USING MOVEMENT HOMEWORK ACTIVITIES TO ENHANCE THE PHONOLOGICAL SKILLS OF CHILDREN WHOSE PRIMARY COMMUNICATION DIFFICULTY IS A PHONOLOGICAL DISORDER

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DEDICATION

I dedicate this dissertation to my mother, Cristina Lopez, and my father, Nelson Diaz. Thank you for raising me to work hard and never give up. Making you proud has always been my constant motivation. I love you both so much!

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ABSTRACT

PAZ DIAZ-WILLIAMS

USING MOVEMENT HOMEWORK ACTIVITIES TO ENHANCE THE PHONOLOGICAL SKILLS OF CHILDREN WHOSE PRIMARY COMMUNICATION DIFFICULTY IS A PHONOLOGICAL DISORDER

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Students who have been classified with a Speech-Language Impairment (SI) are eligible to receive special education services within the U.S. school system. The classification of children with SI is generally categorized into two groups: Those with language impairments (receptive and expressive) or those with speech impairments (e.g., articulation, fluency, voice, phonological). The focus of this dissertation was on phonological disorders, which are one of the most common speech impairments treated during preschool years. It has been reported that up to 20% of all preschool children in the U.S. can be described as having noticeable phonological problems (McKinnon, McLeod, & Reilly, 2007).

There are several concerns to be considered when choosing and applying a therapeutic approach when teaching preschool children with phonological processing disorders. First, a lack of progress is noted when the treatment lacks *adequate opportunities for practice* (number of trials or responses per session and minimal number

of sessions). Second, a preschool child does not receive *developmentally appropriate treatment*; in other words, the application of therapeutic approaches is not modified to fit the audience (e.g., cycles approach). Third, a preschool child naturally has short attention spans and often benefit from gross motor movement (Gallahue & Cleland-Donnelly, 2003). In view of these concerns, the motor domain may be used as a medium to enhance the phonological skills of preschool children.

The purpose of this investigation was to determine the effect of Gross Motor Activity Homework on the phonological skills of preschool children whose primary communication difficulty is a phonological disorder. Three different homework groups were compared: (a) Gross Motor Activity Homework, (b) Structured Table Activity Homework, and (c) Structured Table Activities with Letter-Tracing Homework.

Participants were 30 students (26 males, 4 females, *M* age = 4 years, 5 months, age range: 3.6 - 5.3 years). Children were purposefully selected, and then were randomly assigned to one of three groups (10 in each group). Pretest measures were compared to posttest measures after a 12 week intervention phase that consisted of the participants completing homework assignments with their parents 5 times a week. Based on the analysis of the data, improvement in phonological skill performance was therefore evident for all three groups across the interventions.

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CHAPTER I

INTRODUCTION

Students who have been classified with a Speech-Language Impairment (SI) are eligible to receive special education services within the U.S. public school system. The classification of children with SI is generally categorized into two groups: those with language impairments (receptive and expressive) or those with speech impairments (e.g., articulation, fluency, voice, phonological). The focus of this dissertation is on phonological disorders, which are one of the most common speech impairments treated during preschool years. It has been reported that up to 20% of all preschool children can be described as having noticeable phonological problems (McKinnon, McLeod, & Reilly, 2007).

A phonological disorder is a speech sound disorder in which children demonstrate speech sound errors that are based on the rules of the sound system (phonology) of language (Bernthal, Bankson, & Flipsen, 2009a). These children struggle to imitate and produce *adult-like* speech. Instead, they produce various errors known as processes. Processes are patterns of errors whereby sounds are added, deleted, or changed resulting in unacceptable arrangements of sounds to form words that translate into poor speech intelligibility (Sloat, Taylor, & Hoard, 1978).

Early intervention is critical to reduce or eliminate phonological delays in young children. Providing developmentally appropriate therapy that is based on the child's specific deficiencies is necessary for the successful treatment of phonological disorders. Generally, therapy approaches based on cognitive linguistic theory are recommended for children with phonological disorders. The aims of these linguistic interventions are related to teaching sound contrasts and appropriate phonological patterns to children with multiple sound errors. The primary focus of linguistic approaches is to establish sound and feature contrasts, as well as, to replace error patterns with appropriate phonological patterns. Linguistic approaches have targeted the elimination of homonyms, the establishment of new syllable and word shapes, and the establishment of new sound classes and feature contrasts (Bernthal, Bankson, & Flipsen, 2009d). These types of interventions include minimal pairs, metaphone therapy, and the cycles approach.

For the purpose of this study, the *cycles approach* was used in the classroom. The cycles approach is mostly based on *gesture* concepts (Hodson, 2006). The term gesture refers to a class of articulatory movements that includes implications for metaphonological awareness and literacy, as well as, phonological production. The basic idea of gestural phonology is that phonological representation is based on speech perception and speech production physical constraints. Incorporating metaphonological skill enhancement (e.g., rhyming, segmenting, blending) and tasks with production practice during intervention is a core component of the cycles approach (Prezas & Hodson, 2010).

In addition to choosing and applying a therapeutic intervention (e.g., cycles approach) when working with preschool children with phonological processing disorders, there are several concerns to be considered. First, a lack of progress is noted when the treatment lacks *adequate opportunities for practice* (number of trials or responses per session and minimal number of sessions; Schmidt & Lee, 2005). Second, children do not receive *developmentally appropriate treatment*; in other words, the application of therapeutic approaches is not modified for the children (Gallahue & Cleland-Donnelly, 2003). Third, preschool children naturally have short attention spans and often benefit from gross motor interventions (Gallahue & Cleland-Donnelly). Because on this, a gross motor intervention program for preschool children with phonological disorders is needed as an additional medium for practice.

In view of these concerns, motor skills may be used as a medium to enhance the phonological skills of preschool children. The motor domain is an integral part of a preschooler's development and the basis for learning new concepts (Gallahue & Cleland-Donnelly, 2003). Specifically, the preschool years are a period of important cognitive development and an important time in developing both speech-language and motor skills (Gallahue & Cleland-Donnelly). During the preschool years, children learn fundamental movement skills including how to move their bodies in space (e.g., up, down, around, under), locomotor skills (e.g., run, hop, jump, skip), and manipulative skills (e.g., catch, throw, kick). At the same time, children learn basic speech and language concepts that require them to have prior knowledge about their position in space

in order follow prepositional commands (e.g., up, down, around, under). Preschool children generally learn some basic language concepts through their gross motor movement experiences (Connor-Kuntz & Dummer, 1996). The preschool period of growth and development is critical for learning fundamental motor skills, as well as, enhancing speech and language skills. Since preschool children naturally use movement experiences for learning, using movement as a medium for teaching preschool children phonological skills may be developmentally appropriate.

Speech-language pathologists have recognized the relationship between speech-language and gross motor development, especially when gross motor movement activities are used as a medium to enhance speech and language skills of preschool children (Diaz, Silliman-French, & Moorer-Cook, 2010). For example, gross motor activities can enhance the learning of specific speech and language concepts by increasing motivation, time on task, and target sound production; as well as, providing visual representations of basic concepts. In 2010, 2,800 school-based speech-language pathologists in Texas were surveyed to identify the need to include gross motor activities in the treatment of students with speech-language disorders. The speech-language pathologists in this investigation agreed that there seemed to be a benefit for communication skill development when gross motor activities were included (56% to 85%); however, there were a substantial number of survey statements marked *unknown* (13% to 36%), indicating the need for more research and information on this topic.

Although a tentative relationship is recognized, the use of gross motor activities during a speech or a language therapy session may not allow for sufficient opportunities for practice on account of the limited time constraints. Thus, incorporating practice outside of the classroom may provide preschool children with the necessary repetition and practice needed for success.

The need to include homework to enhance gross motor and language skills in early intervention has also been recognized for at least 10 years (Justice & Ezell, 2000). Further, parents are considered the most influential communication partners for preschool children. In addition, home practice is a great technique for parents to supplement existing therapy interventions that are needed for the high demand practice trials suitable for success.

For instance, Justice and Ezell (2000) examined the efficacy of a homework-based pre-literacy intervention program. Parents were trained on how to reference print materials (e.g., reading from left to right or talking about the title of the book) during reading to help improve literacy skills of their child. Based on the pretest and posttest measures, parental instruction in the home significantly enhanced children's early literacy skills.

Enhancing preschool students' phonological skills through parent-implemented, gross-motor-infused homework may provide preschool students an additional developmentally appropriate means to practice and learn adult-like speech, as well as, offer an adequate opportunity to practice producing target utterances.

Therefore, a homework program that incorporates gross motor activities, as a possible motivating medium for teaching young children with phonological disorders, may enhance the production of target sounds during each session. The homework program must provide age-appropriate activities necessary for successful engagement, interaction, and allow for completion of the necessary verbalizations to enable learning to occur. Despite the potential for increasing preschoolers' success in therapy, little research has been published on either the use of the motor domain to enhance speech-language skills or homework-based interventions in speech therapy and physical activity among children with SI. The lack of evidence regarding the influence of using homework-based gross motor movement activities as a medium for reducing phonological processes supports the need for the present investigation.

Purpose of the Study

The purpose of this investigation was to determine the effect of using Gross Motor Activity Homework on the phonological skills of preschool children whose primary communication difficulty was a phonological disorder. Three different homework groups were compared: (a) Gross Motor Activity Homework, (b) Structured Table Activity Homework, and (c) Structured Table Activities with Letter-Tracing Homework. Groups were compared to determine if the incorporation of gross motor activities would facilitate a greater generalization of target sounds to suppress the inappropriate phonological processes of children who are between the ages of 3 and 5 years.

Null Hypotheses

Based on the purpose of this investigation, three null hypotheses were tested at the .05 level of significance:

1. There is no significant of effect of intervention (Gross Motor Activity Homework, Structured Table Activity Homework, and Structured Table Activities with Letter-Tracing Homework) on the phonological test scores of preschool children with SI.
2. There is no significant effect of time lapse between the pretest and posttest on the phonological test scores of preschool children with SI.
3. There is no significant interaction of intervention (Gross Motor Activity Homework, Structured Table Activity Homework, and Structured Table Activities with Letter-Tracing Homework) and time on the phonological test scores of children with SI.

Delimitations

1. Participants were a population of convenience, which potentially limited the generalization of the results.
2. Protocols used to measure progress were standardized tests and may not yield an in-depth analysis of individual performances.

Limitations

1. Unrelated factors, such as illness or medications, may have negatively affected the participants' testing performance.

2. Daily living habits could not be controlled (e.g., parents' work schedules).
3. Environment, time of day that practiced occurred, number of times parents practiced per week, and total time spent practicing during each homework session could not be controlled.

Assumptions

1. Participants gave maximal effort while taking the phonology test.
2. Participants gave maximal effort during practice at home.
3. Parents completed homework activities in the manner described to them (e.g., while sitting at a table).

Definition of Terms

For the purpose of the study, the following terms were defined:

1. Developmentally Appropriate Treatment: Adopted from the Physical education literature and refers to the belief that preschool children learn through movement. Movement is the vehicle by which they explore all that is around them. Movement enhances their perceptual-motor and cognitive concept learning, promotes the development of a positive self-concept, and promotes positive socialization (Gallahue & Cleland-Donnelly, 2003).
2. Homework: "Homework is an assignment by a teacher to accomplish outside of class" (French, 1979, p. 1).
3. Language Disorder: The American Speech-Language-Hearing Association defined a language disorder as an impairment in comprehension and/or use of a spoken, written,

and/or other symbol system. The disorder may involve the form of language (phonologic, morphologic, and syntactic systems); the content of language (semantic system); and/or the function of language in communication (pragmatic systems) in any combination (American Speech-Language-Hearing Association, 1994).

4. Metaphonological Awareness: *Meta* means thinking about. *Phonological* refers to speech sounds. Metaphonological intervention develops and uses a child's phonological awareness to support and drive speech change. Activities that require a child to think about speech and about the structure of words are tailored specifically to the current speech target and are integrated into therapy sessions alongside production practice. Metaphonological skills are critical for speaking intelligibly and acquiring phonics skills necessary for reading. Metaphonological skills require the child to organize the speech sounds system in his brain (Williams, McLeod, & McCauley, 2010, p. 247).
5. Phonological Awareness: The ability to reflect on and manipulate the structure of an utterance as distinct from its meaning and is essential for the development of reading and spelling (e.g., segmenting and blending; Bernthal, Bankson, & Flipsen, 2009c, pp. 63-64).
6. Phonological Disorder: "The term used to identify children who demonstrate speech sound errors that are based on the rules of the sound system (phonology)" (Bernthal, Bankson, & Flipsen, 2009a, p. 2).

7. Phonology: The science of speech sounds and sound patterns. Each language has its own sound pattern, which is the set of sounds used by a certain language; the acceptable arrangement of these sounds to form words; and the various processes by which sounds are added, deleted, or changed (Sloat, Taylor, & Hoard, 1978).
8. Phonological Processes: The specific patterns of simplifying speech that categorizes speakers' phonological productions, according to commonalities among errors (e.g., final consonant deletion which is the deletion of the final consonant in a word) and assimilatory processes in which one sound is influenced by another sound, such that a sound assumes the features of a second sound (Bankson, Bernthal, & Flipsen, 2009b).
9. Speech Impairment (SI): The U.S. Department of Education classification term to identify children with speech or language impairments (Public Law 108-446; Individuals with Disabilities Education Improvement Act, 2004).
10. Specific Language Impairment (SLI): The term generally used by researchers to study the nature of language disorders in children with *pure* language disabilities: those uncontaminated by intellectual disabilities or other types of deficits.

Theoretical Framework

The theoretical framework of this study was derived from the following: (a) motor learning theory, (b) motor learning process with an emphasis on behavior, and (c) the belief that increased gross motor skills creates a readiness for young children to learn. Motor learning is "a set of processes associated with practice or experience leading to relatively permanent changes in the capability for skilled movement" (Schmidt & Lee,

2005, p. 304). Adams (1971) was the first to develop a comprehensive theory of motor learning.

In motor learning, the most important concept was the closed-loop process in motor control. In a closed-loop process, the individual uses sensory feedback for the ongoing production of skilled movement. Based on the closed-loop process, sensory feedback from the ongoing movement was compared with the stored memory of the individual to the intended movement.

Adams (1971) also theorized that two types of memory are important in the closed-loop process: *memory trace* and *perceptual trace*. Memory trace is used in the selection and initiation of movement. Perceptual trace is then built up over a period of time through practice and becomes an internal reference of correctness. In essence, specific movements are acquired only through practice in the same, exact way. Errors produced during learning are harmful because they increase the strength of an incorrect perceptual trace (Schmidt, 1975).

