, perhaps account for the increase, maintenance, or decrease in physical activity during adolescence and into adulthood.

Summary

The above literature review touched on motor skills variables such as balance, agility and coordination which are considered as stability motor skills. The researcher reviewed literature around the following; concept of motor skills development, factors responsible for motor skills development, how children develop motor skills, importance of motor proficiency, motor skills development programme, overview of motor skills assessment and role of health-related physical fitness in the conceptual model. The literature revealed that there are few studies on the use of developmental games for motor skills development of school children. The few that exist were conducted to improve conditions of Down syndrome victims or correct other health conditions. Though few of these studies were conducted in Africa none in Ghana to the best of the researcher's knowledge. It is clear that the problem of physical inactivity and increasing health challenges in our society is multifaceted, with many factors influencing these disturbing trends. This had helped the researcher in giving direction for the current study "impact of developmental games in motor skills development of school children in the Cape Coast Metropolis". It was clear from the literature that no study has so far been conducted on how developmental games can be appropriately used to develop motor skills of school children in Ghana. Suitable tests to employ were selected and presented in chapter three.

CHAPTER THREE

RESEARCH METHODS

The purpose of the current study was to examine the impact of selected developmental games on balance, agility and coordination of children between the ages of 10 and 12 years-old in the Cape Coast Metropolis. This chapter discusses the research design used to investigate the study, the population, the sample and sampling procedure employed in the study. The chapter also explained the instrument for data collection, validation and reliability of the instrument, data collection and data analysis procedures.

Research Design

This study adopted a quasi-experimental approach. The pre-test, post-tests control group design was used for the study. A quasi-experiment is an empirical study used to estimate the causal impact of an intervention on its target population without random assignment. It shares similarities with the traditional experimental design or randomized controlled trial, but it specifically lacks the element of random assignment to either the treatment or control group. The quasi-experimental design typically allows the researcher to control the assignment to the treatment condition, by using a criterion other than random assignment (Dinardo, 2008). Leedy and Ormrod (2010) also opined that in quasi-experimental research, the researcher manipulates the independent variable and examines its effects on another (i.e. the dependent variable).

According to Mouton (2001) a research design is the blueprint of how researchers plan to best conduct their research. As researchers attempt to increase external and ecological validity, the careful and complete control of the true designs becomes increasingly difficult, if not impossible. The purpose of the quasi-experimental designs is to fit the design to settings more like the real world while still controlling as many of the threats to internal validity as possible. The use of these types of designs in kinesiology, physical education, exercise science, sport science, and other areas (education psychology, and sociology) has increased considerably in recent years (Thomas et al., 2005).

A quasi-experimental design was accordingly used for the current study given that the research population already belonged to existing groups (Baumgartner et al., 2002) in the form of Primary 5 classes. This prevents randomised selection and placement into different sample groups (Bernard, 2000; Thomas et al., 2005). Its greatest strength is the ability to assess causal outcomes and impact (Mouton, 2001).

Since quasi-experimental designs are used when randomization is impractical and/or unethical, they are typically easier to set up than true experimental designs, which require random selection of subjects. Additionally, utilizing quasi-experimental designs minimizes threats to ecological validity as natural environments do not suffer the same problems of artificiality as compared to a well-controlled laboratory setting. Since quasi-experiments are natural experiments, findings in one may be applied to other subjects and settings, allowing for some generalizations to be made about the population. Also, this experimentation method is efficient in longitudinal research that involves longer time periods which can be followed up in different environments. Other advantages of quasi-experiments include the idea of having any manipulations the experimenter chooses. In natural experiments, the researchers have to allow manipulations to occur on their own and have no control over them. Also, using self-selected groups in quasi-experiments also eliminates the chance of ethical, conditional concerns while conducting the study (Durue, 2012).

Notwithstanding the above strength, there are some disadvantages associated with quasi-experimental research. The study groups may provide weaker evidence because of the lack of randomness. Randomness brings a lot of useful information to a study because it broadens results and therefore gives a better representation of the population as a whole. Using unequal groups can also be a threat to internal validity. If groups are not equal, which is sometimes the case in quasi-experiments, the experimenter might not be positive what the causes are for the results (Morgan, 2016).

Quasi- experimental design was adopted for the study because the setting prohibits the formation of artificial groups. Like true experimental designs, quasi-experiments include assignment, but not random assignment of participants to groups. This is because the experimenter cannot artificially create groups for the experiment. Again, since the researcher seeks to use human beings for the study, controlling the activities of these human beings may be a challenge. The nature of the study cannot permit the researcher to camp the participants of the study under a controlled environment, hence the need for the researcher to adopt the quasi-experimental design. The quasi-experimental design is a type of experimental design in which the researcher has limited leverage and control over the selection of study participants. Specifically, in quasi-experiments, the researcher does not have the ability to randomly assign the participants and/or ensure that the sample selected is as homogeneous as desirable (Leedy & Ormrod, 2010). According to Shadish, Cook and Campbell (2005), quasi-experimental research is used to evaluate the effectiveness of an intervention when the intervention has been implemented by educators prior to the consideration of the evaluation procedure. The design for this study involves pre-intervention and post-intervention measurements as well as non-randomly selected control groups. This design is preferred because the study was conducted under the conditions that do not permit total control of the intervening variables that can affect the participants. According to Shadish, Cook and Campbell (2002), quasi-experimental designs do not allow one to make definite causal inferences. However, they provide necessary and valuable information that cannot be obtained by experimental methods alone. Also, the design is preferred because it reduces the time and resources required because extensive pre-screening and randomization was not required or utilized. Also, where the sample is small and randomization is not possible, as in the case of this study, this design is preferred. It is also suitable for real natural world setting. It allows the researcher to evaluate the impact of quasi-independent variables under naturally occurring conditions.

Quasi-experiments work well in natural settings (Schoenfeld, 2006). Though the design lacks random assignment and suffers selection biases, its purpose is to select participants with certain characteristics to be studied. Nevertheless, quasi-experiments still provide fruitful information for the advancement of research (Leedy & Ormrod, 2010). Glaerman, Levy, and Myers (2002) concluded that quasi-experiments, when compared to true experiments, often result in substantially different findings. Such differences were, however, considerably minimal for high quality quasi-experiments. Thus, quasi-experiments are based on creative design techniques to reduce the various threats that may cause the study's findings to be invalid or unreliable (Green, 2006).

Study Area

The study is situated in the Cape Coast Metropolis in the Central Region of Ghana. The Metropolis covers an area of 122 square kilometers and is the smallest Metropolis in the country. It is located on longitude 1° 15' W and latitude 5° 06' N. With its administrative capital as Cape Coast, the Metropolitan Area is one of the oldest districts in the country. It was raised to the status of Municipality in 1987 and upgraded to Metropolitan status in 2007. It is bounded on the south by the Gulf of Guinea, west by Komenda Edina Eguafo/Abrem Municipal, east by the Abura Asebu Kwamankese District and north by the Twifo Hemang Lower Denkyira District. The population of the Metropolis according to 2010 population and housing census stands at 169,894 with 82,810 male and 87,084 females. It plays host to a lot of prominent higher educational institutions including St Augustine College, Mfamtsipim SHS, Adisadel College, Wesley Girls SHS, Holy Child SHS, Aggrey Memorial SHS, Ghana National SHS, OLA College of Education, Cape Coast Nursing and Midwifery Training College, Cape Coast Technical University and University of Cape Coast. There are several basic schools within the catchment area of the Metropolis. The famous Cape Coast Castle is located along the coast and attracts a lot of tourists visiting the Metropolis. Most of the indigenes are fishermen, traders, farmers and few are clerical workers.

Population

The population for this study comprised primary schools in the Cape Coast Metropolis. There are about 142 accredited primary schools in the Metropolis. These schools comprise 66 public primary schools and 76 private primary schools. Out of the public schools, 55 are designated as advantaged while 11 are classified as disadvantaged; due to low socio-economic status of the catchment area. Average total population in Class five in the public schools was 2310 out of which 430 were in the disadvantaged schools and that of the private schools was about 2695 (Metro Education Statistical Record, 2016).

Thus, the target population is 2310 and the accessible population is 430. The pupils aged between 10-12 years. This category of children enjoys a lot of purposeful movement activities, including gross motor activities.

The various primary schools in the metropolis are located in six different circuits. These include Cape Coast, Aboom, Bakaano, OLA, Pedu/Abura and Efutu circuits. Cape Coast hosts 29 primary schools, 10 public and 19 private, Aboom has 14 schools, 11 public and 03 private, OLA has 15 schools, 07 public and 08 private, Pedu/Abura circuit hosts the highest number of primary schools totaling 33, public 12 whiles private 21 and Efutu circuit hosts 27 schools, 12 public and 15 private (Metro Education Statistical Record, 2016).

