

SOUND FIELD AMPLIFICATION: EFFECTS ON MANAGERIAL TIME IN SMALL
GROUP SPEECH THERAPY

by

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Liberty University

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ABSTRACT

Jeffrey Craig Meeks. SOUND FIELD AMPLIFICATION: EFFECTS ON MANAGERIAL TIME IN SMALL GROUP SPEECH THERAPY. (Under the direction of David Holder, Assistant Professor) School of Education, October, 2011.

This study addresses the use of speech amplification devices in speech therapy sessions. The major factor addressed is the impact that speech amplification has upon the managerial time of speech-language pathologists who provide therapy in small group sessions. This study measured the change in the amount of time speech-language pathologists spent on managerial tasks during small group speech therapy with the use of speech amplification equipment versus managerial time without the treatment. Managerial tasks included giving and repeating instructions, and behavior management. Results of the study suggest that there was significant improvement in student on-task behaviors, including a decrease in the number of times therapist facilitators provided on-task reminders, in the experimental group as compared to the control group. A statistically significant change in the number of times that directions were repeated was not noted.

Keywords, speech therapy, special education, sound field amplification, behavior management, interventions

Dedication

I recognize the great blessings I have received from being born of god-fearing parents, being raised with the Gospel of Jesus Christ, and marrying the love of my life. My wife, Marianne, has been by my side as I have gone to school our entire married life thus far. Our children have never known life without their father going to school. They have supported me through this long journey, and they deserve recognition for their support and patience.

My committee members have been supportive and understanding as I have run into obstacles and sought sage advice. I thank Dr. David Holder for his leadership and insights, Dr. Joan Fitzpatrick for her keen eye and editing skills, and Dr. Rance Pullin for his commitment to making me a better educational leader. You are all truly gifted in your areas of expertise, and I feel the combined effects of your contributions.

Finally, I thank Dr. Judy King and Dr. Elise Lindstedt for your many years of friendship and mentorship. My conversations with you during graduate school prompted me to consider pursuing a doctoral education. Were it not for your influence, I might not have had the courage to pursue this degree. I pray that I will contribute to the profession and make you proud.

I dedicate this work to the children with special needs who I serve. Your inspiration and love have kept me moving forward.

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CHAPTER ONE: INTRODUCTION

Background

Thirty-six years ago, the Education for All Handicapped Children Act changed the landscape of public education forever (Education for All Handicapped Children Act, 1975). As a result of this and subsequent legislation, children with special needs are guaranteed a place in the public school system. Beyond having a place to be educated, these students are guaranteed the opportunity to receive reasonable accommodations, specialized services, and extra funding to make their inclusion possible.

Since the introduction of the Education for All Handicapped Children Act (1975), and subsequently with the Individuals with Disabilities Education Act (2004), speech therapy is among the list of required services that must be made available to students with specific needs. Typically, speech-language pathologists (the preferred title for speech therapists) provide therapeutic intervention for students with disorders or delays in the areas of language, fluency, and articulation. In addition to speech, language, and fluency concerns, many students who receive speech therapy have comorbid disabilities. These cognitive delays, autism, behavior disorders, and physical disabilities present additional challenges to speech-language pathologists in a school setting (Johnson, 2006). Even in the absence of other disabilities, the communication deficits associated with language disorder can significantly impact a student's level of engagement in the therapy process as well as social success in the school community (Conti-Ramsden & Durkin, 2008). Service delivery models can either promote or inhibit the level of engagement (Case-Smith & Holland, 2009; Throneburg, Calvert, Sturm, Paramboukas, & Paul, 2000).

The National Outcomes Measurement System (NOMS) was prepared for the American Speech-Language-Hearing Association (ASHA) as a compilation of data concerning speech therapy in schools. Data published in the NOMS study indicated that over 70% of students receiving speech therapy with a diagnosis of language disorder receive intervention in groups of two to four students outside the regular education classroom (Mullen & Schooling, 2009). The most common model for this therapy is twice per week for 20-30 minute sessions. In addition, NOMS data revealed that the single most important factor contributing to functional improvement in spoken language production was treatment time. Considering the small group dynamics of most therapy sessions, the limited amount of time per week each student receives intervention, and the influence that the amount of therapy time has upon improvement, it stands to reason that efficient use of therapy time is important to student progress.

Time management in speech therapy sessions, much like time management in a typical classroom, is often impacted by student behavior and attention to tasks. In fact, the connection between communication disorders and behavior problems is well established (Fontenot, Hayes, & Frilot, 2011). A variety of classroom management techniques may be used to help promote attention to tasks and compliance with instructions. The majority of the techniques employed by teachers and therapists utilize consequential response to behaviors rather than antecedent manipulations or accommodations to prevent off-task behavior (Barkley, 1998). Sound field amplification is a recognized strategy for improving academic and social behavior of students with and without disabilities in the classroom setting (McSporran, Butterworth, & Rowson, 1997). Sound field amplification has the potential to serve as a means of promoting on-task

behavior and to minimize the amount of time required of therapists to redirect behaviors and repeat instructions. This study specifically addresses the impact that sound field amplification has upon the amount of time therapists spend performing classroom management duties versus direct instructional time.

Statement of the Problem

Speech-language pathologists and education administrators are seeking ways to maximize the effectiveness of speech therapy time in public schools. One of the ways this can be accomplished is by minimizing time spent on non-therapeutic or managerial activities such as behavior management. Past studies have found that sound field amplification is effective in decreasing student off-task behavior in regular education classrooms (Eriks-Brophy, & Ayukawa, 2000; Massie & Dillon, 2006; Massie, Theodoros, Byrne, McPherson, & Smaldino, 2002). What is not currently known is the effect that sound field amplification will have on managerial time in a small group, pullout therapy environment. Understanding the potential of sound field amplification in small group settings can better assist practitioners in maximizing on-task time during small group therapy.

Purpose of the Study

The purpose of this study is to examine the role of sound field amplification systems in small group speech therapy sessions. The intent of the research is to determine the impact of time on-task versus managerial time when sound field amplification systems are used in small group speech therapy settings. Sound field amplification systems have been shown to improve time on-task in larger classroom settings, but their potential in small group settings has not yet been established. This

study provides insight into whether or not the use of sound field amplification systems supports better time efficiency in small group speech therapy by supporting on-task behaviors and thus minimizing managerial time.

Significance of the Study

Students with speech and language disorders are commonplace in public education institutions. According to the U.S. Department of Education (2005), 1,460,583 students in public schools were reported under IDEA Part B funding as students with communication disorders. The data reflected only those with communication disorders and did not include students with comorbid disabilities. When the statistics include students with other disabilities who require speech therapy as a related service, the numbers are even greater (U.S. Department of Education, 2005).

Unfortunately, researchers report that many school districts throughout the country are experiencing a serious shortage of speech-language pathologists to serve students with communication disorders (Crowe, Deppe, & Karr, 2008). Crowe, Deppe, and Karr (2008) described some of the efforts school leaders are making to allocate sufficient resources to the needs of children with communication disorders. These efforts include salary supplements to recruit candidates away from medical settings, grants to provide support to graduate students pursuing degrees in speech pathology, and collaborative relationships with state educational institutions to provide incentives for therapists to choose to work in educational settings. Preliminary reports are positive. However, meeting the needs of students with communication disorders goes beyond securing more staff to provide the services. The services that are rendered need to be

more effective, and use of time needs to be more efficient in order to best utilize the providers that are available.

One method of maximizing efficiency of therapy time is eliciting a greater percentage of on-task time during therapy sessions. Students with and without disabilities often have difficulty maintaining attention to tasks (Mather & Goldstein, 2001). However, difficulty attending to tasks appears to be even more prevalent among children with disabilities (Mather & Goldstein, 2001). When addressing the needs of students with communication disorders, it becomes perhaps even more important to encourage maintenance of attention to therapy tasks than for children without a disability in a general education classroom (Fontenot, Hayes, & Frilot, 2011).

Sound field amplification has become a recognized tool for increasing on-task behavior in general education classrooms (Crandell, 1996). Teacher use of sound field amplification results in a significant positive impact on the learning and attention of students with disabilities as well as having a positive impact on students without disabilities. The positive effect of sound field amplification on students with and without disabilities adds to the credibility of its use as a tool for improving performance of all students (Palmer, 1998; Zabel & Taylor, 1993). While it is not a panacea for the challenges faced by therapists and teachers working with students with disabilities, use of sound field amplification has the potential to assist service providers in making the most of limited intervention time.

The results of the study will contribute to the existing body of data related to the role of sound field amplification in supporting on-task time for students by examining the role of sound field amplification in small group speech therapy settings. As the literature

available is relatively limited in regard to use of sound field amplification for students with communication disorders, it is anticipated that the present study will provide data and impetus to guide further research with this population. In addition to providing a springboard for further research, it is anticipated that the results of the study will be of practical importance for school-based speech therapists and teachers. The results of this research may provide direct benefit to the field of speech-language pathology by providing insight into strategies for improving time on-task in small group speech therapy sessions. Establishing an understanding about the degree to which sound field amplification may or may not impact students' attention can provide insight into time maximizing strategies that make the most of often limited therapeutic time.

Research Questions

The study answers the following research questions:

Question 1: Is there a difference in small group speech therapy students' response to directions based on their exposure to sound field amplification?

Question 2: Is there a difference in small group speech therapy students' on-task behavior in small group speech therapy based on their exposure to sound field amplification?

Statement of the Hypotheses

The study is guided by the following two hypotheses:

Hypothesis 1: Use of sound field amplification in small group speech therapy will result in a decreased number of times task directions are repeated in a therapy session.

Hypothesis 2: Use of sound field amplification in small group speech therapy will result in a decreased number of times students are reminded to stay on task in a therapy session.

Identification of Variables

This study examines the effect of sound field amplification on managerial time during speech therapy sessions. The experimental design used in this study is a multiple baseline design across participants (Barlow & Hersen, 1984). This type of design is also referred to as a pre-test post-test design in which participant data is collected a priori and then again after treatment. In this case, data was gathered at baseline and during treatment for each participant. Experimental control is demonstrated when changes in the dependent variables occur only after the intervention has been introduced.

During baseline conditions, all six of the speech-language pathologist facilitators who participated in the study were instructed to conduct therapy sessions without the use of sound field amplification. During the intervention phase, the treatment variable of sound field amplification was in effect for the four speech-language pathologist facilitators working with the experimental groups. During the intervention phase, all six facilitators recorded the number of times therapists repeated instructions and the number of times therapists redirected student behavior. Two dependent variables, one independent variable, and two covariates are used in the study. The dependent variables are the number of times the teacher must repeat task directions and the number of times students are reminded to remain on task. The independent variable is Group Membership (control, experiment), and the covariates are pre-number of times the teacher must repeat task directions and pre-number of times students are reminded to remain on task. This

design is intended to provide an empirical basis for evaluating the role of sound field amplification in small group therapy settings.