While the closed-loop theory did explain the learning of a new skill through practice in the same way it could not explain movements that were made in the absence of sensory feedback, or open-loop movements (i.e., novel movements that were never performed). In response to the many limitations of the closed-loop process, Schmidt (1975) proposed the Schema theory that emphasized an open-loop control process and the generalized motor program concept. Open-loop control is a feed-forward form of motor control and is used to control rapid movements that end before any sensory information can be

processed. It was hypothesized that motor programs do not contain the specifics of movement; instead, they contain generalized rules for a specific class of movement. Schmidt predicted that when learning a new motor program, the individual learns a generalized set of rules that can be applied to a variety of contexts (e.g., in football, the application of appropriate footwork while moving to avoid a defender).

Both theories (i.e., open-loop and closed-loop) are similar in their aim to explain the cognitive process of motor learning (Schmidt, 1975). Further, Schmidt also proposed the process of motor learning with an emphasis on behavior. The motor learning process with an emphasis on behavior focuses primarily on movement behavior that can be observed directly and the many factors or variables affecting the quality of the performance (Schmidt, 1982). Motor learning recognizes the relevant variables that determine gains in proficiency and acquisition of motor skills that focuses on the effects of *practice experience* on performance. Five distinct principles are included in the definition of motor learning and are as follows (Schmidt & Lee, 2005, p. 302):

1. Learning is a *process* of acquiring the capability for producing skilled actions.
2. Learning is the set of underlying events, occurrences, or changes that happen when practice enables people to become skilled at some task.
3. Learning occurs as a direct result of *practice experience.*
4. Learning cannot (at our current level of knowledge) be observed directly, since the process leading to changes in behavior are internal and usually not available for direct

examination; rather, it must be inferred that learning processes occurred on the basis of the changes in behavior that can be observed.

5. Learning is assumed to produce relatively permanent changes in the capability for skilled behavior; for this reason, changes in behavior caused by easily reversible alterations in mood, motivation, or internal states (e.g., fatigue) are not thought of as being due to learning.

There are many variables that affect the motor learning process (Schmidt & Lee, (2005). Motor learning with an emphasis on behavior explores the conditions of practice (i.e., variables) that make the biggest impact, specifically those that are usually controlled by the experimenter (e.g., teacher interested in providing the best *conditions for practice* and learning). For the purpose of this study and in an attempt to better understand the effectiveness of the conditions of practice (e.g., environment), the researcher will only present information on characteristics of conditions of practice because this area relates more closely to the instructional setting, such as in the schools.

> Schmidt and Lee (2005) proposed the following principles regarding the principles of practice for motor learning: (a) Power Law of Practice, (b) Pre-Practice Considerations: Motivation for Learning, (c) Distribution of Practice, (d) Variability of Practice, (e) Scheduling Practice with Several Different Tasks with Blocked versus Random Practice, (f) Mental Practice, (g) Part Versus Whole Practice, (h) Guidance, and (i) Principles of Practice Specificity (p. 321).

The following is a brief description of each of these principles:

1. Power Law of Practice: The most evident variable is the *Law of Practice*, which states that more learning will occur if there are more practice trials. Improvements in average performance are generally large and rapid, at first, and systematically become smaller as practice continues because learning is maintained over time.
2. Pre-Practice Considerations: Motivation for Learning: The *Motivation* principle is considered the driving force for the *Law of Practice*. Schmidt and Lee (2005) stated that one must be motivated to learn a motor task in order for maximally effective learning to occur. If the learner perceives the task to be meaningless or undesirable, then learning of the task will probably be minimal. Further, if the level of motivation is too low people may not practice at all and no learning will occur.
3. Distribution of Practice: The distribution of practice variables includes *Massed* practice and *Distributed* practice. One of the variables that teachers have under their control is the scheduling of services, which might include short time frames vs. longer periods of time (e.g., therapy sessions). The most important aspect of this variable is the effect of the amount of time spent in treatment vs. the time spent at rest. Researchers who investigated the distribution of practice use the terms *massed* practice and *distributed* practice. Massed practice involves a period of work that is substantially longer than the amount of rest between trials (Schmidt & Lee, 2005). For distributed practice, the amount of rest between trials is often equal to or greater than the amount of work within the trial, leading to a somewhat more restful practice

sequence (e.g., practicing producing the target sound during a 30 min therapy session vs. producing the same sound during a 5 min session three times a week; Schmidt & Lee, 2005). Researchers have suggested that there is some generalizability of the results reported in experiments of relatively short duration, when compared to studies that involve practice and retention over much longer periods (Shea, Lai, Black, & Park, 2001).

4. Variability of Practice: Motor learning is also influenced by one's age and gender. In a review of the literature on practice variability, Shapiro and Schmidt (1982) reported that variable vs. constant practice for children (age) was stronger in nearly every study, and girls (gender) seemed to improve more than boys with variable practice.
5. Scheduling Practice with Several Different Tasks with Blocked versus Random Practice: Blocked practice is a sequence in which all the trials in one task are performed together, uninterrupted by practice on any other sequences. This way, the learner can concentrate on improving one task before moving on to the next (e.g., practicing producing the same speech sound "b" and mastering it before moving on to "p"). For random practice, the same task is never repeated on consecutive trials. In both sequences, the same number of trials is performed on each task the only difference being the order in which the various tasks are presented (e.g., alternating practicing the production of the two speech sounds "b" and "p"). Random practice is used in the *cycles approach* (Hodson, 2006) adopted in this study.

6. Mental Practice: In general mentally practicing a skill (i.e., imagining performing it without any associated movements) has been shown to produce a large positive transfer to the physical performance of the actual task (Schmidt & Lee, 2005).
7. Part Versus Whole Practice: A common technique for teaching motor skills is to break them down into smaller parts. For example, in swimming, one can practice separately the arm and leg strokes; or in gymnastics routines, specific stunts can be practiced that later become part of a complete routine. Researchers have suggested that whether or not part practice or whole practice is effective depends largely on the nature of the task (Wightman & Lintern, 1985).
8. Guidance: Guidance is a technique frequently used in teaching and in rehabilitation, whereby the learner is physically assisted through the task to be learned. It refers to a variety of separate procedures, including physically pushing and pulling the learner through a sequence, preventing incorrect movement by physical limitation on the apparatus, or even verbally "talking someone through" a new task. These guidance procedures are used to minimize errors of the learner (Schmidt & Lee, 2005).
9. Principles of Practice Specificity: Specificity in learning is based on the "sensory motor, contextual, and processing activities of the retention and transfer tests (e.g., assessments used to measure performance). The retention and transfer tests impact to a considerable extent the value that we attribute to certain practice conditions" (Schmidt & Lee, 2005, pp. 360-363).

Nine conditions of practice were discussed. Each condition of practice may have a greater or lesser impact on an individual's motor learning success. During the preschool years, two strong conditions of practice seem to be evident: (a) more practice trials which is the focus of this present investigation and (b) motivation for learning. Perceived ideas of what children are motivated by are what guides teacher preparation of activities, since preschool children seem to be motivated when the task is internalized as "fun" (Schmidt & Lee, 2005). Motivation and more practice trials can be accomplished by providing age-appropriate activities that include gross motor skills.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this investigation was to determine the effect of using Gross Motor Activity Homework on the phonological skills of preschool children whose primary communication difficulty was a phonological disorder. Three different homework groups were compared: (a) Gross Motor Activity Homework, (b) Structured Table Activity Homework, and (c) Structured Table Activities with Letter-Tracing Homework. Groups were compared to determine if the incorporation of gross motor activities would facilitate a greater generalization of target sounds, in order to suppress the inappropriate phonological processes of children who are between the ages of 3 and 5 years. In this chapter, the literature reviewed was related to the use of gross motor activity homework as an intervention in physical education and speech-language therapy, as well as, the effect of movement on the cognitive skills of children.

This Chapter was organized in four sections to provide support for the potential significance of gross motor activity homework for preschool children whose primary communication difficulty is a phonological disorder: (a) Strength of Recommendation Taxonomy; (b) Use of Active Homework in Physical Education; (c) Use of Homework in Speech-Language Therapy; and (d) Effect of Movement on Cognitive Skills of Children.

Strength of Recommendation Taxonomy

The Strength of Recommendation Taxonomy (SORT; Ebell et al., 2004) was used to evaluate individual research articles, as well as, the strength of recommendation for a body of evidence of all studies that involved the use of homework in physical education, and the use of homework in speech-language pathology. SORT specifically involves a systematic review of the literature, determination of individual literature and body of all pertinent literature, and recommendation for sound educational practices. The evaluation should address the three key elements: quality, quantity, and consistency of evidence. The following terms were derived from SORT: Systematic Review, Level of Evidence, and Strength of Recommendation.

Systematic Review

Systematic review uses a taxonomy that was incorporated in the present investigation and involves a critical evaluation of existing evidence that focuses on the clinical questions, including a comprehensive literature search assessment of the quality of studies, and reporting the findings in an organized manner. Research evidence was also presented in the publication of original research and involves the collection of original data or the systematic review of other original research publications.

Level of Evidence

Level of evidence refers to both individual studies and the quality of evidence from multiple studies about a specific question or the quality of evidence supporting an intervention. There are three levels of recommendation in this taxonomy to assess

individual studies: Level 1, based on consistent and high-quality patient-oriented evidence; Level 2, based on consistent and limited-quality, patient-oriented evidence; and Level 3, based on typical practice opinion, prevention, or screening.

Strength of Recommendation

SORT recommendations are typically based on the body of evidence. These recommendations consider the types of outcomes measured by the studies, number, consistency, and logic of evidence, and the relationship between the advantages, disadvantages, and cost. There are three grades of strength of the body of evidence in SORT taxonomy to evaluate studies as a group: Grade A is based on consistent and high-quality teacher-preparation evidence; Grade B is based on consistent and limited-quality teacher-preparation evidence; and Grade C is based on usual practice, opinion, prevention, or screening.

Further, there are four general types of research methodologies used in the educational field and within this literature review [Odom et al., 2005; Council for Exceptional Children (CEC)]: (a) Experimental and Quasi-Experimental Research, (b) Single-Subject, (c) Correlational, and (d) Qualitative Designs. Based on the results of SORT taxonomy, the experimental and quasi-experimental research designs are the strongest design. This is because its indicators are similar to Level 1 of SORT which includes randomization, control and experimental group, consistency for the outcome measures, substantiation of the validity of the measures, and assessment of the quality of implementation.

The second methodology, single-subject research, is also a strong design and better than correlational and qualitative designs because it has a baseline and intervention. This design is similar to Level 2 of SORT, because most of the time there is no random selection of the population. This design can be used to further demonstrate external validity of findings established through single-subject methods (Ebell et al., 2004; Odom et al., 2005).

The third methodology is correlational research design. Correlational studies are quantitative, multi-subject designs in which participants have not been randomly assigned to treatment conditions. This is not a strong design and based on SORT, is evaluated as Level 2 or 3. Tests of this design are also not reliable or unreliable; therefore, the researchers who use this design should provide reliability coefficients of the scores for the data being analyzed, even when the focus of their research is not psychometric (Ebell et al., 2004; Odom et al., 2005).

The fourth methodology is the qualitative research design. The qualitative design is considered a Level 3 in SORT because there is no treatment or random selection in this design. In addition, this design is based on usual practice, opinion, prevention, or screening; therefore, it is a weak design. However, this specific technique allows the researchers to establish readers' confidence in the conclusions drawn from the data and to discount rival hypotheses from conclusions that the researcher has drawn from the data (Ebell et al., 2004; Odom et al., 2005).

Given these recommendations, the body of literature that has been provided to support this investigation has been graded at the C level, which was obtained from identifying the level of quality for each individual research study. Each research article was evaluated based on level of evidence from the SORT assessment, along with the investigation summaries, are located in Appendix A. This current body of literature included 23.5% of Level 1 studies, 23.5% of Level 2 studies, and 53% of Level 3 studies used in these studies.

Use of Activity Homework in Physical Education

In the physical education literature, experts have addressed the effectiveness of active homework in the classroom in different ways. For example, Mitchell, Barton, and Stanne (2000; L3) provided an example of homework categorization for elementary and middle school students that incorporated the use of cognitive, affective, and psychomotor domains to support physical education goals. Within each domain, the authors also incorporated fundamental learning principles of preparation practice and extension activities that physical educators might use to help students link content covered in class with active lives outside of the classroom (e.g., practicing the basketball skill of dribbling while at home). Smith and Claxton (2003; L3) supported the use of active homework in physical education as a means of promoting lifelong healthy and physically active lifestyles. It suggested that the use of homework must be planned well and meaningful for students in order for it to be successful.

Further, Black (1996; L3) recommended the following seven principles when assigning active homework: (a) assign students homework that will help them learn powerful curriculum ideals; (b) give homework that is at the appropriate level of difficulty for students so that they can be challenged without getting confused or frustrated; (c) provide students with the information and resources to do their homework successfully; (d) determine whether the homework is worth the students' time and effort; hold students accountable for the successful completion of the homework; (e) involve parents whenever possible; and (f) allow students' to choose their own activities.

Gabbei and Hamrick (2001; L3) also supported the use of active homework to meet the national standards for physical education in an effort to support the goal of physical education, which states that a physically educated person is one who exhibits the knowledge, skills, and confidence to enjoy a lifetime of healthful physical activity (National Association for Sport and Physical Education; NASPE, 2003). Therefore, homework can be a technique used to support physical activity outside of school and can provide physical educators with a means for evaluating NASPE Standard 3 relates to a physically educated person participates regularly in physical activity (NASPE, 2003). As early as 1979, French (L3) discussed the application of motor activity homework and provided numerous types of homework assignments that can be written on a task card as a supportive technique for accountability of homework assignments and ensuring that parents get involved in the process:

> A task card or developmental sequenced set of cards could be incorporated into a homework assignment. Each should include a clear explanation of the task, a listing of safety factors and the amount of time to spend on the task, and a column to record short-term accomplishments if it is a long-term assignment. For younger students, a place could be added for the parent signature, which could be added after successful completion of the task (French, 1979, p. 2).

While there is support for the use of active homework, only a small number of researchers have examined the use of homework assignments in physical education. For instance, Horvat (1982; L1) examined the effect of a home learning program on the balance skills of children who were learning disabled. Fifteen boys, ranging from 7 to 9 years old (M = 7.9 yr, SD 1.1), were evaluated on static and dynamic balance tasks prior to participating in an individualized instructional program and after a program that incorporated a home-based packet of homework as a supporting technique to the instructional physical education program in the school.

Participants were randomly assigned to three groups. Group I was a developmental static and dynamic task, such as standing on one foot and walking lines/boards. Group II was involved in fine-motor skills of cutting and pre-academic, tasks such as listening to records, and reading newspapers/magazines. Group III was a control group and did not receive homework. Instructions and materials were included in participants' home-based packet, and parents were asked to complete homework with their child. Training was implemented by a biweekly, follow-up telephone call. Participants were asked to

complete homework activities three times a week for 30 min a day. It was concluded that parents can significantly ($p < .05$) enhance the static and dynamic balance of their children who were learning disabled by implementing a structured gross motor training program at home.

