4-18-2017

Investigation on Gross Motor Development of Children with Different Sociocultural Backgrounds: A Pilot Study

Kaitlyn Michelle Downing

INVESTIGATION ON GROSS MOTOR DEVELOPMENT OF CHILDREN WITH DIFFERENT SOCIOCULTURAL BACKGROUNDS: A PILOT STUDY

by

Kaitlyn Michelle Downing

A Thesis

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Master of Science

Major: Health and Sport Science

The University of Memphis

May 2017

Acknowledgements

Within the last two years at the University of Memphis, I could not have asked for a better group of professors, mentors, and colleagues. First and foremost, I would like to thank Dr. Yuhua Li for the opportunity to work in the Motor Behavior Laboratory during my time at the University of Memphis. She is always willing to answer questions and present her students with immense opportunities to learn and grow. I am extremely grateful for her support, dedication, and knowledge that allowed me to learn more about the field of exercise science.

Also, to my committee members, Dr. Satomi Taylor and Dr. Gerhild Ullmann, thank you for your support and graciousness. With two professors from different disciplines, I was able to see things in a different perspective and learned tremendously through your feedback. I could not have finished this without your guidance.

Thank you to my fellow graduate students, Lindsey Allison, Kris Camelio, Daniel Gregg and Ross Smith. You have all been there for me in my worst of times and have always given me the encouragement that I needed. Also, many thanks for calming my stress even when things were not that stressful. I consider myself lucky to call you my friends and colleagues.

Lastly, I would like to thank my family. To my mother, Donna, you are my rock. To my father, Mike, and brother, Kendall, thank you for believing in me. To Jake, thank you for drying all my tears, calming my nerves, and never allowing me to give up. To Steve, you pushed me to finish this work more than you will ever know. Breathe easy, friend.

I love you all.

Abstract

Movement is important for successful development for children. It is widely accepted that sociocultural influences have an effect on childhood motor development. The present study aimed to investigate similarities and differences in gross motor skills among American, Chinese, and Japanese children. One hundred fifty children from the three countries were recruited to participate in the study. Three test skills were selected from the Test of Gross Motor Development, second edition (i.e. run, hop and catch). A 3 (groups) X 2 (gender) ANOVA was conducted to examine whether there would be significant differences between the three groups, as well as the gender effect. The results showed a significant group difference on all three test skills. The post-hoc test showed that American and Japanese children were superior on the run, while Japanese children were superior on the hop. Chinese children were better on the catch. Neither gender effect, nor interaction was found.

Keywords: motor development, sociocultural influences, gender difference, children, interventions, physical activity

Preface

The findings from this thesis are in preparation for publication to *Early Child Development and Care.* The manuscript is presented in Chapter I and has been formatted specifically for the journal. In addition, this thesis committee has approved the format of this document.

Table of Contents

	PAGE
CHAPTER I	
Introduction	**1**
Methods	
Participants	**3**
Equipment	**4**
Design and Procedure	**4**
Data Analysis	**6**
Results	**7**
Discussion	**10**
Sociocultural Differences in Skill Execution	**10**
Gender Differences in Skill Execution	**12**
Limitations	**14**
Conclusion	**15**
References	**15**
CHAPTER II	
Literature Review	**19**
Physical Activity and Development	**20**
Fundamental Movement Skills	**21**
Influences on Motor Skill Development	**22**
Test of Gross Motor Development – Edition 2	**24**
Sociocultural Differences and Motor Skills	**25**

Gender Related Differences and Motor Skills 28

Current Gaps in the Literature 30

Summary 30

References 32

Appendices

A. IRB Approval 39

B. Parental Letter 40

C. Performance Criteria Sheet (Selected from the TGMD-2) 42

CHAPTER I

Investigation on gross motor development of children with different sociocultural backgrounds: a pilot study

Introduction

Movement is essential for proper development during childhood (Cools, De Martelaer, Samaey, & Andries, 2008; Piek et al., 2015). Through these movements such as running, skipping, and jumping, children can learn basic motor skills. The basic motor skills, also known as fundamental movement skills, have emerged as the focus of research within the last few years due to the obesity epidemic (Spessato, Gabbard, Valentini, & Rubisill, 2013; Swinburn et al., 2011). These skills are needed in everyday activities and proper execution encourages a healthy development with major benefits (Barbe, 2014; Copple & Bredekamp, 2009; Goldring, 2010). Participation in activities that include these motor skills is crucial for children in order to increase potential for an active lifestyle and to avoid inactivity that could lead to obesity (Dow, 2010; Izumi-Taylor & Morris, 2007). Therefore, parents and teachers should pay close attention to the types of activities that young children choose to participate in and expose children to activities that involve movement and physical activity that may ultimately help with proper motor development.

It has been suggested that many factors can influence a child's development, as well as his/her biological characteristics (Hardy, King, Farrell, Macniven, & Howlett, 2010; Hinkley, Crawford, Salmon, Okley, & Hesketh, 2008; Pienaar & Kemp, 2014; Spessato et al., 2013). These factors that can influence a child's development include the child's physical environment (including home, school and surrounding areas), social interactions, parent's amount of physical activity and body development. It is imperative to be able to identify the specific influences and use our understanding of motor development to improve health and optimize motor performance.

Sociocultural influences have also been proposed to affect preschool children's physical activities (Cools et al., 2008; Hardy et al., 2010; Hinkley et al., 2008; Aponte, French, & Sherrill, 1990; Uys & Pienaar, 2010; Wrotiniak, Epstein, Dorn, Jones, & Kondilis, 2006). It was assumed from previous research (Malina, 2004; Venter, Pienaar, & Coetzee, 2015) that cultural conditioning may have an effect on motor development in children since it can start at a young age and can progress through development. Walter (2011) reported this concept in his research and concluded that in some differing cultures boys are more likely to be encouraged in physical activity and sport participation, while girls are encouraged to complete household chores.

Previous research (Garcia, 1994; Lever, 1978; Spessato et al., 2013) has also found gender differences in children's gross motor skill development. The results, however, are conflicting. Some previous literature has suggested that differences in skill acquisition may be minimal before puberty (Malina, Bouchard, & Bar-Or, 2004; Thomas & French, 1985; Spessato et al., 2013). A recent study by Spessato et al. (2013) investigated children from multiple age groups. Each group is defined by age from 3-10 years old and then divided into boy and girl groups. Specifically, Spessato et al. (2013) used the Test of Gross Motor Development – Edition 2 was used to examine differences among the different age groups. They found a significant difference in the performances of locomotor and object control skills between the older age groups. However, for the young age group, performance between boys and girls showed no significant differences in either locomotor or object control skills. For the older age groups, the authors contributed the differences seen to cultural conditioning. Cultural conditioning refers to the gender-specific roles. That is, girls learn to complete household chores; boys participate in physical activity (Malina, 2004; Venter et al., 2015; Walter, 2011).

In addition, it has been suggested that participation in sports for females is not supported in the same way as for their male counterparts (Goncąlves, Hallal, Amorim, Araújo, & Menezes, 2007; Greendorfer, Blinde, & Pellegrini, 1986). In contrast, Hardy et al. (2010) found significant differences between boys and girls in different fundamental skills. Specifically, they reported a difference in genders with boys scoring higher in both total and individual object control skills compared to the girls except for the catch. Even with the copious amount of conflicting research, it is valuable to investigate possible gender differences in fundamental movement skill execution because it may give parents and preschool teachers an idea regarding how to help children learn and practice their skills and to develop programs that will target specific skill execution for boys and girls.

The purpose of this pilot study was to investigate if sociocultural influences have an effect on motor development. Specifically, two research questions were focused on: 1) Are there significant differences in the development of gross motor skills in American, Chinese and Japanese four-year old children? 2) How are their gross motor skills similar and/or different? It was expected that there would be significant differences between the groups. However, it is unclear of what particular groups would perform better due to the limited previous research. Additionally, we do not expect to see a difference between boys and girls due to their pre-pubescent age.

Methods

Participants

One hundred and fifty (150) 4-year-old children were recruited to participate in this study. There were 78 boys and 72 girls in total. These participants were from Shantong, China; Chiba, Japan, and Memphis, USA. Each location had a variety of schools to pool students. The

Institutional Review Board at the University of Memphis granted approval for human subject data. Parental permission was obtained for each of the participants before testing.

Equipment

Each school that recruited children has a gym that is at least 18 meters by 12 meters in order to complete the testing. For the testing, four orange cones were used to mark off the two stations (locomotor and object control skills). In addition, a plastic ball (10 centimeters in diameter) was used for the object control station. Additionally, we used a scale to measure the weight of the children, as well as a measuring tape to measure the height.

Design and Procedure

Each school was contacted for an initial consultation. During the first consultation with the schools, we explained the research principles and the overall research goal to the headmaster, and provided them with consent forms. These forms described the research and the procedures associated with the study, as well as requesting the name. The headmaster conducted a recruiting meeting for the parents or guardian, discussing the project and handing out consent forms. These forms were distributed to the parents or guardian, were signed, and returned with the child to the respective school in order to take part in the proposed research. Because we were testing children participants, we looked for their assent once the consent forms were received.

In order to score the participants objectively, four assessors in each location were trained before testing. A video series that depicts execution of each skill was used for training. When the video clip was completed, the assessors evaluated the skill in regard to the requirements (Ulrich, 2000; see Appendix C) and discussed potential discrepancies. This allowed them to be familiar with the requirements of each skill execution and the evaluations associated with it. In addition,

the assessors were given a data collection sheet to indicate a check mark "✓" if the requirement was met, and an "X" if the requirement was not met (see Appendix D).