Assumptions and Limitations

Internal validity. Internal validity is defined as how confidently one can conclude that the change in the dependent variable was produced solely by the independent variable and not extraneous variables (Campbell & Stanley, 1963). Accordingly, there are eight empirically identified conditions that can threaten confidence in a study. These include history, maturation, testing, instrumentation, statistical regression, selection, experimental mortality, and selection interaction. However, although all threats may be relevant, specific threats to this study may potentially involve just two--selection and testing. A selection threat suggests that participants may not be functionally equivalent at the time of testing. In the case of this study, efforts to mitigate this threat have been addressed by gathering a sample size that is sufficient for the study and statistical technique being used. A testing threat entails testing participants at different times or under different circumstances. That being said, the study design expects to test all participants over the same time period and under the same environmental conditions.

External validity. The concept of *external validity* is defined as the extent to which the study can be generalized to the greater population. Generally, studies that employ randomization to select participants from the study population have more external validity than those studies that do not. That being said, for this study random sampling of participants was used to reduce the effect of individual differences. Further a

pre-and post-test design was also used to increase control for individual differences across participant groupings.

Definitions

Language disorder—Language behaviors that exhibit slower than expected development or variations in development that significantly interfere with an individual’s communication abilities.

Managerial time—Time spent during the course of a therapy session on non-therapeutic activities. This includes organizational, transitional, and non-subject matter tasks such as repetition of directions and behavior management.

Sound field amplification—An assistive instructional device that amplifies the intensity of a speaker’s voice with the use of a speaker versus headphones.

Speech disorder—A disorder in the production of specific speech sounds or groups of speech sounds, which inhibits an individual’s overall intelligibility to communication partners.

Speech-language pathologist—A special educator whose primary area of training and responsibility lies in training students with communication impairments.

Therapeutic time—Time spent during the course of a therapy session on direct intervention. This includes instruction in new information/strategies and drills/practice of previously learned information/strategies.

Organization of the Dissertation

This dissertation is organized into five chapters. Chapter 1 encompasses the introduction and contains relevant background information, a statement of the problem, a statement of the hypotheses, a statement of the significance of the research, and

definitions. A review of the literature including theoretical support is included in chapter 2. The methods and procedures used to organize and interpret the results of the study are explained in chapter 3. Chapter 4 addresses analyses of the data collected in the study. The final chapter, 5, includes a summary of the results, integrates the results with findings in previous research, discusses implications for practice, and provides recommendations for further research.

CHAPTER TWO: REVIEW OF THE LITERATURE

The ultimate goal of speech therapy in public schools is the same as any educational service. Namely, therapy is expected to result in improvement of students' social and academic skills. With the emphasis on evidence-based practices in public schools, the need for more research on effective therapy intervention procedures is growing. Sound field amplification has proven to be an effective tool for improving student on-task behavior in regular education classrooms (McSporran, 1997), and research shows that special education applications are promising (Maag & Anderson, 2007).

This chapter provides a review of relevant literature related to models of speech-language therapy, the use of sound field amplification in regular education, and the use of sound field amplification in special education. Prior studies in which researchers examined the impact of sound field amplification on effectiveness of speech therapy are also discussed. Particular attention is given to the impact of sound field amplification in promoting on-task behaviors and minimizing managerial time in class.

Evidence-based Practice

Research-driven decision making is becoming more necessary in the field of speech-language pathology (ASHA, 2004; Reilly, Douglas, & Oates, 2004). Professionals and researchers in the medical field pioneered the terminology associated with evidence-based practice, and they have embraced the concepts associated with melding research and practice (Sackett, Straus, Richardson, Rosenberg, & Haynes, 2000).

Sackett, Rosenberg, Gray, Haynes and Richardson (1996) defined evidence-based practice as “the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence-based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research” (p. 71), adding that in addition to clinical expertise and external evidence the practitioner must consider the patient’s wishes (Sackett et al., 1996).

Professionals in the field of education have followed professionals in the medical field by implementing policies and guidelines requiring teachers and other education professionals to follow research-based approaches to instruction (No Child Left Behind Act, 2001). The emphasis on research-based instructional approaches is especially strong in the area of special education (Hardman & Dawson, 2008; Individuals With Disabilities Education Act, 2004). Speech-language pathologists have the unique position of being both medical practitioners and education service providers (Johnson, 2006). The push for justification of clinical practices from both the medical and educational sides of the profession makes the need for evidence that much more important.

According to Vallino-Napoli and Reilly (2004), speech-language pathologists typically report positive attitudes toward the concept of following research-based practices in their professional activities. However, few practitioners truly understand how to actually make decisions based upon the evidence (Gillam & Gillam, 2006; Johnson, 2006). Zipoli and Kennedy (2005) reported that in many circumstances, speech-language pathologists are making decisions less on evidence than they are on personal experience and the advice of others.

The present state of research in the field of speech-language pathology is one that addresses the theoretical and etiological questions of the profession with relatively little direct application to clinical issues (Johnson, 2006). However, to successfully defend the professional practices of speech-language pathologists, increase accountability, and increase credibility, practical research needs to be conducted and disseminated (Dollaghan, 2004; Justice & Fey, 2004). The current body of knowledge available to practicing speech-language pathologists concerning instructional practices is weak in both quality and quantity (Reilly et al., 2004). It is intended that the present study will contribute to the body of practical knowledge to be considered in developing evidence-based practices for students with speech and language disorders.

As members of a profession grounded in both medical and educational philosophies, speech-language pathologists frequently rely upon educational psychology strategies in therapeutic settings to encourage patients to adopt new speech and language habits. The following section discusses the role of behaviorism in speech-language practice and the role that behavioral practices will play in the proposed study.

Theoretical Background Related to Speech-language Therapy

Similar to many therapeutic professionals, speech-language pathologists typically employ techniques consistent with behaviorist philosophy (Holland & Harris, 1968). Behaviorism assumes that lessons move from small analytic units to larger ones and that stimuli, responses, and reinforcement are pivotal in the therapeutic process (Skinner, 1966). In speech therapy, the stimulus is often verbal, and the response is the student's imitation of the stimulus. Reinforcement is often verbal praise or a tangible reward such as a sticker, toy, or other object (Gray & Fygetakis, 1968; Sloane & MacAulay, 1968).

Behavioral-based interventions are heterogeneous but are based on similar precepts. In the present study, behavioral-based intervention models will be followed without requiring individual therapists to alter their personal variations on behaviorist practices or therapeutic approaches. Participants are expected to continue to use verbal stimuli, elicit student responses, and reinforce behavior using verbal praise or another reward system. However, the typical therapeutic approach will be slightly altered with the use of sound field amplification. While the stimuli and reinforcement will still be verbal, they will also be amplified. Thus, the present study will follow a behavioral approach while manipulating the auditory intensity of the stimulus and verbal reinforcement. This study assumes that amplifying the auditory intensity of both the stimuli and reinforcement will serve as a reinforcer in itself.

Theoretical Support for Sound Field Amplification

Research in the use of sound field amplification in regular and special education settings suggests that a correlation exists between the amplification of a teacher's voice and increased student performance (Eriks-Brophy & Ayukawa, 2000; Flexer, Millin, & Brown, 1990; Maag & Anderson, 2007; McSporrان, 1997). The explanation for the effect of sound field amplification is often attributed to increased signal-to-noise ratio. The signal-to-noise ratio is defined as the difference between the intensity of ambient noise and the intensity of the message, measured in decibels (dB). It is hypothesized that increasing the intensity of the signal (spoken message) increases the comprehension by the receiver (student). The suggested hypothesis of this study is supported by the theoretical framework referred to as Communication Theory established by Shannon and Weaver (1949).

Shannon and Weaver (1949) proposed a theoretical model of communication that is both academic and practical. In an effort to develop more efficient communication during World War II, Shannon and Weaver distilled communication into a linear process consisting of an information source, transmitter, signal, noise source, receiver, and destination. Ideally, communication takes place between transmitter and receiver without any interruption in the signal. However, practical experience demonstrates that a noise source always exists in the communication process.

In continuing the work of Shannon and Weaver (1949), Leaf (2005) described a noise source as any signal in the transmission other than the original signal. Noise might include mental distractions, ambient noise, or some other form of static. Cancelling the effect of noise in the communication channel increases the clarity of the intended signal and increases the probability of the message being understood (Leaf, 2005). Use of sound field amplification may be an effective method for increasing signal-to-noise ratio and ameliorating the effects of noise in the classroom communication channel (Larsen & Blair, 2008). By decreasing sources of auditory distraction, the message being presented may be more readily and efficiently received. Clearer understanding of messages decreases the need for repetition of information and, in theory, increases the participation of both sender and receiver in the communication process (Leaf, 2005).

The auditory intensity of the stimulus in the present study was manipulated through the use of sound field amplification. Sound field amplification is used regularly for individuals who are hard of hearing or have learning disabilities, as well as individuals without disabilities, to improve communication. The educational applications

have been researched as well. The following section provides an overview of how sound field amplification is currently used in regular education settings.

Sound Field Amplification in Regular Education

Northern and Downs (1985) first suggested using sound field amplification to benefit all students in the classroom and not limiting use to students with hearing impairment. Since the time of Northern and Downs, numerous studies have supported the positive impact that the use of sound field amplification can have upon the academic success and behavior of students in regular education environments (McSporran, 1997; Eriks-Brophy & Ayukawa, 2000). Research has revealed that sound field amplification may be a cost effective method of maximizing the classroom acoustical environment to optimize listening and learning (McSporran, 1997).

Eriks-Brophy and Ayukawa (2000) found that students in a regular education environment exposed to sound field amplification demonstrated improved on-task behaviors. In addition, they reported improved body orientation, more watching of the teacher, less extraneous movement, and less speaking out of turn. Furthermore, students demonstrated more rapid response times to teacher instructions, less need for repetition of instructions, and increased involvement in class discussions (Eriks-Brophy & Ayukawa, 2000).

In harmony with the findings of Eriks-Brophy and Ayukawa (2000), Massie, et al. (2002) examined the use of sound field amplification with indigenous students in Australia. The researchers discovered increased response to teacher instructions and students taking on a more active role in classroom discussion. In addition, it was noted

that students interacted more with one another following exposure to sound field amplification.

Ryan (2009) employed sound field amplification in a middle school physical education environment. Portable sound field amplification equipment was provided to two female physical education teachers for use during gym and outdoor activities. It was hypothesized that use of sound field amplification would increase student compliance with tasks and decrease the amount of time teachers were required to take roll, give instructions, explain game rules, etc. This multiple baseline study compared baseline data with treatment data for three periods of instruction for each teacher over the course of 25 class sessions. Results indicated that the amount of managerial time spent by teachers at the beginning of classes significantly decreased with the use of sound field amplification.

Sound Field Amplification in Special Education

Similar to applications in regular education, sound field amplification has been a strategy used to assist students with disabilities to increase attentiveness and decrease off-task behavior. In a study of nine students with developmental disabilities, Flexer, Millin, and Brown (1990) found that participants made improvements on the Word Intelligibility Picture Test when amplification was included. Palmer (1998) found that students considered to be having difficulty paying attention and at risk for failure improved on-task behaviors with sound field amplification.