Likewise, the effect of homework in physical education was examined in a pilot study with 607 (302 male and 305 female) children in grades 3 through 5 (Smith, Cluphf, & O'Connor, 2001; L2). Parents and children were provided with an activity a sheet to record their physical activity time. A list of suggested movement activities was provided to help parents and children accumulate movement min. Activities involved walking, jogging, cycling, rollerblading, and a variety of muscular strength activities. Participants were rewarded for completing the most activity time. Awards were also given to the class who accumulated the most min. Statistical analysis of variance was performed on the rate of participation of each classroom teacher, as well as, the rate at which students participated by month during the school year. Based on the results both independent variables were significant.

Moreover, only a few researchers have examined how students and their parents perceived the contribution of homework assignments given in physical education classes. Pantanowitz, Lidor, Nemet, and Eliakim (2011; L2) assigned physical education homework to 95 students in the 11^{th} and 12^{th} grades. Each student was given a homework assignment that included a movement activity requiring 20 to 45 min to complete. Students were also assigned academic work that included reading materials

and writing brief reports on the health benefits of each activity. Pretest and posttest of physical fitness were conducted and compared to a no homework group. Pretest and posttest questionnaires also were reviewed and compared to a no homework group. Based on the results, there were no significant differences of fitness characteristics between the two groups.

Qualitative data was also collected to provide insight on participants' experience in completing their homework. The main reason for completing their homework was "having fun." Other reasons given were the desire to lose weight and to be involved in competitive sports. The researchers reported that more than 50% the students supported homework assignments in physical education. Approximately 30% of the students did not support being given homework assignments. The main reasons were lack of time, large homework load in other classes, and the belief that homework did not belong in high school physical education classes. Twenty percent of students perceived homework in a negative way. On the other hand, the majority of participating parents supported the idea of assigning homework in physical education (Pantanowitz, Lidor, Nemet, & Eliakim, 2011; L2).

Similar to examining parents and students as primary variables of homework success, Burt (2012; L2) took an interesting approach in examining homework in physical education by examining the physical educator as the primary factor in the achievement of homework in physical education. The purpose of this study was to identify how many physical educators (N = 144) were currently assigning homework to their classes and to

identify through a questionnaire the factors that were related to whether physical educators assign homework. Based on the results of the study, the primary reason the physical educators who assigned homework, agreed that homework could increase overall content knowledge and increase physical activity, as well as, make grading easier. In contrast, physical educators who did not assign homework did not believe that students and parents would "like" the homework, "wondered how they could prove the activity homework was completed by the student," and believed that grading homework would take "too much time."

Researchers have included homework as an integral part of their model physical education intervention programs in the schools. Sallis and colleagues (1997; L3) developed the *Sport Play and Active Recreation for Kids* (SPARK) program in an effort to study the effects of a 2-year physical education program designed to increase physical activity during physical education classes and outside of schools. The SPARK program focused on teaching self-management skills (e.g., goal setting, self-reinforcement, self-instruction, and problem-solving skills). Self-management skills were taught to help generalize regular physical activity outside of the physical education classroom. The SPARK program staff was successful in implementing physical education classes that increased physical activity levels and enhanced fitness skills of students in the classroom. However, the SPARK program was not successful in increasing physical activity outside of the school environment. It was reported that children may have learned self-management skills but did not generalize them in the community environment

because of their young age (i.e., elementary school age children) or because they were allowed to go outdoors due safety concerns. The researchers concluded that self-management skills may be more appropriate for older students who are making more autonomous decisions.

Similar to the SPARK program, Roth et al. (2010; L3) developed the *Prevention through Activity in Kindergarten Trial* (PAKT) program, which included homework as a means for providing a holistic pedagogical approach termed "early psychomotor education." PAKT incorporated parents by assigning physical activity homework cards. The physical activity homework cards included gross motor tasks and game activities with a focus on team play, as well as, activities that focused on active cooperation of the family. The activity cards were assigned on a weekly basis. Physical education teachers practiced what was on the activity cards during class time to encourage them to independently complete their homework. Each activity card had specific instructions for parents on how to complete the exercise and modification possibilities for adjusting the level of difficulty. The PAKT program also accounted for physical activity during the holiday breaks by providing children and their families' special seasonal activity cards with games and ideas for active family time. The homework component of this study was analyzed by surveying parent satisfaction level with the physical activity homework cards and the collection of games and exercises tasks. Parents appraised the children's acceptance of the program and the effects of the intervention activities they noticed in their child. Results were not published, since this study is currently in the trial phase

(Roth et al., 2010), but it is important to note that according to the parents remarks the homework component of this research study was successful.

Traditionally, when compared to other instructional areas, the physical education class is not an academic area that is subject to the demands of using homework as a pedagogical practice. There is minimal scientific research available on the use of homework in physical education (Horvat, 1982; Smith, Cluphf, & O'Connor, 2001). Investigators mainly have focused on strategies on how to include homework for physical educators, but there is a lack of research on the use of active homework as an intervention strategy to enhance gross motor skills.

Parent-Implemented Motor-Based Programs

Public Law 99-457, the *Education for all Handicapped Children Act* (1986) extended educational services to infants, toddlers, and preschool children with disabilities or developmental delays and for those at risk for developmental delays. Developmental delays may occur in one or more of the following areas: cognitive, physical, speech and language, psychosocial or emotional, and self-help skills. The researchers on early intervention have demonstrated the positive effects of carefully planned early intervention programs for young children with developmental delays or with disabilities (Goodway-Shielbler, 1994; Sayers et al., 1996; Zittel & McCubbin, 1996).

There seems to be a consensus regarding the importance of early intervention to counter the detrimental impact of developmental delays. There is limited research, though, on carefully planned intervention programs to help children acquire motor skills

in early childhood (Goodway-Shielbler, 1994; Sayers et al., 1996; Zittel & McCubbin, 1996). This may be due to minimal diagnosis of delays in motor skill acquisition as these skills are often overlooked when competing with other areas of development (e.g., cognitive, speech, and language). Specifically, a common misconception of early childhood educators and parents is that motor skills will emerge solely as a part of the growth and maturation of the child, and so this area is often ignored. However, children who have delayed motor skills may specifically need an intervention to develop competent fundamental motor skills. Most often, the physical education class is not included in a child's education program until kindergarten, and so the opportunity for preschool intervention in the area of motor skill acquisition is limited.

With this in mind, researchers clearly have indicated that preschool children who are at-risk for developmental delays can benefit from parental involvement in their pre-academic and early academic program (Seligman, 1988; Waxler, Thompson, & Pobleta, 1990; Williams, 1987). Thus, parental involvement in teaching fundamental skills in early childhood is important to the successful practice of early motor skills. Although parental involvement has been identified as an important factor in early childhood interventions, little research has focused on the use of trained parents in teaching motor skills.

For example, Hamilton, Goodway, and Haubenstricker (1999) investigated the effectiveness of parental involvement on the acquisition of object-control skills (e.g., throwing and catching) of preschool children who are at-risk for developmental delays or

academic failure. Parents of 15 children in the experimental group and 12 children in the control group delivered motor skill intervention over an 8-week period. Pretest and posttest measures showed that the experimental group improved significantly in their object control skills, and the control group did not improve scores in their object control skills. The results indicated that parents mentored by professionals can be effective instructors of their children's motor skill development, as demonstrated by the significant gains ($F(1.26) = 12.55$, $p < 0.002$) in motor performance that occurred in the experimental group.

In a similar study, parents' perception ($N = 22$) of their participation in a home-based pediatric strength intervention program with their children with Down syndrome (6 to 42 months), indicated that they were empowered to implement the program, their expectations about improved motor development of their children had been met, and they perceived the program as worthwhile (Sayers, Cowden, & Sherrill, 2002).Researchers have also investigated home-based and parent-implemented programs to enhance the overall fitness of children with disabilities. In a randomized clinical trial conducted by Katz-Leurer, Rotem, Keren, and Meyer (2009), 20 children ages 7 to13 years with traumatic brain injury ($N = 10$) or cerebral palsy ($N = 10$) were randomly assigned to a control group (regular daily activities) or to an experimental group (regular daily activities plus a home-based, task-oriented exercise program) to improve motor and balance performance skills. Significant differences ($p < 0.001$) were reported related to balance tasks (e.g., an increase in mean scores on the functional reach test and a reduction

of seconds in the timed up-and-go test) for the experimental group, while no significant differences were reported in the control group. Based on the results, a home-based exercise program can improve balance performance in children with spastic cerebral palsy or severe traumatic brain injury.

Tuzin et al. (1998) also investigated the use of parent-implemented intervention for increasing physical activity of children with a health impairment (i.e., cystic fibrosis). The researchers suggested that a home-based, parent-managed program to increase routine physical activity of 10, 7- to14-year-old children can increase physical activity among chronically ill children with cystic fibrosis.

Within this limited research, striving to improve movement skills of children with and without disabilities, an integral part in enhancing skills taught in the physical education classroom was the use of practice (homework) outside of the school environment. Teacher motivation and parent involvement with in the delivery of the interventions (Kirk & Rhodes, 2011; Pless & Carlsson, 2000) were also essential in enhancing skills in physical education. Professionals in the field of physical education, as well as, parents and students, seem to have provided mixed results about the use of homework in their physical education classes (Burt, 2012; Pantanowitz, Lidor, Nemet, & Eliakim, 2011).

Use of Homework in Speech-Language Therapy

The benefits of homework in the field of speech-language pathology are historically rooted in the literature and continue to be of popular practice among speech-language pathologists. Drennen (1955, p. 72; L3) stated:

> Homework is something that parents of exceptional children will do continually. This homework is neither a spelling list nor 10 problems in arithmetic. It is a long never ending job. It means explaining, interpreting, correcting, and encouraging the child to think for himself, to express himself in language that is acceptable and speech that is intelligible. It means giving the child experience about which he can and will talk. The parents who do homework with their child with a disability help school progress tremendously. They will experience a feeling of satisfaction as they see this steady growth.

Parental involvement continues to be highly advocated for overall homework success, not only in school settings but also in clinical settings. Moreover, researchers related to early childhood development have supported the positive link between the role of parents and their preschool children to help foster language and emergent literacy development (Justice & Ezell, 2000; Reese, Sparks, & Leyna, 2010). Additionally, researchers have also supported the effectiveness of parent-implemented language interventions as an effective approach for young children with speech and language impairments (Gibbard, Coglan, & MacDonald, 2004; Iacono, Chan, & Waring, 1998; Kent-Walsh, Binger, & Hasham, 2010). However, there is limited research data supporting specific use of homework as an intervention strategy to improve speech-language skills of children with phonological disorders in early childhood (Fudala, England, & Ganoung, 1972, L1; Günther & Hautvast, 2009, L1).

Within the school setting, speech-language pathologists adhere to district guidelines for the quantity of homework assigned to students with consideration focused on student age and cognitive level. The use of homework by speech-language pathologists in the schools is a frequent practice. It aligns the school-setting custom of homework which is accepted widely as a positive and supportive teaching strategy. Generally, speech-language pathologists use homework as an added pedagogical practice to reinforce student abilities, to add frequency of practice, or to achieve generalization goals beyond the speech therapy class. The academic literature on homework serves as a general guideline for implementation of homework (e.g., time allocated for homework according to student age), but there is minimal evidence-based research on the efficacy of homework as the primary variable of interest for improving speech and language skills taught in the preschool classroom (Fudala, England, & Ganoung, 1972, L1; Günther & Hautvast, 2009, L1; Marvin & Privratsky, 1999, L2).

Marvin and Privatsky (1999; L2) investigated the effects of materials sent home from school to improve expressive language skills, increase vocabulary development, and increase mean length of utterances (MLU) of children in preschool. The materials sent home were designed by the teacher and the child during the school day. The materials were based on the concepts learned in a preschool program. The focus was to provide children with the visual prompts to support their ability to initiate communication with their parents about the concepts learned during their preschool class time. The researchers, with 10 children in this study, compared two conditions. Condition A

consisted of children taking materials (e.g., art projects, drawings made in class) home on days assigned and Condition B consisted of the same children not taking materials home. During Condition A, participants were recorded speaking to their parents when they were picked up from school and on their way home. The materials sent home with students were used as prompts for the children to initiate speech production with parents about recent activities. Based on the results, the children's speech contained significantly more references to recent activities when the children carried home materials than when they did not. A limitation for this study was the low level of parental involvement (e.g., 8 out of 10 parents did not look at materials on their way home).

Similarly, the effects of homework were also researched by Fudala, England, and Ganoung (1972; L1). Investigators conducted a study that included elementary school children ($N = 92$) with articulation disorders to determine: (a) if parents would follow through with regular attendance at speech classes, (b) if parents would continue therapy at home, and (c) if children with articulation disorders would progress more rapidly when their mother attended their speech therapy classes and practiced with their child at home. Children and their parents were divided into two Groups. Group I participated in routine speech therapy with homework assignments but did not require parental involvement in therapy. Group II required parental involvement in therapy with homework activities. All children improved in reducing their articulation errors. Group II (which was the group of interest) had a higher average of improvement (10.8 points) when compared with Group I (3.22 points).

In a similar study, Günther and Hautvast (2009; L1) were interested in how to improve homework completion with parental involvement. Their focus was to determine whether the efficiency of traditional articulation therapy for children with speech sound disorders can be improved by adding a behavioral treatment approach (i.e., contingency management) to the treatment in order to increase the time that students spent doing homework. Children (N = 91) between the ages of 4 and 6 years with articulation impairments participated in the study. The children were divided into three groups: 32 children were treated with traditional articulation therapy (8 sessions, 45 min each); 33 children received a combination of contingency management and traditional therapy; and 26 children received no therapy.

The contingency management program consisted of self-monitoring contingency contracting. A token system was used. Each time a child reached predetermined goals, such as correctly pronouncing a target word, the child earned a token (i.e., stamp). The token system was also applied by parents during homework practice. The results confirmed the fact that the traditional articulation therapy approach was effective for children with articulation impairments. However, adding contingency management significantly increased the frequency of homework sessions completed which resulted in higher therapeutic success. Further, the children were highly motivated to obtain their rewards, which stimulated parents to help them practice more frequently.

In the remaining section homework will be discussed as an integral part of holistic speech intervention programs, as opposed to specific effect of homework. Minimal

research data were reported on the effects of the homework (Bowen & Cupples, 1999, 2004, 2006: L3; Lancaster, Keusch, Levin, Pring, & Martin, 2010; L1). For example, Bowen and Cupples (1998; L3) developed a Parents and Children Together in Phonological Therapy (PACT) program. PACT is an intervention approach for children with phonological impairments, which involves the participation of caregivers in therapy and outside of therapy (i.e., homework). Parent education and homework is an integral part of PACT. Parents were educated about phonological intervention through books, documents, websites, discussions with a therapist, and notes taken home in the child's speech books containing homework activities. The PACT routine includes: (a) auditory bombardment (i.e., listening to target sound), (b) minimal pair contrast task (e.g., sorting cards into pairs of words that sound the same but have different meanings), (c) a judgment of creativeness (e.g., student becomes the teacher), (d) listening to a tape of part of the preceding therapy consultation, and (e) auditory bombardment again. Finally, parents concentrated on modeling and reinforcing a particular behavior for the week. This routine was completed for homework 5 to 7 min, one to three times daily, as directed by the speech therapist.