The Test of Gross Motor Development – Edition 2 was used as the testing tool. This test was designed to assess skill execution in young children and was validated in 2000 (Ulrich, 2000). The test has two subsets with six skills under each subset. The validity and reliability of this test was established in multiple countries (Bardid et al., 2016; Kim, Kim, Valentini, & Clark, 2014; Simons, Daly, Theodorou, Caron, & Andoniadou, 2008; Valentini, 2012; Wong & Cheung, 2010). For this research, three skills were selected from the TGMD-2 (i.e. run, hop and catch). The reason for using a modified version of the TGMD-2 was because of the differing physical activity guidelines mandated by the countries involved in this study. A modified version of the TGMD-2 has been validated in past literature (Cano-Cappellacci, Leyton, & Carreño, 2016; Valentini, 2012). Cano-Cappellacci et al. (2016) used a modified version of the TGMD-2 on Chilean children and found it to be valid and applicable. This included using certain skills and language translations. Additionally, Valentini (2012) combined to different motor skill assessment tests and found it to be valid and reliable on Brazilian children. Before testing began, the respective gyms were set up using the cones and the correct lengths, as defined by the TGMD-2. For the locomotor skills section (run and hop), two cones were placed 15 meters apart. For the object control skills section (catching), two cones were placed 3 meters apart.

Prior to their testing, the participants were asked to sit in chairs and remove their shoes. Anthropometric measurements (height and weight) were recorded for each participant. The participants were brought in to the testing gym four at a time. They were split into two groups to be tested at the two stations (locomotor and object control). Two assessors were present at each station and evaluated the execution of the skills. The participants were given a demonstration

from one of the assessors, and instructions were repeated if the child did not understand the requirements. After the demonstration, each participant completed two trials (test and re-test) for each skill. The assessors evaluated the participant using the grading system as described above ("✓" for yes, "X" for no) according to each requirement for the execution of skill. Once the participants completed the set of skills at the respective station, they transitioned to the subsequent station in order to complete the remainder of the testing with the same procedures as described above.

The overall testing time was approximately 30 to 45 minutes. Once the testing was completed, the participants were returned to their respective class, and four more participants were brought to the testing area until all had completed the testing based on the school scheduling.

Data Analysis

Descriptive statistical analysis was administered based on three different schools and the two different genders. A 3 (groups) x 2 (gender) two-way analysis of variance (ANOVA) was conducted to examine the two main effects and interaction between the two. Additionally, post-hoc tests were run when necessary.

Results

All 150 participants completed the testing with 50 participants from each country (American, Chinese, and Japanese). All participants had to be 4 years old in order to be included in the testing and analysis. Means and standard deviations from demographic information are presented in Table 1. All participants fell within the normal range for height and weight of 4-year old children.

The means and standard deviations for the groups for each skill are presented in Table 2. Results of the ANOVA revealed a significant group difference in all three skills, run, hop and catch, F (2,144) = 28.9, p < .01, η^2= .286; F (2,144) = 13.2, p < .01, η^2= .155; F (2,144) = 43.3, p < .01, η^2= .375, respectively. The follow up tests showed that American and Japanese children scored significantly higher than Chinese children in the run. Also, Japanese children performed significantly higher than American and Chinese children in the hop skill. However, Chinese children performed significantly better than both American and Japanese children in the catch skill. No other significant effects were found (p's>.05).

Table 1. The means and standard deviations of height (cm) and weight (kg) in each of the three groups

Group	Height	Weight
American (n=50)		
Boys (n = 29)	106.39 ± 4.09	17.94 ± 2.04
Girls (n = 21)	105.74 ± 4.37	17.57 ± 1.91
Total (n = 50)	106.05 ± 4.21	17.74 ± 1.96
Chinese (n=50)		
Boys (n = 29)	107.69 ± 4.06	17.82 ± 2.65
Girls (n = 21)	110.19 ± 4.29	18.04 ± 2.58
Total (n = 50)	108.74 ± 4.30	17.91 ± 2.59
Japanese (n= 50)		
Boys (n = 26)	106.44 ± 4.19	16.97 ± 1.86
Girls (n = 24)	106.39 ± 3.20	17.38 ± 1.73
Total (n = 50)	106.40 ± 3.75	17.15 ± 1.80

Table 2. The means and standard deviations of performance scores for the three test skills in boys and girls of the three groups

Group	Run	Hop	Catch
American(n=50)			
Boys (n=24)	3.50 ± .66	2.02 ± 1.50	1.54 ± .66
Girls (n=26)	3.67 ± .42	2.60 ± 1.62	1.73 ± .59
Total (n=50)	3.46 ± .76	2.32 ± 1.57	1.64 ± .62
Chinese (n=50)			
Boys (n=29)	2.55 ± .90	2.38 ± 1.09	3.02 ± .77
Girls (n=21)	2.88 ± .84	3.07 ± 1.33	2.74 ± .78
Total (n=50	2.69 ± .88	2.67 ± 1.24	2.90 ± .78
Japanese (n=50)			
Boys (n=28)	3.76 ± .66	3.80 ± 1.41	1.64 ± .86
Girls (n=22)	3.72 ± .74	3.68 ± 1.60	1.96 ± .61
Total (n=50)	3.74 ± .69	3.74 ± 1.50	1.80 ± .76
Total (n=150)			
Boys (n=78)	3.23 ± .92	2.72 ± 1.52	2.12 ± 1.02
Girls (n=72)	3.46 ± .76	3.11 ± 1.58	2.10 ± .77
Total (n=150)	3.34 ± .85	2.91 ± 1.56	2.11 ± .91

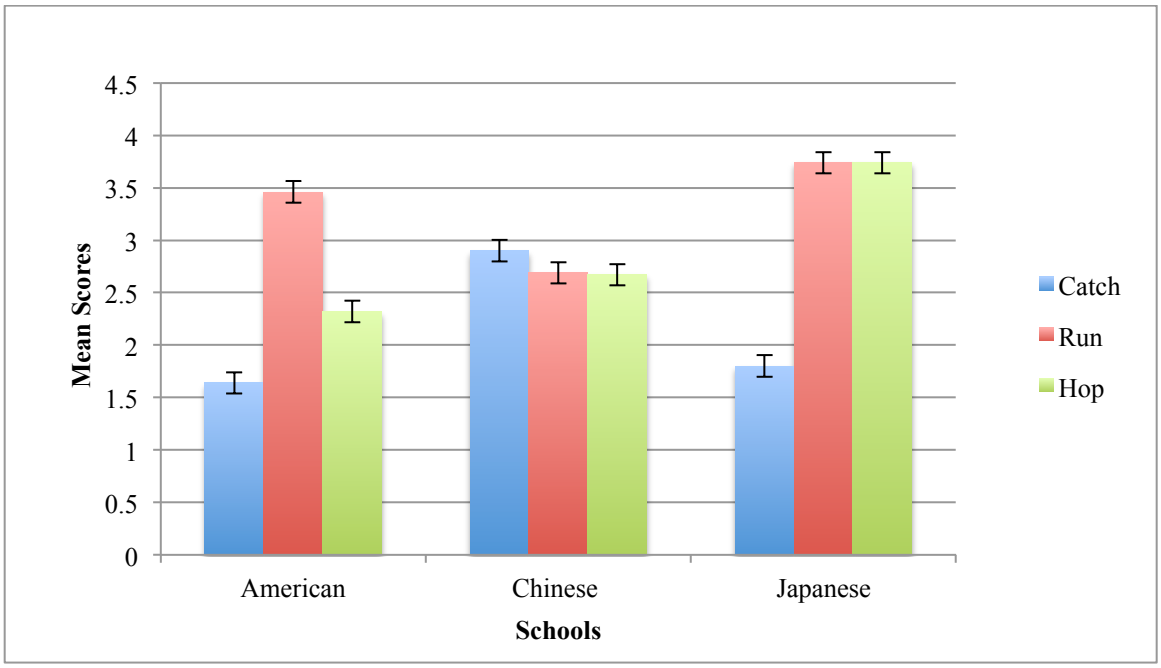

Figure 1. The mean scores of the three test skills in three groups

Discussion

Previous research has suggested that motor development in children may be impacted by sociocultural influences (Cools et al., 2008; Hardy et al., 2010; Hinkley et al., 2008). Limited studies have investigated motor development in cross-cultural participants (Cools et al., 2008; dos Santos, Pachecho, Basso, & Tani, 2016; Venter et al., 2015). The aim of the current study was to identify if sociocultural influences may affect the gross motor development of 4-year old children between American, Chinese and Japanese children.

Sociocultural Differences in Skill Execution

The results revealed a significant difference between the different groups in all the skill tested. The findings were consistent with the original speculation that a significant difference would be seen between the three different groups (Malina et al., 2004; Venter et al., 2015; Uys & Pienaar, 2010). However, we were unsure of what groups would perform better in the skills. Specifically, American and Japanese children were more superior on locomotor skills (i.e. run

and hop), and Chinese children were better on the catch skill. These results support the previous sociocultural research that different sociocultural backgrounds may have an effect on gross motor skill competency. In a recent study, Bardid et al. (2016) investigated Belgian children aged 3 to 8 and compared the results to the American reference sample. It was found that Belgian children had lower performances than the American sample for object control skills. However, they did warrant caution when comparing children from different countries and suggest the need to measure both motor coordination and fundamental movement skills in order to develop a more comprehensive understanding of motor competency.