Maag and Anderson (2007) specifically experimented on the effects of sound field amplification on behaviors in students with a confirmed diagnosis of attention deficit hyperactivity disorder (ADHD). A multiple baseline design was applied to assess

changes in on-task behaviors of three elementary students with attention deficits receiving integrated instruction in a regular education classroom. Student behaviors associated with task demand, high preference activities, alpha commands, and beta commands were recorded. The speed with which students responded to all four types of directions significantly increased.

Sound Field Amplification in Speech Therapy

The use of sound field amplification for students with communication disorders has been historically associated with students with hearing impairments (Thibodeau, 2010). As far back as 1953, Bangs and Shapley (1953) proposed criteria for voice amplification to be applied to preschool children with hearing impairment. The research and recommendations of Bangs and Shapley, as well as others, have served as a foundation for the use of sound field amplification with students having all types of learning disabilities and developmental disorders. The speech-language pathologist has been an important provider in meeting the communication needs of these students.

The 1980s signaled a turning point in addressing needs of students with hearing loss by incorporating wireless FM technology in the classroom (Freeman, Sinclair, & Riggs, 1980; Van Tasell & Landin, 1980). Use of FM systems was originally applied to students with diagnosed hearing impairments, and student-specific amplification was achieved by transmitting a signal directly from the teacher's transmitter to the student's receiver (Van Tasell & Landin, 1980). Many approaches for delivering the signal to students with hearing loss have been compared, and even more recent advancements have led to the use of adaptive FM systems that automatically adjust the signal-to-noise ratio based on ambient noise to maintain a constant level (Thibodeau, 2010). Advances such

as these have led to exploration of the impact that amplification can have upon the performance of students without hearing impairment in classroom settings.

In a series of publications, Tallal and Piercy (1973a; 1973b; 1974; 1975) proposed that all disorders of hearing, speech, and language had an auditory processing deficit at their core. Their view was based upon the assumption that poor processing of an auditory signal would automatically cause a breakdown in an individual's ability to comprehend and later send an accurate communicative message. In an attempt to test hypotheses such as these, Rosen, Adlard, and van der Lely (2009) experimented on the effects of altering the auditory signal presented to 14 children diagnosed with grammatical speech-language impairments. Results of the study suggested that there is no correlation between hearing level thresholds and measures of vocabulary, grammar, or phonology. The researchers disputed the claims of Tallal and Piercy (1973a; 1973b; 1974; 1975) and proposed that there was no correlation between the presence or absence of auditory deficits and specific grammatical impairments. However, Rosen et al. (2009) did find a greater number of participants with auditory processing deficits in the speech-language impaired group than the typical control group.

None of the hundreds of studies reviewed examined the effects of sound field amplification on student behavior in speech therapy. Studies such as those conducted by Blake, Field, Foster, Platt, and Wertz (1991) focused on students with learning disabilities and the use of FM systems to improve behaviors. Although this research study is focused on determining the effect that sound field amplification has on student on-task behavior in a speech therapy setting, the outcome of the study conducted by Blake et al. (1991) is worth noting. The researchers discovered that the use of FM

amplification during classroom instruction increased the attending behaviors of students with learning disabilities. Of particular note as it relates to the present study is the establishment of eye contact as the most improved attending behavior demonstrated by the students. This behavior is considered especially important to the present study because eye contact is a communication skill addressed by speech therapists in therapy.

Summary

Students with and without disabilities have demonstrated improved performance in classroom and other educational settings as a result of implementing the use of sound field amplification. Although studies have focused primarily on attending behaviors in large groups, there is sufficient evidence to suggest similar benefits in a small group setting. Students with speech-language impairments have not been singled out as an experimental group in the studies reviewed. However given the strong connection between attention and processing of auditory signals, it is reasonable to assume students with speech-language impairments would benefit equally well from sound field amplification as those with other learning disabilities. Limited research in general concerning the effects of sound field amplification on attending behaviors in the classroom supports the need for the pursuit of the current research study.

CHAPTER THREE: METHODOLOGY

The purpose of this chapter is to describe the participants, settings, and methods to be used in this study to provide the intervention, and data gathering methods.

Presentation of methodology has been grouped into ten categories: (a) overview and design; (b) hypothesis; (c) operationalization of variables; (d) setting and sample; (e) power analysis; (f) intervention; (g) data gathering methods; (h) validity; (i) data analysis; and (j) ethical considerations.

Overview and Design

The purpose of this study is to examine the effect of sound field amplification on managerial time during speech therapy sessions. The experimental design used in this study is a multiple baseline design across participants (Barlow & Hersen, 1984). This type of design uses an approach that gathers baseline and treatment data for each participant group. The selected design is also referred to as pre-test, post-test design where participant data are collected a priori and then again after treatment. Experimental control is demonstrated when changes in the dependent variables occur only after the intervention has been introduced.

During baseline conditions, therapist facilitators were instructed to conduct therapy sessions as per their typical method without the use of sound field amplification. During the intervention phase, the treatment variable of sound field amplification was in effect for the experimental group. The number of times therapist facilitators repeated

instructions to a group of student participants and the number of times therapist facilitators redirected student behavior were recorded by the facilitators for each therapeutic session. At no time during the study were the student participants informed of the dependent variables, in order to limit corruption of the data.

Hypothesis

Hypothesis 1: Use of sound field amplification in small group speech therapy will result in a decreased number of times task directions are repeated in a therapy session as recorded on weekly data sheets.

Hypothesis 2: Use of sound field amplification in small group speech therapy will result in a decreased number of times students are reminded to stay on task in a therapy session as recorded on weekly data sheets.

Operationalization of Variables

There are two dependent variables, one independent variable, and two covariates used in the study. The dependent variables are the number of times the facilitator repeated task directions and the number of times students were reminded to remain on task. The independent variable is Group Membership (control, experiment), and the covariates are pre-number of times the facilitator repeated task directions and pre-number of times students were reminded to remain on task.

Percent of time students are reminded to remain on task pre and post. The ratio was derived by dividing the number of times student groups are reminded to remain on task over the number of collection days. For example for the baseline data, data were collected for one session for each participant group. If a group was reminded to remain

on task 15 times during collection of baseline data, the resulting ratio was 15/1. Should the hypothesis prove to be true, it was anticipated that the ratio of reminders per session would decrease and thereby support the hypothesis that use of sound field amplification results in a decreased number of times per session that students must be reminded to remain on task.

Percent of times therapist repeats task directions pre and post. The ratio was derived by dividing the number of times per session directions were repeated to students by number of sessions. For example for the baseline data, data were collected for one session for each participant group. If a group had directions repeated to them 15 times during collection of baseline data, the resulting ratio was 15/1. Should the hypothesis prove to be true, it was anticipated that the ratio of the number of times directions were repeated per session would decrease and thereby support the hypothesis that use of sound field amplification results in a decreased number of times per session that directions were repeated.

Group membership (control, experimental). The independent variable in the study is group membership, with two levels, control and experimental. The variable is nominally scaled and was coded as 1 = control group and 2 = experimental group. The control group did not receive the intervention while the experimental group received 9 weeks of intervention.

Setting and Sample

Research was conducted at rural school sites throughout Navajo and Apache counties in northern Arizona. All schools have enrollments of fewer than 500 students

per school site and fewer than 4,000 total students within each given school district. Approximately 10% of the total number of students in these districts receive special education services. The majority of students identified as needing special education services participate in speech therapy. School facilities are typical for school districts throughout the state of Arizona. The majority of the buildings utilized in this study are constructed of concrete block and have metal doors. Windows are standard in all therapy rooms. Curtains are rare but blinds are common. Each therapy site has unique characteristics. However, general construction and size are similar with similar overall acoustic properties.

Facilitators included six licensed speech-language pathologists working in public schools in northern Arizona. Each facilitator worked at a different school site but served similar student populations according to disability level. Therapist facilitators had varied professional backgrounds and years of experience, which ranged from 4 years to over 20 years. Facilitators represented a variety of ethnic backgrounds including Navajo, Hopi, Hispanic, and White. All therapist facilitators were female. Following parent permission to participate, each facilitator selected 20 students from her caseload, according to groupings, as her representative sample, for a total of 120 invited student participants. Of the 120 students asked to participate in the study, 57 parent permissions were received. The 57 student participants were distributed among the experimental and control groups, depending upon the status of their speech-language pathologist as either a randomly selected control group facilitator or experimental group facilitator. Twenty-eight students participated in the control group, and 29 students participated in the experimental group

at the beginning of the study. At week 9 of the study, 25 students remained in the control group, and 22 students remained in the experimental group. Participant mortality was attributed to student participants making sufficient gains that they were exited from speech-language therapy and to student transfers to other schools.

Student participants represented a variety of cultures including, but not limited to, Native American, Hispanic, African American, and White. Student participants ranged in age from 4 years old to 12 years old. Before data collection, human participant consent was obtained from a legally responsible parent or guardian of student participants. Each therapist facilitator signed informed consent as well. All consent forms were gathered by the principal investigator and will be stored in a locked cabinet for a period of 7 years after the conclusion of the study, at which point they will be destroyed. District governing boards were contacted by the primary investigator, and permission was obtained to utilize their district as a research site before contacting therapist facilitators and parents of students.

Prior to beginning the study, facilitators participated in an individual orientation to the study, including background information and research methodology. All facilitators were instructed in the rubric for determining and recording the number of times directions were repeated and the number of times behavior was redirected. The number of times directions were repeated was recorded for each occurrence of either repeating verbatim or rephrasing instructions. The number of times behavior was redirected was recorded for incidences requiring the facilitator to remind students to sit down in a seat, turn in a seat and face the therapist, make eye contact, sit still, or stop

speaking out of turn (Eriks-Brophy & Ayukawa, 2000). The rubric was included on the tally sheets for later reference. To increase reliability of facilitator data collection, the principal investigator observed one student participant group per facilitator during gathering of baseline data and again at 2-3 weeks into the intervention phase to compare the principal investigator's tally sheet with the facilitator's tally sheet. In the event of a significant discrepancy, greater than 10% total number of tally marks per dependent variable, the principal investigator reviewed the rubric with the facilitator and discussed the discrepancy. Facilitators were observed by the principal investigator until the discrepancy between data recorded by both the facilitator and principal investigator were within the 10% discrepancy limit.

Facilitators participating in the experimental group received individualized instruction in the use of the sound field amplification equipment. Sound field volume settings were set, with the primary investigator and facilitators present, to specified levels. These setting levels were written down for facilitators' future reference. Experimental group facilitators were instructed to not alter their therapy sessions from typical lesson plans with the exception of adding the use of sound field amplification.

Power Analysis

A priori sample determination is assessed by conducting a formal power analysis. Three factors are taken into consideration when conducting the analysis, including the intended power of the study, the effect size of the phenomena under study, and the level of significance to be used in rejecting the null hypotheses (alpha). Study power is the probability of rejecting a false null hypothesis. As a matter of convention, adequate

power to reject a false null hypothesis is .80 (Kuehl, 1999). Effect size is an estimated measurement of the strength of the relationship between variables in the study (Cohen, 1988). The effect size was characterized by Cohen (1988) as Cohen's f^2 small, medium, and large, where each level is associated with a specified effect size. Alpha is defined as how confident one is when rejecting the null hypothesis. Social science research convention suggests that alpha should be set at .05.