Lancaster, et al. (2010; L1) also included homework within their approach to treating children with phonological problems. The investigators examined the effectiveness of using a mixture of perceptual processing and production tasks during therapy, giving amounts of therapy more consistent with clinical practice, and involving parents in treating their children. Two experiments were conducted. In the first experiment, one

group of children received the intervention just described (i.e., perceptual processing and production tasks). Parents attended therapy sessions and were given homework tasks to do with their children. All children improved significantly on their articulation scores. In the second experiment, three groups of children were compared. One group was treated with the same program that children were treated with in Experiment 1 ($F (1, 12) = 31.97$, $p < 0.0001$). The second group of children was treated at home by parents who had attended the training sessions and were not provided a speech language therapist ($F (1, 12) = 9.04$, $p < 0.05$). A third group remained untreated. All children who received the treatment improved significantly in their reduction of phonological processes. The group treated by clinicians improved significantly, as well as, the group treated only by parents; no change was reported in the children who were not treated.

There seems to be a consensus in the literature indicating that parental involvement is essential for homework success (American Speech-Language-Hearing Association, 2008). Parents can be proficient in providing intervention strategies that will further enhance their child's speech and language skills. Homework is an integral part of treatment, but few researchers have established the statistical significance of the positive effects of homework as an intervention technique by speech-language pathologists.

Effect of Movement on Cognitive Skills of Children

Generally, the effects of increased levels of movement are associated with increasing heart rate, decreasing body fat, and improving overall health and fitness. Thus low levels of movement can have detrimental effects on the human body, leading to health-related

problems. Further, brain researchers have shown that increased movement activity is associated with improved brain function (Churchhill et al., 2002). Researchers have also suggested that 30 min of vigorous exercise at least three times a week can contribute to enhanced mood, increased brain mass, better circulation, more brain cells, and improved cognition (Churchhill et al.).

Looking closer into the mind and body relationship, there are also reasons to believe that physical activity could enhance learning (Jensen, 2005). Educators have suggested that movement, particularly in very young children, can stimulate cognitive development (Gallahue & Cleland-Donnelly, 2003). According to Piaget (1950), skills and relationships learned during physical activity carry over to learning of other relationships. This suggests that it is the movement involved in an activity that is important, not the physical exertion (Hill, 1998). Historically, writers on education such as Plato and Aristotle, and much later writing in the 19th century, have all asserted that the development of the mind needs to be balanced by the development of the body (Hill).

Numerous mechanisms have been proposed to explain the relationship between physical activity and cognition. These mechanisms can be categorized into two broad categories: physiological mechanisms and learning developmental mechanisms. They are delineated as follows:

1. Physiological mechanisms, such as increased cerebral blood flow, alterations in brain neurotransmitters, structural changes in the central nervous system, and modified arousal levels are based on physical changes in the body brought about by movement.

2. Learning developmental mechanisms provide learning experiences in which movement and physical activity aid and may even be necessary for, proper cognitive development (e.g., tactile-kinesthetic learners; Sibley & Etnier, 2003).

For the purpose of this research study, the developmental learning mechanisms will be the focus of the remaining literature review. During the early school years, children begin to develop the cognitive skills necessary for learning and achieving academic goals. Cognition includes five domains: attention, memory, language, executive function, and visuospatial skills. All human activity requires the coordination and interaction of some or all of these domains (Helm-Estabrooks, 2001) in order to fully function in society and lead productive lives. In the school setting, children are asked to apply these domains to meet academic goals. For instance, in Texas, cognitive skills necessary for achieving academic goals are based on 11 standards (Texas Education Agency: Texas Essential Knowledge and Skills; TEKS, 1998). Each standard addresses an instructional area (e.g., math, science, social studies, and language arts) that describes what students should learn during each school year. Emphasized in the physical education knowledge and skills is that children can use not only the physical domain, but infuse the affective and cognitive domains.

Specifically, in early childhood, the academic goal for physical education in kindergarten to second grade is to teach children to learn fundamental movement skills and begin to understand how the muscles, bones, heart, and lungs function in relation to physical activity; to begin to develop a vocabulary for movement and apply concepts

dealing with space and body awareness; and to engage in activities that develop basic levels of strength, endurance, and flexibility (TEKS, 1998). Goals in physical education require that students use skills from different cognitive domains (e.g., memory, language) to achieve physical education goals. Movement is the medium for improving cognitive skills in physical education.

Bailey et al. (2009) critically examined the benefits of physical education in academic achievement. The benefits were separated into three areas: (a) associations between physical education and sport/activity and academic performance, (b) associations between physical education and sport/activity and cognitive functioning; and (c) associations between physical education and sport/physical activity and the improvement of other areas of the curriculum, as well as, basic skills such as literacy, numeracy, and thinking skills (Bayley et al., 2009). Based on this review, results indicated that the mechanism by which physical education and sport might contribute to cognitive and academic developments are barely understood. Furthermore, the experts have stated that there is some persuasive evidence to suggest that physical activity can improve children's concentration and arousal, which might indirectly benefit academic performance (Bayley et al.).

Corresponding with the above benefits, three longitudinal studies were implemented to examine the effects of increased physical activity/physical education and the positive impact on concentration, learning, and academic success. The first study was conducted between 1951 and 1961 in France which involved reducing academic curriculum time by

26% and replacing it with physical education and sport. Based on the results of this study, academics did not worsen and there were fewer discipline problems, greater attentiveness, and less absenteeism (Shephard, 1996). In a second study conducted in 1978, entitled the Hindmarch Project in Australia, seven randomly assigned primary schools to examine the effects of increased physical education on academic grades. The experimental group received 1 hour of physical education each school day, while the control group continued the usual curriculum, which included more academic instruction. Improvement was reported in physiological and fitness variables, but there were no differences in academic grades. The yearlong follow-up data indicated a trend favoring the experimental students; particularly in arithmetic and reading grades, as well as, the beneficial effects on teachers' ratings of classroom behavior (Dwyer, Connan, Worsley, & Leitch, 1979).

The third longitudinal study was conducted in Canada, in the mid 1970s (Shephard et al., 1984). Students in elementary school (1^{st} to 6^{th} grade) received increased time for physical education and decreased time for other types of instruction. Students in the control group were exposed to an identical academic environment but spent 13% to14% more time in academic instruction. Improvement was reported not only in fitness and psychomotor activities, but also in class grades. In addition, students earned higher grades on a standardized math test, but there were no differences in other subject areas.

Accordingly, in more recent studies, the relationship between physical fitness and academic achievement has been studied by several researchers who focused on younger

school-aged children. Chomitz et al. (2009) reported that the odds of passing specific mathematics and English tests increased as the number of fitness test items passed increased (N = 103; grades fourth, fifth, and eighth). In addition, Castelli, Hillman, Buck, and Erwin (2007) examined fitness levels of 259 public school students in third to fifth grades and reported that field tests of physical fitness were positively related to academic achievement and aerobic capacity, whereas body mass index (wt, in lbs/height, in.) was inversely related. Specifically, associations were demonstrated between the total academic achievement, mathematics, and reading. This suggested that aspects of physical fitness may be globally related to academic performance. In addition, Clark (1958) summarized the results of seven additional studies related to the effects of movement on cognitive skills of children and concluded that all of the results were in a positive direction.

In contrast, numerous researchers have examined the effects of physical education and activity levels on academic achievement in children. The results indicated that physical fitness does not have significant effects on academic achievement testing (Coe, Pivarnik, Womack, Reeves, & Malina, 2006; Sung, 2004; McNaughten & Gabbard, 1993; O'Conner, 1969). In support, Harris (1973) reviewed the literature on motor performance and academic achievement and concluded that the relationship between physical activity and academic achievement had not been established.

Other researchers have reported results that correlations between movement and potential cognitive benefits, which indicate mixed results (Bailey, 2006; Clark, 1958;

Harris, 1973). Mixed results were established in a meta-analysis research study conducted by Etnier et al. (1997) of 11 reviews of literature that analyzed the correlation between physical activity and mental achievement. Etnier's meta-analysis included all relevant studies with sufficient information for the calculation of effect size (N = 134). The overall effect size was 0.25, which suggested that exercise specifically has a small positive effect on cognition. Etnier et al. reported a general consensus that results of the literature reviews were mixed (e.g., evidence of positive effects vs. no evidence of positive effects), indicating the need for further research (Etnier et al.). In addition, Bailey (2009) critically reviewed the literature related to the educational benefits of physical education and sport. Four broad areas of research were discussed: physical, social, affective and cognitive associations. In the review related to the cognitive domain, it was suggested that physical education/activity does contribute to the development of the cognitive domain, but the mechanisms through which these benefits occur are less clear and barely understood once more indicating the need for further research (Bailey, 2009; Caterino & Polak, 1999; Etnier et al., 1997; Gildenhuys & Orsmond, 1996; Lindner, 1999; Raviv & Low, 1990; Shephard, 1996; Trembley, Inman, & Williams, 2000).

In summary, there seems to be evidence in the existing literature as to the effectiveness of physical fitness activities to improve academic areas of school-aged children (i.e., kindergarten and above), as well as, evidence of no positive effects. There is a lack of research on preschool-aged children. Mostly researchers' have focused on

improving fitness skills that play a major role during later schools years, distinct from preschool aged children learning fundamental motor skills. Researchers have minimally explored the use of movement activities while engaged in cognitive tasks, with the focus on using movement as the medium for teaching cognitive skills (Conner-Kuntz & Dummer, 1996). Studies could not be located on the use of movement activities as a medium for enhancing speech skills of preschool children.

Further, an integral part in enhancing motor skills in the physical education classroom was the use of practice (homework) outside of the school environment. There is minimal scientific research available on the use of homework in physical education (Horvat, 1982; Smith, Cluphf, & O'Connor, 2001). Investigators mainly have focused on strategies on how to include homework for physical educators. There seems to be a consensus in the speech language literature indicating that parental involvement is essential for homework success (American Speech-Language-Hearing Association, 2008), but few researchers have established, based on a statistical significance, the positive effects of homework as an intervention technique by speech-language pathologists. Studies could not be located on the use of gross motor homework activities in physical education or speech language therapy to enhance phonological skills of preschool children. This supports the rationale of this study and the need for the current research study.

CHAPTER III

METHOD

The purpose of this investigation was to determine the effect of using Gross Motor Activity Homework on the phonological skills of preschool children whose primary communication difficulty was a phonological disorder. Three different homework groups were compared: (a) Gross Motor Activity Homework, (b) Structured Table Activity Homework, and (c) Structured Table Activities with Letter-Tracing Homework. Groups were compared to determine if the incorporation of gross motor activities would facilitate a greater generalization of target sounds to suppress the inappropriate phonological processes of children who were between the ages of 3 and 5 years. The methods used for this study are described under the following sections: (a) Participants, (b) Selection Procedures, (c) Instrumentation, (d) Testing Procedures, (e) Intervention Procedures, and (f) Research Design and Data Analysis.

Participants

Participants were 30 students (26 males, 4 females, *M* age = 4 years, 5 months, age range: 3.6 - 5.3 years). To qualify for participation in this investigation, participants met the following criteria: (a) identified by school district's identification process as Speech Impaired (SI), (b) received special education services through the Denton Independent School District (DISD) early intervention Preschool Phonology Groups program, and (c) speak English as their first language.

Selection Procedures

Prior to this study, a meeting was held with the supervising speech-language pathologist of the Preschool Phonology Groups (PPG) program at L.A. Nelson and Wilson Elementary Schools in Denton, Texas. The meeting was held to discuss a potential collaborative research investigation that would involve speech-language pathologists, adapted physical educators, and parents of the students enrolled in the PPG program in two schools in DISD. At the end of the meeting, the supervising speech-language pathologist gave verbal approval for her students in the PPG class from both elementary schools to participate in this study. Next, permission was obtained from DISD and the Institutional Review Board for the protection of Human Subjects (IRB) from Texas Woman's University to conduct this research study using human subjects (see Appendix B). At that time, a letter was presented to the parents of the child(ren) that provided detailed information concerning the administration of the study and that requested parental consent for their child(ren) to participate in the study (see Appendix C).

Qualifying participants were then assigned personal identification numbers (PINs). Participants in the two schools were randomly assigned to three groups by drawing a number out of a basket. Obtaining a number "1" placed the participant in the Gross Motor Activity Homework group; obtaining a number "2," in the Structured Table Activity Homework Group; and obtaining a number "3," in the Structured Table Activities with Letter-Tracing Homework Group.

Preschool Phonology Groups

The PPG program is a special education speech therapy program for preschool students who demonstrate a significant delay in phonology skills. In order for students to participate in the PPG program, they must meet eligibility guidelines for the speech-impaired that have been proposed by the Texas Speech-Language-Hearing Association (TSHA, 2009) and adopted by DISD in 2009. Guidelines include the completion of a comprehensive evaluation completed of the student's expressive and receptive language skills. Receptive language scores must be within the average range compared to their same-age peers.

Expressive language scores are depressed due to the phonological impact. A conversational speech sample of 100 words is obtained and purposefully analyzed for an intelligibility percentage, and the results are then compared to the *Weiss Speech Intelligibility Scale* (Weiss, 1982). The term *intelligibility* refers to speech clarity or the proportion of a speaker's output that a listener can readily understand. In typical development, as children learn to talk their comprehensibility to those around them steadily increases. Based on the Weiss Speech Intelligibility Scale (Weiss), children 2 years of age should be 50% intelligible, children 2 years 6 months of age should be 51% to 70% intelligible, and children 3 years of age should be 71% to 80% intelligible. Students must be within the 7th percentile or below in speech intelligibility on the Weiss Speech Intelligibility Scale, as well as, score below the 7th percentile on a standardized articulation test. The standardized test should also reflect numerous phonological

processes (e.g., final consonant deletion, stopping, consonant cluster reduction, fronting or, backing). An Admissions Review and Dismissal (ARD) meeting must have been held at L.A. Nelson or Wilson Elementary Schools, and the ARD committee must have determined that the student is eligible to participate in the PPG program. If the student is eligible for the program, he or she is educationally labeled as SI. The student is then enrolled into either the PPG program at L.A. Nelson or Wilson Elementary School.