These current findings also suggest that sociocultural influences may have an effect on motor skill development even in a very young age, such as 4 years old. Due to prevalence in everyday activities with movement, the difference in skill execution is likely related to the varying physical activity guidelines and exercises. Physical activity guidelines can vary by country. Previous research has found that countries with a more strict physical activity curriculum have a greater percentage of children performing fundamental movement skills at a higher mastery level research (dos Santos et al., 2016). This could possibly explain the significant difference found between the schools on the skills tested. With Japan scoring the highest in two of the three skills (i.e. run and hop), it can be fair to say this could be attributed to the curriculum provided during the typical school day. Japanese children participate in more outdoor physical activities than American and Chinese children (Nakai & Metzler, 2005). This could mean greater opportunities for movement (i.e. running, skipping, jumping, and etc.). In Japan, government issued guidelines for physical activity are implemented at an early age. The Ministry of Education, Culture, Sport, Science and Technology (MEXT) set specific standards and guidelines for physical activity (MEXT, 2008). This may account for the results seen from

this study. Specifically, Japanese children have a higher likelihood for outdoor locomotor practice. This means they may be more proficient in skills like the run and hop.

According to the American Alliance for Health, Physical Education, Recreation, and Dance (AAHRERD) (2014), a possible reason the American children scored moderately in the skills tested is likely related to the curriculum provided in schools in opposition to free play. In the US, there are no such guidelines that are mandated by the government. Also, the curriculum in the United States focuses on mastery of skills instead of encouraging involvement and support. This kind of curriculum that emphasizes involvement may more likely be found in China where children participate in more cultural activities, games, and sport learning (dos Santos et al., 2016). In regard to Chinese children, it can be speculated that the children have a higher level of skill mastery in the upper limbs due to increased hand movements and access to fine motor toys. While there is no solid evidence emphasizing this concept, it may be a possible explanation for the higher score in the catch skill.

Gender Differences in Skill Execution

The results revealed there was no significant difference between boys and girls in all the test skills ($ps>.05$). The findings were consistent with some of the previous literature (Barnett, van Beurden, Morgan, Brooks, & Beard, 2010; Spessato et al., 2013), which suggest that this age could possibly too young to see a significant difference in skill execution. The lack of significant difference is likely related to their age and the early stage of development that they were in at the time of the testing.

Barnett et al. (2010) found no gender differences for the locomotor skills. Additionally, they concluded that gender might not affect childhood skill proficiency. The skills selected for the current study were picked on the ability of young children to perform properly. Because of

biological characteristics and the developing age, these could be possible explanations for the lack of significant differences between genders. Also, similarities in strength and limb length may be a possible explanation for no gender differences seen (Malina et al., 2004). While limb length and strength was not collected for the present study, all participants did have similar height and weight values, which emphasizes the similarities in anthropometric measures in young children. This supports the hypothesis that a gender difference will not be seen due to the pre-pubescent age.

In contrast, previous research has shown a gender difference in motor skill execution. For example, Hardy et al. (2010) tested fundamental movement skills among Australian children. From their research, they concluded that fundamental movement skill acquisition differs by gender and specific skills. They reported that boys had higher object control skill proficiency, while girls had higher locomotor skill proficiency. It seems that gender differences and sociocultural influences may go hand-in-hand with motor development. Also, Bardid et al. (2016) found that boys performed better than girls with object control skills in all age groups. The differing results of the present study from studies like Hardy et al. (2010) and Bardid et al. (2016) may be explained by methodology. While the TGMD-2 was used for the studies mentioned, the modified version used in the present study does not allow for an overall assessment. Only one object control skill was tested, so it would be difficult to see a gender effect; this can also be applied to the locomotor skills since only two were tested. For the current research, the goal was to see if multiple countries could be feasibly collaborated to collect motor development data by using the same methods. However, our data showed no gender difference consistently across the three different groups, which provided interesting evidence in the related literature.

Previous authors have reviewed literature regarding sociocultural influences (Mayson, Harris, & Bachman, 2007). From their findings, it has been suggested that identifying developmental delays as early as possible may be more beneficial in implementing some necessary interventions. Some previous research (Bardid et al., 2013; Goodway & Branta, 2003; Valentini & Rudisill, 2004; Zittel & McCubbin, 1996) has investigated the effects of fundamental movement skill interventions with different age groups. For example, Bardid et al. (2013) showed the improvements in motor skill execution in pre-school aged children with a 10-week program. While the sample size was small for their research, the study found that fundamental movement skill mastery was improved in lower skilled preschoolers.

Another type of intervention proposed involves a home-based fundamental movement skill program, and improvements were shown between boys and girls (Reilly et al., 2006). Additionally, these types of interventions should be considered and tailored to young children for the different age groups. While allowing for free play in order to develop these fundamental movement skills is crucial, teachers directing activities have shown a greater acquisition. This is why it is imperative for teachers to recognize possible delays in a child's motor development in order to intervene with needed interventions (Deli, Bakle, & Zachopoulou, 2006; Derri, Tsapakidou, Zachopoulou, & Kiomourtzoglou, 2001). Also, developing effective interventions for fundamental movement skills may ultimately help to improve potential for future physical activity participation.

Limitations

The strength of this study was that it included cross-cultural and used the same test and measurements in the study. In addition, the tested skills were a part of a validated and standardized test that gives specific guidelines for skills acquisition. However, a few limitations

were worth to noticed. The first limitation is only three out of twelve skills in the TGMD-2 were tested. By using all skills designated by the TGMD-2, this will allow for a better evaluation of gross motor skill development. This will help with a more thorough assessment of motor skill development and will allow the data collected to be directly compared to existed norms. Another limitation for this study was the small sample size. Future studies should include more locations to increase sample size in addition to diversifying the sample. This could include looking into socioeconomic status, culturally blended families, and children with disabilities from different sociocultural backgrounds. In regard to assessing the skill, future studies should be sure to train all assessors well before testing. A video data collection should be considered to make assessments more objective.

Conclusion

The results of this pilot study showed significant differences on the performances of three test skills among four-year old children in three different countries. However, no difference between boys and girls was observed. The current findings highlight the need for cross-cultural research on early childhood motor skill development. The emphasis of identifying influential factors on motor development is imperative and may help to develop effective early intervention programs, which are important to encourage increased daily physical activities that could lead to healthier lifestyles into adolescence and adulthood.

References

AAHPERD Cirriculum Framework Task Force. (2014). *Society of Health and Physical Educator.* State University of New York College at Cortland.

Aponte, R., French, R., & Sherrill, C. (1990). Motor development of Puerto Rican children: Cross-Cultural Perspectives. *Perceptual and Motor Skills, 71*, 1200-1202.

Barbe, J. (2014). Foundations of responsive caregiving: Infants, toddlers, and twos. St. Paul, MN: Redleaf Press.

Bardid, F., Deconicnk, F.J.A., Descamps, S., Verhoeven, L., Pooter, G.D., Lenoir, M., & D'Hondt, E. (2013). The effectiveness of a fundamental motor skill intervention in

pre-schoolers with motor problems depends on gender but not environmental context. *Research in Developmental Disabilites, 34*(12), 4571-4581.
Bardid, F., Huyben, F., Lenoir, M., Seghers, J., De Martelaer, K., Goodway, J.D., & Deconinck, F.J.A. (2016). Assessing fundamental motor skills in Belgian children aged 3-8 years highlights differences to US reference sample. *Acta Pædiatric, 105*, 281-290.
Barnett, L., van Beurden, E., Morgan, P.J., Brooks, L.O., & Beard, J.R. (2010). Gender differences in motor skill proficiency from childhood to adolescence: a longitudinal study. *Research Quarterly, 81*(2), 162-170.
Cano-Cappellacci, M., Leyton, F.M., & Careño, J.D. (2016). Content validity and reliability of Test of Gross Motor Development in Chilean children. *Revista de Saude Publica, 49*(97), 1-7.
Cools, W., De Martelaer, K., Samaey, C., & Adries, C. (2008). Movement Skill Assessment of Typically Developing Preschool Children: A Review of Seven Movement Skill Assessment Tools. *Journal of Sports Science and Medicine, 8*, 154-168.
Copple, C., & Bredekamp, S. (2009). *Developmental Appropriate Practice in Early Childhood Programs: Serving Children from Birth through Age 8*. Washington, D.C.: NAEYC Books.
Deli, E., Bakle, I., & Zachopoulou, E. (2006). Implementing intervention movement programs for kindergarten children. *Journal of Early Childhood Research, 4*(1), 5-18.
Derri, V., Tasapakidou, A., Zachopoulou, E., & Kiomourtzoglou, E. (2001). Effect of a music and movement programme on development of locomotor skills by children. *European Journal of Physical Education, 6*, 16-25.
dos Santos, F.G., Pacheco, M.M., Basso, L., & Tani, G. (2016). A comparative study of the mastery of fundamental movement skills between different cultures. *Motricidade, 12*(2), 116-126.
Dow, C. B. (2010). Young children and movement. Young Children, 65 (2), 30-35.
Gabbard, C.P. (2012). *Lifelong motor development.* San Francisco: Pearson Benjamin Cummings.
Garcia, C. (1994). Gender differences in young children's interactions when learning fundamental motor skills. *Research Quarterly for Exercise and Sport*, *65*(3), 213-225.
Goldring, J. (2010). *Discover me revised edition*. American Digital Printing.
Goodway, J.D., & Branta, C.F. (2003). Influence on a motor skill intervention on fundamental motor skill development of disadvantaged preschool children. *Research Quarterly for Exercise and Sport Science, 74,* 36-47.
Goncąlves, H., Hallal, P.C., Amorim, T.C., Araújo, C.L., & Menezes, A.M. (2007). Sociocultural factors and physical activity level in early adolescence. *Revista Panamericana de Salud Publica, 22*(4), 246-253.
Greendorfer, S.L., Blinde, E.M., & Pellegrini, A.M. (1986). Gender differences in Brazilian Children's socialization into sport. *International Review for the Sociology of Sport, 21*(1), 51-63.
Hardy, L.L., King, L., Farrell, L., Macniven, R., & Howlett, S. (2010). Fundamental movement skills among Australian preschool children. *Journal of Science and Medicine in Sport*, *13*, 503-508.
Hinkely, T., Crawford, D., Salmon, J., Okely, A.D., & Hesketh, K. (2008). Preschool children and physical activity: A review of correlates. *American Journal of Preventative*