Most of these schools have class teachers who teach all subjects on the class timetable. Only few schools including private ones adopt subject teaching. In most of these schools, some subjects including physical education which is practical subject and aims at total development of the school children inadvertently receives less or no attention. This action of most schools violate the human rights of our school children, as it is expected that everyone must have full opportunities for engaging in physical education and sports to develop his/her physical fitness and potentials (UNESCO Charter on PE, 1978).

Sampling Procedure

Random sampling method was used to select the St Francis Xavier Primary school. The names of the eleven schools were written on folded pieces of papers and mixed up in a bold out of which one was picked. Most of the children in the selected school are from a previously disadvantaged community. The school is therefore, classified as one of the previously disadvantaged in the Cape Coast Metropolis (G.E.S Metro Statistical Unit, 2016). It is reported that children from a lower socio-economic bracket perform worse in motor activities, and this may be attributed to malnutrition and decreased participation in physical activity (Mészáros et al., 2008). On the other hand, Purposive sampling method was used to select the class, primary five which consists of 42 children within the target age group (Baumgartner et al., 2002).

This study aimed to recruit children (N-30) between the ages of 10 and 12 years were assigned as the experimental group consisting of (15 girls and 15 boys). This number was arrived at considering the seven hours during the school hours that all participants have to be tested after every four weeks of intervention. Random sampling was used to select five boys and five girls from primary five for each of the age groups, 10, 11, and 12 years into strata. The researcher selected this sample size to meet the demands of the test battery Bruininks-Oseretsky Test of Motor Proficiency-2 [BOT-2] (Bruininks & Bruininks, 2005), which takes 15- 20 minutes to test each participant. Also, all participants were tested at the school. They completed the test during the normal time provided for the test, which is from 8.00am to 2.00pm. In quasi-experimental study, sample size is not large because in general, sample size depends on the nature of the analysis to be performed, the desired precision of the estimates one wishes to achieve, the kind and number of comparisons that were made, the number of variables that have to be examined simultaneously and how heterogeneous a universe is sampled. As noted by Salant and Dillman (1994), if the key analysis of a randomised experiment consists of computing averages for experimental and controls in a project and comparing differences, then a sample under 100 might be adequate.

Data Collection Instrument

During the pre- and post-tests, the experimental group completed the adopted Short Form, as well as the rest of the balance, agility and bilateral coordination subtest activities in the Long Form of the BOT-2 (Bruininks & Bruininks, 2005). This motor proficiency test has been extensively used in school environments (e.g. Plimpton & Regimbal, 1992; Hay & Missiuna, 1998; Reeves et al., 1999; Nourbakhsh, 2006; Wrotniak et al., 2006; Venetsanou et al., 2007; Faught et al., 2008; Venetsanou et al., 2009) and its use is recommended for instances where a brief, screening picture of motor proficiency is required (Bruininks & Bruininks, 2005; Deitz et al., 2007). The motor skills development programme was compiled using information gathered from an extensive literature review (Cheatum & Hammond, 2000; Bruininks & Bruininks, 2005; Dinoffer, 2011; Le Roux, 2011. The experimental group participated in the self-designed motor skills development programme for 12 weeks.

The BOT is an established and tested motor skills test battery and also one of the most popular test batteries used to determine the level of motor abilities or overall motor proficiency in children (Burton & Miller, 1998). This individually administered test battery provides a comprehensive motor skill assessment of children and youths of 4 to 21 years of age (Bruininks & Bruininks, 2005; Deitz et al., 2007), including a variety of measures of gross and fine motor proficiency. This enables the BOT to be a useful tool to a wide variety of practitioners, specialists and researchers in different settings. Some of the important uses of the BOT include: supporting the diagnoses of motor impairments; serving as a screening device to identify those who might have motor ability deficits and may benefit from further testing; making educational placement decisions (for example regarding placement into specific and/or adapted PE programmes); developing and evaluating motor development programmes; and also assisting clinicians and researchers in assessments. This test battery consists of a Long-and Short Form (Burton & Miller, 1998; Bruininks & Bruininks, 2005; Deitz et al., 2007).

Both the Long and Short Form of the BOT comprise four motor area composites: fine manual control; manual coordination; body coordination; and strength and agility. The BOT uses a composite structure that differentiates motor skills according to the limbs and muscles involved during movement, as well as the relationship to functional activities in the areas of postural control, locomotion and object manipulation (Bruininks & Bruininks, 2005).

The four BOT motor area composites are further divided into eight subtests (i.e. fine motor precision, fine motor integration, manual dexterity, upper-limb coordination, bilateral coordination, balance, running speed and agility and strength) (Bruininks & Bruininks, 2005). The Short Form consists of 14 items in total that are carefully selected to ensure a sufficient representation of all eight BOT subtests to cover the widest range of ability and to produce reliable scores (Bruininks & Bruininks, 2005). The Short Form is used to provide a brief overview of a child's motor proficiency (Venetsanou et al., 2009). When preparing to administer this test battery, it is important to consider and follow the BOT guidelines regarding the set-up of the testing area. This set-up requires approximately 10 minutes to suitably prepare the testing area. Testing should always be administered in a space that is free from noise and any other unnecessary distraction that may hinder testing procedures. The testing area should be at least 18.29 meters long and 3.66 meters wide and should include two suitable and age appropriate chairs and a table. The feet of the participant should be able to rest comfortably on the floor when in a seated position. The performance of certain activities requires the set-up of a running course. This running course is created by taping out a 15.24-meter line on the floor and includes: a start/finish line; an examiner (researcher) throwing line; and an end line. Different sections of this running course diagram must be used during the different BOT-2 activities and the Short form only make use of selected sections of this course (Bruininks & Bruininks, 2005). Participants must be tested according to the test guidelines and testing procedures approximately 15-20 minutes per child to complete. Administration guidelines include familiarisation with and adherence to specified test equipment, scoring and administration rules. The researcher must understand the tasks well enough and must be able to sufficiently explain each task to the participants. The researcher should be experienced in the administration and scoring of the test and the testing area should be kept free of all equipment not in use. This ensures the safety and full attention of the participants. Emphasis should always be placed on proper form even if the task required speed. The subtests of the BOT should be placed in a specific order so that all the paper and pencil activities must be performed first and activities that require greater physical exertion at the end of the test. This ensures that fatigue does not influence those activities that may require steadiness and precision. The design of this test structure also makes it very convenient for examiners when working with selected subtests (Bruininks & Bruininks, 2005).

Along with the Short Form activities, the participants completed all the activities in the balance, agility and bilateral coordination subtests of the Long Form of the BOT. Participants were tested according to the test guidelines and testing procedures approximately 15-20 minutes per child to complete.

The Short Form of the BOT is a quick and easy to administer screening tool and provides a single score of motor proficiency, similar to the Total Motor Composite (TMC). The TMC is the most reliable and also the preferred measure when determining and describing overall motor proficiency. It is computed by calculating the sum of the four motor-area composite standard scores, when using the Long Form of the BOT. When describing the overall motor proficiency, the researcher reports the standard score, the confidence interval, the corresponding percentile rank and the relevant descriptive category (Bruininks & Bruininks, 2005).

Five descriptive categories were used as an additional tool for communicating results to the participant, parents and/or teachers. These categories describe the levels of motor proficiency within the BOT motor subtests and composites by using wide ranges of scale or standard scores. The use of these categories allows the researcher to highlight the differences found between the various subtests or among the different motor composites (Bruininks & Bruininks, 2005).

Scoring objectively is just as critical to obtaining valid results as proper administration. Each test item must be scored regardless of the examinee's success or failure on surrounding items, and also independently of the examiner or researcher's knowledge and/or assumptions regarding the examinee's level of ability. Norms and the interpretation of all collected test data, including the validity and reliability, are dependent on the careful adherence to the specific rules of administration and scoring. Altering these rules in any way such as allowing an additional trial or extending the time limit of a subtest item, will influence the results and the researcher will not be able to correctly interpret the abilities of the examinee in a normative sense. Any deviations from the standard procedure must be noted and taken into account when interpreting the performance and ability of the examinee (Bruininks & Bruininks, 2005).

A brief overview of the various steps in the scoring process of the BOT that should be followed strictly to maintain standard procedure of scoring and the correct interpretation of all test results is provided in the appendix F. Record raw scores of all subtest items; convert raw scores to point scores; point scores are summed to yield the subtest, point scores / total point scores and carried to the cover page; subtest total point scores are converted to scale scores (Mean = 15, Standard Deviation = 5); scale scores are converted to composite standard scores and percentile ranks; standard scores of subtests are summed and then converted to calculate the TMC (Mean = 50, Standard Deviation = 5); confidence intervals are determined for scale and standard scores (90% or 95%); age equivalents are obtained for the point scores of each subtest; scale and standard scores are converted to the following descriptive categories.