The PPG therapy was based on the *cycles approach*. A modified cycles approach was used (see Chapter 1), and the speech therapist also included three min of gross motor activities at the end of the therapy session (e.g., jump and say the target sound). The traditional PPG therapy lessons focused on phonological processes skills through the use of a target sound (e.g., production of final "k" to address fronting). Students practiced producing the target sounds either in imitation of syllables, single words, phrases, sentences, or spontaneous speech. The goal was to reduce the inappropriate phonological processes that each student exhibited and to ultimately produce target sounds in spontaneous speech. The target sound was embedded into all activities within a 1 hr therapy session. Students attended therapy, in groups of four; all students attended therapy during a prescribed time, twice a week. Students assigned to L.A. Nelson Elementary School attended therapy Mondays and Wednesdays, and students assigned to Wilson Elementary School attended therapy Tuesdays and Thursdays. The same target sound was practiced for a one-week period at both schools. Therefore all activities

remained the same during a one-week period at both schools, and each week the target sound changed.

The classroom environment was highly structured and predictable. Students practiced their sound production independently, as well as, in groups throughout the lesson. Sound production, auditory bombardment, literacy, and print awareness were taught through multisensory modalities (e.g., audio, visual, tactile, and gross motor movement). A phonologically based lesson was presented at 11 total centers; all centers remained the same every week and serve as the framework for the target sounds that are were embedded within the centers. The centers were: (a) review; (b) emotion expression; (c) sound introduction; (d) auditory bombardment; (e) target words; (f) table activities; (g) individual activities (i.e., oral motor, fine motor, letter-tracing, name tracing, letter search); (h) circle time; (i) gross motor activity; (j) art activity; and (k) departure (see Appendix D).

Instrumentation

Data were collected using the *Peabody Developmental Motor Scales-Second Edition (PDMS-2*; Folio & Fewell, 2000) and the *Hodson Assessment of Phonological Patterns - Third Edition* (*HAPP-3*; Hodson, 2004). The *PDMS-2* was used to assess each participant's performance to ensure that participants were able to safely perform the prescribed motor activity homework. In addition, all participants were tested on their phonological skills using the *HAPP-3* to determine whether there was a significant difference between the pretest and posttest assessment scores of those participants in the

following groups: (a) Structured Table Activity Homework, (b) Gross Motor Activity Homework, and (c) Structured Table Activities with Letter-Tracing Homework.

Motor Development Instrument

The *PDMS-2* is a standardized test used to assess children from birth to 6 years of age. It consists of six subtests addressing reflexes, stationary, locomotion, object manipulation, grasping, and visual motor integration. The purpose of this test is to assess and identify children who are significantly delayed in these reflexive, visual, and motor skill areas. The test provides validity, and test reliability data. Validity is provided through conventional item analysis, item response theory modeling, differential item functioning analysis, criterion-prediction validity, construct identification validity, and age differentiation validity (Folio & Fewell, 2000).

The test reliability is provided through: content sampling, time sampling, and interscorer differences. The reliability interscorer difference error measures for reflexes were .98; stationary, .97; locomotion, .99; object manipulation, .98; grasping, and visual motor integration, .98. The total motor score content sampling error score was .97, time sampling was .93, and interscorer differences were .96. The time required to administer the entire *PDMS-2* varies from approximately 45 to 60 min.

For the present investigation, only the gross motor subtest was administered which, took approximately 20 to 30 min. The gross motor subtest is divided into four categories that can be combined to calculate an overall gross motor score. The gross motor score is used to determine if the child demonstrates age-level or delayed gross motor skills.

Based on information provided, one may conclude that the *PDMS-2* is a "valid measure of motor abilities" (Folio & Fewell, 2000, p. 51).

Speech and Language Instrument

The *HAPP-3* is a standardized norm-referenced, phonological assessment test for preschool children. It provides normative data for ages 3 to 8 years. It involves the elicitation of single words by naming objects and pictures. It is a pattern oriented test that is designed for children with highly unintelligible speech to determine if they require phonological intervention. It is administered prior to intervention to determine severity levels, major phonological deficiencies, optimal target patterns, and baseline data to be used for comparisons to document treatment effect over time. The *HAPP-3* yields three types of scores: raw scores, ability scores/standard scores, and percentile ranks. Ability-standard scores have a mean of 100 and a standard deviation of 15. The *HAPP-3*'s overall reliability is high: content sampling is .96; time sampling is .99; and scorer differences are .98. The *HAPP*-3 provides test validity through content description and construct identification validity. Based on the information provided by the author of this test, the *HAPP*-3 is a "reliable and valid standardized measure of phonological production skills" (Hodson, 2004, p. 137).

Testing Procedures

Motor and language domain specialists were assigned as examiners to conduct the testing. The examiners in the study were:

Examiner 1. Primary investigator administered and scored all gross motor skill tests and also administered and scored all phonological skill tests.

Examiner 2. Graduate student in Adapted Physical Education administered and scored the gross motor skill tests in collaboration with Examiner 1.

Examiner 3. Speech-language pathologist supervisor administered and scored all students' phonological skill tests in collaboration with Examiner 1.

Testing was conducted in two phases: (a) Phase 1 pretesting and (b) Phase 2 was posttesting. Phase 1 testing was used to measure the pretreatment level of performance of the entire participants' gross motor (PDMS-2) and phonological skills (*HAPP-3*). Phase 2 testing was used to measure only the post-treatment level of performance of all participants' phonological skills (*HAPP-3*). After a 5-day-a-week, 12-week intervention period and approximately 20-min of testing time for posttesting.

Phase I

Pretesting began the first week of school, at the beginning of the spring semester. All perspective participants were tested to determine their gross motor skills by Examiners 1 and 2. Examiners 1 and 2 administered each gross motor assessment together. Examiner 1 served as the scorer and observed the participants' movement skills; Examiner 2 verbalized and demonstrated the test items on the testing protocols. Examiners 1 and 2 collaborated and scored the results from all tests protocols. Based on these results, the students were able to safely perform the developmentally appropriate gross motor skills necessary for participation in the study (e.g., hop, jump, walk, and

slide). All gross motor testing was conducted in the PPG classroom. Only the Examiners and participants were allowed in the testing room in order to ensure the same testing environment for all participants.

Phase 1 also consisted of testing phonological skills using the *HAPP-3* evaluation. Examiner 1 and Examiner 3 administered and scored all phonological skill tests for each child. During this phase, Examiner 3 videoed all phonological skill tests as part of this continued yearly testing protocol. The participant sat between Examiner 1 and Examiner 3, and they were not allowed to look at each other's transcriptions (i.e., method used for testing phonological skills). Interrater reliability was used to ensure objectivity of scoring between examiners and reliability of performance and scores of each participant (i.e., 96% agreement). Examiner 1 and Examiner 3 compared each other's transcriptions and reviewed video recordings for any discrepancies, and together they decided on one transcription. All phonological skill testing was conducted in the PPG classroom. Only examiners and participants were allowed in the testing room in order to ensure the same testing environment for all participants.

Phase II

Posttesting was conducted at the end of the 12 weeks. All testing protocols for the level of phonological skills were administered in the same manner as in Phase 1 (i.e., same examiners and same testing environment). The *PDMS-2* gross motor skills test was not re-administered. Interrater reliability was conducted in the same manner as Phase 1 in order to ensure objectivity of scoring between examiners' scores on the *HAPP-3*.

Intervention Procedures

All participants were randomly assigned to one of the three homework groups: (a) Gross Motor Activity Homework, (b) Structured Table Activity Homework, and (c) Structured Table Activities with Letter-Tracing Homework. For the weekly homework, all groups practiced the same target sound that was practiced in the classroom with the speech-language pathologist. All students received the same four picture cards that contained the target sound in single one-syllable words, and their group-specific homework activities (see Appendix E). The three groups' homework activities were placed in a folder, along with a parent homework checklist; the folder was placed inside each participant's backpack.

The parent homework checklist was provided for the parents/guardians to record the days they practiced during each week, the name of the person(s) who completed the homework with the student, and whether or not they viewed the video for the week (see Appendix F). The checklist also contained a data box divided into 40 small squares that were determined by the Speech Therapist and investigator. This process was determined by 3 practice sessions prior to the initial study: (a) practice with the Speech Therapist, (b) practice with the investigator, and (c) practice with a randomly selected student who was not involved in the study. The parents were asked to draw a check mark in each square for every verbal attempt made by the child in producing the target sound. Parents were asked to check the square 40 times during each homework session for 40 verbal attempts made by the child in producing the target sound.

Homework sessions were completed, once the child attempted to produce the target sound 40 times outside of school. Parents were asked to practice their homework five times a week. The primary investigator collected the folders with the parent homework checklist 7 days after it was assigned (i.e., on Monday handed out homework; the following Monday collected the completed homework and handed out the new homework). The speech-language pathologist did not know which group the participants were randomly assigned. The investigator also collected the closed folders from the students every 7 days. The investigator was only present in the classroom on the days of picking up and handing out homework. The speech-language pathologist conducted therapy in the classroom.

The activities for all three homework groups changed the Monday after the weekend the child practiced the sound during the previous 5 school days, along with the four words that contained the target sound. The investigator sent three mass emails (one for each homework group) to the parents with a video link. The video link (one for each group) contained instructions that allowed each parent to view the video footage of how to teach the target sound for the week. The video shows the investigator playing with a student and demonstrating the parent's role in providing specific feedback, as well as, procedures for completing the homework for the current week. All parents were instructed on how to access the link in their email. Parents who did not have access to home computers were allowed computer access in the student's classroom. Parents were asked to provide feedback about the quality of the video instructions received in their

email. Parents were also asked to provide positive reinforcement through verbal praise immediately after the production of a target word (e.g., great job, I heard your skinny sound "s," or "I like how you kept your tongue behind your teeth"). Further, parents were asked to only provide reinforcement using the specific verbiage demonstrated on the video links.

The Gross Motor Activity Homework group practiced saying target sounds in single one-syllable words depicted on the four picture cards (e.g., "duck" for final "k") while executing an assigned developmentally appropriate motor activity (e.g., hop, jump, walk, and slide). During this session, two poly spots (colored circular disc) were also placed 6 ft (1.82 m) apart while the child performed gross motor activities (e.g., jump between the two poly spots while saying the target sound on the picture card every time you jump; slide from one poly spot to another poly spot with lettered bean bag; and put the bean bag on the other poly spot while saying the target word). A 6 ft (1.82 m) quarter inch rope was given to parents for distance consistency of the poly spots. During each gross motor activity homework session, parents used the data box on the checklist to keep track of the verbal attempts (correctness of the sound was not judged) made in producing the target sound. Children practiced the same activity 5 times per week with their parent.

The Structured Table Activities Group received the same four picture cards as the Gross Motor Activity Group. The four words were embedded into table activities and students practiced saying and listening to those words with their parents/guardians while playing the specified activities. Parents were asked to complete their homework while

sitting at a table. Students in this group were also required to make 40 attempts to produce the target sound during each homework session, 5 times per week.

The Structured Table with Letter-Tracing Activities group practiced saying and listening to the same four target words that Gross Motor Activity Group and the Structured Table Activities Group practiced. The four target words were embedded into table activities (e.g., bingo board game that required the child to place one of the four words on top of a designated square and then say the target word). The Structured Table with Letter-Tracing Activities Group received the same activities as the Structured Table Activity Group, but also received an index card that had a written target sound made with white tube and tile adhesive caulk material (e.g., used in sealing sinks and showers). This material develops thick, textured lines for the student to trace the target sound with his/her finger. Parents used the index card as an extra visual and tactile cue while playing the table activities. Parents were asked to complete their homework with their child while sitting at a table. Students in this group were also required to make 40 attempts to produce the target sound during each homework session, 5 times per week.

The parents/guardians of the participants in the three homework groups were asked to model and say the target word, then elicit verbal production from their child immediately after. Every participant produced each word 40 times each session and, overall, produced the target sound 200 times, after 5 homework sessions. A new target sound, four words, and new activities were assigned at the beginning of every week for all three homework groups.

Participants remained in their prescribed groups for 12 weeks, for a total of 60 sessions. During the 12-week study, the speech-language pathologist provided parents feedback on their child's performance only within the classroom. Once the homework sessions began, the investigator was available once a week (when handing out new homework) and answered parental questions through email and telephone.

Research Design and Data Analysis

An experimental randomized group design was used to compare the phonological skill development of three groups. To address three null hypotheses, 3 x 2 between and within participants factorial ANOVA was used (Field, 2009; Portney & Watkins, 2009). The independent variables were intervention groups (Structured Table Activity Homework vs. Gross Motor Activity Homework vs. Structured Table Activities with Letter-Tracing Homework) as between participants factor and time (pretest 1 vs. posttest 2) as the within participants factor; the dependent variable was the phonology scores of all participants.

CHAPTER IV

RESULTS

The purpose of this investigation was to determine the effect of using Gross Motor Activity Homework on the phonological skills of preschool children whose primary communication difficulty was a phonological disorder. Three different homework groups were compared: (a) Gross Motor Activity Homework, (b) Structured Table Activity Homework, and (c) Structured Table Activities with Letter-Tracing Homework. Groups were compared to determine if the incorporation of gross motor activities would facilitate a greater generalization of target sounds, to suppress the inappropriate phonological processes of children who were between the ages of 3 and 5 years. It was conjectured, based on specific motor learning theory, that preschool children who participated in the Gross Motor Activity Group could generalize the target sounds and suppress phonological processes more than the other preschool children in the two groups. In this Chapter, the results will be presented in the following order: (a) Participant Demographic Information, (b) Homework Assignments Completed, and (c) Phonological Test Results.

Participant Demographic Information

A total of 30 preschool students who were purposefully selected with their parents/guardians participated in this investigation. Descriptive statistics are displayed in Table 1 and include participants' mean age, gender, ethnicity, and medical history. It

Table 1

Participant Demographic Information

Motor Group (n = 10)	Table Group (n = 10)	Table Trace Group (n = 10)
5 years 1 month	4 years 11 months	4 years 11 months
4 years 1 month	4 years 8 months	5 years 0 months
4 years 0 months	4 years 9 months	4 years 5 months
3 years 3 months	5 years 3 months	5 years 0 months
5 years 3 months	4 years 5 months	4 years 1 month
5 years 0 months	5 years 2 months	4 years 9 months
5 years 5 months	4 years 9 months	3 years 3 months
3 years 6 months	3 years 6 months	3 years 6 months
3 years 1 month	3 years 4 months	4 years 9 months
4 years 7 months	3 years 5 months	4 years 2 months
M age: 54 months	53 months	52 months
Age range: 39 - 63 months	40 - 63 months	39 - 59 months
Gender: 9 Males, 1 Female	9 Males, 1 Female	8 Males, 2 Females
Ethnicity: 10 C	10 C	9 C, 1 AA
Medical History: 7 E, 1 O	7 E, 1 O	6 E, 3 O

Note: Age is expressed in years and months; C = Caucasian; AA = African-American; E = Ear infections; O = Operations (i.e., pressure equalizing tube insertion).

should be noted that students traditionally with speech sound disorders have a history of chronic ear infections (Hamaguchi, 2001). In this study, 8 out of 10 participants in each of the Gross Motor Activity Homework Group and Structured Table Activity Homework Group reported a history of ear infections. Nine out of 10 participants in the Structured

Table Activities with Letter-Tracing Homework Group reported a history of ear infections. Of the 30 participants, 5 had ear tube surgeries (i.e., pressure equalizing tube insertion). Demographic information from all mothers in each group was collected because they were the primary responsible party for picking up their child from school and completing the assigned homework. If the mothers needed assistance, the father, grandparents, or other family member helped with transportation and homework assignments. Mother's demographic information is as follows: (a) *M* age = 34.7 years, (b) marital status (84% married, 16% single), (c) education (20% high school diploma, 40% bachelor's degree, 40% graduate degree), (d) employment (56% employed, 44% unemployed), (e) average number of children 3, and (d) average household size 5.