Medicine, 34(5), 435-441.
Izumi-Taylor, S., & Morris, V. G. (2007). Active play and cooking activities for toddlers. PlayRights, 29(3), 7-10.
Kim, S., Kim, M.J., Valentini, N.C., & Clark, J.E. (2014). Validity and Reliability of the TGMD-2 for South Korean children. *Journal of Motor Behavior, 46*(5), 351-356.
Lever, J. (1978). Sex differences in the complexity of children's play and games. *American Sociological Review*, *43*(4), 471-483.
Malina, R.M. (2004). Motor development during infancy and early childhood: Overview and Suggested directions for research. *International Journal of Sport and Health Science, 2*(1), 50-66.
Malina, R.M., Bouchard, C., & Bar-Or, O. (2004). *Growth, maturation, and physical activity.* 2nd edition. Champaign, IL: Human Kinetics.
Mayson, T.A., Harris, S.R., & Bachman, C.L. (2007). Gross motor development of Asian and European children on four motor assessments: a literature review. *Pediatric Physical Therapy, 19*, 148-153.
Nakai, T., & Metzler, M.W. (2005). Standards and Practice for K-12 Physical Education in Japan. *Journal of Physical Education, Recreation and Dance, 76*(7), 17-22.
Piek, J.P., Kane, R., Rigoli, D., McLaren, S., Roberts, C.M., Rooney, R., Jensen, L., Dender, A., Packer, T., & Straker, L. (2015). Does the Animal Fun Program Improve Social-Emotional and Behavioural Outcomes in Children aged 4-6 Years? *Human Movement Science, 43*, 155-163.
Pienaar, A.E., & Kemp, C. (2014). Motor proficiency profile of Grade 1 learners in the North-West Provience of South Africa: NW-child study. *South African Journal for Sport, Physical Education and Recreation*, *36*(1), 183-198.
Reilly, J.J., Kelly, L., Montgomery, C., Williamson, A., Fisher, A., McColl, J.H., Conte, R.L., Paton, J.Y., & Grant, S. (2006). Physical activity to prevent obesity in young children: cluster randomized controlled trial. *BMJ, 333.*
Simons, J., Daly, D., Theodorou, F., Caron, C., & Andoniadou, E. (2008). Validity and reliability Of the TGMD-2 in 7-10-year-old Flemish children with intellectual disability. *Adapted Physical Activity Quarterly, 25*, 71-82.
Spessato, B.C., Gabbard, C., Valentini, N., &Rudisill, M. (2013). Gender differences in Brazilian children's fundamental movement skill performance. *Early Child Development and Care*, *183*(7), 916-923.
Swinburn, B.A., Sacks, G., Hall, K.D., McPherson, K., Finegood, D.T., Moodie, M.L., & Gortmaker, S.L. (2011). The global obesity pandemic: shaped by global drivers and local environments. *The Lancet, 378*(9793), 804-814.
The Ministry of Education, Culture, Sports, Science and Technology. (2008). *Course of study for kindergarten.* Retrieved from: http://www.mext.go.jp/en/policy/education/index.htm.
Thomas, J.R., & French, K.E. (1985). Gender differences across age in motor performance: a Meta-analysis. *Psychological Bulletin, 98*(2), 260-282.
Ulrich, D.A. (2000). *Test of gross motor development* (2nd ed.). Austin, TX: Pro-ED.
Uys, P.L. & Pienaar, A.E. (2010). Physical and motor development of pre-school children from Different socio-economic circumstances. *South African Journal of Research in Sport, Physical Education and Recreation, 32*(2), 131-144.
Valentini, N.C. (2012). Validity and reliability of the TGMD-2 for Brazilian children. *Journal of Motor Behavior, 44*(4), 275-280.

Valentini, N.C., & Rudisill, M.E. (2004). Motivational climate, motor-skill development, and perceived competence: Two studies of developmentally delayed kindergarten children. *Journal of Teaching in Physical Education, 23*(3), 216-234.

Venter, A., Pienaar, A.E., & Coetzee, D. (2015). Extent and nature of motor difficulties based on age, ethnicity, gender, and socio-economic status in a selected group of three-to five-year-old children. *South African Journal for Research in Sport, Physical Education, and Recreation*, *37*(3), 169-183.

Walter, C. (2011). In school and physical activity patterns of primary school learners from Disadvantaged schools in South Africa. *African Journal of Physical, Health Education Recreation and Dance, 17*(4), 779-788.

Wrotniak, B.H., Epstein, L.H., Dorn, J.M., Jones, K.E., & Kondilis, V.A. (2006). The relationship between motor proficiency and physical activity in children. *Pediatrics, 118*, 1758-1765.

Wong, A.K., & Cheung, S.Y. (2010). Confirmatory factor analysis of the Test of Gross Motor Development-2. *Measurement in Physical Education and Exercise Science, 14*, 202-209.

Zittel, L.L., & McCubbin, J.A. (1996). Effect of an integrated physical education setting on motor performance of preschool children with developmental delays. *Adapted Physical Activity Quarterly, 13,* 316-330.

CHAPTER II

Literature Review

Movement is important for promoting a healthy development, which includes motor, social and emotional aspects (Cools et al., 2008; Piek et al., 2015). Motor development can be defined into two major components: fine motor development and gross motor development. Fine motor development includes using the small muscles in the body (i.e the hand), while gross motor development focuses on the large muscle groups in the body (i.e. legs, core, arms, etc.). More specifically, successful progression of motor development is imperative to children. Gross motor development is essential part of everyday activity, and it is widely known that there are benefits to motor development through movement (Barbe, 2014; Bardid et al., 2016; Copple & Bredekamp, 2009; Goldring, 2010; Mayson et al., 2007). A successful motor development helps the muscle and muscle tone in the body to develop and balance. With this development and balance, children are able to stand, run or walk with ease and establish a basis for a good posture. For children, motor development helps them to discover the environment and maintain control as they progress through stages of life (Cools et al., 2008).

Gross motor development includes an increased functional use of limbs; this can be seen in activities such as jumping, climbing and running (Copple & Bredekamp, 2009). Skills like those mentioned are important to promote healthy lifestyles and healthy bodies (Barnett et al., 2010; Okely, Booth, & Patterson, 2001; Ridgeway et al., 2009); with young children, inactivity is one of the major causes of obesity (Dow, 2010; Izumi-Taylor & Morris, 2007). In 2002, the National Association of Sport and Physical Education (NASPE) recommended that children between birth and age five engage in physical activity (NASPE, 2002). This recommendation helps to promote overall fitness and movement skills that will eventually impact development.

With the obesity epidemic escalating within the last few years, understanding the factors behind childhood development is crucial more than ever.

Literature on motor skills and development was reviewed in order to determine a need for sociocultural investigation. The review of literature began with an overview of gross motor development and movement in addition to physical activity and development. Fundamental movement skills were addressed in order to understand the skills that will be tested. Influences on motor development was investigated and presented to show the need for investigating sociocultural aspects of influence. Additionally, the Test of Gross Motor Development – Edition 2 was described because of the testing tools used.

Physical Activity and Development

Physical activity can simply be defined as movement that expends energy (Caspersen, Powell, & Christenson, 1985). According to the U.S. Department of Health and Human Services, the recommended amount of physical activity for young children is 60 minutes at least three days a week (U.S. DHHS, 2008). Physical education classes are often used to meet those guidelines during the school day. More countries around the world use physical education curriculum. Some countries have specific guidelines for the physical activity curriculum; these guidelines can be set by the educational system or by the government.

An association between physical activity and physical development has been shown in previous literature (Okely et al., 2001; Hardy, Reinten-Reynolds, Espinel, Zask, & Okely, 2012; Hinkley et al., 2008; Williams et al., 2008). With a positive physical development, there is a greater chance for increased physical activity into adolescence and adulthood. Because of their prevalence in physical activity, fundamental movement skills are necessary for a successful development and allow for a greater movement patterns in activities and sport. Additionally,

proficiency in fundamental movement skills is linked to a more active lifestyle as an adult and willingness to participate in physical activity during childhood (Barnett et al., 2009; Hume et al., 2008; Lubans, Morgan, Cliff, Barnett, & Okely, 2010; Stodden et al., 2008). Longitudinal studies have been conducted in order to determine if fundamental skill mastery is an effective predictor of physical activity participation during one's lifetime (Barnett et al., 2009; Lopes, Rodrigues, Maia, & Malina, 2011). In the research, they found that children who had a higher level of mastery in fundamental movement skills were more likely participate in physical activities into adolescence. Stodden et al. (2008) concluded that the relationship between fundamental movement skill mastery and future physical activity levels is developmentally dynamic in addition to be reciprocal in nature. Because of this relationship, it is has been shown to be imperative to identify possible delays and deficits in motor development by monitoring motor skill execution (Bardid et al., 2013).