Validity and reliability of the instrument

The instrument or test battery used in this study is an internationally developed one used over time. Therefore, it is assumed to be highly valid across time and cultures. (See appendix D, for assessment test battery) The instrument consists of eight items in total that are carefully selected to ensure a sufficient representation of all eight BOT-2 subtests to cover the widest range of ability and to produce reliable scores (Bruininks & Bruininks, 2005). It is used to provide a brief overview of a child's motor proficiency (Venetsanou et al., 2009). This test has an internal consistency of $r \geq 0.80$, an inter-rater reliability of $r \geq 0.90$ and a test-retest reliability of $r \geq 0.80$ (Deitz et al., 2007). Construct validity of this test is also good, $r = 0.78$ (Cools et al., 2009).

The pre-testing used the test-retest procedure to calculate the reliability, with 13 primary school pupils from a public school taken through the various tests and again after four weeks. The instrument recorded test-retest reliability of r = 0.79 and internal consistency reliability of 0.81, all considered high and appropriate (Cools et al., 2009).

Data Collection Procedure

Ethical clearance was sought from University of Cape Coast, Ethical Review Board (see Appendix A). With an Introductory letter from the Department of Health, Physical Education and Recreation, UCC (see Appendix B), permission was also sought from the Metro Education Service and the Head of the school to conduct the study (see Appendix C). Informed consent was sought from the Head and the parents. Pupils' levels of balance, coordination and agility were assessed with BOT battery test using one group pretest- posttest design.

The group participated in the 12-week motor skills development programme designed for this study. By comparing the pre-test to the post-test results of the group's motor skill performance, the effects of the motor skills development programme were observed (Torgerson & Torgerson, 2008).

Boys and girls between the ages of 10 and 12 years from the selected school were included in this study. Any child with an obvious disability or physical injury, who would not be able to participate in the motor proficiency test, was excluded from this study. The conduction of the motor proficiency test battery and the implementation of the self-designed motor skills development programme took place in the facilities provided by the school involved in this study.

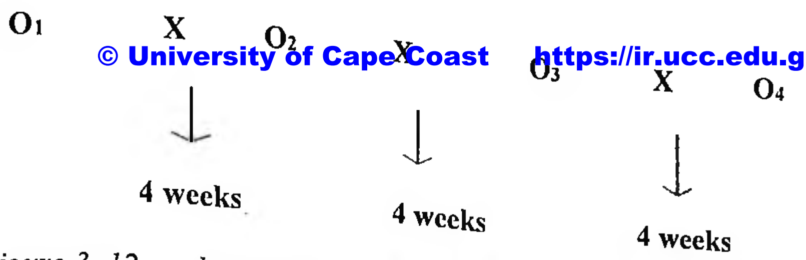

Figure 3. *12 weeks intervention design with four tests i.e. one pre- test and three post- tests (O_1 represents the pre-test and O_2, O_3 & O_4 represent post-tests. X represents the intervention).*

Intervention activities

The selected children received a jump rope training programme (coordination) for twelve weeks during the 30 minutes section, twice in a week, lorry type jumping (balance) and squirrel in the forest (agility) also for the same duration. The entire intervention programme involved 12 weeks starting from January to March. Prior to each day's training, participants went through warm-up section, involving general running exercises and dynamic stretching activities for 10 minutes.

Jump Rope/Skipping (Coordination); during the jump rope training, all the repetitions were guided by Metronome rate for 120 rotations per minutes to ensure equal exercise intensity among children. The jump rope intervention consisted of five exercise performed with the following order: basic bounce step, double basic bounce step, alternate foot step, scissors step and double under. Each exercise was executed by all participants using a jump rope with identical features in terms of weight (i.e. 230g), length (i.e. shoulder measurement) and material (i.e. PVC Polyvinyl chloride). The children also performed three basic types of rope jumping activities- lights, graceful leaps over a rope, turned by an individual or with a partner. Rope jumping which involves jumping over a long rope turned by two performers. Finally, ropes were jumped in a variety of ways to enhance improvement concepts and skills.

This intervention was performed by participants within 30 minutes two times every week over four weeks.

Lorry Tyre Games (Balance); children were in six groups of five (5), one behind the other, in a file. The tyres were placed flat in front of each group for participants to perform jumping activities into the holes of the tyres. After describing and demonstrating how the activities were to be performed, each participant went through the jumping exercises while maintaining balance. Children, in-turns, jumped into the hole within the tyre and jumped out landing in front, and joined the colleagues from behind to have other trials. Children performed varieties of the jumping activities using the lorry tyres. Other tyres were added to have continuous jumping into two or three tyres before joining the queue to have further trials. To end each day's activity, participants competed between the groups using tyre jumping activities to declare the winner for the day. This varying interventional activity was undertaken for 30 minutes twice a week for twelve weeks.

The last but one concerned *Squirrels in the Forest* (Agility); this is a game involving two groups with one being "trees" and the other "squirrels". The "trees" were asked to find their personal space in the playing area within a playing area of 20-by-10 meters. Meanwhile, the "squirrels" ran and dodged around the "trees" without being touched. Members of the "trees" group assumed stationary position and stretched both arms horizontally in search of the "squirrels". By the command "go", the members of "squirrel" group ran and dodge the "tree". However, the roles changed if a "squirrel" was touched by a "tree". The pupils went through this game four times for five minutes each with 2 minutes rest between each set.

Finally, regarding *Foxes and Squirrels* (Agility), three children were chosen to be foxes. All other children were arranged in groups of three. Numbers 1 and 2 of each group joined hands overhead to form a tree. Numbers 3 in each group were the squirrels and stood under the tree of the group. On signal from the teachers "go", the squirrels ran to find a new tree while foxes tried to tag a squirrel before they reached new trees. Only one squirrel was allowed under a tree. When a fox cached a squirrel, they changed position on the next turn. The game was repeated after all squirrel were tagged or under a new tree. This varying interventional activity was undertaken for 30 minutes twice a week for four weeks.

Assessment test battery

Key elements of the Bruinincks-Oseretsky Test (BOT) of Motor Proficiency were used to assess the gross motor skill development of the participants. This standardized procedure permits replication and comparison between and within individuals in the study. Extensive validity and reliability evidence is reported for both the complete battery and short form. This test has been normed on children whose gross motor skills are considered to be within a normal range (Bruininks, 1978). The eight tests take a time of 15 - 20 minutes to administer per child. The shortened version of the test battery was used to accommodate time constraints and the gross motor skill limitations of the research work. The BOT was individually administered and the test began with a pre-test to determine the child's arm and leg preference. Performance scores for each item were converted to point scores on the appropriate scales given in the test manual.

Test battery procedures

The assessment was undertaken at a selected school in the Cape Coast Metropolis and the test battery of eight sub-tests was used. On the scheduled days of assessment, the tester set up the required testing stations in the order of 1) the timed sprint, 2) balancing on preferred leg, 3) walking heel-toe on the balance beam, 4) test for bilateral coordination; tapping feet alternately while making circles with fingers, 5) jumping once while clapping hands as many times as possible, 6) standing long jump, 7) catching a tossed ball with the preferred hand and 8) throwing ball at a target with the preferred hand. A maximum of four subjects were assessed at one time on an individual basis. They accompanied the tester to the venue for briefing prior to assessment. Following this, each participant commenced the test with the physical assessment to determine arm and leg preference. The candidates then follow the testing procedures as in the order set out by the tester [as mentioned above] which the tester explained in detail as to what was expected of the learner at each activity. The participants were encouraged at all times to complete each task to the best of his/her capability. The learners were not forced to change into physical education kit but they were required to remove shoes and socks and undertake the assessment barefooted.

Sub-test 1: (a) Reaction time/Running speed/ Agility

Two lines 16 yards (14.5m) apart are marked; a beanbag is placed on the far line. A short line, the "timing line", is marked 1 yard (90cm) in front of the first line. The child begins at the first line, runs to the far line, picks up the beanbag, and then runs back across the first line as fast as possible. The child is timed to the nearest 0.2 second between the first and the last crossings of the timing line. Two trials are taken and the best score is recorded.

Sub-test 2: Balance

Standing on the preferred leg on balance beam, the child stands on the preferred leg on the balance beam, looking at a wall target, with hands on hips, and free leg held with thigh parallel to the floor. The score is made up of the time the child can maintain the balanced position to a maximum of 10 seconds. A second trial is given if the child does not score the maximum on the first trial.

Walking forward heel-to-toe on balance beam, the child walks forward on the balance beam heel-to-toe, with hands on hips. The recorder keeps track of the correct and incorrect steps on six steps. The child must make six consecutive steps correctly to achieve maximum score (6). A second trial is given if the child does not score the maximum on the first trial.