Homework Assignments Completed

All participants were asked to complete their homework assignments five times per week, for a short duration of approximately 5 min. Thus, each homework session required each participant to verbalize the target word 40 times, for a total of 200 verbalizations per week; and a total of 2,400 verbalizations in 60 sessions, during 12 weeks. Parents/guardians completed the homework data sheets by documenting the total words verbalized by their child during each session, and the total homework sessions completed (see Appendix E). The following is a list of the completed homework results by each group.

1. The Gross Motor Activity Homework Group completed 532 homework sessions out of 600 and verbalized the target sound 21,280 times out of 24,000 for an overall 88% homework completion average.
2. The Structured Table Activity Homework Group completed 564 homework sessions out of 600 and verbalized the target sound 22,560 times out of 24,000 for an overall 94% homework completion average.
3. The Structured Table Activities with Letter-Tracing Homework Group completed 440 sessions out of 600 and verbalized the target sound 17,600 times out of 24,000 times for an overall 73% homework completion average.

Using the cycles approach during the classroom therapy, the classroom speech therapist introduced a new sound at the beginning of each week and in then theses sounds were infused into the homework assignments. The target sounds that were practiced in class during each week were also assigned for homework. Table 2 provides the target sound and position (i.e., initial; sound occurs at the beginning of the word) of the target sound within single words that were assigned for each homework assignment during each week. During Week 10 students did not have therapy and the target sound from the previous week was assigned for homework as students were on a holiday break.

Phonological Test Results

Pretest and posttest descriptive data for each group are provided in Table 3 including means and standard deviations of the test scores. The units represent the average number

Table 2

Target Sounds Assigned

Week	Target Sound (5 times per week)	Position
1	/p/	Medial
2	/ʧ/	Final
3	/sn/	Initial
4	/sk/	Initial
5	/ts/	Final
6	/t/	Final
7	/dʒ/	Initial
8	/sm/	Initial
9	/st/	Initial
10	/st/	Initial
11	/ʧ/	Initial
12	/z/ and /s/	Final

Note: Position = referencing where the sound is targeted within one and two syllable words. Target sounds are written using the International Phonetic Alphabet (IPA).

Table 3

Descriptive Statistics of the Group's Pretest to Posttest HAPP-3 Measures

		HAPP-3		
	Intervention	*M*	SD	N
Pretest	Motor	63.30	53.16	10
	Table	102.70	53.98	10
	Table trace	73.50	42.26	10
Total		79.83	51.23	30
Posttest	Motor	50.00	54.19	10
	Table	70.90	54.71	10
	Table trace	59.60	36.62	10
Total		60.16	48.29	30

Note: *M* = the average *HAPP-3* score of each group.

of errors for each group. Based on the results, all groups reduced the mean number of phonological errors on the *HAPP-3*'s pretest to posttest measures.

As a preliminary analysis, one-way ANOVA was used to compare the pretest scores between the groups. Based on the results, participant's pretest scores were generally the same F (2, 27) = 1.66, p = .208.

In order to investigate whether the Gross Motor Activity Homework Group improved more than the Structured Table Activity Homework Group and the Structured Table Activities with Letter-Tracing Homework Group, three null hypotheses were tested at the .05 level of significance:

1. There is no significant effect of intervention (Gross Motor Activity Homework, Structured Table Activity Homework, and Structured Table Activities with Letter-Tracing Homework) on the phonological test scores of preschool children with SI.
2. There is no significant effect of time lapse between pretest and posttest on the phonological test scores of preschool children with SI.
3. There is no significant interaction of intervention (Gross Motor Activity Homework, Structured Table Activity Homework, and Structured Table Activities with Letter-Tracing Homework) and time, on the phonological test scores of children with SI.

In order to investigate the three null hypotheses, a 3 x 2 between and within participants factorial ANOVA was used (Field, 2009; Portney & Watkins, 2009). The

independent variables were the intervention groups (Gross Motor Activity Homework vs. Structured Table Activity Homework vs. Structured Table Activities with Letter-Tracing Homework) as between participants factor and time (pretest 1 vs. posttest 2) as the within participants factor. The dependent variable was the number of phonological errors of all participants.

The results of the 3 x 2 between and within participants factorial ANOVA indicated: (a) there was no significant main effect of the interventions on the phonological test scores of all participants F (1, 27) = .990, p = .385; (b) there was a significant effect of time between the pretest and the posttest F (1, 27) = 35.92, p < .001, on the phonological test scores; (c) there was no significant interaction of the intervention and the time on the phonological test scores of the participants F (2, 27) = 3.42, p = .047; and *(*d) the assumption of homogeneity of variance was met (pretest; p = .885 and posttest; p = .627) based on the Levene's test. The results of the three null hypotheses are as follows:

1. Accept the Null that there is no significant effect of intervention (Gross Motor Activity Homework, Structured Table Activity Homework, and Structured Table Activities with Letter-Tracing Homework) on the phonological test scores of children with SI. Thus, incorporating motor activities as a medium to suppress phonological processes was equally as efficient as traditional homework and letter tracing homework.

2. Reject the Null that there is no significant effect of time lapse between pretest and posttest on the phonological test scores of children with SI. Thus, all participants demonstrated significant improvement in phonological test scores from pretest to posttest measures.
3. Accept the Null that there is no interaction effect of the intervention (Gross Motor Activity Homework, Structured Table Activity Homework, and the Structured Table Activities with Letter-Tracing Homework) and the time on the phonological test scores of children with SI. Thus, the change in phonological test scores over time was the same for all three groups.

Although there were no significant effects of intervention type on phonological test scores, pairwise comparisons of test scores resulted in statistically significant effect of pretest scores to posttest scores within each intervention group: (a) Motor Group ($p = .027$), (b) Table Group ($p < .001$), and (c) Table Trace Group ($p = .021$). Therefore, all three groups demonstrated a statistically significant reduction of phonological errors in their posttest scores (see Figure 1).

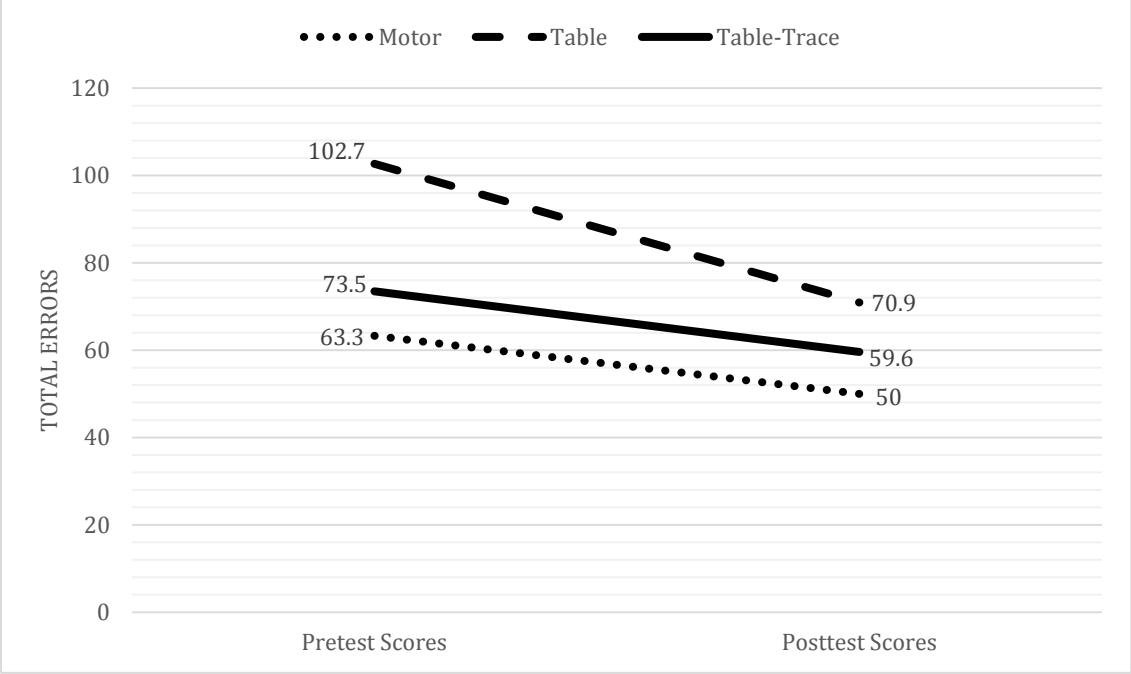

Figure 1. Visual representation of pretest vs. posttest *HAPP-3* group means.

CHAPTER V

SUMMARY, DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS FOR FUTURE STUDIES

The purpose of this investigation was to determine the effect of using Gross Motor Activity Homework on the phonological skills of preschool children whose primary communication difficulty was a phonological disorder. Three different homework groups were compared: (a) Gross Motor Activity Homework, (b) Structured Table Activity Homework, and (c) Structured Table Activities with Letter-Tracing Homework. Groups were compared to determine if the incorporation of gross motor activities would facilitate a greater generalization of target sounds, in order to suppress the inappropriate phonological processes of children who were between the ages of 3 and 5 years. Information in this Chapter related to the purpose of this study is presented in the following four sections: (a) Summary, (b) Discussion, (c) Conclusions, and (d) Recommendations for Future Studies.

Summary

In this section, a summary of the method and results of this investigation is provided in order to lead the reader into a discussion of possible reasons for the results and significance of using motor activity homework to enhance the phonological skills of preschool children. In this investigation, participants were 30 preschool children (26

males and 4 females) between 3 and 5 years of age. Children were purposefully selected, and then randomly assigned to one of three intervention groups (10 in each group). Pretest measures were compared to posttest measures of the *HAPP-3* test scores after a 12-week intervention phase that consisted of the participants completing homework assignments with their parents 5 times a week.

Based on the results of the analysis (3 x 2 between and within subjects factorial ANOVA), all groups improved their scores across the 12 weeks of the study. In contrast, there was no significant difference between the Gross Motor Activity Group, the Structured Table Activity Group, and the Structured Table Activities Group with Letter-Tracing composite test scores.

Discussion

The use of the motor domain (e.g., gross motor skills) as an intervention strategy to improve speech and language skills has been often overlooked (Hill, 2001). After an extensive search of the literature, intervention programs that involved the use of the gross motor activities to enhance phonological skills could not be located. Because of this, the specific interest of this investigator was the application of gross motor activities to speech therapy homework that was traditionally assigned as a table activity homework (i.e., completed while sitting down, with no gross motor movement). The following headings are used to discuss the specific results in relation to the purpose of this study, as well as, to compare to past research related to the: (a) Impact of Gross Motor Activity

Homework, (b) Motor Learning Theory: Power Law of Practice and Pre-practice Considerations: Motivation for Learning, and (c) Parental Influence.

Impact of Gross Motor Activity Homework

Three null hypotheses were investigated in this study. Two null hypotheses were accepted (see Chapter 4), and the following null hypothesis was rejected: There was no significant effect of time between pretest and posttest on the phonological test scores of preschool children with SI. This indicated that posttest mean scores significantly improved across all groups: (a) Gross Motor Activity Group (50.0), (b) Structured Table Activity Group (70.90), and (c) Structured Table Activities Group with Letter-Tracing Group (59.60). Accordingly, in the present study the impact of the motor activities was equally as efficient as structured homework and letter-tracing homework. Therefore, motor activities can be added to phonological homework without compromising improvement in phonological skills.

These results are similar to a study conducted by Connor-Kuntz and Dummer (1996), who investigated the use of language-enriched physical education for preschool children (ages 4 to 6 years). Preschool children were assigned to a physical education class without language-enriched activities or language-enriched physical education class. Language and motor skill performances were measured before, immediately following, and 3 months following the 24-session, 8-week intervention. Results illustrated that language instruction can be added to physical education lessons without requiring additional instructional time and, more importantly, without compromising improvement

in motor skill performance. Further, preschool children exposed to language-enriched physical education improved their language skills. Compared to the results in the present study, motor activities can be added to speech therapy lessons without compromising improvement in speech sound acquisition.

Similarly, educators and researchers have advocated the multiple benefits resulting from increased physical activity for preschool and school-age children. Gallahue and Cleland-Donnelly (2003) advocated the use of gross motor activities for preschool children that are developmentally appropriate and may even be necessary to meet their needs as active learners. In support, Jensen (2005) stated that physical activity can enhance learning, but the mechanisms by which this phenomenon occurs cannot be explained. Further, some of the benefits that have been suggested were improvement in: (a) concentration and arousal (Bailey et al., 2009) and (b) academic performance in math, English, and reading (Castelli, Hillman, Buck, & Erwin, 2007; Chomitz et al., 2009; Shephard et al., 1984).

The results of the present study also adds to the literature that supports preschool children can generally learn basic speech and language concepts through their gross motor movement experiences (Connor-Kuntz & Dummer, 1996). Since preschool children naturally use movement experiences for learning, using movement as a medium for teaching preschool children phonological skills seems developmentally appropriate.

Motor Learning Theory: Power Law of Practice and Pre-practice Considerations: Motivation for Learning

The theoretical framework that guided this research was based on the motor learning theory with an emphasis on behavior. Motor learning is the transfer of knowledge outside of the practice session. The ultimate goal of learning is the generalization of skills to novel situations (Schmidt & Bjork, 1992). This generalization is an indication that true learning has been achieved by incorporating the appropriate conditions of practice.

Researchers have explored the conditions of practice variables (e.g., motivation) that make the biggest impact on learning, specifically those that are usually controlled by the experimenter (Schmidt & Lee, 2005). In the present study, the investigator established the practice conditions for all participants. The homework practice conditions and in-class sessions were the same for all groups (e.g., distributed practice, random practice, guidance). The cycles approach was used during the classroom therapy, as well as, during the homework assignments. The classroom speech therapist introduced a new sound at the beginning of each week. The target sounds that were practiced in class during each week were also assigned for homework. Pictures with target sounds were used in both the classroom instruction and the intervention settings by the same speech therapist.