Power analysis for a dependent sample t -test was conducted in G-POWER to determine a sufficient sample size using an alpha of 0.05, a power of 0.80, a large effect size ($d_z = 0.5$), and two tails (Faul et al., 2008). Based on the aforementioned assumptions, the desired sample size is 15.

Intervention

The control group was derived via random selection. That is, using a random number generator, therapist facilitators were assigned to the control group and the experimental group. Thus, the student participants they served were subsequently assigned to either the control or experimental group, respectively. For the experimental group, therapist facilitators were each given a portable sound field amplification system to use in their speech therapy room. The Hearit SE UHF Broadcaster was utilized due to the ease of use of the equipment, its portability, and its unique phonologic amplification. Components included the Hearit SE, two speakers, instructor headset microphone and transmitter, and a multi-channel receiver. The microphone and transmitter were worn by each facilitator, and speakers were placed on a desk or shelf behind the therapist. Each Broadcaster was set with speakers at a volume level of 50% and Hearit unit at a level of 7

to ensure consistent amplification across participant groups. These levels were selected due to results of preliminary trials performed by the principal investigator using a digital sound level meter. Speech signals without the use of the Broadcaster were measured at 65dB and at 75dB, with the unit at the specified settings. Based upon previous research, an increase of +10dB was expected to contribute to a noticeable difference in student attention and understanding if amplification alone produced a significant effect on the dependent variables (Rosenberg, Blake-Rahter, Heavner, Allen, Redmond, Phillips, & Stigers, 1999).

Data Gathering Methods

Students received therapy from the participating therapist facilitator as specified in his/her Individual Education Plan (IEP). Student participants were divided into therapy groups of two to four students each, according to age, location, and class schedules at the facilitator's discretion. Each small group was assigned a number by their therapist facilitator, and data were gathered as a group, rather than per individual student participant, to increase confidentiality. Only group data were reported to the principal investigator. During each session, the therapist facilitator tallied the number of times instructions were repeated, as well as the number of times behavior was redirected, per the predetermined rubric, for the group of student participants. Data were collected and organized by student participant group. Data were gathered for a period of 10 weeks with data for one session of therapy being recorded for each student participant group per week. One week was spent gathering baseline data while 9 weeks were used for gathering intervention data. It is believed that applying the intervention for a period of 9

weeks was sufficient time to ameliorate any effects associated with the novelty of the intervention.

Following conclusion of the intervention phase of the study, student participants and therapist facilitators in the experimental group were asked a series of questions. The investigator of this study adapted questions from a study on sound field amplification by McSporrán, Butterworth, and Rowen (1997). Student participants were asked to respond to a series of five yes/no questions about their feelings toward the use of the sound field equipment. All students had the questions presented to them orally by the therapist facilitator. In addition, experimental group therapist facilitators were requested to respond to a series of 14 yes/no questions addressing their attitudes toward the use of sound field equipment and their desire to continue using the equipment.

Data Analysis

Data was entered into PASW version 18.0 for Windows. Descriptive statistics were calculated for each research group (control and experimental) to describe the research variables, including the number of times task directions were repeated and the number of times students were reminded to stay on task. This included frequencies, percentages, means, and standard deviations as appropriate.

Preliminary Analysis

Prior to hypothesis testing, preliminary analyses were conducted on the baseline data to assess any differences by small group (control vs. experimental) prior to the start of intervention. This consisted of two independent sample *t*-tests. One *t*-test assessed differences in the number of times the facilitator had to repeat task directions by small

group (control vs. experimental). One t -test assessed differences in the number of times students were reminded to remain on task by small group (control vs. experimental).

Research Question 1

RQ1: Is there a difference in small group speech therapy students' response to directions based on their exposure to sound field amplification?

H₁₀: There is no difference in students' response to directions based on their exposure to sound field amplification as recorded on weekly data sheets.

H_{1a}: Use of sound field amplification in small group speech therapy will result in a decreased number of times task directions are repeated in a therapy session as recorded on weekly data sheets.

To examine research question 1, a one within one between analysis of variance (ANOVA) was conducted to examine if there was a difference in the students' response to directions based on their exposure to sound field amplification from baseline to week 9 of the intervention. The dependent variables were the number of times task directions were repeated, and this was measured once a priori (at baseline) followed by nine times after treatment (weeks 1-9). The control group did not receive the sound field amplification. The experimental group did receive sound field amplification.

Research Question 2

RQ2: Is there a difference in small group speech therapy students' on-task behavior in small group speech therapy based on their exposure to sound field amplification?

H2₀: There is no difference in students' on-task behavior in small group speech therapy based on their exposure to sound field amplification by Group Membership (control, treatment) as recorded on weekly data sheets.

H2_a: Use of sound field amplification in small group speech therapy will result in a decreased number of times students are reminded to stay on task in a therapy session as recorded on weekly data sheets.

To examine research question 2, an ANOVA was conducted to examine if there was a difference in the students' on task behavior in small group speech therapy based on their exposure to sound field amplification from baseline to week 9 of the intervention. The number of times students were reminded to remain on task was measured once a priori (at baseline) followed by nine times after treatment (weeks 1-9). The dependent variables were the number of times the students were reminded to remain on task. The control group did not receive the sound field amplification. On the other hand, the experimental group did receive sound field amplification.

Ancillary Analysis

After hypothesis testing, ancillary analyses were conducted on the 9th week data to assess any differences by small group (control vs. experimental) at the 9th week of intervention. This consisted of two independent sample *t*-tests. One *t*-test assessed differences in the number of times the teacher had to repeat task directions, by small group (control vs. experimental). One *t*-test assessed differences in the number of times students were reminded to remain on task, by small group (control vs. experimental).

Justification for Mixed Model ANOVA

The current research design measures subjects on one continuous independent variable (group membership) between two dependent variables (number of times task directions are repeated and number of times students are reminded to remain on task) repeated more than once (Tabachnick & Fidell, 2001). The ANOVA uses the F test, which compares difference in group means. If the obtained F is larger than the critical F , the null hypothesis is rejected. However, if the F is smaller than the critical F , the null hypothesis is retained. The results of the mixed model ANOVA provide a means for determining the main effect and evaluates differences by time (within-subjects) and by separate groups (between-subjects). The interaction of group and time evaluates possible differences among group and time simultaneously (Pagano, 2010). The assumptions of normality and homogeneity of variance/covariance matrices were also assessed to verify these assumptions. Normality was assessed using the one sample Kolmogorov Smirnov (KS) test to establish that scores were normally distributed (Morgan, Leech, Gloekner, & Barrett, 2007). Homogeneity of variance, which assumes that both groups have equal error variances, was assessed using Levene's test.

Ethical Considerations

This study was conducted in accordance with research protocols in recognition that learners acting as researchers are faced with ethical concerns. Thus, to maintain ethical obligations, the researcher obtained informed consent from all participants (Gall, Gall, & Borg, 2006). Elements of informed consent include notifying the participants of who will conduct the study; letting the participant know the time commitment required,

explaining the study in easily understandable language; and offering to answer any questions. In addition, the researcher is responsible for informing participants that their involvement is voluntary; informing participants that they can withdraw at any time; letting participants know the limits of confidentiality (Rudestam & Newton, 2007); and ensuring that participants will emerge from the research unharmed.

No personal data were collected from students, and only aggregated data were published. Moreover, the researcher will maintain data in a secured, password-protected, electronic file for 7 years. Upon expiration of the 7-year period, the researcher will permanently destroy the data file. All hardcopy tally sheets and informed consent forms will be maintained in a locked file cabinet and destroyed following the expiration of the 7-year period after the conclusion of the study.

CHAPTER FOUR: RESULTS

As stated in chapter 1, the purpose of this study was to examine the effect of sound field amplification use on student on-task behavior during small group speech therapy sessions. This chapter reports the data associated with the research questions stated in chapter 1. It first reports the results of the *Therapist Facilitator Attitude Questionnaire* and the *Student Participant Attitude Survey*. The chapter then reports the statistical analyses associated with recording student on-task reminders and repetition of directions.

Descriptive Statistics

The speech-language pathologist facilitators who used the sound field equipment for the experimental group completed the *Therapist Facilitator Attitude Questionnaire*. They were asked if they agreed or disagreed with the statements about the use of the sound field equipment. All four of the facilitators agreed on the following statements that: they would like to keep the amplification equipment in their room permanently; it was easy to use; they were comfortable using the equipment; they have better control over their students when they use it; using the equipment has improved the learning environment in their room; the equipment increased the overall level of their children's attention in their room; and it decreased the need to repeat directions to their students.

All four of the facilitators disagreed on the following statements that: it decreased listening skills of the students; the students did not like the equipment; and it decreased participation in their room. There were mixed responses on the following statements that:

using the equipment decreased how tired they felt at the end of the day; it decreased the time it took to switch to other activities; it increased or enhanced their use of other audio-visual equipment in their room; and parents and other staff have made positive comments about the equipment. Frequencies and percentages for each of the survey questions are presented in Table 1.

Table 1

Therapist Facilitator Attitude Questionnaire Responses

Statement	Yes		No	
	<i>n</i>	%	<i>n</i>	%
I would like to keep the amplification equipment in my room permanently.	4	100.0	0	0.0
The amplification equipment was easy to use.	4	100.0	0	0.0
I am comfortable using amplification equipment in my room.	4	100.0	0	0.0
Using the amplification equipment decreased how tired I felt at the end of the day.	1	25.0	3	75.0
I have better control over my students when the equipment is used.	4	100.0	0	0.0
The amplification equipment has improved the learning environment in my room.	4	100.0	0	0.0
The amplification has increased the overall level of children's attention in my room.	4	100.0	0	0.0
Using amplification equipment decreased the time needed to switch to other activities.	2	50.0	2	50.0
The amplification equipment decreased the need to repeat directions to my students.	4	100.0	0	0.0
The amplification equipment has increased or enhanced my use of other audio-visual equipment in my sessions.	2	50.0	2	50.0
Parents and other staff in the school have made positive comments about the use of the amplification equipment.	2	50.0	2	50.0
Amplification equipment has decreased the listening skills of the students in my sessions.	0	0.0	4	100.0
The students in my room do not like the amplification equipment.	0	0.0	4	100.0
Using amplification equipment has decreased participation in my room.	0	0.0	4	100.0

There were 22 students still participating in the sound field group by the end of the study. The participating students were given the *Student Participant Attitude Survey*, which asked if they agreed or disagreed with statements about the amplification equipment. The majority of students agreed on the following statements: that they liked it when the teachers turned on the equipment; that their teacher’s voice was clearer with it on; that it was easier to hear the teacher talk when it was on; and that they would like to keep the speakers in their speech room. The students had mixed responses that when the speakers were off, it was hard to hear their teacher. Frequencies and percentages for each of the survey questions are presented in Table 2.