Sub-test 3: Bilateral Coordination

Tapping feet alternately while making circles with fingers; the child sits on a chair and attempts to tap feet alternatively while simultaneously making inward to outward circles with the index fingers. This item is scored pass or fail. The child is given 60 seconds to complete 10 consecutive foot taps correctly. A participant is said to have passed if six or more consecutive successful performance was achieved.

Jumping up and clapping hands. The child jumps as high as possible before landing. The score is the number of claps; a maximum score is five. A second trial is given if the child does not score the maximum on the first trial.

Sub-test 4: Strength - Broad jump

After warming up, the child assumes a bent-knee position, and then does a standing long jump. The child's score is the longest jump of three trials, recorded to the nearest number on the test kit measuring tape.

Sub-test 5: Upper-limb Coordination

Catching a tossed ball with the preferred hand; the child stands on the mat and the assessor slowly tosses the ball underhand from the 3m tape mark towards the child. The child is given one practice trial. The number of correct catches made in five trials is recorded.

Throwing a ball at a target with the preferred hand; with the preferred hand, the child throws a tennis ball overhand at a target from a distance 1.5 m. The child is given one practice trial. The number of correct throws (that hit the target) in five trials is recorded.

Data Processing and Analysis

The data was processed using SPSS software. The analyses were preceded by data screenings. A three-way mixed model analysis of variance was done with time, gender and age as the fixed effects and the participants nested in age group*gender as the random effect. The third order interaction effect (time*age*gender) was investigated to determine if gender in any way affected the results, and thereafter the time*age and second order interaction effect was investigated to determine if the intervention (experimental group) showed a different effect. Summary results were presented as means and standard deviations. A significance level of less than 5% ($p<0.05$) was used as guideline for reporting significant results, but in some instances, trends were reported for results that were not statistically significant. Data for hypothesis 1, 2, and 3 were analysed with repeated measure ANOVA. In addition, data for hypothesis 4 was analysed with repeated factorial ANOVA. The reported statistics included means (M), standard deviations (SD), degree of freedom (df), F-statistics (F) 'post hock' with partial eta squared (η^2) and p-value ($< .05$).

CHAPTER FOUR

RESULTS AND DISCUSSION

The purpose of the current study was to examine impact of some selected existing developmental games on the motor skill (balance, coordination and agility) development of children between the ages of 10 and 12 years in the Cape Coast Metropolis in the Central Region of Ghana. This chapter focuses on the presentation of the results and discussion in relation to the four hypotheses that underpinned the study.

Hypothesis One: School Children Aged Between 10 to 12 Years, in the Cape Coast Metropolis, Would Significantly Improve in their Balance Abilities after Participating in the Selected Developmental Games for 12 Weeks

The aim of this hypothesis was to measure the difference in balance acquired as the children went through the developmental games for 12 weeks. Repeated measure ANOVA was applied to the data, which was collected at four times in four weeks interval, including the base-line. Test of Sphericity shows a violation of Mauchly's Test of Sphericity, χ^2 (5) = 11.64, p = .040, an indication that the variance in the tests are not equal. Therefore, Huyhn-Feldt Test was used, which was significant, F (3) = 117.25, p = .001, η^2_p= .80. With a large magnitude of differences (effect size), Bonferroni post-hoc analysis reveals a significant difference in balance improvement between the Pre-Test (M = 7.33, SD = .66) and Post-Test 1 (M = 8.57, SD = .68), Post-Test 2 (M = 8.70, SD = .59) and Post-Test 3 (M = 8.83, SD = .50), but not among the rest of the tests (refer to Table 1 for data). Hence, developmental games could be effective tool for improving balance among children between 10 and 12 years.

The finding indicated that participation in 12-week developmental games can improve skill balance significantly among children between 10 and 12 years. This suggests that the developmental games are effective in improving the balance of children between aged 10 to 12 years old, and that 12 weeks are enough to see change in improvement.

Table 1: Repeated ANOVA Test of Balance among Children Aged between 10-12 Years

Variables	*N*	*M*	*SD*	*F*	χ^2	*Df*	*Sig.*	η^2_p
Mauchly's Test					11.64	5	.040	
Huyhn-Feldt				117.25		3	.001	.80
Pre-Test	30	7.33*^@	.66					
Post-Test 1	30	8.57*	.68					
Post-Test 2	30	8.70^	.59					
Post-Test 3	30	8.83@	.50					

***N* = 30, *df* = 3, 26**

It must be noted that the developmental games used in this study were physical activity related games, and thus, not surprising that these developmental games improved the development of balance ability among the children. This may infer that children who are physically active have better balancing skills than children whose activity levels are low (Burgi et al., 2011; Stodden et al., 2008; Vandorpe et al., 2012).

For purposeful intervention studies, Gupta, Bhamini and Kumaran (2011) found that children (7 to 15 years) with Down's syndrome showed great improvement in balance after they were taken through 12 weeks physical activity training programme. This supports the findings of this study which also discovered a significant improvement in balancing skills after children 10 to 12 years were exposed to developmental games. Despite the similarities in results, this study used healthy children aged 10-12 years whereas children with Down's syndrome participated in Gupta, Bhamini and Kumaran's (2011) study. What is common is that the interventions for the two studies were all physical activity programmes and this can explain the similarities in the results. The findings of this study also support that of Graft, Koch, Kretschmann-Kandel and Falkowski (2012), who employed a specific intervention programme aimed at increasing students' fundamental movement skills in Finnish junior high school Physical Education. Graft et al found that balance and locomotor skills were significantly enhanced. The similarities in the findings of these studies can be explained by the fact that both studies used children around the same age group, and that the interventions were physically active oriented.

Further analysis revealed that there was a consistent improvement as the number of developmental games increased. Nevertheless, this consistent improvement in balance ability as a function of increased developmental games can be attributed to maturation of numerous systems of the children's organs and familiarisation of the intervention programmes (Okely & Booth, 2004; Wards, Vaughn, McWilliams, & Hales, 2010). In other words, children develop physiologically and the ability to perform certain activities is a function of growth and long/repeated exposure to physical activities. A number of studies have revealed a bidirectional relationship between physical activity and balancing skills (Burgi et al., 2011; Eliakim, Nemet, Balakirski, & Epstein, 2007). This suggests that as children attain some level of improvement in balancing skills on first developmental game, performing the subsequent developmental games becomes easy. Furthermore, once a child is exposed to a developmental game, performance on later similar game would be better. This also accounted for the consistent improvement in performance as the number of games increased. Therefore, introducing the children to these games early becomes vital to ensuring their development and uptake of many physical activity skills enough for life and sports participation.

The development of motor skills with games could also be affected by the stage of the children. Donath, Imhof, Roth, and Zahner (2014) assessed the improvement of motor skill development among 4-6 years preschool children using card-based KIDZ-box activity for 7 months. In their study, the activity was not found to be effective in improving balance of preschool children. Although the card-based activity comprised three different activities just like the three different developmental activities used in this study, the results were different. Even though it has been established that repeated and/or long exposure of physical activity related programmes to children significantly improve their balance ability, this was not the case in Donath et al.'s study. The discrepancies might be attributed to the fact that whereas this study used children between 10-12 years, 4-6 year old children were used in Donath et al.'s study. In another study, Ehmig, Dunkel and Lenares' (2009), study using KIDZ-box activities did not significantly improve balance ability among children in Switzerland. Further investigations by Ehmig et al. (2009) discovered that majority of KIDZ-Box activities are not meant for improving balancing skills in children. Contrasting the studies by Donath et al. (2014) and Ehmig et al. (2009) with this study, some evidence can be gathered that indeed the developmental games used in this study improved the balancing skills of the children.

The implications of this finding are to the children, teaching of the subject P.E. and the general development of skills for appropriate sports participation promotion in Ghana. The development and improvement in the skill of balance is foundational and essential to most other motor movements, and that the earlier children pick it, the better (Gupta et al., 2011). In addition, many of the children grow out from the areas where these developmental games are part of the integration process. Thus, in the sphere of the limited resources, these developmental games could be an important means to developing the skill of balance in the children. Moreover, teaching and learning of the PE subject become locally-based when such already known and culturally accepted movement games or plays are used in the development of the essential motor skills in the children.