Important variables of learning for all three groups were *power law of practice and pre-practice considerations: motivation for learning.* The motivation variable is

considered the driving force for the power law of practice, which states that more learning will occur if there are more practice trials (Schmidt & Lee, 2005). Therefore, one must be motivated to learn a motor task in order to maximize practice trials and for effective learning to occur. If the learner perceives the task as meaningless or undesirable, then learning of the task will probably be minimal (Schmidt & Lee, 2005). Further if the level of motivation is too low, children may not practice at all, and no learning will occur.

The *power law of practice* was researched by Edeal, Gildersleeve- Nueman (2011), who investigated the treatment for two children with the speech sound disorder termed childhood apraxia of speech. The researchers explored the importance of production frequencies during speech therapy to determine whether more practice (100 productions in 15 min as opposed to 30 to 40 productions in 15 min) of speech targets (e.g., saying words that begin with the sound "t") led to increased performance within each session. They also investigated whether generalization to untrained words would occur. Based on the results, all target sounds improved, but the target sounds with the highest production frequency were acquired faster and were generalized to the untrained words.

Compared to the results in the present study, parents believed that the frequency and distribution (5 times per week) of homework practice for a short period of time (3 to 5 min) provided a "routine, as well as, one-on-one time for parents to be a part of their child's therapeutic success." In support, researchers have suggested that there is some generalizability of the results reported in experiments of relatively short duration when

compared to the results of the studies that involved practice and retention over much longer periods (Shea, Lai, Black, & Park, 2001).

Moreover, supplementary descriptive data provided insight on the participants' *motivation* to complete their homework assignments. In the present investigation, based on comments by parents/guardians on the parent questionnaire, the activities were motivating across all treatment groups:

1. "Our child enjoyed watching us put the check marks on the sheet."
2. "The activities helped my child stay motivated and have fun."
3. "It allowed for one on one time with my child and pushed us as parents to work harder with our kids."
4. "My child would ask to do homework, and he usually practiced more on his own."
5. "I felt I did a better job with the homework, knowing I was instructing her as you instructed me to do."
6. "My child loved and misses the homework. It made him feel good when I told him he completed all his homework."
7. "It helped my child be responsible and reinforced what they were working on in class."
8. "I loved the hands-on activities. They helped my busy boy stay on task and focus."

While not the major focus of this study, these supplementary descriptive data were also supported by Pantanowitz, Lidor, Nemet, and Eliakim (2011) who reported that the main reason high school students completed their homework, was they were "having fun."

Overall, the feedback related to the homework activities from these parents indicated that they believed there was improvement when homework assignments were added to compliment the classroom therapy. Some of the written comments specific to motor activities were: "The motor activities really encouraged him to work. Beforehand, it was very difficult to get him to focus." "She enjoyed any activity with jumping. She learns best while playing." These results were similar to the results of a previous study in the physical education literature by Roth et al. (2010) who surveyed parent satisfaction level with physical activity homework. Parents valued the children's acceptance of the homework assignments and the effects of the intervention activities that they noticed in their child. Parents agreed that the active homework assignments were a success.

It should be noted that in the present study, a token economy was not infused into the homework assignment to possibly improve the motivation and the level of completion rate of homework. A token economy was not a strategy normally used by the classroom speech therapist in this investigation. However, when the students came to class with their homework assignments, the investigator provided social praise (e.g., verbal praise, high-fives). There is a possibility that a token economy system may have increased the percentage of homework completed by all groups; still parents in the present study

reported that participant homework completion increased due to the motivational activities.

Günther and Hautvast (2009) used a token system to increase homework completion compliance. Each time a child reached predetermined goals, such as correctly pronouncing a target word, the child earned a stamp (token) from his/her parents during the homework session. As a result, the children were highly motivated to obtain their rewards, which stimulated parents to help them practice more frequently (5.9 control group vs. 7.9 experimental group) and spend more time practicing (control group at 47.5 min a week vs. experimental group at 62.2 min per week; Günther & Hautvast, 2009). In the present study, in terms of frequency and consistency of practice, 7 out of 30 children completed all homework assignments during 12 weeks, 24 out of 30 children completed from 1 to 5 homework assignments every week during 12 weeks; and 6 children missed at least 5 assignments during one week over the course of 12 weeks.

Parental Influence

Next, researchers have also supported the effectiveness of parent-implemented speech and language interventions as an effective approach for young children with speech and language impairments (Gibbard, Coglan, & MacDonald, 2004; Iacono, Chan, & Waring 1998; Kent-Walsh, Binger, & Hasham, 2010). The effects of parental involvement were researched by Fudala, England, and Ganoung (1972). These investigators conducted a study that included elementary school children (N = 92) with articulation disorders to determine if children would progress more rapidly when their mother attended their

speech therapy classes and practiced with them at home. All children improved in reducing their articulation errors; Group II (which was the group of interest) had a higher average of improvement (10.8 points) when compared to Group I (3.22 points) whose parents did not attend therapy sessions and were not involved in homework assignments.

Accordingly, many educators and researchers have recognized the need to engage parents/guardians in their children's homework assignments and concluded that parent involvement was a significant factor in the completion of gross motor homework assignments (Horvat, 1982; Katz-Leurer, Rotem, Keren, & Meyer, 2009; Tuzin et al., 1998), and speech therapy homework (Günther & Hautvast, 2009; Marvin & Privatsky, 1999). Further, in the present investigation parents/guardians in all groups were involved in their children's homework in order to enhance their phonological skills.

The homework data sheets kept parents accountable, the videos provided clarification for the assignments, and the materials sent home were essential for completion of assignments. This also allowed for parents to play a critical role in their child's success by being a part of their child's learning. For instance, one mother stated "I like the accountability. We have to check the boxes of completion because it gives us a goal." Most parents across the three interventions were also in agreement that homework data sheets were helpful to "track the sessions completed and to stay accountable." Just a few parents did not see the need for the homework data sheets. It was reported by one mother that they always completed the homework assignments. They would have completed the homework with their child regardless of whether they had to complete the data sheets.

The materials sent home were placed inside a folder that was then placed inside the child's backpack. Each week, all participants received four words with pictures of the target sound, as well as, the materials necessary for completing the homework assignments (e.g., poly spots). Parents across the three intervention groups were in agreement that having all materials necessary for homework made it easier to complete the homework assignments.

Further, Black (1996) suggested the importance of providing students with the information and resources to successfully do their homework. The videos that parents received on a weekly basis provided a visual and audio aid for parents to follow and to clarify the homework assignment directions on how to implement the homework activities successfully. As early as 1979, French suggested including a task card with a clear explanation of the homework assignment and the amount of time to spend on the task.

It is not known in the present investigation, whether the preschool children improved due to the parental involvement in homework assignments, motor activities, or classroom therapy, since all children improved significantly across the three homework groups. While the addition of a control group would have strengthened the research design, the speech therapist felt that the use of preschool children in a control group would be unethical.

Conclusions

Within the limitations of this study, it was concluded that Gross Motor Activity Homework and both Structured Table Activity Homework and Structured Table Activities with Letter-Tracing Homework were effective in improving the phonological skills of preschool children. This indicates that motor skills can be included as a medium in which to emphasize phonological skills, without compromising the development of speech sound acquisition compared to the other two groups.

Recommendations for Future Studies

Based on the current findings and limitations of this study, the following recommendations are made for future studies:

1. The intervention be expanded to improve phonological skills at the conversational level through the generalization of target sounds in single words to conversational speech. In this study homework was effective across three interventions in improving phonological skills at the word level.
2. An investigation be initiated related to the impact of collaboration between speech-language pathologists and adapted physical educators to improve the motor skills and phonological skills of preschool children with phonological disorders. The relationship between these two professionals is critical to develop and to implement an effective evidence-based motor activity program.
3. A control group be used that does not receive homework in order to compare the effects of homework vs. no-homework. In this study, it should be noted that a

control group was not used at the request of the speech therapist for ethical reasons.

4. A token economy be infused in homework assignments to determine the influence of the percentage of homework completed by all the preschool children. Past researchers, have suggested that a token economy can increase the level of homework completion.
5. An investigation be initiated where the preschool children are matched on their *HAPP-3* pretest scores. In the present study, participants were randomly assigned to groups but not based on pretest scores. Although the groups were not statistically different on pretest scores, there was an approximately 30% difference in pretest scores among the groups. Such a difference could be controlled by matching the children by test result scores on the *HAPP-3* scores.
6. An investigation be initiated related to the correlation between preschool children with phonological disorders with and without ear infections and/or tube surgeries. Based on the literature this may have an impact on speech development. In this study, a total of 25 of the 30 participants from the three groups reported a history of ear infections. Of the 30 participants, 5 had ear tube surgeries (i.e., pressure equalizing tube insertion).

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APPENDIX A

Strength Recommendation Taxonomy Related to the Use of Homework in the Field of Physical Education and Speech Language Pathology

Author	SORT Score	Consistency of Evidence	**Summary of the Use of Homework in Physical Education**
Black (1996)	L3	C	Opinion based article advocates the use of homework, and provides principles for assigning active homework.
Burt (2012)	L2	B	Research based dissertation on the prevalence of physical educators assigning homework to their classes and to identify factors that are related to whether physical educators assign homework. Questionnaire was completed by 144 employed physical educators. Correlation analysis; Logistical regression; independent sample *t test*, and chi-square to analyze predictors. Primarily, the physical educators who assigned homework agreed that homework could increase overall content knowledge and increase physical activity, as well as, make grading easier.
French (1979)	L3	C	Opinion based article that discusses the use of homework in physical education as a supportive technique. The author provides numerous types of homework assignments that can be given (e.g., task cards, cut-outs, sports event attendance, coach or officiate, television and radio, games, and film loops).
Gabbei & Harick (2001)	L3	C	Opinion based article, advocates the use of homework in physical education, to support progress toward NASPE standards concerning physically active lifestyles. Also provides three effective homework practice principles for physical educators.
Horvat (1982)	L1	A	A research based experimental design was used to improve the balance of children who were learning disabled through the use of gross motor homework program. Comparison between a control group and experimental groups was used. Purposeful sampling and random assignment was used. It was concluded that parents can significantly enhance the static and dynamic balance of their children who were learning disabled by implementing a structured gross motor training program at home.

Note: A = consistent and high-quality teacher-preparation evidence; B = consistent and limited-quality teacher-preparation evidence; C = typical practice opinion, prevention, or screening.

Mitchell, Barton, & Stanne (2000)	L3	C	Opinion based article reflecting on the need to help students make meaningful, connections between class content (physical education class) and their lives. Provides an example of a homework taxonomy that includes using the cognitive, affective, and psychomotor domains, in homework assignments.
Pantanowitz, Lidor, Nemet, & Eliakim (2011)	L2	B	A research based qualitative design was used (questionnaire) was used to explore the attitude and compliance toward homework assignment in physical education among high school students and their parents. Homework groups and non-homework groups were compared. Based on the results, there were no significant differences of fitness characteristics between the two groups.
Roth et al., (2010)	L3	C	A research based qualitative study. The homework piece of this study was analyzed by surveying parent satisfaction level with the physical activity homework. Parents appraised the children's acceptance of the program and the effects of the intervention activities they may notice in their child. The homework component of this research study was successful, according to parents' remarks.
Salliset et al., (1997)	L3	C	An opinion based study on the significance of the homework piece were analyzed and determined to be an integral part of the program. SPARK program increased physical activity during physical education classes and outside of schools. The SPARK program staff was successful in implementing physical education classes that increased physical activity levels and enhanced fitness skills of students in the classroom. However, the SPARK program was not successful in increasing physical activity outside of the school environment
Smith & Claxton (2003)	L3	C	Opinion based article suggests that active homework in one way to expand the physical education curriculum in order to promote lifelong activity from kindergarten to college. Suggestions for implementation are also provided.

Note: A = consistent and high-quality teacher-preparation evidence; B = consistent and limited-quality teacher-preparation evidence; C = typical practice opinion, prevention, or screening.

Smith, Cluphf, & O'Connor (2001)	L2	B	A research based correlational pilot study to examine the effects of homework in physical education by: rate of completion, participation, gender, grades, and month of school year. Based on the results, the classroom teacher was a significant factor in the return of the homework, as well as, the rate at which students responded in December and January vs. the remainder of the months in the school year (i.e., August through May). December and January was significantly less on account of breaks (vacation time) in classroom time.

Note: A = consistent and high-quality teacher-preparation evidence; B = consistent and limited-quality teacher-preparation evidence; C = typical practice opinion, prevention, or screening.

Author	SORT Score	Consistency of Evidence	**Summary of the Use of Homework in Speech-Language Therapy**
Bowen & Cupples (1998)	L3	C	Opinion based articles on the inclusion of homework within the developed PACT program. Researchers recommended the use of homework to enhance phonological skills of children.
Drennen (1955)	L3	C	Opinion based article on the importance of use of homework by parents.
Fudula, England & Ganoung (1972)	L1	A	Experimental research design was used to compare II groups of children, pre-test and post-test means were compared. Group I participated in routine speech therapy with homework assignments. Group II required parental involvement in therapy with homework activities. All children improved in reducing their articulation errors. Group II (which was the group of interest) had a higher average of improvement when compared with Group I.
Gunther & Hautvast (2009)	L1	A	Experimental research study design was used to compare three groups of children. Researchers were interested in how to improve homework completion. Adding contingency management significantly increased the frequency of homework sessions completed, which resulted in higher therapeutic success.
Marvin & Privratsky (1999)	L2	B	One group of children (n=10) were compared after intervention. The results were then analyzed using the Wilcoxon matched pairs singed-ranks test to compare children in two conditions. Based on the results, the children's speech contained significantly more references to recent activities when the children carried home materials than when they did not. A limitation for this study was the low level of parental involvement.
Lancaster, Keusch, Levin, & Martin (2010)	L1	A	Experimental research design was used to compare three groups of children receiving. Treatment + parent involvement, treatment + clinician intervention, no treatment was compared.

Note: A = consistent and high-quality teacher-preparation evidence; B = consistent and limited-quality teacher-preparation evidence; C = typical practice opinion, prevention, or screening.

APPENDIX B

Texas Woman's University IRB Approval Letter

TWU
TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON

Institutional Review Board
Office of Research and Sponsored Programs
P.O. Box 425619, Denton, TX 76204-5619
940-898-3378 FAX 940-898-4416
e-mail: IRB@twu.edu

December 2, 2011

Ms. Paz Diaz-Williams
2308 Crestmeadow St.
Denton, TX 76208

Dear Ms. Diaz-Williams:

Re: Using Homework Activities to Enhance the Phonological Skills of Children with Phonology Disorders (Protocol #: 16846)

The above referenced study has been reviewed by the TWU Institutional Review Board (IRB) and was determined to be exempt from further review.

If applicable, agency approval letters must be submitted to the IRB upon receipt PRIOR to any data collection at that agency. Because a signed consent form is not required for exempt studies, the filing of signatures of participants with the TWU IRB is not necessary.

Any modifications to this study must be submitted for review to the IRB using the Modification Request Form. Additionally, the IRB must be notified immediately of any unanticipated incidents. If you have any questions, please contact the TWU IRB.