Fundamental Movement Skills

Fundamental movement skills (Wickstrom, 1977) have been suggested to be the basis for more advanced movement patterns of daily living activities and sport (Bardid et al., 2016; Clark & Metcalfe, 2002; Haubenstricker & Seefeldt, 1986). Fundamental movement skills are comprised of three different categories: locomotor, object control and body management skills. Locomotor skills are known as the most basic form of movement; more specifically, they have been called the building blocks of movement. Walking, jumping and skipping are just a few examples. Object control skills require the control of an object or tool in order to execute the skill. Some examples of object control skills include throwing a ball (both overarm and underarm), kicking, and catching. Because of the prevalence in physical activities, the two common types of skills studied together are locomotor and object control. Acquisition of these

skills is developmentally sequenced (Branta, Haubenstricker, & Seefeldt, 1984; Hardy et al., 2010) proper sequencing and execution of these skills is dependent upon numerous internal and external factors, such as biological, social, cognitive along with other factors (Hardy et al., 2010).

It has been suggested that there is a noticeable difference in fundamental movement skills between performances as children progress in age (Barnett et al., 2010; Hardy et al., 2010; Cools et al., 2008). More specifically, this addresses how children who are older are more capable to accurately perform these skills. Further identification of possible influences on skill execution may enable childhood researchers to target interventions that allow for more successful skill acquisition.

According to the current literature (Barnett et al., 2010; Branta et al., 1984; Goodway et al., 2010), four-year-old children should be able to execute some fundamental movement skills, while other skills may be difficult for them to complete. In addition, during the preschool years, it has been shown that acquisition and performance of fundamental movement skills show more significant changes than other years (Williams et al., 2008). Recently, fundamental movement skill acquisition has become the focus of research in childhood motor development due to the prevalence in physical activities for young children. It can be assumed that research dealing with fundamental movement skills and preschool age children is emerging and will continue to be a focus in childhood development research (Hardy et al., 2010).

Influences on Motor Skill Development

Several factors can be linked to being influential on motor skill development. Some of these factors include opportunity, encouragement from parents and guidance for physical activity practice (Gallahue, Ozmun, & Goodway, 2013; Tani, 2011). The importance of parental

participation in physical activity has been suggested to be influential in a child's successful development (Davidson & Birch, 2001; Gustafson & Rhodes, 2006). If children see parents participating in physical activities, this may promote a positive image for them. Additionally, this could encourage them to try new skills or become more efficient in already mastered skills. Also, participation in a physical education class may play an important role in motor skill development (Manoel, 1994; Tani, 2011). It has been shown that there is a strong relationship between motor skill competence and physical activity (Barnett, Morgan, van Beurden, Ball, & Lubans, 2011; Stodden et al., 2008). Concurrently, Stodden et al. (2008) hypothesized that children with a higher level of mastery with fundamental movement skills will participate in more physical activity and sports, while children with a lower level mastery will choose inactivity.

Generally, physical activity guidelines vary by country. Specifically, in the United States and China focus on the development of fundamental movement skills (AAHRERD Curriculum Framework Task Force, 2014; Curriculum Development Council [CDC], 2002). More specifically, the Chinese curriculum focuses on development but encourages learning, cultural games and activities (Curriculum Development Council, 2002). Moreover, the American curriculum focuses on the mastery of the skill for each age group (AAHRERD, 2014). Furthermore, it has been suggested that, in regard to curriculum, direct goals for development in fundamental movement skills show a greater level of mastery; from this, it can be assumed that a successful motor development in fundamental movement skills during the early years in school should be encouraged by parents, teachers and friends and supported by a physical education curriculum (dos Santos, Pacheco, Basso, & Tani, 2016).

Japan, however, has physical activity guidelines that are mandated by the government. The Ministry of Education, Culture, Sport, Science and Technology (MEXT) set specific

guidelines for physical activity during the school day (MEXT, 2008). These guidelines are applied at a young age and include multiple opportunities for mastery of fundamental movement skills. More specifically, Japanese schools allow for more outdoor time, which can promote the improvement in locomotor skills. While guidelines vary by country, it is small requirements like the increased outdoor time that may results in greater acquisition in certain fundamental movement skills.

Lastly, economic status has been hypothesized to have an effect on fundamental movement skill development (Booth et al., 1999; Hardy et al., 2012; Morley, Till, Ogilvie, & Turner, 2015; Okely & Booth, 2004). Children that live in a lower socioeconomic status region may be at a higher risk for developmental delay when starting school (Okely & Booth, 2004). From this research, Roeber et al. (2012) suggested that early detection and intervention programs be targeted to the groups identified as lower socioeconomic status in order to allow for children to catch up and develop alongside the other students from higher socioeconomic statuses. These intervention programs have been shown to be effective not only for children of lower socioeconomic status, but also children with disabilities and home based interventions (Bardid et al., 2013; Reiliy et al., 2006). Ultimately, being able to understand factors that influence motor skill development may help to develop effective interventions to decrease risks associated with inactivity.

Test of Gross Motor Development – Edition 2

Standardized tests are used to assess motor skills. There are a variety of tests that are used. These tests can be described as product-oriented or process-oriented measurements (Bardid et al., 2016). The primary difference between the two types of measures is the evaluation methods. Primarily, the product-oriented focuses on outcomes, while the process-oriented

focuses on movements' patterns (Bardid et al., 2016). Both types are seen as important for measuring motor skill execution in children. However, a process-oriented test that is most commonly used to test motor skill development in children is the standardized called the Test of Gross Motor Development – Edition 2 (TGMD-2) (Ulrich, 2000).

This test is criterion- and norm-reference and described as easily administered to assess qualitative aspects (Bardid et al., 2016; Wiart & Darrah, 2001). Within the test manual, r-values of >0.85 have been given to the test-retest reliability and inter-rate reliability (Bardid et al., 2016). This test can evaluate skill competency in children aged 3 to 10 years old with or without disabilities (Ulrich, 2000). In regard to the TGMD-2, the data was normalized within the United States but has been shown to be reliable in other countries (Kim et al., 2014; Simons, Daly, Theodorou, Caron, & Andoniadou, 2008; Valentini, 2012; Wong & Cheung, 2010). Additionally, the TGMD-2 has been described to be the only test that provides different interpretations (Kim et al., 2014).

For the TGMD-2, there are twelve total fundamental movement skills. The test is divided into two subsets: locomotor and object control. The locomotor subset includes run, hop, gallop, horizontal jump, leap, and slide, while the object control subset includes underhand roll, overhand throw, catch, kick, stationary dribble, and striking a stationary ball. For testing, the participant performs two trials (test and re-test) in order to identify correct movement pattern as defined by the performance criterion. Participants are, then, evaluated and scored on the performance. Trained assessors are used for the data collection in order to decrease risk for error.

Sociocultural Differences and Motor Skills

Further explanations can be categorized as sociocultural (Aponte et al., 1990; dos Santos et al., 2016; Spessato et al., 2013). From previous research (Goodway et al., 2010; Okely &

Booth, 2004; Valentini, 2012), it has been suggested that children from different countries do not reach the same skill mastery level even though fundamental skills are practiced in different cultures (Burton & Miller, 1998). In a limited amount of current literature, sociocultural influences have been proposed to play a role in motor development during childhood (Hadders-Algra, 2000; Uys & Pienaar, 2010; Wright et al., 1994). It has been shown in a limited amount of literature that variations in gross motor development in children with different ethnic backgrounds are present (Cintas, 1995). Children who have non-English-speaking backgrounds have shown to have lower level of fundamental movement skill execution (Booth et al., 2004; Booth et al., 1997; Hardy et al., 2010). Venter et al. (2015) examined ethnicity differences between African-American and Caucasian children only; however, this lacked research into many other cultures.

In a recent study, Bardid et al. (2016) tested Belgian children aged 3-8 and compared their fundamental movement skill scores to an American sample. Their sample consisted of 1614 children from 51 settings in Belgium. There were 841 boys and 773 girls in total that participated. The participants were tested using the TGMD-2 that included 12 motor skills. From their research, they concluded that Belgian children had lower motor competency than the American children and contributed the differences to cultural factors. Specifically, potential factors included popular culture sports and difference in education systems (Bardid et al., 2016).

Also, in a recent study by dos Santos et al. (2016), the sociocultural factors of differing physical education systems and popular cultural sports in young children were tested. For their research, 3289 participants were recruited from three different countries (China, Portugal, and USA). Since its validation was shown in all three countries (Alfonso et al., 2009; Ulrich, 2000; Wong & Cheung, 2006), the TGMD-2 was used to test motor skill proficiency in the three

groups of children aged 4-10 years old. The results from their research concluded that the different physical activity guidelines did affect the motor skill mastery, but popular sports did not have the same affect. Incorporating cross-cultural research in the motor development field is an under-investigated area and may begin to explain sociocultural influences. For this research, an example of sociocultural influence that may have a primary effect is *cultural conditioning*. The concept of cultural conditioning can be taken into account for these analyses.