Sub-Hypothesis Two: School Children Aged between 10 to 12 Years, in the Cape Coast Metropolis, Would Significantly Improve in their Agility after Participating in Selected Developmental Games for 12 Weeks

The object of this analysis was to test whether the children (10-12 years) improved in their agility skills after going through 12 weeks developmental games. Using repeated measure ANOVA, the result indicates that Mauchly's Test of Sphericity was not assumed χ^2 (5) = 36.67, p = .001, and that the variance in the four tests are not equal. However, when a corrected test, Huyhn-Feldt Sphericity, was used, the result became significant, F (3) = 117.25, p = .001, η^2_p= .54. When Bonferroni multiple comparison test was applied, the results showed a marked improvement in the children's agility at Pre-Test (M = 3.43, SD = .50) and Post-Test 2 (M = 4.30, SD = .47) and 3 (M = 4.30, SD = .47). In addition, the children gained significant agility from Post-Test 1 (M = 3.42, SD = .50) and Post-Test 2 (M = 4.50 SD = .47) and Post-Test 3 (M = 4.30, SD = .47), but not between Pre-Test and Post-Test 1 nor between Post-Test 2 and 3 (refer to Table 2 for data), though effects size was medium. Therefore, children aged 10-12 years can be helped to improve their level of agility with developmental games.

The finding revealed that children aged 10-12 years would improve markedly in their level of agility when taken through appropriately designed developmental games for 12 weeks. The result is not surprising since the developmental games in this study were all physical activity-oriented games.

Table 2: Repeated ANOVA Test of Agility among Children Aged Between 10-12 Years

Variables	*N*	*M*	*SD*	*F*	χ^2	*df*	*Sig.*	η^2_p
Mauchly's Test					36.67	5	.001	
Greenhouse Geisser				33.49		3	.001	.536
Pre-Test	30	3.43*@	.50					
Post-Test 1	30	3.50^&	.63					
Post-Test 2	30	4.30*^	.47					
Post-Test 3	30	4.30@&	.47					

N = 30, *df* = 3, 26

Several studies have unraveled the significance of physical activity participation in the development and improvement in the skill of agility (Burgi et al., 2011; Stodden et al., 2008; Vandorpe et al., 2012). For example, this finding is consistent with that of Yanci et al. (2015) who examined the effect of contextual interference training on the agility development of school children. According to Yanci and his colleagues, a statistically significant improvement in agility skill was found among the children after taking them through the intervention programme. Although similar results were found, there was a difference in participants' age in both studies. While Yanci et al.'s study involved children around the age of 6, whereas this study included children between 10-12 years. Thus, the age difference in the children, where the current study utilized older children, could be the result of the significant improvement in the agility capacity of the children. Meanwhile, the intervention for the current study lasted for 12 weeks, but Yanci et al.'s was only 4 weeks. However, the similarities in the results confirm the claims in literature that contextual interference training and developmental games are agility training programmes for children (Holmberg, 2009).

A significant aspect of this study is the use of primary school children as participants. It must be acknowledged that there appears to be little studies conducted among primary school children between the ages of 10 to 12 which evaluates agility after taking participants through diverse intervention programmes (Eliakim, Nemet, Balakirski, & Epstein, 2007). Most studies on agility were conducted using athletes of different sports and different ages (Donath et al., 2014; Yanci et al., 2015; Young et al., 2001). For instance, Meylan and Malatesta (2009) discovered significant improvements in agility after applying a plyometric training programme to young soccer players (13.3±0.6 years). Similarly, Oxyzoglou, Kanioglou and Ore (2009) recorded significant difference in performance in agility test after a 6-week training period between a group of children who performed a specific handball training programme and another group that was taken through physical education sessions. The two groups differed markedly, with the handball training group attaining higher improvements in agility after the training period. Even though these two above-mentioned studies were carried out on children, it is difficult to make comparisons with the findings of this study since there are significant discrepancies in the participants and their age, duration of the programme, differences in intervention programmes and the methods involved in these studies.

Results from descriptive studies on agility in children of similar ages to those who were involved in this study support the current finding. For instance, McKenzie et al., (2004) assessed the differences in agility at developmental ages between Anglo-American and Mexican-American adolescents. Similarly, Lam and Schiller (2001) evaluated the agility of young school children in Hong Kong through the shuttle run test. All these descriptive studies revealed that physical activity levels influenced the agility levels of the children. Nevertheless, none of these studies used a specific agility training programme in observing the influence of the programme in agility development. Therefore, it becomes difficult to understand and carry out an evaluation on the efficacy of a specific physical activity in improving the agility of children. Young, McDowell and Scarlett (2001) found no significant difference in numerous agility tests in a group that only participated in a training programme comprising a single task performance. However, their finding indicated improvements in agility performance following the exposure of the children to the 12-week developmental games. The difference in the findings between this study and that of Young et al. (2001) could be attributed to the differences in the ages of the participants. Young and colleagues studied adults while the current study focused on children between age 10 and 12. Moreover, in the current study, the children underwent multiple physical training using developmental games.

The findings of this study have implications on the growth and developments of the children. In Japan, injuries and accidents occurring from low agility abilities in children as a result of colliding with other children and not being capable of dodging a ball or use their hands for proper support when falling have been frequently reported (National Agency for the Advancement of Sports and Health [NAASH], 2010). Improvement in agility can help prevent everyday injuries and accidents among basic school students, thus leading to safer, healthier everyday life. Besides, teaching, learning, development and improvement in many other motor skill performances such as strength, speed, catching a ball and shooting, heading, goal keeping could be explore to the promotion of the PE and development of the sports men and women for the nation.

Sub-Hypothesis Three: School Children Aged Between 10 to 12 Years, in the Cape Coast Metropolis, Would Significantly Improve in their Coordination Abilities after Participating in Selected Developmental Games for 12 Weeks

Repeated measure ANOVA was used to test the extent of improvement in coordination among children aged between 10 to 12 years after they had undergone an intervention of 12 weeks of developmental games. There was a violation of Mauchly's Test of Sphericity (χ^2 (5) = 12.51, p = .028), and that the variance in the four tests are not equal, hence Huyhn-Feldt, which shows a significant result was used, F (3) = 146.54, p = .001, η^2_p= .84. Running the multiple comparison, Bonferroni test revealed a significant increase in coordination from Pre-Test (M = 2.50, SD = .51) to Post-Test 2 (M = 4.37, SD = .61), to Post-Test 3 (M = 4.60, SD = .56), and from Post-Test 1 (M = 2.78, SD = .50) to Post-Test 2 (M = 4.37, SD = .61) to Post-Test 3 (M = 4.60, SD = .56). The differences are large in magnitude (effect size). However, no such difference exists between Pre-Test and Post-Test 1, and between Post-Test 2 and Post-Test 3 (refer to Table 3 for data). Therefore, developmental games can be effective tools to improving coordination ability in children aged between 10-12 years.

Table 3: Repeated ANOVA Test of Coordination among Children 10-12 Years

Variables	*N*	*M*	*SD*	*F*	χ^2	*df*	*Sig.*	η^2_p
Mauchly's Test					12.51	5	.028	
HuyhnFeldt				146.54		3	.001	.84
Pre-Test	30	2.50*@	.51					
Post-Test 1	30	2.78^$	.50					
Post-Test 2	30	4.37*^	.61					
Post-Test 3	30	4.60@$	.56					

***N* = 30, *df* = 3, 26**

The finding showed developmental games are effective tools that can be utilized to improve the coordination ability in children aged between 10-12 years, especially if the children are given about three months training. Based on the findings of this study, it can be said, that the group significantly improved in their coordination ability, which confirms the assertion that when children are taken through designed physical activity programmes that are familiar to them, they could improve their coordination (Šimonek, 2014; Altinkök, 2016). In support of this, Thies and Travers (2006) also indicated that motor games and activities in the form of games are effective programmes in enhancing the coordination ability of children. Furthermore, the findings of this study supports similar study conducted by Altinkök (2016) who investigated the effect of 12-weeks training programme on skill development (coordination) of preschool children. Altinkök had two groups: control and experimental groups. The experimental group recorded a statistically significant improvement on the post-test tasks. Altinkök's findings revealed that preschool children who had undergone coordination focused exercise programmes had significant improvement in their fundamental motor movements. Though the current study used only an experimental group, it collected four-time data points (pre-test, post-test 1, 2, and 3), where the post-tests checked as the controls on the earlier once.

In another study consistent with the current one, Au et al. (2014) compared a task-oriented motor training with a core stability programme in improving motor proficiency in children and found significant improvements in motor skill proficiency such as coordination in both groups as a result of the task oriented programme. This indicates that task-oriented intervention programmes are effective in developing coordination skill in the children as was found in this study. Similarly, Offor, Williamson and Caçola (2016) examined the effectiveness of an intervention programme for children with developmental coordination disorder. Similar to the present study, Offor et al. found that the intervention programme was effective in enhancing the coordination ability of the children. The similarity in results can be explained from the point of view that both intervention programmes entailed physical activities which develop the muscles for coordination. Moreover, these are children at their formative stages in life where development in motor skill ability becomes vital if further improvement and mastering in motor proficiency are to be achieved (Yanci et al., 2015).

