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Using therapy dogs to improve reading fluency of children who are deaf or hard of hearing: Is it effective?

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USING THERAPY DOGS TO IMPROVE READING FLUENCY OF CHILDREN WHO ARE DEAF OR HARD OF HEARING: IS IT EFFECTIVE?

By

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Abstract: The purpose of this paper is to discuss the effectiveness of using therapy dog reading programs with children who are deaf or hard of hearing using cochlear implants and hearing aids. It includes a literature review of reading fluency and therapy dog programs.

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Abbreviations

A	Asked
Abs	Absent
Est. ORF	Estimated Oral Reading Fluency
EPM	Errors per Minute
GE	Grade Equivalency
NR	No Response
R	Repetition
SB	Spring Break
SC	Self-Corrections
SMD	Snow Makeup Day
Sub	Substitutions
SS	Scaled Score
T	Told
TTA	Try That Again (student completely misread sentence and was asked to reread it)
WAE	Word Addition Errors
WCPM	Words Correct per Minute
WEE	Word Ending Errors
WPM	Words per minute
WRC	Words Read Correctly

Introduction

43 of the 50 United States as well as Australia, Canada, Italy, the United Kingdom, and India have animal assisted literacy programs (Land of PureGold Foundation, 2014). Why this abundance of programing involving children reading to dogs? Making reading motivating, fun, and engaging, especially for children who struggle with reading can be quite difficult. Research suggests that reading to therapy dogs greatly improves reading attitudes, comprehension, and fluency for struggling readers. Reading intervention using a therapy dog can be motivating and engaging, giving children a reason and desire to read.

A significant number of children who are deaf or hard of hearing present with delayed language, low vocabulary, and a reduced amount of background experience; thus they struggle with reading. Consequently, as with any child who struggles with reading, their confidence is lowered and they read less material less often.

This brings the reader to the question and purpose of this study: Could using a therapy dog reading program as a supplement to classroom reading improve reading fluency in children who are deaf or hard of hearing as with children with typical hearing? To better understand this question, this paper begins with a literature review on reading fluency. This literature review provides the reader with a foundation in reading fluency, reading fluency of children who are deaf or hard of hearing who use cochlear implants and hearing aids, and reading fluency programs. This section includes an explanation and brief description of animal therapy, therapy dog programs, and their services. This paper then reviews the literature of therapy dog reading programs for children with typical hearing. The final section of this paper explores the use of

therapy dogs during an after-school reading program for children who are deaf or hard of hearing who are learning listening and spoken language.

Literature Review of Reading Fluency

Reading Fluency

Reading is not a simple task. In fact, it is quite a complex process. Reading is the ability to construct meaning from print. Without fluency one is not capable of properly constructing meaning from print (Gunning, 2013). In their 2001 literature review, "Oral Reading Fluency as an Indicator of Reading Competence: A Theoretical, Empirical, and Historical Analysis," L.S. Fuchs, Fuchs, and Hosp defined oral reading fluency as the oral translation of text with speed and accuracy (L.S. Fuchs, Fuchs, & Hosp, 2001). Pikulski and Chard, in their 2005 article, "Fluency: Bridge Between Decoding and Reading Comprehension," explain that this definition is not enough. Rather, they stress a fluency definition needs to include a comprehension component because fluency lacking a high level of comprehension is of little value (Pikulski and Chard, 2005). L.S. Fuchs, Fuchs, and Hosp explain this process. A reader must change written text to oral words. The faster and more accurate one is at this process, the better reader he/she will be. A reader must automatically translate letters into sounds, turn those sounds into whole words and sentences, process the meaning between these words and sentences, and relate the text to previous information and infer missing information. Oral reading fluency reflects one's ability to do the above steps automatically. This skill gradually develops through childhood (L.S. Fuchs et al., 2001). In, "Toward a Theory of Automatic Information Processing in Reading" LaBerge and Samuels (1974) explain automaticity and its role in reading. Automaticity pertains to a reader's capability to read words effortlessly, or automatically. More

complex skills, such as comprehension, require more attention than less complex skills, such as segmenting and phonological coding, or breaking sentences down to words and words down to individual sounds. Thus, word identification becomes automatic so one can put more attention into comprehension skills (LaBerge and Samuels, 1974). The aim is to read words accurately and automatically (Rasinski, 2012).

Reading expression, or prosody, is a component of reading fluency and comprehension. Automaticity and prosody go hand in hand. Whereas automaticity relates fluency to word recognition, prosody further connects fluency to comprehension (Rasinski, 2012). Comprehension is needed for the reader to use correct phrasing and intonation (Easterbrooks and Estes, 2007). One sentence can have several different meanings that may be inferred depending upon the prosody used to convey that sentence. This inferred meaning, known as inferential comprehension, is a higher level skill than literal comprehension, or understanding the meaning strictly from the written words of the text. This inferential comprehension, made possible by prosody, allows the reader to gain more information, and derive meanings from the text that are not explicitly written (Rasinski, 2012).

L.S. Fuchs et al. (2001) explain reading fluency can be used to collect data on the development of reading competence. Reading fluency is a direct measure of segmenting and decoding skills as well as automatic word recognition. This means fluency directly measures the reader's ability to break sentences and words down to smaller parts and then put them back together, as well as recognize words upon seeing them. Additionally, L.S. Fuchs, Fuchs, & Hosp discuss oral reading fluency as an indicator of reading proficiency because fluency allows the reader to pull meaning from print by decoding and segmenting, making inferences, supplying

missing information, and understanding individual words as well as sentences. Automaticity of lower level reading skills, such as decoding, allows the reader to put more attention to higher level skills, such as deriving meaning from the text. The less the reader struggles with pronouncing the words, the more he/she can focus on the meaning. Consequently, the fluency of changing written words to spoken words is an indicator of one's word recognition skills and comprehension (L.S. Fuchs et al., 2001).

Reading Fluency in Children Who are Deaf or Hard of Hearing

In "Developing Literacy Skills in Children With Hearing Loss" Easterbrooks and Estes (2007) discuss the reading process and difficulties for children who are deaf or hard of hearing. They explain reading comprehension is made up of five elements including background experience of what is being read, ability to decode words, remembering the words read, mastery of all parts of language, and the ability to recognize and figure out misinterpretations. With these elements, Easterbrooks and Estes developed a pyramid to show the relationship among literacy processes and language. There are seven steps containing the elements of comprehension, all of which are connected. The base of the pyramid is conceptual knowledge. Conceptual knowledge includes the reader's experience. It is the knowledge one brings with them when reading a book. The next step of the pyramid includes language components. There are four main components of language, namely semantics or word meaning and vocabulary, phonology or phonemic awareness, pragmatics or use of language and the reasons for reading, and syntax and morphology or grammar and reading phrases and sentences. The third step of the pyramid is decoding or breaking sentences and words down to read. Above decoding on the pyramid is fluency. The next two steps include retaining the information that was read and using text

processing strategies. This leads to the final step on the top of the pyramid, comprehension or constructing meaning (Easterbrooks and Estes, 2007).

Children with typical hearing build the base of their pyramid, their world knowledge and language skills, well before learning to read. They are constantly overhearing, thus building their experiences and language. This is not necessarily so for children who are deaf or hard of hearing. Easterbrooks and Estes explain that children who are deaf or hard of hearing miss out on hearing a lot of information, lessening their experiences and world knowledge. Their language and vocabulary are not as developed as children with typical hearing. This less developed language and vocabulary restricts their capability to read, and their understanding of what they read. Children who are deaf or hard of hearing may have missed out on skills important for decoding. Their limited access to sound along with their insufficient vocabulary makes decoding difficult. The base of the pyramid for children who are deaf or hard of hearing is not very solid, making it difficult for them to build up to the subsequent levels including reading fluently. Easterbrooks and Estes further explain that without this base, children who are deaf or hard of hearing are trying to put symbols to the sounds of a language that is not meaningful to them (Easterbrooks and Estes, 2007). Relating this information to automaticity as previously discussed, children who are deaf or hard of hearing often have limited vocabulary and decoding skills meaning they are attempting to read many unfamiliar words. Sounding out these many unfamiliar words becomes very laborious, thus lacking fluency. They must put much of their energy and resources into these basic skills of reading leaving less energy and resources for comprehension, the more complex task.

Additionally, material typically used to teach young children to read may not be appropriate for children who are deaf or hard of hearing. The language level of the reading material is often too high. With that being said, if a teacher chooses to use repeated reading as a strategy to improve fluency with children who are deaf or hard of hearing it is vital that the children understand what they are reading (Easterbrooks and Estes, 2007).

There is little research on reading fluency of children who are deaf or hard of hearing. In their 2005 article, "Teaching Reading to Children Who Are Deaf: Do the Conclusions of the National Reading Panel Apply?," Schirmer and McGough only found two studies on the instruction of fluency for children who are deaf or hard of hearing. One of these studies was about independent oral reading. The other study investigated the different fluency abilities of average and skilled readers who are deaf. The first study was conducted by Limbrick, McNaughton, and Clay in 1992. The researchers investigated the relationship between the amount of time a child is engaged in reading or an activity related to reading and reading achievement in children who were deaf. They found a correlation between the level of engaged reading and reading achievement (Limbrick et al., 1992). The second study conducted by Kelly in 1995 investigated distinguishing factors of average readers who are deaf from skilled readers who are deaf. Kelly found that those who were skilled readers read significantly faster. Both groups read familiar topics faster than unfamiliar topics, and skilled readers were significantly more fluent (Kelly, 1995). From these two studies Schirmer and McGough concluded that independent oral reading used as an instructional approach to improve fluency could increase the fluency of readers who are deaf (Schirmer & McGough, 2005).