Cultural conditioning starts at a young age (Malina, 2004; Venter et al., 2015; Vygotski, 1978; Walter, 2011), but can progress throughout childhood and development. For children, cultural conditioning refers to gender specific roles (i.e. girls learning to complete household chores, boys participating in physical activity) (Spessato et al., 2013; Venter et al., 2015). It is these cultural influences that may explain a difference seen in motor development. In particular, cultures that value the education of boys over the education of girls may focus on the boy's motor development rather than equally emphasizing development in boys and girls (Venter et al., 2015). Additionally, it has been hypothesized in previous literature (Goncąlves, Hallal, Amorim, Araújo, & Menezes, 2007; Greendorfer, Blinde, & Pellegrini, 1986) that male participation in sports in supported in more cases than for females; ultimately, female participation is discouraged. This could possibly be contributed to cultural conditioning.

With regard to cultural conditioning, in different cultures with strong parental influence, it has been shown that parents may have an effect on competence in children (Liong, Ridgers, & Barnett, 2015). In societies where parents are heavily present in the upbringing, it is possible that their over emphasis on gender specific roles may affect the child's motor development. A study examined the differences in skill execution between genders, as well as different regions

(Goodway et al., 2010). In their research, they found a significant difference to be between locomotor skills; however, there was not a significant difference between object control skills.

Because of interactions with friends or other classmates, motor skill acquisition can be different among children (Garcia, 1994; Hardy et al., 2010; Lever, 1978). These interactions, even though barely investigated, may cause an impact on children's skill execution. For example, if a young girl is discouraged from playing a game of kickball because it is deemed a "boy's games", some of her motor skills may be altered because of that gender specific roles placed in basic children's games (Hardy et al., 2010).

The lack of research examining sociocultural differences suggests that more emphasis should be put on cross-cultural research and fundamental movement skills. Since it has been suggested that external influences (i.e. parents, friends, home environment) can have a tremendous effect on children and their perception of motor skills (Thomas & French, 1985), it is essential that research include subjects from different sociocultural backgrounds; this may begin to identify or explain the primary sociocultural influences that can affect a child's development.

Gender Related Differences and Motor Skills

It has been assumed that a variety of factors have been most influential on the differences between the two genders (Spessato, Gabbard, Valentini, & Rudisill, 2013). Some of these factors include sport activities, physical activity and general gender-specific roles as discussed previously. Literature suggests that biological differences may be a primary factor that can affect the performance of motor skills (Bardid et al., 2016; Nelson, Thomas, Nelson, & Abraham, 1986). These biological characteristics can include anthropometric measures as well as limb lengths. However, differences between boys and girls may be minimal before puberty (Gabbard, 2012; Spessato et al., 2013). Copple and Bredekamp (2009) suggested that at the age of 4,

children are at the most sensitive age and in one of the most pivotal developmental stages of life; this is where changes in development might be noticed first. However, Hardy et al. (2010) conducted a study that included testing preschool aged (between 2.1 years and 6.1 years, with mean age of 4.4 years) boys and girls in locomotor and object control skills; from the results, they found that boys had higher object control scores compared to girls, except for the catch (p = 0.6). Additionally, the hop locomotor skill was shown to be significantly different (p = 0.01) between girls and boys. Pienaar and Kemp (2014) also reported that boys had better overall motor proficiency than girls at the age of 6.8 years. Also, previous research has shown that boys are more proficient in object control skills (i.e. throwing, catching, and kicking) than their female counterparts (Bardid et al., 2016; Hume et al., 2008; Okely & Booth, 2004; Valentini, Spessato, & Rudisil, 2007).

However, there have been studies conducted that find no gender difference between motor skill execution of boys and girls (Goodway, Crowe, & Ward, 2003; Hume et al., 2008; Kirk & Rhodes, 2011, O'Dwyer, Foweather, Stratton, & Ridgers, 2011; Pollatou, Karadimou, & Gerodimos, 2005; Wong & Cheung, 2006). These studies looked at different age groups and still found no gender difference. There has been research that shows difference with motor skills in boys and girls only measured to a certain degree (Barnett et al., 2010; Branta et al., 1984; Thomas & French, 1985); this included certain skills instead of total scores. Anastasi (1981) suggested that explaining possible sex differences would not rely on biology alone, but it also includes culture and environment. From that, it can be speculated that multiple factors may have an impact on gender differences seen in motor skill execution. The inconsistent findings of previous studies suggest that further research is needed to provide direct insight dealing with sex-related differences in motor skills. Despite conflicting findings, it is necessary to continue to

investigate the biological differences in order to gain insight into motor development. The findings that discuss otherwise may be partially explained through biological differences and socialization of different children.

Current Gaps in the Literature

A gap in the current literature is a limited number of previous studies have investigated the sociocultural influences on development in children. Researchers propose the effects of sociocultural influences, but more research is needed to help understand the influences. Additionally, there is a lack of previous cross-cultural research that investigates the differences in motor skill execution. Moreover, one primary question that remains unanswered is if similar findings would be observed in other countries. Lastly, inconsistent findings of a gender effect on skill execution in young children in the literature warrant further investigations.

Summary

Successful fundamental movement skill execution is necessary for proper development. Determining possible influences is beneficial because proper interventions can be implemented in order to defer these influences. Future research dealing with motor skills and children should address the inconsistencies that exist in the current literature. Specifically, the impact that sociocultural influences have on skill execution should be investigated. It is possible that these sociocultural influences have a greater impact on childhood motor development than previously known. As a result, future studies should continue to look into sociocultural influences; this could include using European countries along with Asian countries. In addition, the findings of previous literature should be used as a guide to develop new methods, as well as potential interventions. Also, since conflicting research is present in this area of motor development, the future studies can be used to fill the gaps and help clarify blurred lines. Data gathered from these

future studies will help researchers to gain insight into motor development and the influences on motor development in children.

References

AAHPERD Cirriculum Framework Task Force. (2014). *Society of Health and Physical Educator.* State University of New York College at Cortland.

Alfonso, G.H., Freitas, D.L., Carmo, J.M., Lefevre, J.A., Almeida, M.J., Lopes, V.P., Neves, A.C., Rodrigues, A.J., Antunes, A.M., Esteves, C.M., Conceição, L.P., Gouvela, E.R., Fernandes, F.J., & Maia, J.A. (2009). Motor performance. A normative and criterial study in children from the Autonomous Region of Madeira, Portugal. *Revista Portugesa de Clências de Desporto, 9*(2-3), 160-174.

Anastasi, A. (1981). Sex differences: Historical perspectives and methodological implications. *Developmental Review*, *1*: 187-206.

Aponte, R., French, R., & Sherrill, C. (1990). Motor development of Puerto Rican children: Cross-Cultural Perspectives. *Perceptual and Motor Skills, 71*, 1200-1202.

Barbe, J. (2014). Foundations of responsive caregiving: Infants, toddlers, and twos. St. Paul, MN: Redleaf Press.

Bardid, F., Deconinck, F.J.A., Descamps, S., Verhoeven, L., Pooter, G.D., Lenoir, M., & D'Hondt, E. (2013). The effectiveness of a fundamental motor skill intervention in pre-schoolers with motor problems depends on gender but not environmental context. *Research in Developmental Disabilities, 34*, 4571-4581.

Bardid, F., Huyben, F., Lenoir, M., Seghers, J., De Martelaer, K., Goodway, J.D., & Deconinck, F.J.A. (2016). Assessing fundamental motor skills in Belgian children aged 3-8 years highlights differences to US reference sample. *Acta Pædiatric, 105*, 281-290.

Barnett, L.M., Morgan, P.J., van Beurden, E., Ball, K., & Lubans, D. R. (2011). A reverse Pathway? Actual and perceived skill proficiency and physical activity. *Medicine & Science in Sports & Exercise, 43*(5), 898-904.

Barnett, L., van Beurden, E., Morgan, P.J., Brooks, L.O., & Beard, J.R. (2010). Gender differences in motor skill proficiency from childhood to adolescence: a longitudinal study. *Research Quarterly, 81*(2), 162-170.

Barnett, L.M., van Beurden, E., Morgan, P.J., Brooks, L.O., Zask, A., & Beard, J.R. (2009). Six year follow-up of students who participated in a school-based physical activity intervention: A longitudinal cohort study. *International Journal of Behavioral Nutrition and Physical Activity, 6*(48), 48-56.

Booth, M.L., Okely, A.D., Denney-Wilson, E., Hardy, L.L., Yang, B., & Dobbins, T. (2006). NSW Schools Physical Activity and Nutrition Survey (SPANS) 2004: full report. NSW Department of Health; Sydney.

Booth, M.L., Okely, T., McLellan, L., Phongsavan, P., Macaskill, P., Patterson, J., Wright, J., & Holland, B. (1999). Mastery of fundamental motor skills among new South Wales school students: Prevalence and sociodemographic distribution. *Journal of Science and Medicine in Sport, 2*(2), 93-105.

Booth, M.L., Macaskill, P., McLellan, L., Phongsavan, P., Okely, T., & Patterson, J. (1997). NSW Schools Fitness and Physical Activity Survey 1997. NSW Department of School Education: Sydney.