The post-hoc results of this study indicated that there were consistently higher levels of coordination among the participants. This was noticed as the children showed remarkable improvement in coordination over the 12 weeks period. This consistent change might be due to repeated or prolonged performance of the games or as a result of maturation. Evidence shows that the first two years of schooling for children (usually between 10-12 years) is the stage characterised by the fastest coordination skill development (Čillík & Willwéber, 2018). This suggests that it is possible that even without an intervention programme, there would have been a significant improvement in coordination enhancement among children. Unfortunately, this study did not establish this view because there was no control group but the multiple post-test measures negate the limitation of the effect of non-comparable groups. Moreover, other fundamental motor skills such as balance and agility, which do not necessarily improve as a result of maturation, also got improved among the children after the 12-week programme.

Development of appropriate coordination skills in children would be essential to the prevention of injuries as a result of falls and other activities. In addition, teaching and learning of activity subjects and improvement in other advance motor skills become easier and better for both the children and their teachers. Besides, improvement in coordination may help in unearthing sports talents since many advanced skill and performance rely on it.

Hypothesis Four: There would be Significant Gender Interaction Effect in the Improvement of Motor Skill Levels of School Children Aged between 10 to 12 Years after Participating in Selected Developmental Games for 12 Weeks, in the Cape Coast Metropolis

Series of repeated factorial ANOVA were run to determine the interaction effect of gender on the improvement in balance, agility and coordination after the children had been taken through the 12-week developmental games. Test of sphericity showed a violation of Mauchly's Test of Sphericity, χ^2 (5) = 12.977, p = .024). The corrected test of Huyhn-Feldt also revealed a non-significant gender*balance interaction result, F (3) = 1.16, p = .33, η^2_p = .040. The result indicated a non-significant gender interaction effect on balance among the children, F (5, 84) = 1.79, p = .174, Pillai's Trace = .171, partial η^2_p = .171.

Further analysis indicated a significant gender interaction on agility improvement of the children after they had gone through the 12-week developmental games, with a medium magnitude of difference, F (5, 84) = 7.74, p= .001, Pillai's Trace =.472, partial η^2_p= .472. Besides, with a small effect size, there was a significant gender interaction on differences in coordination among the children after they had gone through the 12 - week developmental games, F (5, 84) = 3.65, p = .025, Pillai's Trace =.297, partial η^2_p= .297. Specifically, males improved (M = 3.75, SD = .414) better than the females (M = 3.37, SD = .414). Therefore, while there was no significant gender interaction on balance, agility and coordination produced significant interaction results, with males having better coordination compared with the females, though in small magnitude.

The study revealed that while there was no significant gender interaction on balance, agility and coordination produced significant interaction results, with males having better coordination compared with the females, though in small magnitude. In other words, both the males and female participants improved in the various motor skills relatively at the same rate and levels. However, at the individual motor skill level, the level of effectiveness of the developmental games on agility and coordination was not the same for male and female participants. Thus, male participants had statistically significant higher levels of agility and coordination as compared to their female counterpart. Literature in the field of motor skill development shows that difference in male and female children is normally not significant, however, this difference appears to increase after the puberty stage (Butterfield & Loovis, 2003). Bouchard et al. (2004) noted that both boys and girls before the puberty stage have similar skills and ability in hopping and balance. This supports the findings of this study, which found a non-significant gender difference in effectiveness of developmental games on balance skills.

Despite the observations of Bouchard et al. (2004) and Butterfield and Loovis (2003) that there appear to be no significant gender difference in motor development, this study revealed a statistically significant difference in agility and coordination of male and female children after taking them through the developmental games. In other words, the developmental games were more effective for males than females in improving agility and coordination but not for balance. These variations may be due to subtle disparities in the degree of neurological maturation demonstrated by the two genders. 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 (Bouchard et al., 2004). Girls are generally encouraged to play quietly and practice fine motor skills such as drawing and colouring whilst boys are encouraged to participate in more vigorous movement activities such as running, chasing and jumping (Bouchard et al., 2004).

Consistent with the findings of this study, Govatos (1999) and Krombholz (2001) revealed that with respect to physical performance of motor skills, significant differences were identified between girls and boys, where boys exceeded on some items and girls on others. However, boys and girls of similar growth status seemed to be equally effective in activities involving running and jumping, but boys appeared to excel more than girls in throwing and kicking. Supporting the views of Govatos (1999) and Krombholz (2001), Butterfield and Loovis (2003) discovered that boys tend to attain maturity in performing most physical activities at an earlier age compared to girls. From a different perspective, prior studies on preschool children from diverse cultural backgrounds have revealed that females outperform the males on agility and balance (Kourtessis et al., 2008; Livesey, Coleman, & Piek, 2007; Sigmundsson & Rostoff, 2003). These findings from previous studies do not support the findings of this study. This study did not attain differences in balancing skills between male and female participants. For agility, this study rather found that male participants performed better than their female counterparts.

It is reasonable that variances in motor skills ability between genders is present throughout early childhood and can be attributed to a multifaceted interaction of biological, environmental and sociocultural factors (Cools, De

Martelaer, Samaey & Andries, 2009). It has been found that brain development and structure varie between genders during early stages (Alexander & Wilcox, 2012). This may have residual effects during the preschool years, demonstrated by improved development of the brain's left hemisphere, that is largely associated to improved acquisition of language, social cognition, and fine motor skills in young infant girls compared to boys (Cools, De Martelaer, Samaey, & Andries, 2009).

Furthermore, the finding that gender discriminates with regards to the effectiveness of the developmental games on agility and coordination, has been theorised (Barnett, van Beurden, Morgan, Brooks, & Beard, 2010; Pate, 2004) that socio-cultural and environmental factors may partially explain the reason preschool male children normally do well than girls at object control skills, as girls spend more time in language, literacy, art, and fine motor activities and boys in a number of different ball games and gross motor activities.

Although no known study have investigated whether gender discriminates with regards to the effectiveness of developmental games/intervention programmes on motor skill development, it is convincing to indicate that male and female children even before the introduction of a training programme, are not equal on motor skill development as shown in several studies (Alexander & Wilcox, 2012; Cools, De Martelaer, Samaey, & Andries, 2009; Sigmundsson & Rostoff, 2003). This suggests that male and female children at preschool level have different mechanisms fostering their development of motor skills. If this happens, any effective intervention programme introduced to them would, to a larger extent, result in different levels of performance after the intervention.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The purpose of the current study was to examine impact of some selected existing developmental games on the motor skill (balance, coordination and agility) development of children between the ages of 10 and 12 years in the Cape Coast Metropolis in the Central Region of Ghana. This chapter presents a summary, findings, conclusions and the recommendations of the study

Summary

Motor skills are very important in life as they help in performing related movement activities and serve as bedrock in performing specialized motor activities. Development in such useful motor skills do not only yield to the benefits of the children, it also plays a vital role in the teaching and learning of the Physical Education subject and serves as avenues for identifying and developing sports men and women for the country. However, many children fail to develop these motor skills early or tend to develop them inappropriately, affecting teaching, learning and future engagement in motor performance related activities.

Developing appropriate fundamental motor skills in children help them to play and enjoy games better, prevent injuries and provide them a platform for improving their skills to become performers in the near future. However, children may become frustrated, dissatisfied, disappointed and often regret being born in such environments where no effort is made to correct this adverse phenomenon. Thus, developmental games which are quite known to the children but not structured could be used in teaching them the appropriate movement skills for better learning and advancement in other complex ones.

Physical Education as an academic subject is critical to the development of each child's health and fitness, necessary for life. However, the subject suffers and continues to struggle with resource constraints making teaching and learning difficult for both teachers and school authorities and learners. In developing countries like Ghana, Physical Education teachers consistently complain about the lack of or inadequate materials and equipment such as fields or space, balls, and many others, for teaching and learning. Even where these materials and equipment are available, they are sub-standard. Moreover, there is a limited allotted time space on the school time table for teaching and learning of the subject. Therefore, it becomes imperative that innovative, culturally and socially accepted fundamental games be used to help the development of these motor skills in the children, in the resource constrained environment like this.

Many developing nations like Ghana lack or have woefully inadequate infrastructure to appropriately develop these essential motor skills at the early stage of life, where growth in these foundational skills becomes vital. This situation is translating into the rate of developing men and women for the country. The level of their performance at the various championships could be minimized with the use of these socially acceptable developmental games to teach and increase the fundamental motors skills necessary for complex and advanced movement skills associated with many sports. Therefore, the purpose of this study was to ascertain whether using developmental games as intervention strategies could help improve motor skills development among selected school children in Cape Coast. The study examined impact of some selected existing developmental games on the motor skill (balance, coordination and agility) development of children between the ages of 10 and 12 years in the Cape Coast Metropolis in the Central Region of Ghana.