Reading Programs

Developing a reading program that encompasses reading fluency is important. Pikulski and Chard explain that it was once thought reading independently was enough to attain fluency (Pikulski and Chard, 2005). Current research now indicates a teacher's guidance and expert instruction is needed for some children. To expand on this notion, Pikulski and Chard developed a nine-step program to foster improvement of fluency. The program starts with graphophonic foundations necessary for fluency and works up to monitoring fluency development. The seven steps in between include expert instruction in oral language skills, increasing vocabulary, high-frequency words, word parts and spelling patterns, practice and modeling in decoding strategies, using appropriate texts, and using repeated and wide reading (Pikulski and Chard, 2005).

Repeated reading, also known as deep reading, consists of having a child read the same text repeatedly until he/she attains a certain level of fluency (Rasinski, 2012). The more the reader reads the text, the more automatic and accurate he/she becomes with that text. The reader begins to recognize and remember the words and prosodic elements. This automatic word recognition and prosody practice is then likely to transfer to other text (Rasinski, 2012). Though this has been proven to be an effective strategy, Rasinski warns that one must be careful not to change the focus of reading for meaning to reading for speed when using repeated reading (Rasinski, 2012).

In wide reading, unlike repeated reading, a text is only read once. After the book is read, there is a discussion of the story and then a lesson on a specific reading strategy or skill. Wide reading expands the amount of different texts a child reads. As children read different books they come across different prosodic elements and a variety of words, allowing for practice with prosody, accuracy, and automaticity (Rasinski, 2012).

Reading programs may also be volunteer led, or peer led. In 2000 Elbaum, Vaughn, Hughes, and Moody conducted a meta-analysis literature review investigating the effectiveness of supplemental one-to-one interventions delivered by adults to elementary students with low reading skills. Elbaum et al. explain that one-to-one tutoring used as a supplement to classroom learning is an effective way of increasing student achievement. The researchers found that volunteers who had been trained provided significant assistance to children who were struggling with reading. The researchers noted that these programs should not replace, but should supplement the instruction by certified teachers. The volunteers need to be trained and the program needs to be well designed (Elbaum et al., 2000).

Peer reading programs in which children read to each other have also been found to be effective. One example of such a program is paired repeated reading. According to Koskinen and Blum (1986) paired repeated reading is a 10-15 minute follow-up activity of reading instruction where children are partnered with a peer from their reading group to read a short passage aloud. The children pick their own passages and read them silently before reading aloud to each other. They read this passage three times. After reading, the children evaluate their reading and their partner's reading (Koskinen & Blum, 1986).

Another popular reading program is readers' theater. Readers' theater improves student interest and confidence in reading, and improves fluency in terms of the number of words read correctly per minute (Corcoran & Davis, 2005). Readers' theater uses repeated reading while giving children motivation to read. Readers' theater is made up of a multitude of elements including independent practice, guidance, and modeling while rehearsing the chosen passage including plays, poems, or speeches. Children are split into groups. When ready, as a group,

children perform for the other groups of children. The children are not required to memorize or act out the reading, and sets, props, and costumes are not required. The focus is on appropriate fluency (Corcoran & Davis, 2005).

Reading programs need to be engaging and motivating to be most effective. In, "Teaching For Literacy Engagement," Guthrie (2004) describes reading engagement as "Reading that consists of motivational dispositions, cognitive strategies, conceptual understanding, and social discourse." In order to make reading programs engaging, Guthrie suggests letting the children have a say by letting them choose their reading. Guthrie also suggests using hands-on activities, interesting and diverse reading material, and organizing collaborative learning (Guthrie, 2004).

Therapy dog reading programs can also be quite motivating. An after school supplemental therapy dog reading program is considered Animal-Assisted Therapy (AAT). In the 2003 "Standards of Practice for Animal-Assisted Activities and Therapy," the Delta Society, now known as Pet Partners, a nonprofit organization for therapy, services, and companion animals, defines AAT as, "A goal-directed intervention in which an animal that meets specific criteria is an integral part of the treatment process." The visits are carried out by health care or human service professionals with training in the area of intervention. Additionally, the Delta Society explains AAT is intended to foster improvement in human functioning including the areas of social, cognitive, and physical functioning. Data is obtained during these visits (Delta Society, 2003). Liz Aurbach, Therapy Dog Program Director of Canine Helpers Allow More Possibilities (CHAMP) Assistance Dogs, Inc. further explains in AAT the therapy dog is like a tool to help the child be more relaxed, helping to achieve their goal. The therapy dog makes the

person or child want to work on their goal (Aurbach, 2014). According to Intermountain Therapy Animals (ITA) a therapy animal is an animal that has the necessary skills and aptitude to provide therapy with the direct instruction of their handler.

There are several different therapy animal programs across the country, many of which include reading programs. Following is a brief description of a few of these programs. All of these programs have similar missions of improving children's literacy skills and reading confidence through the use of certified therapy animals. All of the programs are free and have teams that visit facilities such as schools, libraries, hospitals, and more.

Intermountain Therapy Animals (ITA), based in Utah, was founded in 1993. ITA was one of the first animal therapy programs to have a therapy dog reading program. ITA has several Reading Education Assistance Dogs (READ) teams across the United States and several other countries. This program was developed in 1999. The mission of READ is to "Improve the literacy skills of children through the assistance of registered therapy teams as literacy mentors" (Intermountain Therapy Animals, 1999-2014). READ uses registered therapy dogs and trained handlers. Therapy dogs and their handlers visit schools, libraries, before-and after-school programs, youth detention facilities, and health care facilities. Children spend approximately half an hour with the therapy dog, including taking time to get acquainted with the therapy dog, reading time, and a few minutes for tricks and treats with the therapy dog after reading. As children meet their goals set with the READ team, they receive a new book "pawtographed" by the therapy dog.

Sit Stay Read, a therapy dog reading program based in Chicago Illinois, was founded in 2003 to bring therapy dog teams to inner-city community programs and Chicago Public Schools.

Sit Stay Read's mission is to "Improve literacy skills and foster a love of learning in at-risk children" (SitStayRead, 2013). This program is for children in first through fourth grade, and is year-round. Sit Stay Read's dog visits consist of creative story writing and small-group fluency activities. Children who participate in this program are rewarded with a celebration party and summer reading and writing material at the end of the year.

Reading with Rover is a therapy dog reading program in Washington, and is an affiliate of READ. They are a nonprofit organization. Reading with Rover has a mission to "Inspire children to discover the joy of reading while developing literacy skills and confidence in a safe environment using Reading with Rover Dogs" (Reading with Rover, 2001).

CHAMP (Canine Helpers Allow More Possibilities) in St. Louis, Missouri is a nonprofit organization with three primary programs. These include the Service Dog program, the Education program, and the Therapy Dog program. The Service Dog program is a free program that places highly skilled service dogs with people who have physical disabilities. The Education program provides information to schools and community groups about service dogs, disability awareness, and safe interactions with canines. The Therapy Dog program consists of animal assisted therapy and social visits, as well as canine listeners for young readers. This program may occur at a variety of settings including hospitals and hospices, nursing homes, homeless centers, day cares, schools, and libraries. The dog must pass temperament, health, and obedience tests to be accepted into the Therapy Dog program. Together, the dog and handler must graduate from a four-month course learning and practicing how to interact with the public. The CHAMP Reading Program uses Therapy Dogs to promote literacy: "dogs listen to children

read and provide a tangible topic that sparks talking and writing" (CHAMP, 1998-2014). This Therapy Dog Reading Program was used in the current study.

Therapy dog reading programs can be set up in a variety of ways. For instance, one could incorporate the therapy dog program as part of a repeated reading program. Just as in readers' theatre, this technique gives the children a natural reason to want to reread the same story or passage and to improve their skills. For example, the students could pick a book to read, practice it during school all week, and then read on Friday afternoon to the therapy dog. Knowing they will read to the therapy dog on Friday gives them the motivation to read throughout the week. A therapy dog program can also be used as a supplement to a program designed for wide reading. Reading to the therapy dog one afternoon a week would provide the child with additional reading time with another book allowing for more exposure and practice.

Literature Review of Therapy Dog Reading Programs

A review of the research literature points to the effectiveness of AAT and therapy dog reading programs.

Using dogs as part of therapy has a long history. Boris Levinson, a child psychologist, was named the father of Animal Assisted Therapy (AAT). His work originated in the 1960s and 1970s when he used his dog as part of his therapy sessions. Research leads one to believe animals as part of therapy began before this time, but there are no definitive records. Dogs are used in therapy for several purposes. In AAT, therapy dogs and their handlers work with teachers and therapists to help children achieve an educational objective. Animal assisted therapy, such as a reading program, should be a supplemental program. The therapy dog is a non-judgmental supplement to an intervention (Friesen, 2009).

In their highly referenced 1983 article, “Social Interaction and Blood Pressure: Influence of Animal Companions” Friedmann, Katcher, Thomas, Lynch, and Messent, note that psychological evidence shows merely the presence of an animal can decrease anxiety, making a scene less threatening. Friedmann et al. designed their study to investigate the relationship of the presence of a pet on children’s blood pressure at rest and when reading aloud. The study was comprised of thirty-six children ranging in age from 9 to 16, with an average age of 12 years, 2 months (Friedmann et al., 1983).