Branta, C., Haubenstricker, J., & Seefeldt, V. (1984). Age changes in motor skills during childhood and adolescence. *Exercise and Sport Sciences Reviews, 12*, 467-520.

Burton, A.W., & Miller, D.E. (1998). *Movement Skill Assessment*. Champagn, IL: Human Kinetics.

Caspersen, C.J., Powell, K.E., & Christenson, G.M. (1985). Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public Health Reports, 100*(2), 126-131.

Cintas, H.L. (1995). Cross-cultural similarities and differences in development and the impact of parental expectations on motor behavior. *Pediatric Physical Therapy, 7,* 103-111.

Clark, J.E., & Metcalfe, J.S. (2002). The mountain of motor development: A metaphor. *Motor development: Research and reviews, 2*, 163-190.

Cools, W., De Martelaer, K., Samaey, C., & Adries, C. (2008). Movement Skill Assessment of Typically Developing Preschool Children: A Review of Seven Movement Skill Assessment Tools. *Journal of Sports Science and Medicine, 8*, 154-168.

Copple, C., & Bredekamp. S. (2009). *Developmental Appropriate Practice in Early Childhood Programs: Serving Children from Birth through Age 8*. Washington, D.C.: NAEYC Books.

Curriculum Development Council (CDC). (2002). *Physical education: Key learning area curriculum guide*. Hong Kong.

Davidson, K.K., & Birch, L.L. (2001). Children overweight: A contextual model and Recommendation for future research. *Observational Research, 2*, 159-171.

dos Santos, F.G., Pacheco, M.M., Basso, L., & Tani, G. (2016). A comparative study of the mastery of fundamental movement skills between different cultures. *Motricidade, 12*(2), 116-126.

Dow, C. B. (2010). Young children and movement. Young Children, 65 (2), 30-35.

Gabbard, C.P. (2012). *Lifelong motor development.* San Francisco: Pearson Benjamin Cummings.

Gallahue, D.L., Ozmun, J.C., & Goodway, J.D. (2013). *Understanding Motor Development: Infants, Children, Adolescents, Adults.* Boston: McGraw-Hill Higher Education.

Garcia, C. (1994). Gender differences in young children's interactions when learning fundamental motor skills. *Research Quarterly for Exercise and Sport*, *65*(3), 213-225.

Goldring, J. (2010). *Discover me revised edition*. American Digital Printing.

Goodway, J.D., Crowe, H., & Ward, P. (2003). Effects of motor instruction on fundamental motor skill development. *Adapted Physical Activity Quarterly, 20*(3), 298-314.

Goodway, J.D., Robinson, L.E., & Crowe, H. (2010). Gender differences in fundamental motor skill development in disadvantaged preschoolers from two geographical regions. *Research Quarterly for Exercise and Sport*, *81*(1), 17-24.

Goncąlves, H., Hallal, P.C., Amorim, T.C., Araújo, C.L., & Menezes, A.M. (2007). Sociocultural factors and physical activity level in early adolescence. *Revista Panamericana de Salud Publica, 22*(4), 246-253.

Greendorfer, S.L., Blinde, E.M., & Pellegrini, A.M. (1986). Gender differences in Brazilian children's socialization into sport. *International Review for the Sociology of Sport, 21*(1), 51-63.

Gustafson, S., & Rhodes, R. (2006). Parental correlates of physical activity in children and early adolescents. *Sports Medicine, 36*, 70-97.

Hadders-Algra, M. (2000). The neuronal group selection theory: Promising principles for understanding and treating developmental motor disorder. *Developmental Medicine and Child Neurology, 42*(1), 707-715.

Hardy, L.L., King, L., Farrell, L., Macniven, R., & Howlett, S. (2010). Fundamental movement skills among Australian preschool children. *Journal of Science and Medicine in Sport*, *13*, 503-508.

Hardy, L., Reinten-Reynolds, T., Espinel, P., Zask, A., & Okely, A.D. (2012). Prevalence and Correlates of low fundamental movement skill competency in children. *Pediatrics, 130,* 390-398.

Haubenstricker, J., & Seefeldt, V. (1986). Acquisition of motor skills during childhood. *Physical Activity and Well-Being,* 41-92.

Hinkely, T., Crawford, D., Salmon, J., Okely, A.D., & Hesketh, K. (2008). Preschool children and physical activity: A review of correlates. *American Journal of Preventative*

Medicine, 34(5), 435-441.

Hume, C., Okley, A., Bagley, S., Telford, A., Booth, M., Crawford, D., & Salmon, J. (2008). Does weight status influence associations between children's fundamental movement skills and physical activity. *Research Quarterly for Exercise and Sport, 79*, 158-165.

Izumi-Taylor, S., & Morris, V. G. (2007). Active play and cooking activities for toddlers. PlayRights, 29(3), 7-10.

Kim, S., Kim, M.J., Valentini, N.C., & Clark, J.E. (2014). Validity and Reliability of the TGMD-2 for South Korean children. *Journal of Motor Behavior, 46*(5), 351-356.

Kirk, M.A., & Rhodes, R.E. (2011). Motor skill intervention to improve fundamental movement skills of pre-schoolers with developmental delay. *Adapted Physical Activity Quarterly*, *28*(3), 210-232.

Lever, J. (1978). Sex differences in the complexity of children's play and games. *American Sociological Review*, *43*(4), 471-483.

Liong, G.H.E., Ridgers, N.D., & Barnett, L.M. (2015). Associations Between Skill Perceptions and Young Children's Actual Fundamental Movement Skills, *Perceptual & Motor Skills: Physical Development & Measurement, 120*(2), 591-603.

Lopes, V.P., Rodrigues, L.P., Maia, J.A.R., & Malina, R.M. (2011). Motor coordination as predictor of physical activity in childhood. *Scandinavian Journal of Medicine and Science in Sports, 21*, 663-669.

.

Lubens, D.R., Morgan, P.J., Cliff, D.P., Barnett, L.M., & Okely, A.D. (2010). Review of the benefits associated with fundamental movement skill competency in youth. *Sports Medicine, 40*(12), 1019-1035.

Malina, R.M. (2004). Motor development during infancy and early childhood: Overview and Suggested directions for research. *International Journal of Sport and Health Science, 2*(1), 50-66.

Manoel, E.J. (1994). Desenvolvimento motor: implicações para a educação física escolar. *Revista Paulista de Educação Física, 8*(1), 82–97.

Mayson, T.A., Harris, S.R., & Bachman, C.L. (2007). Gross motor development of Asian and European children on four motor assessments: a literature review. *Pediatric Physical Therapy, 19*, 148-153.

Morley, D., Till, K., Ogilvie, P., & Turner, G. (2015). Influences on gender and socioeconomic status on the motor proficiency of children in the UK. *Human Movement Science, 44*, 150-156.

National Association of Sport and Physical Education. (2002). *Active start: A statement of physical activity guidelines for children birth to five years.* Reston, VA.

Nelson, J.K., Thomas, J.R., Thomas, K.R., & Abraham, P.C. (1986). Gender differences in children's throwing performance: Biology and environment. *Research Quarterly for Exercise and Sport, 57*(4), 280-287.

O'Dwyer, M.V., Foweather, L., Stratton, G., & Ridgers, N.D. (2011). Physical Activity in Non-Overweight and Overweight UK Preschool Children: Preliminary Findings and Methods of the Active Play Project. *Science & Sports, 26*, 345-349.

Okely, A., & Booth, M.L. (2004). Mastery of fundamental skills among children in New South Wales: Prevalence and sociodemographic distribution. *Journal of Science and Medicine In Sport, 7*(3), 358-372.

Okely, A., Booth, M.L., & Patterson, J.W. (2001). Relationship of physical activity to fundamental movement skills among adolescents. *Medicine and Science in Sports and Exercise, 33*(11), 1899-1904.

Piek, J.P., Kane, R., Rigoli, D., McLaren, S., Roberts, C.M., Rooney, R., Jensen, L., Dender, A., Packer, T., & Straker, L. (2015). Does the Animal Fun Program Improve Social-Emotional and Behavioural Outcomes in Children aged 4-6 Years? *Human Movement Science, 43*, 155-163.

Pienaar, A.E., & Kemp, C. (2014). Motor proficiency profile of Grade 1 learners in the North-West Province of South Africa: NW-child study. *South African Journal for Sport, Physical Education and Recreation*, *36*(1), 183-198.

Pollatou, E., Karadimou, K., & Gerodimos, V. (2005). Gender differences in musical aptitude, rhythmical ability and motor performance in preschool children. *Early Childhood Development and Care, 175*(4), 362-369.

Ridgway, C., Ong, K.K., Tammelin, T.H., Sharp, S., Ekelund, U., & Jarvelin, M.R. (2009). Infant motor development predicts sport participation at age 14 years: northern Findland birth cohort of 1966. *PloS One, 4*(8).

Reiliy, J.J., Kelly, L., Montgomery, C., Williamson, A., Fisher, A., McColl, J.H., Conte, R.L., Paton, J.Y., & Grant, S. (2006). Physical activity to prevent obesity in young children: Cluster randomized controlled trial. *BMJ, 333.*

Roeber, B.J., Tober, C.L., Bolt, D.M., and Pollak, S.D. (2012). Gross motor development in Children adopted from orphanage settings. *Developmental Medicine and Child Neurology, 54*(6), 527-531.

Simons, J., Daly, D., Theodorou, F., Caron, C., & Andoniadou, E. (2008). Validity and reliability of the TGMD-2 in 7-10-year-old Flemish children with intellectual disability. *Adapted Physical Activity Quarterly, 25*, 71-82.