Table 2

Student Attitude Questionnaire Responses

Statement	Yes		No	
	<i>n</i>	%	<i>n</i>	%
I like it when my teacher turns on the speakers.	20	90.91	2	9.09
When the speakers are on the teacher’s voice is clearer.	21	95.45	1	4.55
When the speakers are on it is easier to hear the teacher talk.	19	86.36	3	13.64
When the speakers are off it is more difficult to hear the teachers.	12	54.55	10	45.45
I would like to keep the speakers in my speech room.	20	90.91	2	9.09

Preliminary Analyses

Preliminary analyses were conducted prior to hypothesis testing to assess if any differences in the number of times the teacher must repeat task directions and the number of times students are reminded to remain on task occurred in the baseline data by group (control vs. experimental). The results of the preliminary analyses showed that the

number of times students were reminded to remain on task was significantly higher for the experimental group than it was for the control group. The effect size for this difference is large (Cohen, 1988). Results of the preliminary analyses as well as means and standard deviations are presented in Table 3.

Table 3

Results of Preliminary Analyses

Test	<i>t</i>	<i>df</i>	<i>p</i>	Cohen's <i>d</i>	Experimental (E)		Control (C)	
					<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Repeat directions (E - C)	2.16	16	.047	1.02	5.67	3.35	3.00	1.58
Reminded to stay on task (E - C)	-1.73	15	.105	0.85	4.29	3.73	7.50	3.81

Research Question 1

To examine research question 1, a one between one within analysis of variance (ANOVA) was conducted to assess if there were differences in the number of times directions were repeated over time (baseline to week 9) by group (experimental vs. control). The assumption of normality was assessed with 10 Kolmogorov Smirnov tests. The results of the tests were all not significant, verifying the assumption of normality. Homogeneity of variance was assessed with 10 Levene's tests. The results of the tests had two significant outcomes; however the *F* statistic is robust against violations of normality and in situations where the variance is unequal provided group sizes are similar (Stevens, 2009). The results of the test showed no significant effect of time, group, or of the interaction of time and group. Results of the one between one within ANOVA are

presented in Table 4. Table 5 presents the means and standard deviations by group.

Figure 1 shows the number of times directions were repeated by group over time.

Table 4

ANOVA for Number of Times Directions Were Repeated

Source	SS	df	MS	F	p	Partial η^2
Within-Subjects						
Time	61.72	9	6.86	1.26	.279	0.15
Time*Group	42.69	9	4.74	0.87	.558	0.11
Error	344.08	63	5.46			
Between-Subjects						
Group	16.81	1	16.81	1.24	.303	0.15
Error	95.08	7	13.58			

Table 5

Means and Standard Deviations for the Number of Times Directions Were Repeated

	Experimental		Control	
	M	SD	M	SD
Baseline	5.27	3.50	2.70	1.77
Week 1	7.27	5.78	3.50	3.69
Week 2	5.00	3.92	2.00	1.15
Week 3	3.70	3.65	2.33	0.82
Week 4	3.00	3.02	3.00	2.50
Week 5	2.60	1.51	5.00	3.12
Week 6	2.63	1.69	3.00	2.00
Week 7	2.67	2.18	1.33	0.58
Week 8	2.80	1.93	1.33	1.00
Week 9	1.90	1.60	2.75	1.49

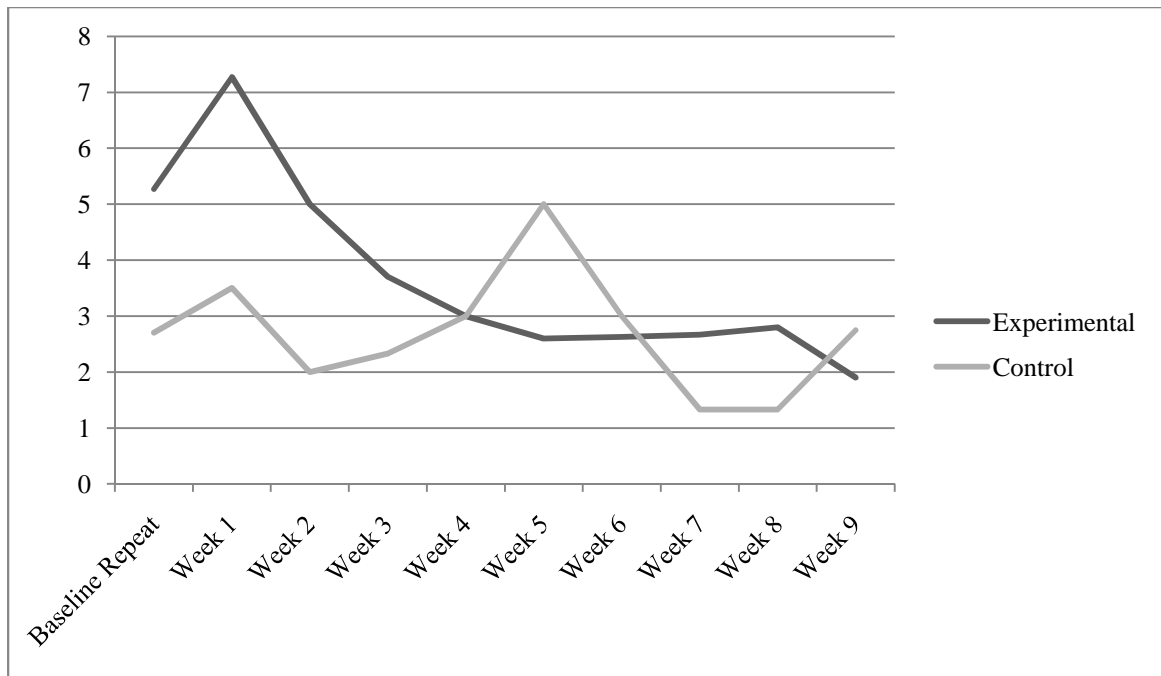


Figure 1. Number of times teachers repeated themselves over time by group.

Research Question 2

To examine research question 2, a one between one within analysis of variance (ANOVA) was conducted to assess if there were differences in the number of times the students were reminded to stay on task over time (baseline to week 9) by group (experimental vs. control). The assumption of normality was assessed with 10 Kolmogorov Smirnov tests. The results of the tests were all not significant, verifying the assumption of normality. Homogeneity of variance was assessed with 10 Levene's tests. The results of the tests were not significant, verifying the assumption. Results of the ANOVA showed a significant effect of group (experimental vs. control), $F(1, 7) = 21.97$, $p = .002$, suggesting the experimental group was reminded to stay on task significantly less than the control group. Results of the ANOVA also showed a significant interaction of group and time, $F(9, 63) = 2.30$, $p = .027$, suggesting there was a difference in the

number of times a student was reminded to stay on task over time. Figure 2 shows that over time, the experimental group steadily decreased in this while the control group fluctuated greatly in the number of times a student was reminded to stay on task.

Table 6

ANOVA for Number of Times a Student Was Reminded to Stay on Task

Source	SS	df	MS	F	p	Partial η^2
Within-Subjects						
Time	31.69	9	3.52	1.53	.156	0.18
Time*Group	47.42	9	5.27	2.30	.027	0.25
Error	144.67	63	2.30			
Between-Subjects						
Group	810.69	1	810.69	21.97	.002	0.76
Error	258.33	7	36.91			

Table 7

Means and Standard Deviations for the Number of Times a Student Was Reminded to Stay on Task

	Experimental		Control	
	M	SD	M	SD
Baseline	4.00	4.82	7.50	3.81
Week 1	4.45	4.11	4.20	2.25
Week 2	3.82	4.02	6.14	4.10
Week 3	2.64	2.06	6.83	2.04
Week 4	2.90	2.77	4.56	2.92
Week 5	2.10	2.18	5.00	3.16
Week 6	2.25	3.15	8.33	2.08
Week 7	2.13	2.30	7.33	2.31
Week 8	1.89	2.26	5.89	3.44
Week 9	1.90	2.28	4.50	2.45

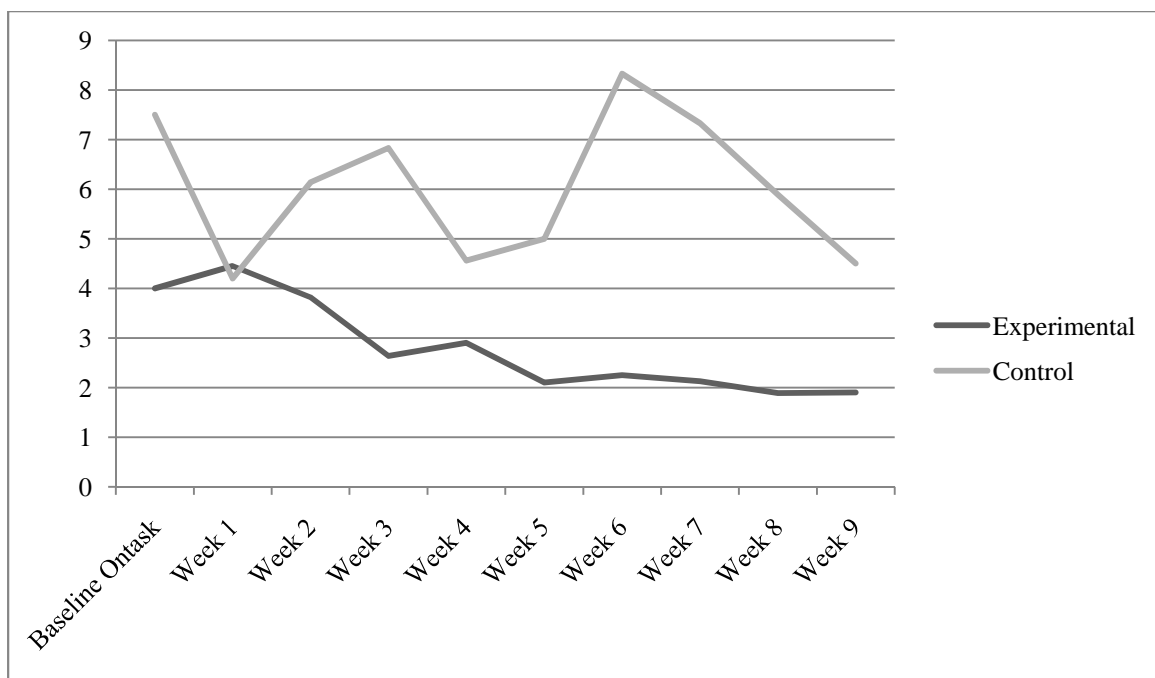


Figure 2. Number of times students were reminded to stay on task over time by group.

Ancillary Analyses

Two independent sample *t*-tests were conducted to assess if, at week 9, there was a difference in the number of times directions were repeated and the number of times a student was reminded to stay on task by group (control vs. experimental). The results of the *t*-tests showed a significant difference in the number of times a student was reminded to stay on task, $t(15) = -2.91, p = .011$, suggesting the experimental group was reminded to stay on task significantly less than the control group. The effect size for this difference is large (Cohen, 1988). Results of the independent sample *t*-tests are presented in Table 8.