The study took place at one of the researcher’s homes. An experimenter stayed with the children for the duration of the trial. Heart rate, and three different types of blood pressure levels, systolic (SBP) diastolic (DBP), and mean arterial (MAP), were obtained at 1 minute intervals for 10 minutes throughout the procedures. The children were told to rest for 2 minutes, and then they were instructed to read from a children’s poetry book for 2 minutes in two different conditions of random order. During one of the 2 minute sets, 1 of 3 friendly dogs was present. In the other of the 2 minutes there was not a dog. The children had a 2 minute break between the two conditions. The children were not able to touch or talk to the dog. Participants were told the study was measuring blood pressure in the home environment (Friedmann et al., 1983).

This design allowed the researchers to examine four different factors. The first factor was the condition. This included the presence and absence of a dog. The second factor was the activity. This included whether the child was at rest or reading aloud. The third factor was time. This included comparing the first and second minute of each individual activity. The final factor

was order. This included whether the dog was present in the first or second trial (Friedmann et al., 1983).

Friedmann et al. (1983) found children had a higher blood pressure and heart rate while reading than at rest. Their blood pressure and heart rate was lower when the dog was present whether they were reading or resting. The dog was also found to have a greater effect when it was present first. The results confirmed the hypothesis. The presence of the dog was associated with a lowered blood pressure and heart rate during reading and rest for children, thus reducing their anxiety (Friedmann et al., 1983).

Tony LaRussa's Animal Rescue Foundation (ARF) developed a program, "All Ears Reading Program," using AAT to promote improvement in children's reading skills as well as their relationships with and empathy for animals. In 2010, Smith and Meehan conducted a study using this program with the intent of documenting changes in reading fluency skills (Smith and Meehan 2010).

The study included 11 home-schooled children ranging in age from 6-12. The children went to the University of California Davis campus once a week for 10 weeks to meet with the "All Ears Reading Program" dogs and their handlers. The children read aloud to the dogs for approximately 15-20 minutes. Before reading, the children were able to interact with the dogs for a few minutes (Smith and Meehan 2010).

The researchers used the Oral Text Reading for Comprehension Test, an assessment developed by the California Reading and Literature Project conducted in 2001-2002. This test specifically looked at words per minute and errors per minute for reading fluency and accuracy. This test was used for baseline data and results. The baseline data average for words per minute

was 96. At the end of the 10 weeks the average increased to 121 words per minute. This increase in words per minute showed that reading fluency increased by 30%. The baseline data and results for reading accuracy were consistent with approximately two errors per minute. The researchers also interviewed the children to ascertain their thoughts on reading aloud to dogs once the study was complete. A few of the comments included, “Dogs don’t critique you; they just listen.”, “I feel relaxed when I am reading to a dog because I am having fun.”, and “The dogs help by not pushing me to do my work and by calming me.” (Smith and Meehan, 2010). This study suggests that including a therapy dog when children read aloud may promote a more positive reading environment (Smith and Meehan, 2010).

In their 2011 article, “Benefits of Reading Assistance Dogs” Lenihan, McCobb, Freeman, and Diurba suggest using a therapy dog as part of a reading program to improve motivation, self-esteem, individual instruction, and the amount of time children spend reading on their own. Their study was comprised of 18 children who were entering second grade. The children were split into two groups, either a non-dog control group or the R.E.A.D. program. The children in the control group were paired with and read aloud to a volunteer. Those in the R.E.A.D. program were paired with a therapy dog, and read aloud to that dog. They met for 30 minutes once a week for five weeks between June and August of 2010 (Lenihan et al., 2011).

The researchers used the Curriculum Based Measurement (CBM) to establish baseline data and to collect data throughout the study. Lenihan et al. explained they used the CBM for several reasons. This commonly-used assessment allowed the researchers to compare the scores of the children within the study. The CBM directly assesses academic skills, is relatively quick to administer, is sensitive to short term gains, and can be given multiple times in a short period of

time. This assessment required each participant to read three different passages containing at least 150 words at the second grade reading level. Each passage was read for one minute. During this minute the number of words read correctly per minute (WCPM) was calculated. The CBM score was derived from the median of each of these three passages (Lenihan et al., 2011).

The examiners also used the Elementary Reading Attitude Survey (ERAS) to assess reading attitude of the children. Reading attitude is important because children who struggle with reading often have poorer reading attitudes. The ERAS investigates a child's reading attitude in academic and recreational settings. The ERAS is made up of 20 questions, 10 geared toward reading in an academic setting, and 10 for a recreational reading setting. This survey uses a range of pictures of Garfield the cat. There are four pictures in the range ranging from very happy to very upset (Lenihan et al., 2011).

Baseline data of the CBM and the ERAS between the control and experimental groups did not have significant differences. During the study, 3 of the 9 children who were in the controlled non-dog group dropped out. None of the children in the R.E.A.D. program dropped out. Though not significantly different, those in the control group had a decrease in CBM scores. When the ERAS scores of the two groups were compared those in the control group also had a reduction with their ERAS scores, while over time, the scores of those in the dog group increased. The difference was not significant for the recreational questions on the ERAS, yet there was a significant reduction on the academic questions of the ERAS in the control group (Lenihan et al., 2011).

This study suggests that a reading program involving reading to therapy dogs may be beneficial for children who struggle with reading, and help to increase their reading attitude over

time. Lenihan et al. suggest that using the R.E.A.D. program may be a fun and creative way to prevent regression of reading ability in children during summer months (Lenihan et al., 2011).

The International Society for Anthrozoology (ISAZ), a nonprofit organization that was developed to support scientific and scholarly research in the area of human-animal interactions, held a conference on July 11-13, 2012 at the Murray Edwards College in Cambridge. In a presentation titled "Quantifying the Impact of Incorporating Therapy Dogs in an Afterschool Program: a Comparison of Net Change in Reading Fluency" Emmert and Gonzales worked to assess the value of specially trained therapy dog teams in an after school literacy program to support children who were below-level or were at-risk in reading. All participants had test scores at or between *far below basic* and *below basic* on the English Language Arts component of the California Standards Test. There were 60 children total, 30 in the experimental group and 30 in the control group. Eight of the children had Attention Deficit Hyperactivity Disorder (ADHD), and 22 of the students had an individualized education plan (IEP). All the children were in third or fourth grade. Data was collected for approximately three years, with new participants at the start of each term (Emmert and Gonzales, 2012).

Children read to the therapy dogs for approximately 15 minutes a week for 10 weeks. The control group did not read to a therapy dog. In both the experimental and control groups, participants were given an oral fluency test, assessing their ability to read accurately and with understanding. It was a one minute test at the start and end of each story (Emmert and Gonzales, 2012).

Emmert and Gonzales (2012) found that using therapy dog teams in after-school reading programs significantly improved reading fluency compared to traditional reading programs. On

average those reading to the dogs increased by 31.3 words per minute. Those in the control group averaged an increase of 9 words per minute. There was not carryover into other academic areas; however it was observed that many of the participants had a desire to practice reading, even without a dog. The researchers observed participants with ADHD had an increase in focus when petting the dog while reading. The researchers noted participants had an increase in self-esteem and confidence because reading to the therapy dogs gave them something to share with their friends, as reported by their educators (Emmert and Gonzales, 2012).

Intermountain Therapy Animals (ITA) conducted several pilot studies using their "Reading Education Assistance Dogs (READ)" program. The following study took place from March 2000 through June 2001. There were ten at-risk children, all reading below grade level, from the ages of 5 to 9, with three of the ten children having English as a second language. The children were paired with a therapy dog and handler to read to once a week. They met for 20 minutes once a week after school. The children in kindergarten and first grade were assessed with the Reading Roots Assessment tool from the Success For All Foundation, a nonprofit education reform organization. The children in second grade through sixth grade were assessed using the Success for All tool. All children significantly improved their scores. Teachers also noted an increase in self-confidence and esteem, found an increase in reading attitude, and a decrease in absences among other notable changes (Intermountain Therapy Animals, 2001).

Intermountain Therapy Animals also has a "Tales of Joy R.E.A.D. Program" that is part of their Reading Education Assistance Dogs. During 2010, the program's fourth year, 52 students between first and fifth grade were enrolled in the program. 16 of the students had disabilities. The children read to the therapy dogs and their handlers for 20-30 minutes once a

week, for 32 weeks. This design allowed for the children to have one-on-one reading intervention for a total of approximately 16 hours (Intermountain Therapy Animals, 2010).

Children were assessed with either the Developmental Reading Assessment (DRA) published by Pearson Education Inc., the Measure Academic Progress computerized assessment (NWEA MAP) published by the Northwest Evaluation Association, or the Accelerated Reader STAR Reading program computerized assessment published by Renaissance Learning. Teachers were given a TALES of JOY READ Teacher Survey, and parent comments were recorded. "The Tales of Joy R.E.A.D. Program" found that none of the children had a decline in their overall reading scores through the course of the study, rather they increased their reading scores. Teacher surveys and parent comments found that the children's desire to read increased. This program gives students a purpose to read, thus making reading meaningful (Intermountain Therapy Animals, 2010).

In, "Paws for Reading. An Innovative program helps kids read better" Robin Briggs Newlin (2003), a library media coordinator at the Alderman Elementary School in Wilmington, North Carolina, discusses the year long reading program she created that included using therapy dogs as "listening partners." Newlin used the Carolina Canines for Service, a nonprofit organization developed to provide specially trained dogs for people with disabilities (Newlin, 2003).