Stodden, D.F., Goodway, J.D., Langendofer, S.J., Roberton, M.A., Rudisill, M. E., Garcia, C., & Garcia, L.E. (2008). A developmental perspective on the role of motor skill competence In physical activity. *Medicine & Science in Sports and Exercise, 37*(4), 684-688.

Spessato, B.C., Gabbard, C., Valentini, N., & Rudisill, M. (2013). Gender differences in Brazilian children's fundamental movement skill performance. *Early Child Development and Care*, *183*(7), 916-923.

Tani, G. (2011). Leituras em educação física: Retratos de uma jornada [Readings in physical education: Pictures of a journey. São Paulo: Phorte.

The Ministry of Education, Culture, Sports, Science and Technology. (2008). *Course of study for kindergarten.* Retrieved from: http://www.mext.go.jp/en/policy/education/index.htm

Thomas, J.R. (1997). Motor Behavior. *The History of Exercise and Sport Science* (p. 203). Champaign, IL: Human Kinetics.

Thomas, J.R., & French, K.E. (1985). Gender differences across age in motor performance: a meta-analysis. *Psychological Bulletin, 98*(2), 260-282.

Ulrich, D.A. (2000). *Test of gross motor development* (2nd ed.). Austin, TX: Pro-ED.

U.S. Department of Health and Human Services. (2008). *Physical Activity Guidelines for Americans.* Washington, D.C.: U.S. Department of Health and Human Services.

Uys, P.L., & Pienaar, A.E. (2010). Die fisieke en motoriese ontwikkeling van voorskoolse kinders vanuit verskillende sosio-ekonomiese omstandighede: Thusano-studie (trans: Physical and motor development of pre-school children from different socio-economic circumstances: Thusane study). *South African Journal for Research in Sport, Physical Education and Recreation, 32(*2), 131-144.

Venter, A., Pienaar, A.E., & Coetzee, D. (2015). Extent and nature of motor difficulties based on age, ethnicity, gender, and socio-economic status in a selected group of three-to five-year-old children. *South African Journal for Research in Sport, Physical Education, and Recreation*, *37*(3), 169-183.

Valentini, N.C. (2012). Validity and reliability of the TGMD-2 for Brazilian children. *Journal of Motor Behavior, 44*(4), 275-280.

Valentini, N.C., Spessato, B.C., & Rudisill, M.E. (2007). Fundamental motor skills: A Description of the most common errors demonstrated by children. *Journal of Sport & Exercise Psychology, 29*(supplement), 47-48.

Vygotsky, L.S. (1978). Mind in society. Cambridge, MA: Harvard University Press.

Walter, C. (2011). In school and physical activity patterns of primary school learners from Disadvantaged schools in South Africa. *African Journal of Physical, Health Education Recreation and Dance, 17*(4), 779-788.

Wiart, L., & Darrah, J. (2001). Review of four tests of gross motor development. *Developmental Medicine & Child Neurology, 43*, 279-285.

Wickstrom, R.L. (1977). *Fundamental Motor Patterns* (Vol. 1). Philadelphia: Lea & Febiger.

Williams, H.G., Pfeiffer, K.A., O'Neill, J.R., Dowda, M., McIver, K.L., Brown, W.H., & Pate, R. R. (2008). Motor skill performance and physical activity in preschool children. *Obesity, 16*(6), 1421-1426.

Wong, A.K., & Cheung, S.Y. (2006). Gross motor skills performance of Hong Kong Chinese Children. *Journal of Physical Education and Recreation, 12*(2), 23-29.

Wong, A.K., & Cheung, S.Y. (2010). Confirmatory factor analysis of the Test of Gross Motor Development-2. *Measurement in Physical Education and Exercise Science, 14*, 202-209.

Wright, H.C., Sugden, D.A., NG, R., & Tan, J. (1994). Identification of children with movement problems in Singapore: Usefulness of the Movement ABC checklist. *Adapted Physical Activity Quarterly, 11*(2), 150-157.

Appendix A – IRB Approval

Institutional Review Board
Office of Sponsored Programs
University of Memphis
315 Admin Bldg
Memphis, TN 38152-3370

Oct 17, 2016

PI Name: Kaitlyn Downing
Co-Investigators: Yuhua Li, Satomi Taylor
Advisor: Yuhua Li
Submission Type: Initial
Title: Investigation on Gross Motor Development on Children with Different Sociocultural Backgrounds

Expedited Approval: Oct 14, 2016
Expiration: Oct 14, 2017

Approval of this project is given with the following obligations:

1. This IRB approval has an expiration date, an approved renewal must be in effect to continue the project prior to that date. If approval is not obtained, the human consent form(s) and recruiting material(s) are no longer valid and any research activities involving human subjects must stop.

2. When the project is finished or terminated, a completion form must be submitted.

3. No change may be made in the approved protocol without prior board approval.

Approval of this project is given with the following special obligations:

Thank you,

James P. Whelan, Ph.D.
Institutional Review Board Chair
The University of Memphis.

Appendix B – Parental Letter

Yuhua Li, Ph.D.
Professor
216 Elma Neal Roane Fieldhouse
School of Health Studies
Memphis, TN 38152-3480
Office: (901) 678-2311
FAX: (901) 678-3591
E-Mail: yuhuali@memphis.edu

Dear Parent/Caregiver:

Your child has been invited to participate in a meaningful research project: Investigation on gross motor development of children with different sociocultural background, sponsored by the University of Memphis. The primary purpose for this study is to examine gross motor skill performances levels among children at 4-years old among three different countries, US, China and Japan. A total of 6 motor tasks will be tested: run, hop, horizontal jump, stationary dribble a ball, catch and kick a ball. This research will be an important step in helping us understand better about child motor development levels in three different countries. We seek your permission for your child's participation in this project.

The total of the testing will take about 30 minutes. Allowing your child to complete the tests is optional and all performance scores will be kept confidential and reported anonymously. All efforts, within the limits allowed by law, will be made to keep the personal information in your research record private. The results of the testing will be kept private and recorded with coded ID, which will be set up by the principal investigator and co-principal investigator, so no individual's name should be identified. We believe that there are no more than minimal risks or problems associated with this research. The University of Memphis does not have a fund set aside for compensation in the case of study related injury. In the event of a research-related injury to the subject, please contact Dr. Jian Zhang, at 52153246, in Shanghai, China; Dr. Ito, 2902590 in Chiba, Japan; Dr. Yuhua Li, (901) 678-2311, in Memphis.

Thank you in advance for your willingness to consider assisting with this project. Please do not hesitate to contact me should you have any questions. Also, if you have any questions regarding the research subjects' rights, you can contact Administrator of the Institutional Review Board for the Protection of Human Subjects at the University of Memphis (901-678-2533).

Sincerely,

Yuhua Li, Ph.D.

I have read this informed consent document and the material contained in it has been explained to me verbally. I understand each part of the document, all my questions have been answered, and I freely and voluntarily choose to allow my child to participate in this study.

My child's name (print) _____ Date _____

My name (print) _____ Signature _____

Please list any sport programs that your child participate in: _____

And if yes, for how long? _____ months

Consent obtained by:

_____	_____	_____
Date	**Signature**	**Printed Name and Title**

Appendix C – Performance Criteria (Selected from the TGMD-2)

SKILL	PERFORMANCE CRITERIA	TRIAL 1		TRIAL 2	
		0	1	0	1
RUN	1. Arms move in opposition to legs, elbows bent	O	O	O	O
	2. Brief period where both feet are off the ground	O	O	O	O
	3. Narrow foot placement landing on heel or toe (not flat footed)	O	O	O	O
	4. Nonsupport leg bent approximately 90° (close to buttocks)	O	O	O	O
HOP	1. Nonsupport leg swings forward in pendular fashion to produce force	O	O	O	O
	2. foot of nonsupport leg remains behind body	O	O	O	O
	3. Arms flexed and swing forward at takeoff to produce force	O	O	O	O
	4. Takes off and lands three consecutive times on preferred foot	O	O	O	O
	5. Takes off and lands three consecutive times on nonpreferred foot	O	O	O	O
HORIZONTAL JUMP	1. Preparatory movement includes flexion of both knees with arms extended behind body	O	O	O	O
	2. Arms extended forcefully forward and upward reaching full extension above the head	O	O	O	O
	3. Takeoff and land on both feet simultaneously	O	O	O	O
	4. Arms are thrust downward during landing	O	O	O	O
STATIONARY DRIBBLE	1. Contacts ball with one hand at about belt level	O	O	O	O
	2. Pushes ball with fingertips (not a slap)	O	O	O	O
	3. Ball contacts surface in front of/or to the outside of foot on the preferred side	O	O	O	O
	4. Maintains control of ball for four consecutive bounces without having to move the feet to retrieve it.	O	O	O	O
CATCH	1. Preparation phase where hands are in front of the body and elbows are flexed	O	O	O	O
	2. Arms extend while reaching for the ball as it arrives	O	O	O	O
	3. Ball is caught by hands only	O	O	O	O
KICK	1. A rapid continuous approach to the ball	O	O	O	O
	2. An elongated stride or leap immediately prior to ball contact	O	O	O	O
	3. Nonkicking foot placed even with or slightly in back of the ball	O	O	O	O
	4. Kicks ball with instep of preferred foot (shoe laces) or toe	O	O	O	O