Four hypotheses were generated to test whether school children aged between 10 to 12 in the Cape Coast Metropolis, would significantly improve in their balance, agility and coordination abilities after participating in selected developmental games for 12 weeks and if there would be significant gender interaction effect on the improvement of motor skill levels of the children. This study was a quasi-experimental design consisting of 30 participants (15 boys and 15 girls). These children were selected from basically one of the less endowed schools where the students are believed to be at a disadvantage in the level of their motor skills development compared to their counterparts from affluent educational institutions. The study involved one sample repeated measures, a pre-test-intervention-post-test 1, 2 and 3, which provided for self-control. In addition, One-way repeated measure ANOVA was utilized to test hypotheses 1, 2, and 3, with the Bonferroni post-hoc and partial eta square analyses identifying the pairs that markedly differ from each other, and the magnitude of that difference, respectively. In addition, hypothesis 4 was analysed using repeated factorial ANOVA to find out whether there was gender interaction effect on the improvement of motor skill levels of school children.

Main Findings

The following findings are drawn based on the results:

1. The developmental games used in this study are effective tool for improving balance among children aged between 10 and 12 years after they had gone through the 12 weeks intervention programme. This is an indication that when these basic school children are given 12-week training in these designed developmental games, they are very likely to improve their skill of balance.

2. The study also revealed that children aged between 10-12 years improved markedly in their level of agility when taking through appropriately designed developmental games for 12 weeks. Agility is very important not only to prevent or protect the child from falls and injuries, it is also fundamental to the acquisition of many other skills, and learning and improvement in complex ones. Therefore, these age old socio-culturally accepted developmental games are evident as good tools to shaping and increasing the motor skills of the children.
3. The study further showed that the selected developmental games are effective tools that could be utilized in improving the coordination ability among children aged between 10-12 years, especially if the children are given about three months interval to practice with the games. Coordination is a neuro-muscular activity which also serves as fundamental to developing advanced complex skills associated with many games and sports such as athletics, gymnastics, netball, handball, soccer and many others. Thus, using these locally available games can reduce the effects limited resources is having on the teaching and learning of P.E. and the general development and promotion of sports in the country.
4. Though gender interaction was not significant generally and on balance, agility and coordination produced significant interaction results, with males having better coordination compared with the females, though with a small magnitude. This implies that there is the need to give equal attention to all genders in sports, and that these games do not pose particular difficulty to any one gender over the other.

Conclusions

The following conclusions are drawn based on the findings:

1. Children from less endowed schools would improve the motor skills with appropriately designed developmental games. Moreover, the games will improve the fundamental skills of the children if they are allowed to go through for considerable number of weeks such as 12 weeks.
2. In specific term, the skill of balance will improve when these children are given about 12 weeks to practice these developmental games. However, the games need to be designed and children taken through if the skill of balance is to be acquired properly.
3. The 12-week developmental games programme is also a useful tool for the development of agility among the children. Thus, children with ages between 10 and 12 years would increase in their agility level when taken through such a well-designed physical activity programme that comprises local games.
4. It is evidenced from the study also that the children will tremendously improve in coordination when they go through the 12-week developmental games. Moreover, it appears that the developmental game programme does not necessarily favour boys over the girls in the improvement of their motor skills. However, when the children are given equal training for a period of 12 weeks, the males will have advantage in increment of their agility and coordination abilities.

Recommendations

The following recommendations are based on the findings:

1. Firstly, it is recommended that physical education teachers at the basic level of education resort to the use of developmental games, to help children to improve their motor skills.
2. Secondly, teachers should encourage and give more opportunities to children to play since most of these developmental games are well-known local ones.
3. Finally, it is recommended that Children from less endowed schools should be allowed to go through developmental games for considerable number of weeks such as 12 weeks to improve their motor skills.

Implications for Physical Education Practice

1. Motor skill proficiency, especially in balance, agility and coordination, plays such an important role in the physical activity participation of children. Children need to master the basic motor skills by the age of seven. Yet, as seen in this study, children between the ages of 10 and 12 still struggle to perform some of the most basic balance, agility and coordination tasks, such as skipping, throwing at a target, dodging run or balancing on one leg. This suggests that the children of today are struggling to master their motor skills during the relevant windows of opportunity and thus experience delays in motor skill proficiency, subsequently affecting their participation in physical activity. If participation in physical activity is inhibited in this manner, it may be detrimental to physical activity participation later in life and add to an increase in adults living sedentary lifestyles with its attendant health problems.

2. Delays in motor skill proficiency may not only be detrimental to physical activity participation, but also affects children within the classroom environment. Motor skill proficiency plays an important role in the maintenance of the correct posture (for example sitting correctly at the school desk), as well as the performance of reading and writing skills. Therefore, motor skill proficiency may benefit children within and outside of the classroom environment, as well as adulthood.
3. The current P.E. system appears not to be as beneficial in all schools as expected, which may negatively affect teaching of the PE subject and how properly children learn and improve on their motor skills. Thus, implementing movement programmes that promote and develop motor skills may be more beneficial in the improvement of motor skill proficiency, teaching of P.E. and learning and thereby increase interest in the subject. Increased motor skill proficiency may lead to children wanting to participate in the current physical activity opportunities offered by the school (including P.E. and sports) and hopefully lead to increased physically active lifestyles outside of the school environment.

Suggestions for Further Research

1. Looking at the present scope of the study, it is suggested that the same research be carried out in other schools of the regions. This might lead to the development of concepts in terms of the right theories to use in improving motor skills of school children in Ghana.
2. There are various developmental games. Using other forms of these developmental games for the same kind of research is suggested. This will also help test such games in promoting the development of motor skills in children.

3. Finally, a further study could be carried out using a large number of participants. Besides, other designs, instruments and statistical tools could be employed in conducting similar studies as a way of comparing their outcomes.

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APPENDECES

APPENDIX A

ETHICAL CLEARANCE LETTER

UNIVERSITY OF CAPE COAST

INSTITUTIONAL REVIEW BOARD SECRETARIAT

TEL: 0558093143 / 0508878309/ 0244207814
E-MAIL: irb@ucc.edu.gh
OUR REF: UCC/IRB/A/2016/283
YOUR REF:
OMB NO: 0990-0279
IORG #: IORG0009096

C/O Directorate of Research, Innovation and Consultancy

6TH DECEMBER, 2018

Mr. Richmond Stephen Sorkpor
Department of Health, Physical Education and Recreation
University of Cape Coast

Dear Sorkpor,

ETHICAL CLEARANCE –ID: (UCCIRB/CES/2018/18)

The University of Cape Coast Institutional Review Board (UCCIRB) has granted Provisional Approval for the implementation of your research protocol titled *Impact of development games on motor skills of school children in the Cape Coast Metropolis.* This approval requires that you submit periodic review of the protocol to the Board and a final full review to the UCCIRB on completion of the research. The UCCIRB may observe or cause to be observed procedures and records of the research during and after implementation.

Please note that any modification of the project must be submitted to the UCCIRB for review and approval before its implementation.

You are also required to report all serious adverse events related to this study to the UCCIRB within seven days verbally and fourteen days in writing.

Always quote the protocol identification number in all future correspondence with us in relation to this protocol.

Yours faithfully,

Samuel Asiedu Owusu, PhD
UCCIRB Administrator

ADMINISTRATOR
INSTITUTIONAL REVIEW BOARD
UNIVERSITY OF CAPE COAST
Date: 12/12/18

APPENDIX B

INTRODUCTORY LETTER FROM DEPARTMENT

UNIVERSITY OF CAPE COAST
CAPE COAST, GHANA
COLLEGE OF EDUCATION STUDIES
FACULTY OF SCIENCE AND TECHNOLOGY EDUCATION
DEPARTMENT OF HEALTH, PHYSICAL EDUCATION & RECREATION

TELEPHONE: +233 - (0)206610931 / (0)543021384 / (0)268392819

TELEX: 2552, UCC, GH

Cables & Telegrams:
UNIVERSITY, CAPE COAST

Our Ref: ED/PED/15/0001/10

27th February, 2018.

The Chairman
Institutional Review Board
University of Cape Coast
Cape Coast.

INTRODUCTORY LETTER

The bearer of this letter Mr. Richmond Stephen Sorkpor with index number ED/PED/15/0001 is an Ph.D student of the above - named department. I support his application for ethical clearance from your outfit. he is conducting a research on the topic " **Impact of Developmental Games on Motor Skills Development of School Children between the ages of 10-12 years in the Cape Coast Metropolis**" as part of the requirements for obtaining an Ph.D Degree in Physical Education at the University of Cape Coast.

I am the Principle Supervisor of his work and he has satisfied the conditions for data collection. I shall be grateful if he is given the necessary assistance.

Thank you.