Though not an empirical study Newlin's program included 15 children in second grade. These children scored below grade level on fluency and reading tests. The children read to a therapy dog team once a week for 20 minutes. The dog handlers were trained by the school reading specialist. The children read age-appropriate books that had animal themes. Once a

month each child was given a new book that had been stamped with their reading partner's paw print. Upon completion of the book, therapy dog handlers would complete a checklist that was developed by the school's reading specialist. This checklist allowed progress to be tracked and difficult words to be noted. Accelerated Reader tests were used to measure reading comprehension. The reading specialist then analyzed the scores each month in order to analyze growth. Through the course of the program Newlin found most children improved their reading skills by at least two grade levels. Newlin also observed increased self-confidence in the children (Newlin, 2003).

The results from the above studies concerning the presence of therapy dogs in supplemental reading programs are consistent. The presence of therapy dogs decreased the stress and anxiety of children reading aloud (Friedmann et al., 1983). Smith and Meehan (2010), Lenihan et al. (2011), and Emmert and Gonzales (2012) all found that children's reading fluency scores increased when reading aloud in the presence of a therapy dog. The presence of a therapy dog allows for a nonjudgmental, calming environment resulting in greater enjoyment of reading. More positive reading attitude results in improved reading fluency.

Analysis of The Effectiveness of Therapy Dog Reading Programs on Children Who are Deaf or Hard of Hearing

Considering the above research demonstrating the effectiveness of therapy dog reading programs for children with typical hearing who struggle with reading, and the research about children who are deaf or hard of hearing who use cochlear implants and hearing aids as struggling readers, one would expect a therapy dog reading program would be equally as effective for those who are deaf or hard of hearing. The investigator was not able to find any

data involving children who are deaf or hard of hearing and therapy dog reading programs. Thus, the aim of this study is to investigate the effectiveness of a therapy dog reading program for children who are deaf or hard of hearing. With this, one would hypothesize that all participants will improve their reading fluency as well as their comprehension throughout the entire study due to the increased reading time; however one would expect a greater rate of increase when reading to the therapy dog.

Methods

CHAMP (Canine Helpers Allow More Possibilities), in St. Louis, MO, graciously agreed to participate in this study, allowing the researcher to create a pilot study analyzing the effectiveness of using therapy dogs as a supplemental reading program for children who are deaf or hard of hearing, who use cochlear implants and hearing aids. The analysis of the program focused on oral reading fluency and comprehension.

Participants. Three children who were deaf or hard of hearing ranging in age from 8-12 participated in this study. These children used cochlear implants and/or hearing aids. All three children attended the same school for the deaf focusing on teaching listening and spoken language. None of the participants had an allergy or fear of dogs. For confidentiality purposes, private information about the participants is not reported, and coding systems were used. Participants were randomly labeled as Participant A, Participant B, and Participant C.

Procedures. Before students were allowed to participate in the study, consent was obtained, and parents of the children filled out a prescreening form created by the investigator to ensure the participants did not have an allergy or fear of dogs. Oral reading fluency and comprehension were analyzed through an assessment used within the Accelerated Reader

Program (AR) published by Renaissance Learning, a running record, and a calculation of words read per minute while reading a story aloud. Reading attitude was also subjectively assessed through participant and teacher interviews**.**

The AR Program is a computerized reading program that assesses and tracks reading comprehension and related skills. After children read a book within the AR system, they take an online quiz. This quiz is comprised of 5-10 questions specifically for the book the child read. AR also has other quizzes, one of which can be used to assess vocabulary. This program gives instant feedback to children and teachers. Also within the program is the STAR Reading Enterprise assessment. This assessment provides a report that may be used for screening, progress monitoring, instructional planning, Core Progress learning, benchmarking for standards, and Student Growth Percentile Measures. The STAR Reading Enterprise assessment measures 46 different reading skill areas within 11 domains such as fluency, phonics and word recognition, and key ideas and details to name a few. This assessment takes approximately 15 minutes. The level of difficulty changes based on the students responses (Renaissance Learning, 2014). This study used the STAR Reading Enterprise assessment. The participants completed this assessment on a computer in the school library when it was unoccupied. The principal investigator sat in to ensure the test was completed. This assessment reported five metrics on the score reports, however for the purpose of this study only three of these metrics were used. Data collected from this assessment for baseline data, mid-study data, and final data included a scaled score (SS), grade equivalency (GE), and estimated oral reading Fluency (Est. ORF).

The examiner interpreted all results according to the score definitions provided in the STAR Reading Software Manual:

- Scaled Score:
  The Scaled Score is the most fundamental score produced by STAR Reading tests. It ranges from 0–1400 and spans grades K–12. It is calculated based on the difficulty of the questions and the number of correct responses. Scaled Scores are useful for comparing student performance over time and across grades. In STAR Reading tests, all other norm-referenced scores are derived from the Scaled Score (Renaissance Learning, 2010, p. 60).
- Grade Equivalent:
  Grade Equivalent scores range from 0.0–12.9+. They represent how a student's test performance compares with that of other students nationally. For example, if a 5th-grade student has a GE of 7.6, his or her score is equal to that of a typical 7th grader after the sixth month of the school year. This score does not necessarily mean that the student is capable of reading 7th-grade material. It only indicates that his or her reading skills are well above average for his or her grade level (Renaissance Learning, 2010, p. 60).
- Estimated oral reading fluency (Est. ORF):
  Estimated Oral Reading Fluency is an estimate of a student's ability to read words quickly and accurately in order to comprehend text efficiently. Students with oral reading fluency demonstrate accurate decoding, automatic word recognition, and appropriate use of the rhythmic aspects of language (e.g., intonation, phrasing, pitch, and emphasis). Estimated ORF is reported in correct words per minute, and is based on the correlation between STAR Reading performance and a recent study that measured student oral reading using a popular assessment (Renaissance Learning, 2010, p. 60).

A running record is an informal assessment used to track and analyze a reader's errors. The examiner has a copy of the reading material to make notes, (if not allowed by copyright a separate sheet was used) using a set of symbols to denote which words are read correctly (WRC), as well as any errors made by the child, and their self-corrections (SC) (Gunning, 2013). Self-corrections were not counted as errors. Errors noted in this study included word substitutions (Sub) (replacing one word for another), additions (WAE) (adding words to the reading), No responses or omissions (NR) (deleting words from the reading), repetitions (R) (repeating a word), and word ending errors (WEE) (deleting plural or tense markers), as well as words told (T) to the student by the volunteer or handler, or words in which the children asked (A) for help.

An error was also noted when a student completely misread a sentence and was asked to “try that again” (TTA).

In a running record, the number of words read per minute is calculated to measure fluency. To calculate words read per minute, each participant is timed for one minute. During that minute words read incorrectly are noted. Then, the total number of words read within that minute is subtracted by the errors, giving a total of words read correctly per minute. The principal investigator administered this assessment during each session while the participant read.

Reading attitude was subjectively assessed through face-to-face participant and teacher interviews developed by the principal investigator. The interviews were included in this study to determine if reading attitude improved. The principal investigator conducted each interview. See Appendix B.

This study was set up as a single subject and within subject design. The participants were compared to themselves over time, and rate of growth was analyzed. Due to the many variables within the chosen population, the children acted as their own control group, meaning they were compared only to themselves, not each other or other populations. The children participated for 20 minutes per week for 12 weeks, for a total of 12 reading sessions.

The study was split into two 6-week sessions. During the first half of the study, the children read to a volunteer for approximately 20 minutes per week for 6 weeks. The volunteer was a 29 year old female with teacher certification in elementary education, grades 1-6. She had 6 years of teaching experience and was currently training to be a teacher of the deaf. The children read to the same volunteer each week. During the second half of the study, the children

read to a CHAMP therapy dog and its handler for approximately 20 minutes per week for 6 weeks. The handler was a 72 year old professor emeritus who retired from the Department of Communication Disorders and Deaf Education at Fontbonne University. She had certification in speech-language pathology and learning disabilities. The therapy dog had certification through CHAMP. In order to receive this certification, the dog passed a temperament and basic obedience test, and graduated from a 16-week course with his handler that consisted of learning how to behave with the public, and move in public places. Both the handler and therapy dog were certified as a therapy dog team by the CHAMP organization. The handler and therapy dog started volunteering for reading programs in 2013, and have been working with children who are deaf or hard of hearing for over a year. The participants read to the same therapy dog team each week.

The study took place on Tuesday evenings after school from 4:15 to 5:15. The study started on January 21, 2014, continued each week, and ended on April 15, 2014. The first half of the study was from January 21 through February 25. The second half of the study was from March 4 to April 15. There was one makeup day on Thursday, February 6 due to a snow day on the scheduled day of the study. Participants were not scheduled on March 11 due to their Spring Break.

Each 20 minute session took place in the same room, a quiet room within the school the participants attended. The room did not have a window, and the door was kept closed. Those in the room included the participant who was reading, the volunteer or therapy dog team, and the principal investigator. During the first half of the study, when reading to the volunteer, the participant sat on the floor next to the volunteer. The principal investigator sat behind them to

reduce distraction. The child held the book and turned the pages. When needed, the volunteer would assist the participant with the pronunciation and meaning of words. During the second half of the study, when the participant was reading to the therapy dog, the participant sat on the floor next to the therapy dog team. The therapy dog laid in close proximity to the participant with constant contact such as putting his head on their lap. The participants were also able to pet the therapy dog as they read. The handler sat next to the therapy dog and participant. The principal investigator sat behind them to reduce distraction. The child held the book and turned the pages. When needed, the handler would assist the participant with the pronunciation and meaning of words.