Summary

The results presented in this chapter suggest that both students and facilitators benefited from the use of sound field amplification during small group speech therapy. A

more detailed discussion of the research findings and implications for clinical practice are presented in chapter 5.

Table 8

Results of Ancillary Analyses

Test	<i>t</i>	<i>df</i>	<i>p</i>	Cohen's <i>d</i>	Experimental (E)		Control (C)	
					<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Repeat directions (E - C)	-1.11	15	.285	0.50	1.89	1.69	2.75	1.49
Reminded to stay on task (E - C)	-2.91	15	.011	1.40	1.44	1.88	4.50	2.45

CHAPTER FIVE: DISCUSSION

In this final chapter, the author reviews the research problem, hypotheses, and methodology. That review is then followed by a summary of the research findings, implications for practice, discussion of limitations, and suggestions for areas of future research.

Review of Statement of the Problem

The purpose of this study was to explore the relationship between sound field amplification and student on-task behavior in small group speech therapy. The problem statement included two research questions:

1. Is there a difference in small group speech therapy students' response to directions based on their exposure to sound field amplification?
2. Is there a difference in small group speech therapy students' on-task behavior in small group speech therapy based on their exposure to sound field amplification?

Review of the Hypotheses

The hypotheses for this study were as follows:

H₁: Use of sound field amplification in small group speech therapy will result in a decreased number of times task directions are repeated in a therapy session as recorded on weekly data sheets.

H₂: Use of sound field amplification in small group speech therapy will result in a decreased number of times students are reminded to stay on task in a therapy session as recorded on weekly data sheets.

Review of Methodology

The experimental design used in this study is a multiple baseline design across participants (Barlow & Hersen, 1984). This type of design is also referred to as a pre-test post-test design where participant data are collected a priori and then again after treatment. In this case, data were gathered at baseline and during treatment for each participant group over the course of a 10-week experiment. Experimental control is demonstrated when changes in the dependent variables occur only after the intervention has been introduced.

During baseline conditions, all six of the speech-language pathologist facilitators who participated in the study were instructed to conduct therapy sessions without the use of sound field amplification. In addition, during the baseline conditions, the primary researcher observed the participant groups and recorded data using the rubric provided to facilitators in addition to the data being gathered by the facilitators. The researcher's tally sheets were compared to the tally sheets used by the facilitators to verify inter-rater reliability. Once inter-rater reliability was established, facilitators officially began gathering data for the study.

During the intervention phase, the treatment variable of sound field amplification was in effect for the four speech-language pathologist facilitators working with the experimental groups. During the intervention phase, all six facilitators recorded the

number of times therapists repeated instructions and the number of times therapists redirected student behavior.

Two dependent variables, one independent variable, and two covariates were used in the study. The dependent variables were the number of times the facilitator had to repeat task directions and the number of times students were reminded to remain on task. The independent variable was Group Membership (control, experiment), and the covariates were pre-number of times the facilitator had to repeat task directions and pre-number of times students were reminded to remain on task.

Discussion of Results

The researcher analyzed inferential statistics to summarize results for the study's research questions.

Research question one. To examine research question 1, a one between one within analysis of variance (ANOVA) was conducted to assess if there was a difference in the number of times directions were repeated over time (baseline to week 9) by group (experimental versus control). The results of the test showed no significant effect of time, group, or of the interaction of time and group. These results indicate that there was not a statistically significant difference between the number of times directions were repeated during a therapy session at baseline and the number of times directions were repeated over time. These data do not support the notion that use of sound field amplification during small group speech therapy results in a lower number of times per session that therapist facilitators repeat task directions.

Research question two. To examine research question 2, a one between one within analysis of variance (ANOVA) was conducted to assess if there were differences in the number of times the students were reminded to stay on task over time (baseline to week 9) by group (experimental versus control). Results of the ANOVA showed a statistically significant effect of group (experimental versus control), suggesting the experimental group was reminded to stay on task significantly less than the control group. Results of the ANOVA also showed statistically significant interaction of group and time, suggesting there was a difference in the number of times a student was reminded to stay on task over time. Over time, the experimental group steadily decreased in the number of times that on-task reminders were given while the control group fluctuated greatly. These results suggest that student on-task behavior, including sitting in a seat and making eye contact, did improve with the use of sound field amplification. On the other hand, such improvement was not noted with the control group, further suggesting that the use of sound field amplification did play a role in the change in student behavior.

Descriptive statistics. Facilitators and students who participated in the experimental group were asked to respond to questionnaires associated with their impressions of the impact of sound field amplification on their therapy sessions. The 4 speech-language pathologist facilitators responded to a 14-question *Therapist Facilitator Attitude Questionnaire*. Facilitators were in unanimous agreement on positive statements associated with the ease of use of the equipment, better control over the students when using the equipment, increased overall attention of the students, and desire to continue utilizing the sound field amplification system. None of the facilitators reported any

perceived negative effects. Therapist facilitator attitudes and perceptions coincide with the positive effects demonstrated by statistical analysis.

Student participants responded to the *Student Participant Attitude Survey*, a five-question survey that asked if they agreed or disagreed with statements about the amplification equipment. The majority of students agreed that they liked having the equipment used during their sessions and that they would like to keep the equipment in the room. The overwhelming majority reported that they would like to continue using the sound field equipment in their speech room. Student affinity toward the use of the sound field equipment supports the notion that a clearer, more intense auditory signal may in fact be a motivator for improved student behavior.

Implications for Practice

The results of this study support the findings of previous studies on the effect of sound field amplification use in regular education and special education classrooms. These studies suggest that sound field is an effective behavior management tool for large classroom settings, while the present study confirms similar student response in a small group setting. The two major implications for practice garnered from the results of this study are that sound field amplification is an effective tool for increasing student on-task behavior and that it is an easy intervention to which speech-language pathologists quickly accommodate. In addition, at approximately \$1000 for the broadcaster unit, the system is relatively inexpensive.

On-task behavior. The implication most important to the results of this study is the use of sound field amplification as an effective tool for behavior management in small

group speech therapy. Given that this is the only known study to address sound field amplification's behavior management effects as they relate to small group speech therapy, this study contributes a unique perspective on sound field amplification research. Previous research suggested that sound field amplification was effective in increasing student on-task behavior in regular education and special education classroom settings. Eriks-Brophy and Ayukawa (2000) found that, as a group, students without identified disabilities exposed to sound field amplification demonstrated improved on-task behaviors in their regular education classrooms. The on-task behaviors specifically noted to increase included improved body orientation, watching the teacher, less extraneous movement, and less speaking out of turn. In addition, the researchers noted a decrease in the number of times teachers needed to repeat instructions (Eriks-Brophy & Ayukawa, 2000). Palmer (1998) investigated similar on-task behaviors in students with attention deficits and noted that sound field amplification increased on-task behavior in the classroom setting.

The present study confirms the findings of previous research that sound field amplification is an effective tool for increasing student on-task behavior. Given that many student participants had comorbid disabilities, including learning disabilities and attention deficit hyperactivity disorder, it is reasonable to suggest that the positive effects of sound field amplification apply to students with and without disabilities, across settings, and without regard to size of the classroom population. Thus, sound field amplification may be included in a growing list of universal classroom intervention tools for improving student learning and increasing on-task behavior.

Facilitator accommodation and ease of use. Although it may seem to go without saying, individuals who are more comfortable with technology are more likely to use technology. Again, referring to the generational factor as a predictor of technology use, one may assume that individuals who were raised using technology are more likely to incorporate technology in teaching. However, practical knowledge of how to integrate technology seems to come from specific training directed toward practical needs and thought processes of teachers (Kluwin & Noretsky, 2005). Technology use in the classroom may not be related to general technology knowledge as much as it is related to technology integration training. The sound field amplification equipment used in this study, while considered to be a technology-based intervention, required approximately 15 minutes of instruction for the experimental group facilitators to feel comfortable with its use. At week 9 of the study, all experimental group facilitators reported on the *Therapist Facilitator Attitude Questionnaire* that they felt comfortable using amplification equipment in their room. The combination of short training requirements and reported levels of comfort with equipment use suggests that educators would be likely to employ sound field amplification as a technology-based intervention.

One other factor associated with the potential for sound field amplification to be generally accepted as a classroom intervention is ease of use. Each of the four experimental group facilitators reported that the sound field amplification equipment was easy to use. Kauffman (2001) suggested that one of the greatest obstacles to teacher use of classroom-based interventions is the time and effort involved in incorporating the intervention. Given that use of sound field amplification requires little to no effort on the

part of the educator, it is expected that educators will readily embrace sound field amplification as a classroom-based intervention. It is especially important to note that this study and those previously mentioned regarding on-task behavior support the use of sound field amplification for increasing student response to directions. Walker, Ramsey, and Gresham (2004) reported that teachers list student compliance with directions as their most preferred student behavior. One would suppose that use of a simple intervention that increases the student behavior most preferred by teachers would result in improved teacher satisfaction with their teaching experience and improved classroom environmental conditions.

Limitations

The results of this study were based on a limited population. Small numbers of participants, and a subsequently limited data set, affected the statistical procedures followed and subsequent interpretation of those statistics. A larger sample size might yield results different from those of the present study. All student participants were from schools located in northeastern Arizona. Although the study population was representative of the general student population in northeastern Arizona, results might differ in another geographical region. Although speech-language pathologist facilitators participated voluntarily, student participants participated voluntarily, and facilitators were randomly assigned as either control or experimental, there is still a potential for the Hawthorne effect, which suggests that change occurred in response to the subjects' knowledge of their participation in a study. The likelihood of the Hawthorne effect applying to the students is not as likely as a potential effect on the speech-language

pathologist facilitators. It is possible that speech-language pathologist facilitators changed their classroom behavior management style and their attempts at student behavior correction as a result of the requirements to record the number of times they redirected behavior or repeated instructions. As therapist facilitators became more aware of their own corrective behaviors, said behaviors may have changed. Recording of actual student behaviors by an outside observer would improve the methodology and respond to the possibility of change in facilitator behavior. Such limitations should be considered when generalizing the study results.

The *Therapist Facilitator Attitude Questionnaire* and the *Student Participant Attitude Questionnaire* were based on questionnaires administered in previous studies, and results were consistent with those studies. However, responses to the stimulus items were based on individual feelings and impressions. Results of the questionnaires should be interpreted with caution and in the context of the complete study as the questionnaires alone do not provide a complete picture of the effect of sound field equipment on behavior. Nevertheless, the questionnaires do yield some interesting data on how well the equipment was received by facilitators and participants.

Areas for Future Research

Sound field amplification is a viable option for increasing on-task behaviors in speech therapy rooms. This technology is readily available and relatively cost effective. However, use of sound field amplification is not a panacea for improving student behavior in speech therapy sessions. Many other factors that impact student behavior in speech therapy were addressed in this study. One factor to be carefully considered and

researched further is speech-language pathologist facilitator behavior management style. As discussed in the Limitations section of this study, it is currently unknown whether the behavior management style of the speech-language pathologist facilitators changed with the use of the sound field equipment. There is potential for the same antecedent behavior effect on student behavior hypothesized with the use of sound field amplification to change facilitator feedback and behavior management. A study on the impact of sound field amplification equipment on speech-language pathologist behaviors would be a worthwhile endeavor to address this question.