Sincerely,

Rhonda R Buckley

Dr. Rhonda Buckley, Co-Chair
Institutional Review Board - Denton

cc. Dr. Charlotte Sanborn, Department of Kinesiology
√Dr. Lisa Silliman-French, Department of Kinesiology
Graduate School

APPENDIX C

Parent Consent to Participate in Research

TEXAS WOMAN'S UNIVERSITY
CONSENT TO PARTICIPATE IN RESEARCH

Title: Using homework activities to enhance the phonological skills of children with phonology disorders

Principal Investigator (PI): Paz Diaz-Williams..... 940-587-5439
Advisor: Lisa Silliman-French..... 940-898-2589

Explanation and purpose of the research

The purpose of this study is to determine the effect of three different homework strategies on the phonological skills of children in a Preschool Phonology Program who demonstrate delays in phonological skills. The PI will use this as her Dissertation. Three different homework strategies will be introduced to determine which strategy will have the best results on their test scores: (a) Traditional, (b) Gross Motor Activities, and (c) Letter Tapping.

Research procedures

Participants who do not receive parental consent will receive the same curriculum, as well as, the traditional homework but will not be a part of the study. The 30 students who are currently enrolled in a Preschool Phonology Program, 2 times per week for 60 minutes each, will be randomly separated into three groups for participation in this study. Data will be collected during three phases of performance: (a) pre-testing, (b) intervention, and (b) post-testing. Prior to the study participants will be tested on their phonology skills using the *Hodson Assessment of Phonological Patterns Third Edition* (HAPP-3; Hodson, 2004). The HAPP-3 assessment is used as part of the general curriculum's educational practices of the program. The participants' current speech-language pathologist uses this evaluation to measure the students' progress throughout the semester. For the purpose of this study, the HAPP-3 test will be re-administered after a 12-week period of homework to evaluate progress. Pre-testing will be conducted in order to ensure that participants are able to safely perform the prescribed motor activity homework. In addition, all participants will be tested on their developmental motor abilities using the *Peabody Developmental Motor Scales, Second Edition* (PDMS-2; Folio & Fewell, 2000).

All participants will be randomly assigned to their homework groups: (a) traditional, (b) gross motor activity, and (c) letter tapping. All students will receive phonology speech therapy from the same speech-language pathologist. For weekly homework, all groups will receive the same 10 speech picture cards one time per week. At the end of class, the speech-language pathologist will place an envelope that contains their homework (i.e., picture cards with same target sound), as well as, data check off sheet (e.g., number of words pronounced correctly) inside each participant's back-pack. The parent(s)/guardian(s) will receive the same picture cards for homework inside the envelope, with their same target sound for that week. The data check off sheet will be provided for the parent/guardian to record their child's performance sessions during their homework. The speech-language pathologist will collect the envelopes with homework and data check off sheets at the end of the week it is assigned; not knowing which group the participants are randomly assigned. The PI will collect the envelopes at the end of the week from the speech-

language pathologist and inform the therapist the scores of the homework (i.e., number of words pronounced correct out of 10).

The traditional group will receive picture cards that contain words that elicit the same target sound (e.g., "duck" for final "k") production; students will practice saying and listening to those words with their parent(s)/guardian(s) while sitting down for 10 minutes, 5 times per week. The gross motor activity group will practice the same target sounds as the traditional speech group, but will produce the sound while executing developmentally appropriate motor activities. The picture cards will be embedded into the gross motor activities. During this session, two poly spots will also be placed 6 feet apart while the children perform gross motor activities (e.g., walk to a poly spot while saying the target sound on the picture card, slide with lettered bean bags and put on poly spots while saying the target word) 10 minutes, 5 times per week. The tapping homework group will practice saying and listening to the same target sounds as the traditional while tapping the same target sound on the picture cards and sitting down 10 minutes, 5 times per week (Horvat, 1982). The parent/guardian of the children in the three homework groups will be asked to model and say the target word then elicit verbal production from their child immediately after. Every participant will produce each word approximately 120 times for a total of 1 minute per word and overall produce the target sound 1200 times during one 10 minute homework session. A new target sound will be assigned at the beginning of every week for all three homework groups.

Participants will remain in their prescribed groups for 12 weeks for a total of 60 sessions and perform the same activity with the prescribed speech target cards. During the 12 week study, the speech-language pathologist will only provide parents feedback on their child's performance within the classroom. Once the homework sessions begin, the PI will conduct weekly follow-up telephone calls to answer parent questions and monitor student progress.

This information will be used in the data analysis process. If a participant misses more than two homework sessions, they will continue in the intervention, but at the end of data collection their data will not be analyzed.

Potential Risks

Your child's identity will be held confidential all data will be stored in a locked filling cabinet in the investigator's office. The data will be erased and hard copies of the test documents will be shredded within 5 years of completion of the research. The PI and your child's speech-language pathologist are the only persons who know the identification of your child by name. The consent forms will be turned into the IRB office at the completion of the study. It is anticipated that the results of this research will be published in one of the APE, language, or a speech journal. No participants' names will be included in the study. Confidentiality will be protected to the extent that is allowed by law.

Participation and Benefits

Participants involvement in this research project is completely voluntary, and the parent(s)/guardian(s) may discontinue their child's participation at any time without penalty. Non-participants in this study will not be penalized they will continue to receive speech-language therapy services and the services they are currently receiving will not change. The parent(s)/guardian(s) may discontinue their child's participation at any time without penalty. In the end of the study, the PI will explain the results to the speech-language pathologist and parent/guardian. The participants' parent(s)/guardian(s) can ask questions (i.e., before, during, or after the investigation) and the PI will answer all questions. The speech-language pathologist and parent/guardian will have access to information about their child's results in this study.

The results of the study will be provided to the parents/guardians. This may help the speech-language pathologists determine effective techniques to use when providing homework for students. The speech-language pathologist and/or parent(s)/guardian(s) can contact the PI for further questions and more explanations.

Confidentiality & Withdrawal

Your child's identity will be held confidential. If at any time your child objects to any aspect of the study, you may withdraw consent of participation. After your child is withdrawn from the study his/her data will be erased and hard copies of the scoring rubric will be shredded. Any publications resulting from this study will contain data which are confidential and do not disclose the identity of your child. The researchers will try to prevent any problem that could happen because of this research. You should let the researchers know at once if there is a problem and they will help you. However TWU does not provide medical services or financial assistance for injuries that might happen because you are taking part in this research.

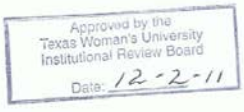
Questions regarding the study

If you have any questions about the research study, you may ask the PI or advisor; their phone numbers are at the top of this form. If you have questions about your rights as a parent/guardian/participant in this research or the way this study has been conducted, you may contact the Texas Woman's University Office of Research and Sponsored Programs at 940-898-3378 or via email at IRB@twu.edu. You will be given a copy of this signed and dated consent form to keep.

Participant Name: _____

Parents/Guardian's Name Printed: _____ Date: _____

Parents/Guardian's Signature: _____ Date: _____



APPENDIX D

Preschool Phonology Group's Sample Lesson Plan

PPG lesson plan targeting final “k”
1. Review - Clinician will take data on last week’s sound by going through picture cards with target sounds and have students produce it spontaneously or in imitation. Students are asked to do this while sitting down at the activity table.
2. Emotion Expression - Clinician will direct participants to clap while singing “how do you feel today,” the goal is for each child to clap at each syllable. This is done to improve awareness of syllables /rhythm and rate. All students are sitting around the activity table.
3. Sound introduction – Students will be asked to look at the word train (toy train with target sound place at the beginning of the train). Students are asked to identify were the sound is on the word train. All students are sitting around the activity table.
4. Listening/Auditory Bombardment - Using headphones and an amplified listener, students will be asked to listen to target sound in single words (e.g., small, smell, smart). All students are sitting around the activity table.
5. Target words - Clinician will review target practice cards. Target cards are pictures with target words in single words, phrases, and sentences. Depending on the student’s ability to produce the target sound. Students are given four cards and asked to line them up in a row (to assimilate reading from left to right) on the table and produce target sound spontaneously or in imitation from left to right when asked by the clinician. All students are sitting around the activity table.
6. Table Activity - Clinician will choose from assortment of three activities from an activity basket are: (a) die activity; consist of rolling a die across the table to another person and saying the target word that the die lands on; (b) matching activity which consist of matching and saying target words to the matching board that is place in the middle of the table; and (c) Velcro/say it where all students are given a card that contains pictures of the target sounds. Students have to detach all the pictures from the card while saying their target sound, and then reattach the target words while saying their target sound. All activities are completed while sitting down.
7 a. Oral motor practice – Students will be asked to sit in front of a mirror and produce target sound through an oral motor activity that targets the sound of the week. The clinician will direct the student in improving his/her sound production by raising awareness of his/her articulators.
7 b. Fine motor/print awareness - Trace the “k” sound with index finger and make the sound while standing.
7 c. Letter search - Students will be asked to search for the magnet letters of their target sound from a field of 10 to 25 letters.
7 d. Name Tracing - Students will be asked to find then trace their name with their finger and verbalize each phoneme while at the same time tracing their name.
8. Circle time - Students will sit and listen to a story; the story is filled with embedded words that contain the target K sound. The clinician will read the story using strategies that raise awareness of print, as well as, ask questions that elicit target sound productions.
9. Motor Activity - Students will have to complete a mini gross motor activity that will infuse the target sound “k” within the movement activity. Kicking, underhand roll, throwing, and dribble skills will be targeted.
10. Art Activity - An art activity will be facilitated by the clinician all students work on an art project that contains opportunities for practice of the K sound (e.g., gluing and saying a target sound).
11. Departure - Students will be asked to line up behind the blue line. The clinician will direct students to Jack and Jill (picture of two characters on the wall). Jack is holding a “stick” and Jill is holding “block,” the clinician will ask each student “What is Jack holding?” students respond in imitation “Jack is holding a stick

APPENDIX E

Sample Picture Cards with Target Sounds

Cut pictures apart on dotted line

136 stack

stop

120 stand

stick.

APPENDIX F

Parent Homework Checklist

DATA BOX

Please circle the name of the person(s) who completed the homework with the child this week.	Were you able to watch the video of the week? Circle response below.	Please circle the da practiced this week response below.
Mother Father Grandparent Other	YES or NO	Mon. Tue. Wed. Sat. Sur

APPENDIX G

Participants' Homework Completion Data as Reported by Parents

Participants Homework Completion as Reported by Parents

Motor Group	Week 1 HSC	Week 2 HSC	Week 3 HSC	Week 4 HSC	Week5 HSC	Week 6 HSC	Week 7 HSC	Week 8 HSC	Week 9 HSC	Week 10 HSC	Week HSC	Week 12 HSC
1	5	4	5	5	4	5	5	5	5	4	5	2
2	5	5	5	5	4	4	4	0	4	0	5	4
3	5	5	5	5	5	5	5	5	5	5	5	5
4	5	5	5	5	5	5	5	5	5	5	3	5
5	5	5	5	5	5	5	5	5	3	4	5	3
6	5	4	5	5	5	5	5	5	4	5	5	5
7	5	5	3	5	5	5	5	5	5	5	5	5
8	5	5	5	5	5	5	3	5	5	5	5	5
9	5	2	4	4	2	1	3	1	1	1	3	1
10	5	5	5	5	4	5	5	5	4	5	5	5
Total HSC	50	45	47	49	44	45	45	41	41	39	46	40

Table Group	Week1 HSC	Week 2 HSC	Week3 HSC	Week 4 HSC	Week 5 HSC	Week 6 HSC	Week 7 HSC	Week 8 HSC	Week 9 HSC	Week 10 HSC	Week 11 HSC	Week 12 HSC
11	5	5	5	5	5	5	5	5	5	5	5	5
12	5	5	3	5	5	5	5	5	5	5	5	5
12	5	5	5	5	5	4	5	5	5	5	5	5
14	5	5	5	5	5	5	5	5	5	5	5	5
15	5	5	5	4	5	5	5	5	3	5	5	5
16	5	5	5	5	5	5	5	5	5	5	5	5
17	5	5	4	5	5	3	5	5	5	5	5	5
18	5	5	5	5	5	5	5	5	5	5	5	5
19	5	4	4	5	5	1	2	0	0	0	5	3
20	5	5	5	5	5	5	5	5	5	4	5	5
Total HSC	50	49	46	49	50	43	47	45	43	44	50	48

Note: HSC = homework sessions completed

Continued Participants Homework Completion as Reported by Parents

Table T Group	Week 1 HSC	Week 2 HSC	Week 3 HSC	Week 4 HSC	Week 5 HSC	Week 6 HSC	Week 7 HSC	Week 8 HSC	Week 9 HSC	Week 10 HSC	Week 11 HSC	Week 12 HSC
21	5	5	5	5	5	5	5	5	5	5	5	3
22	5	5	5	5	5	5	5	5	5	5	5	5
23	5	5	5	5	5	5	5	5	5	5	5	5
24	5	2	5	5	5	3	4	5	3	3	5	0
25	5	0	1	0	0	0	0	0	0	0	0	0
26	5	2	0	3	3	3	2	5	0	0	5	0
27	5	3	5	1	2	4	2	0	5	5	4	4
28	5	5	5	5	5	5	5	5	5	5	5	5
29	5	5	5	5	5	5	5	5	5	5	5	5
30	5	1	3	0	0	0	0	0	5	4	0	5
Total HSC	50	33	39	34	35	35	33	35	38	37	39	32

Note: HSC = homework sessions completed

APPENDIX H

Parent Demographic Questionnaire

Demographic Information

1. Gender: Male, Female
2. Age_____
3. Marital status: Single, Married, Divorced, Separated
4. How many people (including you) live in your house? _____
5. What is the highest education you have attained:

   High school diploma, College diploma, Bachelor's degree, Master's degree, Doctoral degree.
6. What is your current employment standing:

   Employed, Employed part time, Seeking for Employment, Self-Employed, Unemployment
7. What is the total annual income in your household? Please indicate $_____
8. Please provide the background details of children under your care below.

   Name_____ Age_____ Gender_____ DOB_____

   Name_____ Age_____ Gender_____ DOB_____

   Name_____ Age_____ Gender_____ DOB_____

   Name_____ Age_____ Gender_____ DOB_____

   Name_____ Age_____ Gender_____ DOB_____

*** DOB- Date of birth**

9. What is your relationship to the children:

   Biological parent, Adoptive parent, Foster parent, Parent's partner, Step parent, Other (*please provide)* _____

10. How many children are in school? _____. State their current education levels below:

    _____

    _____

    _____

    _____

11. Do you enlist any outside help in taking care of the children? (*Depending on whether married, divorced, separated or single*)

    Yes, No

12. Has your child ever had an ear infection? Never, once, a few times, frequently

13. Has your child undergone ear operation(s)? Yes or No if so at what age_____