During the first half of the study, prior to reading at each 20 minute session, the participant spoke with the volunteer to warm up, and at the end of the session the volunteer thanked the participant for reading. During the second half of the study, prior to reading at each 20 minute session, the participant spoke with the handler and petted the therapy dog to warm up, and at the end the therapy dog gave the participant a "high five." The participants were allowed to pick out their own books at their independent reading level, as measured by the AR program, to read to the volunteer and therapy dog.

The children were given a baseline assessment and interviewed at the beginning of the study. They were then reassessed and interviewed at the end of the first 6 weeks, and at the end of the last six weeks. A running record as well as words read per minute was completed during each visit for each child. Each participant's teacher was interviewed before the study, in-between the two 6 week sessions, and at the end of the study.

Results

Due to the low number of participants, inferential statistics must be interpreted with caution. It should also be noted that the second half of the study included an extra week due to a break for spring break, but there were still a total of six sessions. Participant A was absent from a total of two sessions: one session reading to the volunteer, and one session reading to the therapy dog. Participant B was absent from a total of four sessions: two sessions reading to the volunteer, and two sessions reading to the therapy dog. Participant C was absent from a total of one session: one session reading to the volunteer.

STAR Reading Enterprise Assessment. Upon analysis of descriptive results for the scaled score, it was found that the mean performance among all participants increased throughout the study. Average performance of scaled scores for all participants increased by 16.33 between baseline and mid-study assessment, and by 47.33 between mid-study and final assessment, giving an overall increase of 63.67 between baseline and final assessment. Please refer to Table 1.

Given the small sample size of the study (N = 3), inferential statistics were conducted for exploratory purposes only. There were no significant differences between the mean baseline and mid-study scaled scores, indicating that reading to a volunteer did not have a measureable effect on reading as measured by the STAR assessment. However, there was a marginally significant difference between mid-study and final scaled scores, $t(2) = 3.50$, $p = .07$. The intervention of reading to a therapy dog appeared to have a positive effect on reading, as measured by the STAR assessment. Again, it should be noted that these statistical analyses should be interpreted with caution, as there were only three participants in the study. Please refer to figure 1 and figure 2.

When looking at scaled score results for individual participants, Participant A increased between baseline and mid-study assessment by 45, and by 42 between the mid-study and final assessment. Thus, Participant A's scaled score improved through the whole study, increasing by 3 more during the six week session reading to the volunteer. Please refer to Table 2.

Participant B decreased between baseline and mid-study assessment by 4, and increased by 27 between mid-study and final assessment. Though Participant B had a greater increase in scaled score while reading to the therapy dog, Participant B decreased between baseline and final assessment by 23. Please refer to Table 3.

Participant C's scaled score increased by 8 between baseline and mid-study assessment, and by 73 between mid-study and final assessment. This demonstrates that Participant C's scaled score improved during the duration of the study; however there was a greater increase when reading to the therapy dog, by 65. Please refer to Table 4.

For grade equivalency, inferential statistics were not conducted; rather results were analyzed using descriptive statistics. Mean performance for grade equivalency increased during the duration of the whole study. Mean performance for this metric increased by .1 grade equivalencies between baseline and mid-study assessment, and by.4 grade equivalencies between mid-study and final assessment. This is a .5 grade equivalency increase through the duration of the study with a .3 greater grade equivalency increase when reading to the therapy dog. Please refer to Table 1.

When analyzing individual participants, Participant A had an overall increase in grade equivalency throughout the whole study. During both conditions, Participant A increased by .2 grade equivalencies demonstrating equal rates of growth. Please refer to Table 2.

Participant B's grade equivalency stayed the same between baseline and mid-study assessment, whereas between mid-study and final assessment, Participant B's grade equivalency increased by .4 grade equivalencies. Thus Participant B increased more by .4 grade equivalencies when reading to the therapy dog. Please refer to Table 3.

Participant C's grade equivalency increased by .1 between baseline and mid-study assessment, and by .6 between mid-study and final assessment. This demonstrates Participant C's grade equivalency improved throughout the duration of the study, with a greater increase by .5 grade equivalencies while reading to the therapy dog. Please refer to Table 4

Descriptive statistics were also analyzed for estimated oral reading fluency. Mean performance on this metric for all participants increased throughout the entire study. Mean performance of estimated oral reading fluency increased by 4 words between baseline and mid-study assessment, and by 11.34 words between mid-study and final assessment. This demonstrates a greater increase of words when reading to the therapy dog by 7.34. Please refer to Table 1.

When looking at individual participants' performances Participant A increased throughout the entire study. Participant A increased by 11 words when reading to the volunteer as well as when reading to the therapy dog, thus Participant A's estimated oral reading fluency increased equally in both conditions. Please refer to Table 2.

Participant B's estimated oral reading fluency increased through the course of the study; however it decreased by one word between baseline and mid-study assessment. Participant B's estimated oral reading fluency then increased by 6 words between mid-study and final assessment. Please refer to Table 3.

Participant C's estimated oral reading fluency increased overall during the entire study. Between baseline and mid-study assessment, Participant C's estimated oral reading fluency increased by two words, and between mid-study and final assessment by 17 words. Participant C demonstrated a greater increase in estimated oral reading fluency while reading to the therapy dog by 15 words. Please refer to Table 4.

Running Record. Mean performance for all participants for words read correctly out of 100 was calculated. When reading to the volunteer, all participants as an average read 88.93 words correctly out of 100. When reading to the therapy dog, as an average they read 91.29 words correctly out of 100. This is an average increase of 2.36 words read correctly out of 100 when reading to the therapy dog.

As with the scaled scores, for exploratory purposes paired *t*-tests were conducted comparing mean number for all participants in the volunteer condition to the mean in the therapy dog condition for words read correctly out of 100 on the running record. There was not a significant difference for this measurement. Please refer to Figure 3 and Figure 4.

When analyzing the differences between reading to the volunteer versus reading to the therapy dog for individual participants on words read correctly out of 100, Participant A's average number of words read correctly out of 100 increased by five words when reading to the therapy dog. Please refer to Table 5 to see data from each session, as well as specific errors.

Participant B's average number of words read correctly out of 100 increased by one word when reading to the therapy dog. Please refer to Table 6 to see data from each session, as well as specific errors.

Participant C's average number of words read correctly out of 100 increased by 1.06 words when reading to the therapy dog. Please refer to Table 7 to see data from each session, as well as specific errors.

Words Read Correct per Minute. Upon analyzing mean performance for all participants for words read per minute, on average when reading to the volunteer participants read 68.98 words per minute. When reading to the therapy dog they read an average of 60.62 words per minute**.** This is an average of 8.36 words less per minute when reading to the therapy dog. Mean performance for all participants for errors per minute was analyzed as well. When reading to the volunteer, the mean performance of errors per minute was 8.95, and when reading to the therapy dog the mean performance of errors per minute was 5.11. This demonstrates an average of 3.84 errors less per minute when reading to the therapy dog. By using the words per minute and errors per minute, words correct per minute was calculated. The average number words read correctly per minute for all participants while reading to the volunteer was 60.03, and when reading to the therapy dog this average was 55.52. Thus, this demonstrates an average of 4.51 fewer words read correctly per minute while reading to the therapy dog.

For exploratory purposes, paired *t*-tests were conducted comparing mean number of words read per minute for all participants in the volunteer condition to the mean in the therapy dog condition. There was a marginally significant difference between reading to the volunteer and reading to therapy dog on the words read per minute, $t(2) = 4.063$, $p = .07$, indicating the participants read fewer words per minute while reading to the therapy dog. This measurement was further investigated, analyzing errors per minute, deriving a words read correct per minute score. Again, inferential statistics were conducted on these metrics for exploratory purposes

only. There were no significant differences between the mean words read correctly per minute while reading to the volunteer and while reading to the therapy dog. However, there was a marginally significant difference for the mean errors per minute between reading to the volunteer and reading to the therapy dog, ($t(2) = 4.06$, $p = .06$). This indicates children made fewer errors per minute when reading to the therapy dog than when reading to the volunteer. Please refer to figure 5-figure 10.

When analyzing the results of individual participants on the words read correct per minute, Participant A read an average of 4.4 fewer words per minute, and an average 1.6 fewer words correct per minute when reading to the therapy dog; however, Participant A also had an average of 2.8 fewer errors when reading to the therapy dog. Please refer to Table 8.

Participant B read an average of 12.75 fewer words per minute and an average of 9.75 fewer words correct per minute when reading to the therapy dog; however, Participant B also had an average of 3 fewer errors per minute when reading to the therapy dog. Please refer to Table 9.

Participant C read an average of 7.93 fewer words per minute and an average of 2.2 fewer words correct per minute when reading to the therapy dog; however, Participant C also had an average of 5.73 fewer errors per minute when reading to the therapy dog. Please refer to Table 10.

Interviews. Data from the participant and teacher interview was not reported. Data from the interviews was not measureable, nor did it have valuable information in either a positive or negative manner.

Discussion

Previous research suggests reading to a therapy dog may improve fluency and reading comprehension for children with typical hearing, while also decreasing anxiety levels. The purpose of this pilot study was to analyze the effectiveness of using therapy dogs as a supplemental reading program for children who are deaf or hard of hearing, who use cochlear implants and hearing aids. This study focused on the oral reading fluency, and thus comprehension as well. It was hypothesized that all participants would improve their reading fluency as well as their comprehension throughout the entire study due to the increased reading time; however one would expect a greater rate of increase when reading to the therapy dog.