The author of this study referred to improving time management in small group speech therapy, with the assumption that more on-task time would result in improved therapeutic outcomes, as a benefit of the study. While the study succeeded in addressing the concept of increasing student on-task behavior, therapeutic outcomes were outside the scope of the study. With increasing therapeutic outcomes, and speeding student progress, as the ultimate goal of utilizing sound field amplification as a therapeutic tool, it would be logical to pursue research with regard to the effect of sound field amplification on student gains in speech and language skills. If sound field amplification were to prove to be effective in promoting greater student gains in speech and language, the position of sound field amplification as an evidence-based therapeutic tool would be solidified in the field of speech-language pathology.

Conclusion

It is this researcher's opinion that sound field amplification as a classroom tool is underutilized. The present study supports the use of sound field amplification in a variety

of educational settings, including specifically the use of sound field amplification in a small group speech therapy setting. The gains in student on-task behavior, while not completely eliminating off-task behaviors common to all children, justify the use of sound field amplification by speech-language pathologists in their daily practice.

Therapist facilitators and student participants alike were very receptive to the intervention and expressed a preference to continue using sound field amplification in their therapy sessions. Due to the need for maximizing limited therapeutic intervention time, it is anticipated that the promising results of the study will serve as a catalyst for further discussion and research on the use of sound field amplification in speech-language therapy

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APPENDIX A

Consent Form (Students)

Sound Field Amplification: Effects on Managerial Time in Small Group Speech Therapy

Jeffrey Craig Meeks

Liberty University

College of Education

Your child is invited to be in a study of the effect of using an amplifier and speaker during speech therapy and its impact on therapists' time management. You were selected as a possible participant because your child's speech therapist has agreed to participate in this study. We ask that you read this form and ask any questions you may have before agreeing to participate in the study.

This study is being conducted by: Jeffrey Craig Meeks, doctoral candidate in the College of Education at Liberty University.

Background Information

The purpose of this study is to determine if making the speech therapist's voice louder will change students' behavior. We will measure the number of times per session the therapists have to repeat directions and how many times they need to get students' attention back on therapy.

If you agree to be in this study, we would ask you to do the following things:

- Encourage your child to attend school and not miss therapy sessions
- Do not discuss what we are tracking with your child to keep their behavior as natural as possible

- Allow your child’s speech therapist to give the researcher data concerning the child’s attention in therapy without identifying your child by name.
- Allow your child to be randomly selected to be part of the “typical” therapy group or the “experimental” group (using amplification).

Risks and Benefits of Being in the Study

The study has very minimal risk since students assigned to the experimental group will receive the same therapy they currently receive with the exception of having therapy delivered with the additional volume of the loudspeaker. There is a potential risk that your child may become more distracted with the new equipment and might attend less to therapy than if there was not a loudspeaker. This risk is minimal since research tends to support that attention will actually be better.

The benefits to participation are: potentially better use of time in your child’s speech therapy; improving resources available to your child’s therapist; and helping your child’s therapist/district determine if purchasing sound equipment would be a good investment.

Compensation:

Neither you nor your child’s therapist will be compensated for participation in this study.

Confidentiality:

The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research records will be stored securely in a locked cabinet, and only researchers will have access to the records. Data will be kept in a secured electronic data file for 7 years, at which point it will be destroyed. Your child’s therapist will assign a code number to the

student, and not even the researcher will know your student's name. Only the identifying number will be used in correspondence between the therapist and researcher.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University or your child's school district. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions:

The researcher conducting this study is: Jeffrey Craig Meeks. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact him at Navajo County Education Service Agency, PO Box 668, Holbrook, AZ 86025, 928-524-2123, director1@citlink.net. You are also welcome to contact his faculty advisor with concerns: Dr. David Holder, Liberty University College of Education, 434-582-2445, deholder@liberty.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), **you are encouraged** to contact the Human Subject Office, 1971 University Blvd, Suite 2400, Lynchburg, VA 24502 or email at irb@liberty.edu.

You will be given a copy of this information to keep for your records.

Statement of Consent:

I have read the above information. I have asked questions and have received answers. I consent to participate in the study.

Signature: _____ Date: _____

Signature of parent or guardian: _____ Date: _____

(If minors are involved)

Signature of Investigator: _____ Date: _____

APPENDIX B

CONSENT FORM (THERAPIST)

Sound Field Amplification: Effects on Managerial Time in Small Group Speech Therapy

Jeffrey Craig Meeks

Liberty University

College of Education

You are invited to be in a research study of the effect of using an amplifier and speaker during speech therapy and its impact on therapists' time management. You were selected as a possible participant because you represent speech therapists in northern Arizona, our target participant group. We ask that you read this form and ask any questions you may have before agreeing to participate in the study.

This study is being conducted by: Jeffrey Craig Meeks, doctoral candidate in the College of Education at Liberty University.

Background Information

The purpose of this study is to determine if making the speech therapist's voice louder will change students' behavior. We will measure the number of times per session the therapists have to repeat directions and how many times they need to get students' attention back on therapy.

If you agree to be in this study, we would ask you to do the following things:

- Be willing to participate in either the control group or experimental group, which means you may or may not be using sound field amplification during therapy.

- Be willing to continue therapy as usual and not change your typical therapy approach.
- Be willing to maintain a simple tally sheet and affix a tally mark each time you repeat a direction or remind a student to get back on task.
- Submit your tally sheets to the researcher at the end of every week.

Risks and Benefits of Being in the Study

The study has very minimal risk since the actual therapy taking place is no different than the therapy you already provide. However, there is a risk that your students may become more distracted with the new equipment and might attend less to therapy than if there was not a loudspeaker. This risk is minimal since research tends to support that attention will actually be better.

The benefits to participation are: potentially better use of time in your speech therapy sessions as a benefit of less management time; improving resources available to your students; and helping your district determine if purchasing sound equipment would be a good investment. As with all professional research, your participation has the potential to benefit your colleagues and the evidence base of the profession of speech-language pathology.

Compensation:

You will not be compensated for participation in this study.

Confidentiality:

The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research

records will be stored securely in a locked cabinet, and only researchers will have access to the records. Data will be kept in a secured electronic data file for 7 years, at which point it will be destroyed.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University or the researcher. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions:

The researcher conducting this study is: Jeffrey Craig Meeks. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact him at Navajo County Education Service Agency, PO Box 668, Holbrook, AZ 86025, 928-524-2123, director1@citlink.net. You are also welcome to contact his faculty advisor with concerns: Dr. David Holder, Liberty University College of Education, 434-582-2445, deholder@liberty.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), **you are encouraged** to contact the Human Subject Office, 1971 University Blvd, Suite 2400, Lynchburg, VA 24502 or email at irb@liberty.edu.

You will be given a copy of this information to keep for your records.

Statement of Consent:

I have read the above information. I have asked questions and have received answers. I consent to participate in the study.

Signature: _____ Date: _____

Signature of parent or guardian: _____ Date: _____

(If minors are involved)

Signature of Investigator: _____ Date: _____

APPENDIX C

APPLICATION TO USE HUMAN RESEARCH SUBJECTS

Liberty University

Committee on the Use of Human Research Subjects

1. Project Title: Sound Field Amplification: Effects on Managerial Time in Small Group Speech Therapy
2. Full Review Expedited Review
3. Funding Source (State N/A if not applicable): N/A
4. Principal Investigator:
Jeffrey Craig Meeks, Doctoral Student _____
5. Faculty Sponsor (if student is PI), also list co-investigators below Faculty Sponsor, and key personnel:
David Holder, PhD, Dissertation Chair College of Education
6. Non-key personnel:
N/A _____
7. Consultants:
N/A _____
8. The principal investigator agrees to carry out the proposed project as stated in the application and to promptly report to the Human Subjects Committee any proposed changes and/or unanticipated problems involving risks to subjects or others participating in approved project in accordance with the Liberty Way and the Confidentiality

Statement. The principal investigator has access to copies of 45 CFR 46 and the Belmont Report. The principal investigator agrees to inform the Human Subjects Committee and complete all necessary reports should the principal investigator terminate University association. Additionally s/he agrees to maintain records and keep informed consent documents for three years after completion of the project even if the principal investigator terminates association with the University.

Principal Investigator Signature

Date

Faculty Sponsor (If applicable)

Date

Submit the original request to: Liberty University Institutional Review Board, CN Suite 1582, 1971 University Blvd., Lynchburg, VA 24502. Submit also via email to irb@liberty.edu

APPLICATION TO USE HUMAN RESEARCH SUBJECTS

10. This project will be conducted at the following location(s): (please indicate city & state)

Liberty University Campus

Other (Specify): School districts in northern Arizona (Holbrook Unified

School District, Holbrook, Arizona; Round Valley Unified School District, Eagar,

Arizona; Heber Unified School District, Heber, Arizona; Winslow Unified School District, Winslow, Arizona; Joseph City Unified School District, Joseph City, Arizona; Alpine Elementary School District, Alpine, Arizona; Vernon Elementary School District, Vernon, Arizona; Concho Elementary School District, Concho, Arizona; St. Johns Unified School District, St. Johns, Arizona; Blue Ridge Unified School District, Lakeside, Arizona; Show Low Unified School District, Show Low, Arizona; Snowflake Unified School District, Snowflake, Arizona)

11. This project will involve the following subject types: (check-mark types to be studied)

Normal Volunteers (Age 18-65) Subjects Incapable Of Giving

Consent

In Patients Prisoners Or Institutionalized

Individuals

Out Patients Minors (Under Age 18)
 Patient Controls Over Age 65
 Fetuses University Students (PSYC Dept.

subject)

Cognitively Disabled Other Potentially Elevated Risk
 Physically Disabled
 Pregnant Women

12. Do you intend to use LU students, staff or faculty as participants in your study? If you do not intend to use LU participants in your study, please check “no” and proceed directly to item 13.

YES NO

If so, please list the department and/classes you hope to enlist and the number of participants you would like to enroll.

In order to process your request to use LU subjects, we must ensure that you have contacted the

appropriate department and gained permission to collect data from them.

Signature of Department Chair:

Department Chair Signature(s)

Date

13. Estimated number of subjects to be enrolled in this protocol: 120 minors (students), 10 adults

14. Does this project call for: (check-mark all that apply to this study)

Use of Voice, Video, Digital, or Image Recordings?

Subject Compensation? Patients \$_____ Volunteers \$_____

Advertising For Subjects?

More Than Minimal Risk?

More Than Minimal Psychological Stress?

Alcohol Consumption?

Confidential Material (questionnaires, photos, etc.)?

Waiver of

Informed Consent?

Extra Costs To The Subjects (tests, hospitalization, etc.)? VO2 Max
Exercise?

The Exclusion of Pregnant Women?

The Use of Blood? Total Amount of Blood _____ Over Time Period (days)

The Use of rDNA or Biohazardous materials?