Dr. Charles Domfeh
HEAD
(Principal Supervisor)
Tel: 0504595527
Email: cdomfeh@ucc,edu,gh

APPENDIX C

INTRODUCTORY LETTER FROM EDUCATION DIRECTORATE

GHANA EDUCATION SERVICE

In case of reply the Number and date of this Letter should be quoted

REPUBLIC OF GHANA

METROPOLITAN EDUCATION DIRECTORATE
P. O. BOX 164
CAPE COAST

Tel. 042-32514/33405
Fax 042-32199
capecoastmeo@yahoo.com

My Ref. No GES/MD/EP.1/Vol.4/4/136
Your Ref. No.

5th April, 2018

THE HEADTEACHER
ST FRANCIS CATHOLIC MIXED SCHOOL
CAPE COAST ✓

LETTER OF INTRODUCTION

I write to introduce Mr. Richmond Stephen Sorkpor, a Ph.D. student of the College of Education Studies of the Faculty of Science and Technology Education, UCC. He is conducting a research on "*Impact of Developmental Games on Motor Skills Development of Schools Children between the ages of 10-12 years in the Cape Coast Metropolis*".

Permission has been granted him to conduct the research in your school. However, you are to ensure that his activities do not interfere with teaching and learning in the school.

Please accord him the necessary assistance to make his project successful.

Thank you.

STEPHEN RICHARD AMOAH
METRO DIRECTOR OF EDUCATION
CAPE COAST

APPENDIX D

ASSESSMENT TEST BATTERY

Key elements of the Bruinincks-Oseretsky Test (BOT) of Motor Proficiency would be used to assess the gross motor skill development of the participants. This standardized procedure permits replication and comparison between and within individuals in the study. Extensive validity and reliability evidence is reported for both the complete battery and short form. This test has been normed on children whose gross motor skills are considered to be within a normal range (Bruininks, 1978). The eight tests take a time of 15 - 20 minutes to administer per child. The shortened version of the test battery would be used to accommodate time constraints and the gross motor skill limitations of the research work. The BOT would be individually administered. The test would begin with a pre-test to determine the child's arm and leg preference. Performance scores for each item would be converted to point scores on the appropriate scales given in the test manual.

Test Battery Procedures

The assessments would be undertaken at a selected school in the Cape Coast Metropolis and the test battery of eight sub-tests would be used. On the scheduled days of assessment, the tester would set up the required testing stations in the order of 1) the timed sprint, 2) balancing on preferred leg, 3) walking heel-toe on the balance beam, 4) test for bilateral coordination; tapping feet alternately while making circles with fingers, 5) jumping once while clapping hands as many times as possible, 6) standing long jump, 7) catching a tossed ball with the preferred hand and 8) throwing ball at a target with the preferred hand. A maximum of four subjects would be assessed at one time on an individual basis. They would accompany the tester to the venue for briefing prior to assessment. Following this, each candidate would commence the test with the physical assessment to determine arm and leg preference. The candidates will then follow the testing procedures as in the order set out by the tester [as mentioned above] which the tester explained in detail as to what was expected of the learner at each activity. The participant will be encouraged at all times to complete each task to the best of his/her capability. The learners would not be forced to change into physical education kit but they would be required to remove shoes and socks and undertake the assessment barefooted.

Sub-test 1: (a) Reaction time/Running speed/ Agility

Two lines 16 yards (14.5m) apart are marked; a beanbag is placed on the far line. A short line, the "timing line", is marked 1 yard (90cm) in front of the first line. The child begins at the first line, runs to the far line, picks up the beanbag, and then runs back across the first line as fast as possible. The child is timed to the nearest 0.2 second between the first and the last crossings of the timing line. Two trials are taken and the best score is recorded.

Sub-test 2: Balance

Standing on the preferred leg on balance beam, the child stands on the preferred leg on the balance beam, looking at a wall target, with hands on hips, and free leg held with thigh parallel to the floor. The score is made up of the time the child can maintain the balanced position to a maximum of 10 seconds. A second trial is given if the child does not score the maximum on the first trial.

Walking forward heel-to-toe on balance beam. The child walks forward on the balance beam heel-to-toe, with hands on hips. The recorder keeps track of the correct and incorrect steps on six steps. The child must make six consecutive steps correctly to achieve maximum score (6). A second trial is given if the child does not score the maximum on the first trial.

Sub-test 3: Bilateral Coordination

Tapping feet alternately while making circles with fingers. The child sits on a chair and attempts to tap feet alternatively while simultaneously making inward to outward circles with the index fingers. This item is scored pass or fail. The child is given 60 seconds to complete 10 consecutive foot taps correctly. A learner is said to have passed if six or more consecutive successful performance was achieved.

Jumping up and clapping hands. The child jumps as high as possible before landing. The score is the number of claps; a maximum score is five. A second trial is given if the child does not score the maximum on the first trial.

Sub-test 4: Strength - Broad jump

After warming up, the child assumes a bent-knee position, and then does a standing long jump. The child's score is the longest jump of three trials, recorded to the nearest number on the test kit measuring tape.

Sub-test 5: Upper-limb Coordination

Catching a tossed ball with the preferred hand. The child stands on the mat and the assessor slowly tosses the ball underhand from the 3m tape mark towards the child. The child is given one practice trial. The number of correct catches made in five trials is recorded.

Throwing a ball at a target with the preferred hand. With the preferred hand, the child throws a tennis ball overhand at a target from a distance 1.5 m. The child is given one practice trial. The number of correct throws (that hit the target) in five trials is recorded.

STATISTICAL ANALYSIS

The research is quantitative in nature and comparative when examined in relation to norms. The outcomes would be converted into standardized scores and the mean score calculated for each of the five areas of motor proficiency tested. Repeated Measure ANOVA and Repeated Factorial ANOVA would be used to assess comparisons between the data collected.

APPENDIX E

EVALUATION SHEET FOR EACH ASSESSMENT

Name:.. **Boy:** [ ] **Girl** [ ]

Date of Birth: ....

Subject 1: Running Speed and Agility

1. Running Speed and Agility

Trial 1: Seconds: ....

Trial 2: Seconds: ....

Score: ....

Subject 2: Balance

1. Balancing on preferred leg on balance beam (10 sec. max. per trial)

   Trial 1: .... Seconds: ....

   Trial 2:.............................. Seconds:..................

   Score: ....

2. Walking Forward Heel to toe on Balance Beam

   Trial 1: .... Steps: ....

   Trial 2: .... Steps:...................

   Score: ....

Subject 3: Bilateral Coordination

1. Tapping feet alternatively with making circles with fingers (60 seconds max)

   Pass: ....

   Fail: ....

   Score:..........................

2. Jumping up and clapping hands (maximum of 5 trials)

   1. Number of claps: .... Score: ....

Subject 4: Strength

1. Standing Broad Jump (record distance with tape measure)

   Trail 1: ....

   Trail 2: .... Score: ....

Subject 5: Upper Limb Coordination

1. Catching a tossed Ball with a preferred hand (5 trials)

   Number catch: .... Score:..................

2. Throwing a Ball at a target with preferred Hand (5 trials)

   Number of Success: .... Score: ....

Observation:..

Date Tested: ....

APPENDIX F

POINT SCORE TABLE

Table 1: Point scores for test 1 Running speed and agility

Raw Score	Point Score
10.9 – 11	1
10.5 – 10.8	2
9.9 – 10.4	3
9.5 – 9.8	4
9.4 – 8.9	5
8.8 – 8.5	6
8.4 – 7.9	7
7.8 – 7.5	8
7.4 – 6.9	9
6.8 – 6.7	10
6.6 – 6.3	11
6.2 – 6.1	12
6.0 – 5.7	13
5.6 – 5.5	14
<5.5	15

Table 2: Point scores for test 2 balance (standing on the preferred leg on a balance beam)

Raw Score (seconds)	Point Score
1 – 2	1
3 – 4	2
5 - 6	3
7 – 8	4
9	5
10	6

Table 3: Point scores for test 2 balance (walking forward heel-to-toe on a balance beam)

Raw Score (steps)	Point Score
0	1
1 – 3	2
4	3
5	4
6	

Table 4: Point scores for test 3 Bilateral Coordination (tapping feet alternately while making circle with fingers)

Raw Score	Point Score
Pass	1
Fail	0

Table 5: Point scores for test 3 Bilateral Coordination (jumping up and clapping hands)

Raw Score (claps)	Point Score
0	0
1	1
2	2
3	3
4	4
>4	5

Table 6: Point scores for test 4 strength (Broad jump)

Raw Score (distance)	Point Score
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15

Table 7: Point scores for test 5 Upper-Limb Coordination (catching a tossed ball with the preferred hand)

Raw Score	Point Score
0	0
1 – 2	1
3 – 4	2
5	3

Table 8: Point scores for test 5 Upper-Limb Coordination (throwing a ball at a target with the preferred hand)

Raw Score	Point Score
0	0
1 – 2	1
3 – 4	2
5	3