Comprehension was measured through the use of the STAR Reading enterprise assessment. Results from the participants as a whole on the scaled score revealed differences that were not significant while reading to the volunteer. Further, the results did indicate differences that were marginally significant while reading to the therapy dog.

All participants demonstrated an increase on all metrics on this assessment when reading to the therapy dog. Participant A and Participant C demonstrated an increase in all measures when reading to the volunteer as well. With further analysis one could hypothesize the score improvements by all participants on the STAR assessment while reading to the therapy dog could be due to the motivating reading practice and safe reading environment provided by the therapy dog in addition to their in-school instruction. However, mean performance for all participants as a whole on this assessment did not agree with the hypothesis because one of the participants did not increase on all metrics during the duration of the study, and not all participants had a greater increase on all metrics when reading to the therapy dog. This could be

due to the participant(s) not performing to their fullest potential on the test during each assessment.

Though Participant A demonstrated an increased scaled score during both conditions, Participant A demonstrated a greater increase when reading to the volunteer than when reading to the therapy dog. Participant A showed an equal increase in grade level equivalency and estimated oral reading fluency for each condition. Participant A's individual performance on the STAR Reading Enterprise assessment did not follow the hypothesis. Though Participant A had an overall increase as expected, he/she did not have a greater increase on this assessment while reading to the therapy dog.

Interestingly, Participant B demonstrated a decreased scaled score and estimated oral reading fluency, and an unchanged grade equivalency after reading to the volunteer as compared to baseline data. However, Participant B showed an increase in these areas when reading to the therapy dog as compared to mid-study data. Participant B's individual performance did not agree with the hypothesis. Although Participant B had a greater increase on all metrics on this assessment when reading to the therapy dog, he/she did not have an overall increase throughout the duration of the study. One could hypothesize that the behavior demonstrated by Participant B may substantiate previous research. Reading to an adult may seem to be a judgmental environment, even when the adult is nonjudgmental. Whereas the therapy dog is perceived as nonjudgmental as he lays his head on the participant's lap and listens to the reading. If the current study was continued and the condition was switched back to the volunteer, one would expect the rate of improvement to decrease.

Participant C demonstrated a greater increase in scaled score, grade equivalency, and estimated oral reading fluency after reading to the volunteer and therapy dog as compared to baseline data. However, Participant C had a greater increase when reading to the therapy dog than when reading to the volunteer. Participant C's individual performance agrees with the hypothesis. Participant C had an overall increase on all metrics on this assessment throughout the whole study, and had a greater increase on these metrics when reading to the therapy dog.

Oral reading fluency was monitored with the use of a running record each session, as well as calculating words read correctly per minute each session. There was not a baseline assessment with either of these measures because these were recorded each session.

When analyzing the running record, though not significant, mean performance for all participants as a whole demonstrated an average increase on words read correctly out of 100 after the six-week session of reading to the therapy dog, as compared to after the six-week session of reading to the volunteer. This was true for each individual participant as well. Specific errors were noted with the running record. No patterns were found and thus specific errors were reported on the tables but were not discussed.

All participants demonstrated a decrease in reading rate as measured by words read per minute. All participants read slower when reading to the therapy dog. With this slower rate, the mean performance of the participants had a decrease in the amount of errors per minute that was marginally significant. This suggests reading at a faster rate is not always better. As these children slowed down they read with fewer errors. There could be several reasons as to why the children read with a slower rate and fewer errors when reading to the therapy dog. One could hypothesize the children slowed down and read more clearly so the dog could better understand

them. One could also hypothesize the children had less stress and anxiety, and thus read slower at a more comfortable rate. One may extend this hypothesis to say the therapy dog is nonjudgmental and is not expecting a certain level of reading or reading speed from them, thus allowing the children to read naturally. Further analyses and research would need to be conducted to determine the reason as to why the children read with a slower reading rate and fewer errors.

The interviews used within this study to assess change in participant reading attitude did not produce measureable or anecdotal information in neither a positive nor a negative manner. The researcher felt the responses by the participants were not reliable because the questions had to be asked in several different ways, and in some cases options had to be given, changing the question from an open-ended question to a close ended question. Participants may have also been trying to "please" the examiner by giving expected desired answers.

Limitations. This study was a pilot study. A very small number of participants were studied over a short period of time. Though the study was set up over a period of 12 weeks; six sessions with a volunteer followed by six sessions with a therapy dog, the actual number of sessions for each child was less due to participant absence. Using a larger number of participants with a longer duration of study may yield more consistent and significant results. This study approached significance ($p = .05$) on several measures, thus more power (more participants) would likely yield more confidence in results.

Another limitation of this study is that it does not take into account reading instruction and activities during the school day. Because this study took place after school instead of within

the school day, the participants had more exposure to reading. The results may be a combination of what is being taught during the school day, as well as the study.

A third limitation was the design of the study. The experimenter was in the room collecting data while the participants read to the volunteer and therapy dog. This may be a limitation because the participants know data is being collected. It may affect their performance. One effect of reading to a volunteer or therapy dog is to decrease the feeling of judgment on the child. Observing and taking notes while the child reads may negate the supposed effect. Perhaps future research could benefit from using a room with a two-way mirror so the experimenter can see the participant without themselves being seen. This may allow for more accurate results and a better representation of the program.

Implications for Future Research. Research could be furthered on this study by implementing an ABA or ABAB design rather than the AB design of the current study. The A would be reading to the volunteer and the B would be reading to the therapy dog. By implementing an ABA or ABAB design, one could more directly study the effects of a therapy dog reading program. By using an ABA design, participants would be introduced to a volunteer for some time, then they would read to a therapy dog just as in the current study, but they would then return back to reading to the volunteer again at the end. One would expect an overall increase in reading fluency and comprehension regardless of the condition due to the extra reading practice provided by the supplemental reading program. However, with an in-depth analysis, one would expect an increase in scores during the first third of the study (A), an even bigger increase during B, and then if the therapy dog is more effective one would expect this rate of growth to drop as the participants complete the last third of the study (A).

Research could also be extended to looking at a repeated reading method. Instead of having the participants pick a book the day of the study to read, participants could pick a book on Monday, practice reading it all week, and then read it to the therapy dog on Fridays. This would be similar to readers' theatre. Rereading the same book for a week to improve fluency becomes more motivating when rereading for a reason. Reading the same book repeatedly for a week in preparation for reading to the therapy dog is motivating and gives the children a reason to want to reread and practice.

Another extension to investigating a supplemental reading program incorporating therapy dogs could be a summer school reading program to decrease regression in reading during the long summer break. It is well researched that many children regress during the summer break. By offering a reading program over the summer that is motivating and fun for the children, they may be more apt to join and attend the program.

Conclusion

Upon completion of a literature review of reading fluency, reading fluency programs, and a literature review of therapy dog reading programs, an analysis of the effectiveness of therapy dog reading programs for children who were deaf or hard of hearing, who use cochlear implants and hearing aids was implemented. For each participant, there was an increase in reading skills, including comprehension and oral reading fluency, as measured by the STAR Reading Enterprise assessment and a running record when reading to the therapy dog. Each participant demonstrated a decrease in the words read per minute, however, the number of errors per minute also decreased. The information in this study may help teachers and others who work with

children who are deaf or hard of hearing to find a motivating reading intervention program to supplement class reading.

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Table 1

STAR Assessment Mean Performance for All Participants

	SS	GE	Est. ORF
Baseline	263.67	2.4	63.33
Mid-Study	280	2.5	67.33
Final	327.33	2.9	78.67

Note. SS = scaled score, GE =grade equivalency, Est. ORF = estimated oral reading fluency.

Table 2

STAR Assessment Scores for Participant A

	SS	GE	Est. ORF
Baseline	100	1.4	29
Mid-Study	145	1.6	40
Final	187	1.8	51

Note. SS = scaled score, GE =grade equivalency, Est. ORF = estimated oral reading fluency.

Table 3

STAR Assessment Scores for Participant B

	SS	GE	Est. ORF
Baseline	332	2.7	78
Mid-Study	328	2.7	77
Final	355	3.1	83

Note. SS = scaled score, GE =grade equivalency, Est. ORF = estimated oral reading fluency.

Table 4

STAR Assessment Scores for Participant C

	SS	GE	Est. ORF
Baseline	359	3.1	83
Mid-Study	367	3.2	85
Final	440	3.8	102

Note. SS = scaled score, GE =grade equivalency, Est. ORF = estimated oral reading fluency.

Table 5

Running Record of Participant A

Condition	Date	WRC	SC	Sub	NR	T	A	TTA	R	WEE	WAE
	1/21/2014	92	3	2	0	1	2	0	0	3	0
Volunteer	1/28/2014	88	1	4	0	0	2	0	0	6	2
	2/6/2014	81	0	7	2	0	2	0	1	7	0
	2/11/2014	86	0	10	0	0	2		0	2	2
	2/18/2014 (SMD)	89	3	6	0	0	2	0	1	2	0
	2/25/2014 (Abs)										
	Average	87.2	1.4	5.8	0.4	0.2	2	0	0.4	4	0.8
Therapy dog	3/4/2014	87	1	6	0	6	0	0	0	1	2
	3/11/2014 (SB)										
	3/18/2014	90	2	0	0	8	2	0	0	0	0
	3/25/2014	95	2	2	0	2	1	0	0	0	0
	4/1/2014	98	2	1	0	1	0	0	0	0	0
	4/8/2014 (Abs)										
	4/15	91	0	0	0	8	1	0	0	0	0
	Average	92.2	1.4	1.8	0	5	0.8	0	0	0.2	0.4

Note. WRC= words read correctly, SC = self-corrections not counted as errors, Sub = substitutions, NR = no response, T = told, A = ask, TTA = try that again, R = repetition, WEE = word ending errors, WAE = word addition errors.