The Use of Human Tissue or Cell Lines?

The Use of Other Fluids that Could Mask the Presence of Blood (Including Urine and
Feces)?

The Use of Protected Health Information (Obtained from Healthcare Practitioners or
Institutions)?

15. This project involves the use of an **Investigational New Drug (IND)** or an **Approved
Drug For An Unapproved Use.**

YES NO

Drug name, IND number and company: _____

16. This project involves the use of an **Investigational Medical Device** or an **Approved
Medical Device For An Unapproved Use.**

YES NO

Device name, IDE number and company: _____

17. The project involves the use of **Radiation or Radioisotopes:**

YES NO

18. Does investigator or key personnel have a potential conflict of interest in this study?

YES NO

EXPEDITED/FULL REVIEW APPLICATION NARRATIVE

A. PROPOSED RESEARCH RATIONALE

This study is being conducted to determine whether amplifying a speech therapist’s voice will impact student on-task behavior. Research suggests that on-task behavior in a regular classroom setting is improved by amplifying the teacher’s voice. Increasing on-task behavior is expected to increase productivity of therapy sessions. The impact of amplification in speech therapy has yet to be established, and the results of this study have the potential to impact current therapeutic approaches.

B. SPECIFIC PROCEDURES TO BE FOLLOWED

- Following IRB approval, school district governing boards will be approached and formal permission to utilize their facilities, staff, and students for the purpose of the study will be obtained.
- Ten adult therapist facilitators will be selected from among participating school sites and sign consent to participate in the study.
- Therapist facilitators will be oriented on the purpose of the study, data gathering methods, and use of sound field amplification equipment.
- Therapist facilitators will be randomly selected as control and experimental groups (5 each).

- Therapists will select 12 students each from their current caseload to participate in the study (3-4 groups of 3-4 students per group).
- Student participants' parents / guardians will be contacted with an informed consent form explaining the research study, potential harmful effects, compensation, etc. Informed consent forms will be written by the principal investigator and distributed by therapist facilitators.
- Signed informed consent forms will be obtained by therapist facilitators from parents / guardians of students, delivered to principal investigator via the US Postal Service, and retained by principal investigator in a locked file cabinet for a period of 7 years, after which they will be destroyed.
- Student participants in the control group will receive speech therapy without the use of sound field amplification, and student participants in the experimental group will receive speech therapy with the additional modality of sound field amplification.
- Therapist participants will utilize tally sheets for groups of students and record # of times students are reminded to stay on task and # of times directions are repeated. Tally sheets will include a rubric describing what constitutes a repetition of directions of reminder to stay on task. Tally sheets will be sent to principal investigator weekly.
- Principal investigator will review tally sheets each week to monitor therapist facilitator compliance with tasks and consistency in maintaining records.

- Principal investigator will personally observe one group of students per therapist facilitator during the baseline phase and again at 2-3 weeks into the intervention phase. Tally sheets will be used by both therapist facilitators and principal investigator. Tally sheets will be compared by principal investigator to check for inter-rater reliability. Guidance will be provided to facilitators in the event they are not accurately recording data.
- Following the intervention phase, facilitators for the experimental group will respond to a survey addressing attitudes toward use of the sound field equipment. Student participants in the experimental group will be interviewed by facilitators and respond to survey questions concerning their feelings and attitudes toward the use of sound field amplification.
- Principal investigator will gather and analyze data including tally sheets and surveys. All data sheets will be stored securely in a locked file cabinet and destroyed 7 years after the completion of the project.

C. SUBJECTS

Who do you want to include in your study? Please describe in nonscientific language:

- Therapist facilitators will be selected according to their status as speech therapists in northern Arizona public schools.
- Student participants will be selected due to their status as students with speech and language disorders receiving therapy from therapist facilitators.

- Exclusion criteria is based on participants' location of residence outside of northern Arizona and/or lack of diagnosis as a student with a speech or language disorder.
- Students with speech and language disorders are targeted for participation in this study as the results of the study are intended to guide therapeutic intervention in the future. Use of sound field amplification has been established in regular education classrooms but not in speech therapy.
- The maximum number of participants expected to be enrolled in this study is 130 (120 student participants and 10 therapist facilitators). This sample size was selected to enable greater accuracy when determining effect size.

D. RECRUITMENT OF SUBJECTS AND OBTAINING INFORMED

CONSENT

- Ten therapist facilitators will be selected according to their worksite location in participating northern Arizona public schools.
- Therapists will be selected and personally contacted by the principal investigator to determine their willingness to participate in the study.
- Once willingness to participate is determined, therapist facilitators will receive an informed consent notice, sign it, and return the form to the principal investigator.
- Therapist facilitators will be oriented on the purpose of the study, data gathering methods, and use of sound field amplification equipment.

- Therapist facilitators will be randomly selected as control and experimental groups (5 each).
- Therapists will select 12 students each from their current caseload to participate in the study (3-4 groups of 3-4 students per group).
- Student participants' parents / guardians will be contacted with a signed consent form explaining the research study, potential harmful effects, compensation, etc. Informed consent will be written by the principal investigator and distributed by therapist facilitators.
- Signed informed consent forms will be obtained by therapist facilitators from parents / guardians of students, delivered to principal investigator via the US Postal Service, and retained by principal investigator in a locked file cabinet for a period of 7 years, after which they will be destroyed.

E. PROCEDURES FOR PAYMENT OF SUBJECTS

- Subjects will not receive any compensation for their participation.

F. CONFIDENTIALITY

- Confidentiality with regard to student participants will be maintained by assigning each student a participant number. Only therapist facilitators will know which student has been assigned a particular number. The researcher will only know students by their participant number. Data will be recorded and interpreted cumulatively as a group. No data will be collected or interpreted according to individual students. No personal data will be collected from students, and only aggregated data will be published.

Therapist facilitators will be known to the researcher by name, but identifying data will not be used in published materials.

- The researcher will maintain data in a secured, password-protected electronic file for 7 years after the end of the research study.
- Upon expiration of the 7-year period, the researcher will permanently destroy the data file. Data will not be used for future research.

G. POTENTIAL RISKS TO SUBJECTS

- The study has very minimal risk to student participants. Therapy services will continue to be provided to all student participants by their existing therapists. The only change to therapy sessions required by this study is the addition of sound field amplification to the experimental group.
- There is a risk for student participants in the experimental group to become more distracted with the increased volume and novelty of the new equipment. Students in the experimental group may attend less to therapy than if there was not a loudspeaker.
- Risk to the therapist facilitators is considered to be negligible. No change to regular therapy routines will be required with the exception of extra duties for maintaining tally sheets.

H. BENEFITS TO BE GAINED BY THE INDIVIDUAL AND/OR SOCIETY

- The benefits to participation are: potentially better use of time in speech therapy; improving resources available to therapists; and helping a

therapist/district determine if purchasing sound equipment would be a good investment.

- This study will be a contribution to the body of knowledge currently available regarding approaches to speech therapy service delivery. Should use of sound field amplification prove to be an effective tool for time management, therapy time could be improved.

I. INVESTIGATOR’S EVALUATION OF THE RISK-BENEFIT RATIO

The identified risks are considered negligible. Therapists will not employ any therapeutic techniques they do not currently employ. The only change to service delivery will be the addition of sound field amplification for the experimental group. No detrimental effects have been recorded in previous experiments using sound field amplification in regular classrooms. The benefit of increasing time on task during speech therapy far outweighs the risks associated with exposing students to the intervention. Speech therapy time is at a premium, and any improvement in managing therapy time would benefit students and therapists alike.

J. WRITTEN INFORMED CONSENT FORM (*Please attach to the Application Narrative. See Informed Consent IRB materials for assistance in developing an appropriate form. See K below if considering waiving signed consent or informed consent*)

K. WAIVER OF INFORMED CONSENT OR SIGNED CONSENT

Waiver of consent is sometimes used in research involving a deception element.

Waiver of signed consent is sometimes used in anonymous surveys or research

involving secondary data. See Waiver of Informed Consent information on the IRB website. If requesting either a waiver of consent or a waiver of signed consent, please address the following:

1. For a Waiver of Signed Consent, address the following:

- a. Does the research pose greater than minimal risk to subjects (greater than everyday activities)?
- b. Does a breach of confidentiality constitute the principal risk to subjects?
- c. Would the signed consent form be the only record linking the subject and the research?
- d. Does the research include any activities that would require signed consent in a non-research context?
- e. Will you provide the subjects with a written statement about the research (an information sheet that contains all the elements of the consent form but without the signature lines)?

2. For a Waiver of Consent Request, address the following:

- a. Does the research pose greater than minimal risk to subjects (greater than everyday activities)?
- b. Will the waiver adversely affect subjects' rights and welfare? Please justify?
- c. Why would the research be impracticable without the waiver?
- d. How will subject debriefing occur (i.e., how will pertinent information about the real purposes of the study be reported to subjects, if appropriate, at a later date?)

L. SUPPORTING DOCUMENTS *(to be attached to the Application Narrative)*

M. COPIES:

For investigators requesting **Expedited Review** or **Full Review**, email the application along with all supporting materials to the IRB (irb@liberty.edu). Submit one hard copy with all supporting documents as well to the Liberty University Institutional Review Board, Campus North Suite 1582, 1971 University Blvd., Lynchburg, VA 24502.

APPENDIX D

Data / Tally Sheet

Therapist: _____

Date: _____

Group #	Repeat Instructions: <i>(Examples include repeating verbatim or rephrasing instructions)</i>	On-task Reminder: <i>(Examples include reminders to sit down in seat, turn in seat and face therapist, make eye contact, sit still, and stop speaking out of turn)</i>

APPENDIX E

Therapist Facilitator Attitude Questionnaire

Please indicate whether you agree (Yes) or disagree (No) with these statements by checking the corresponding box.		
Statement	Yes	No
I would like to keep the amplification equipment in my room permanently.		
The amplification equipment was easy to use.		
I am comfortable using amplification equipment in my room.		
Using the amplification equipment decreased how tired I felt at the end of the day.		
I have better control over my students when the equipment is used.		
The amplification equipment has improved the learning environment in my room.		
The amplification has increased the overall level of children's attention in my room.		
Using amplification equipment decreased the time needed to switch to other activities.		
The amplification equipment decreased the need to repeat directions to my students.		
The amplification equipment has increased or enhanced my use of other audio-visual equipment in my sessions.		
Parents and other staff in the school have made positive comments about the use of the amplification equipment.		
Amplification equipment has decreased the listening skills of the students in my sessions.		
The students in my room do not like the amplification equipment.		
Using amplification equipment has decreased participation in my room.		

APPENDIX F

Student Participant Attitude Questionnaire

Please indicate whether you agree (Yes) or disagree (No) with these statements by checking the corresponding box.		
Statement	Yes	No
I like it when my teacher turns on the speakers.		
When the speakers are on the teacher's voice is clearer.		
When the speakers are on it is easier to hear the teacher talk.		
When the speakers are off it is more difficult to hear the teachers.		
I would like to keep the speakers in my speech room.		