Table 6

Running Record of Participant B

Condition	Date	WRC	SC	Sub	NR	T	A	TTA	R	WEE	WAE
Volunteer	1/21/2014	97	2	0	1	0	0	0	0	2	1
	1/28/2014 (Abs)										
	2/6/2014 (SMD)	91	0	4	1	0	0	0	0	4	0
	2/11/2014	90	2	4	1	0	0	0	0	5	0
	2/18/2014	90	1	3	5	0	0	0	0	2	2
	2/25/2014 (Abs)										
	Average	92	1.25	2.75	2	0	0	0	0	3.25	0.75
Therapy Dog	3/4/2014	86	4	4	2	4	0	0	1	3	0
	3/11/2014 (SB)										
	3/18/2014 (Abs)										
	3/25/2014	94	2	2	0	2	0	0	0	2	0
	4/1/2014 (Abs)										
	4/8/2014	95	4	1	1	2	0	0	0	1	0
	4/15 end	97	1	1	0	0	0	1	0	1	0
	Average	93	2.75	2	0.75	2	0	0.25	0.25	1.75	0

Note. WRC= words read correctly, SC = self-corrections not counted as errors, Sub = substitutions, NR = no response, T = told, A = ask, TTA = try that again, R = repetition, WEE = word ending errors, WAE = word addition errors.

Table 7

Running Record of Participant C

Condition	Date	WRC	SC	Sub	NR	T	A	TTA	R	WEE	WAE
Volunteer	1/21/2014 (Abs)										
	1/28/2014	94	1	2	0	0	0	0	0	4	2
	2/6/2014 (SMD)	89	0	7	0	1	0	0	0	3	0
	2/11/2014	84	1	9	0	0	0	0	0	7	3
	2/18/2014	85	0	6	1	0	1	0	0	7	0
	2/25/2014	86	2	8	3	0	1	0	0	2	0
	Average	87.6	0.8	6.4	0.8	0.2	0.4	0	0	4.6	1
Therapy Dog	3/4/2014	85	1	7	2	2	0	0	0	4	0
	3/11/2014 (SB)										
	3/18/2014	88	3	6	3	1	0	1	0	1	1
	3/25/2014	88	1	2	1	2	0	0	0	7	1
	4/1/2014	91	1	0	3	0	1	0	0	5	0
	4/8/2014	91	4	2	1	3	0	0	0	3	0
	4/15/2014	89	2	4	0	1	0	0	0	6	0
	Average	88.67	2	3.5	1.67	1.5	0.17	0.17	0	4.33	0.33

Note. WRC= words read correctly, SC = self-corrections not counted as errors, Sub = substitutions, NR = no response, T = told, A = ask, TTA = try that again, R = repetition, WEE = word ending errors, WAE = word addition errors.

Table 8

Words Read Correct per Minute for Participant A

Condition	Date	WPM	EPM	WCPM
Volunteer	1/21/2014	39	4	35
	1/28/2014	45	12	33
	2/6/2014	35	4	31
	2/11/2014	34	7	27
	2/18/2014 (SMD)	40	4	36
	2/25/2014 (Abs)			
	Average	38.6	6.2	32.4
Therapy Dog	3/4/2014	21	5	16
	3/11/2014 (SB)			
	3/18/2014	29	4	25
	3/25/2014	35	4	31
	4/1/2014	49	0	49
	4/8/2014 (Abs)			
	4/15	37	4	33
	Average	34.2	3.4	30.8

Note. WPM = words per minute, EPM = errors per minute, WCPM = words correct per minute.

Table 9

Words Read Correct per Minute for Participant B

Condition	Date	WPM	EPM	WCPM
Volunteer	1/21/2014	78	2	76
	1/28/2014 (Abs)			
	2/6/2014 (SMD)	73	8	65
	2/11/2014	85	11	74
	2/18/2014	71	12	59
	2/25/2014 (Abs)			
	Average	76.75	8.25	68.5
Therapy Dog	3/4/2014	49	8	41
	3/11/2014(SB)			
	3/18/2014 (Abs)			
	3/25/2014	69	4	65
	4/1/2014 (Abs)			
	4/8/2014	73	6	67
	4/15/2014	65	3	62
	Average	64	5.25	58.75

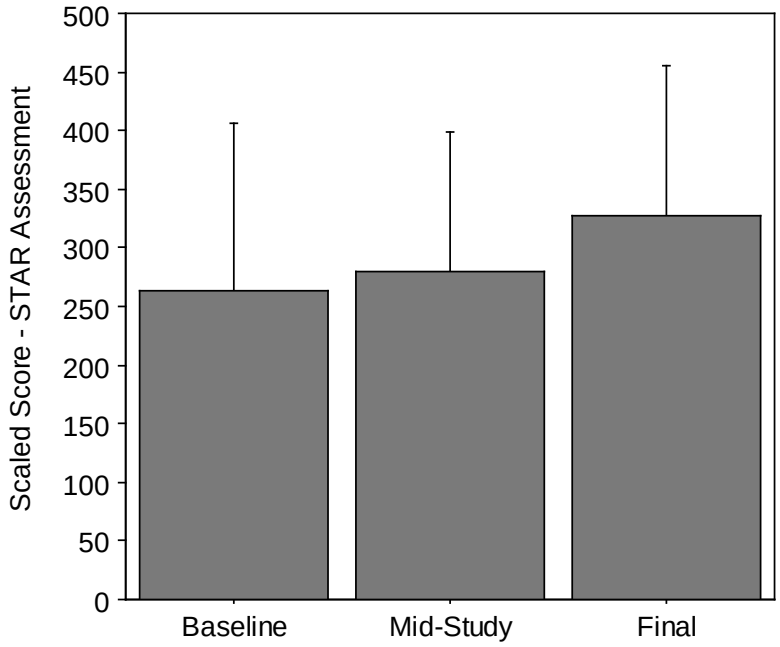
Note. WPM = words per minute, EPM = errors per minute, WCPM = words correct per minute.

Table 10

Words Read Correct per Minute for Participant C

Condition	Date	WPM	EPM	WCPM
Volunteer	1/21/2014 (Abs)			
	1/28/2014	92	6	86
	2/6/2014 (SMD)	98	15	83
	2/11/2014	86	8	78
	2/18/2014	101	21	80
	2/25/2014	81	12	69
	Average	91.6	12.4	79.2
Therapy Dog	3/4/2014	76	7	69
	3/11/2014 (SB)			
	3/18/2014	76	8	68
	3/25/2014	87	6	81
	4/1/2014	99	6	93
	4/8/2014	66	5	61
	4/15 end	98	8	90
	Average	83.666	6.666	77

Note. WPM = words per minute, EPM = errors per minute, WCPM = words correct per minute.



Paired t-test
Hypothesized Difference = 0

	Mean Diff.	DF	t-Value	P-Value
Baseline, Mid-Study	-16.333	2	-1.108	.3834
Baseline, Final	-63.667	2	-3.120	.0892
Mid-Study, Final	-47.333	2	-3.495	.0730

Figure 1. Mean scaled scores at baseline, mid-study, and final assessment.

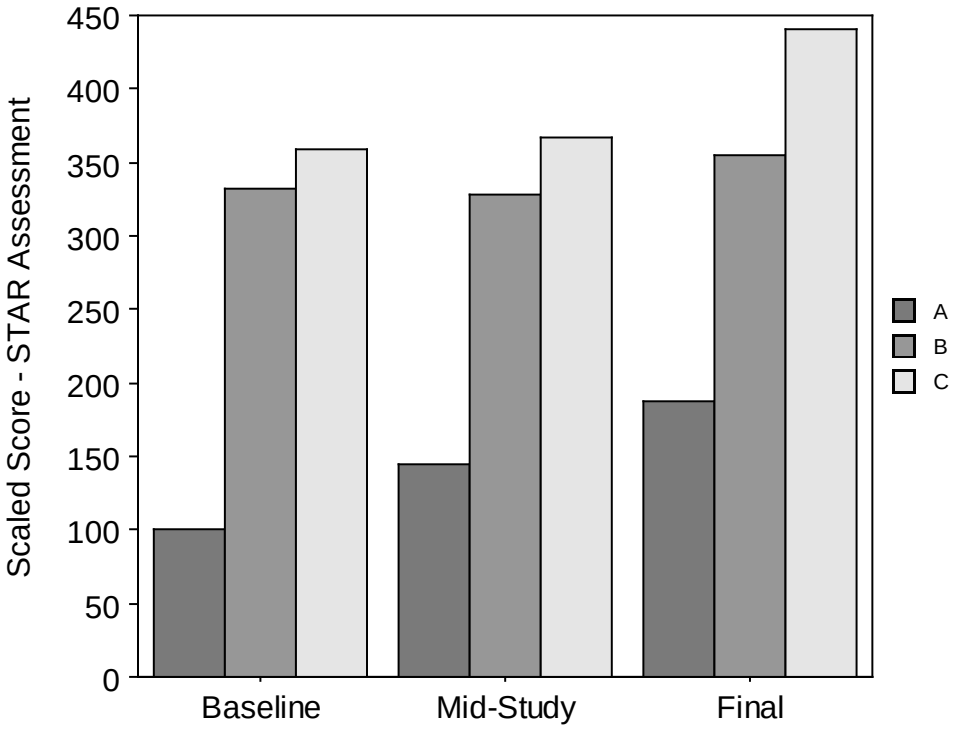
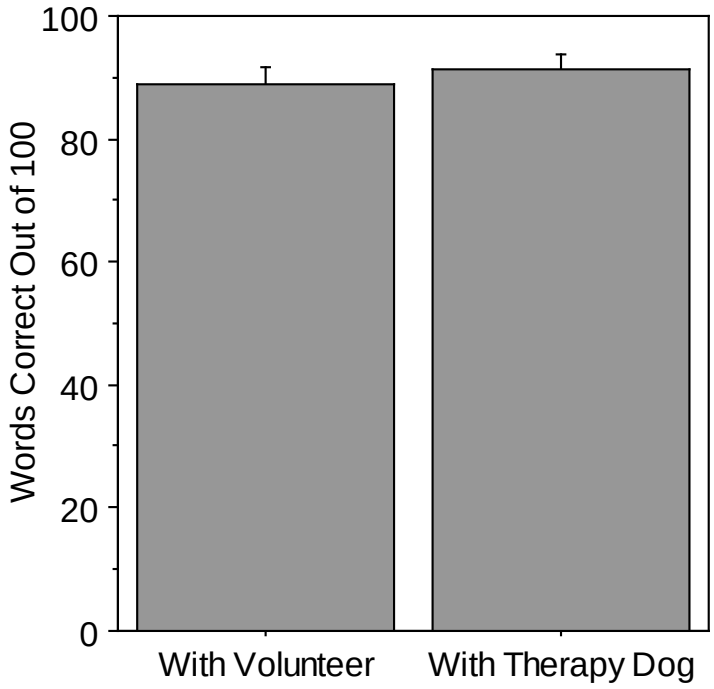


Figure 2. Individual scaled scores for baseline, mid-study, and final assessment. A, B, C = Participant A, Participant B, and Participant C.



Paired t-test
Hypothesized Difference = 0

	Mean Diff.	DF	t-Value	P-Value
With Volunteer, With Therapy Dog	-2.356	2	-1.781	.2168

Figure 3. Mean words read correct out of 100.

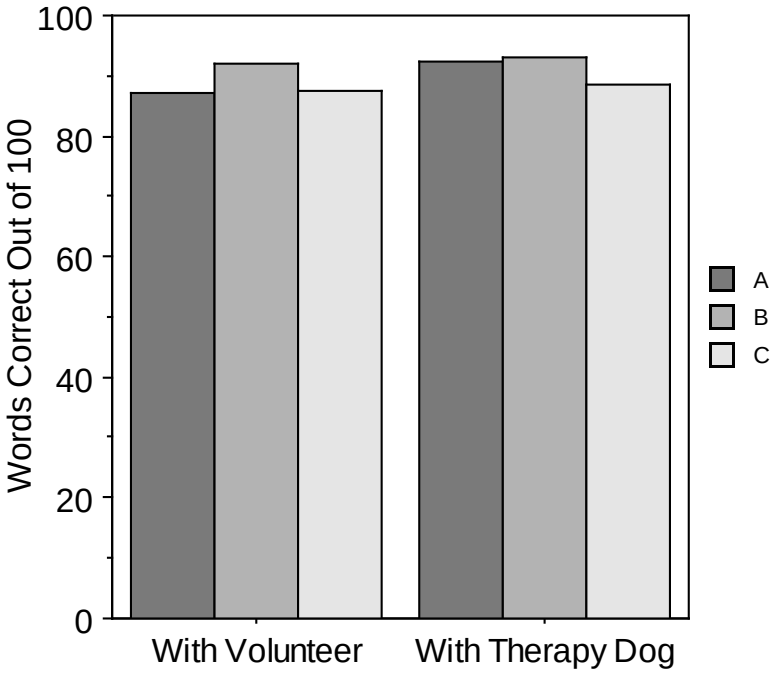
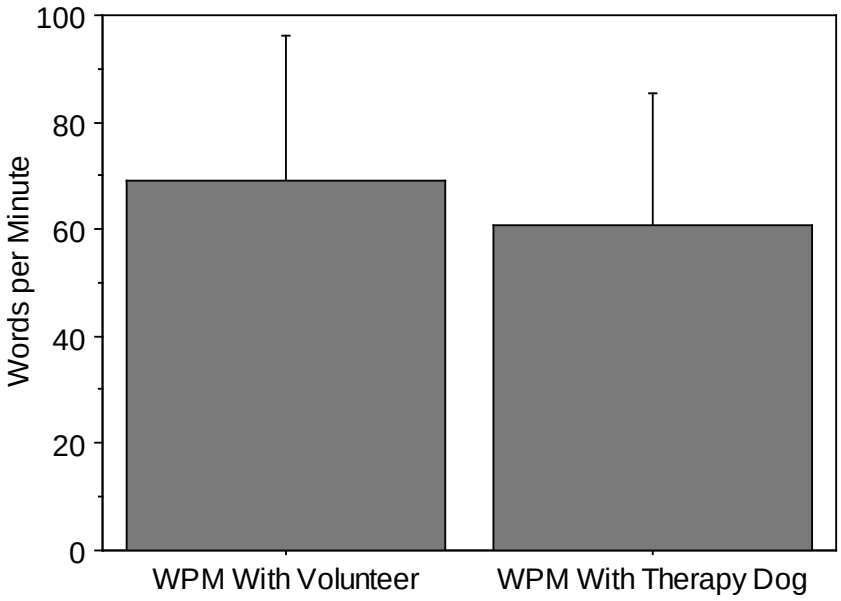


Figure 4. Individual words read correct out of 100. A, B, C = Participant A, Participant B, and Participant C.



Paired t-test
Hypothesized Difference = 0

	Mean Diff.	DF	t-Value	P-Value
WPM With Volunteer, WPM With Therapy...	8.361	2	3.455	.0745

Figure 5. Mean number of words read per minute. WPM = words per minute.

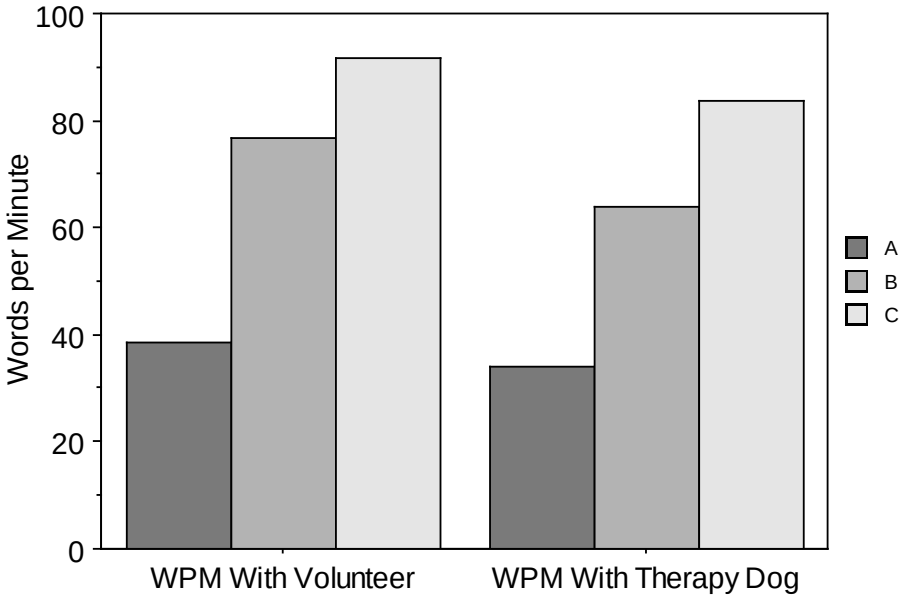
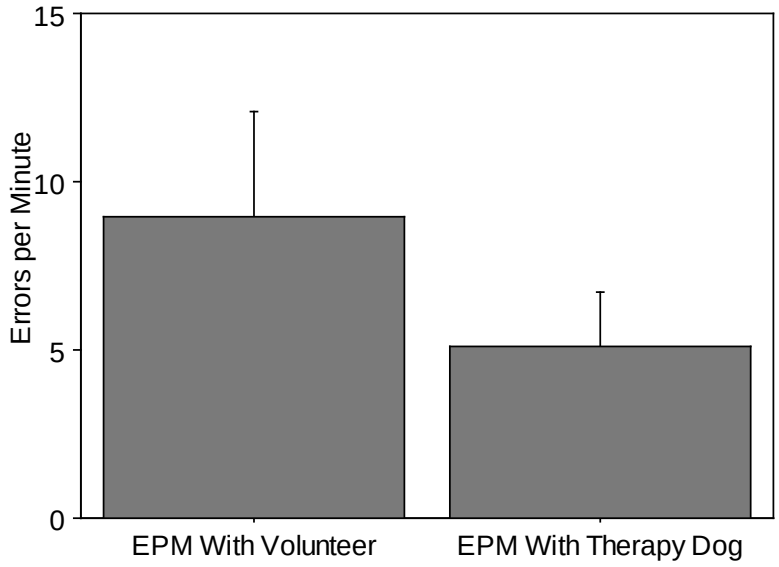


Figure 6. Individual number of words read per minute. WPM = words per minute, and A, B, C = Participant A, Participant B, and Participant C.



Paired t-test
Hypothesized Difference = 0

	Mean Diff.	DF	t-Value	P-Value
EPM With Volunteer, EPM With Therapy D...	3.844	2	4.063	.0556

Figure 7. Mean number of errors made per minute. EPM = errors per minute.

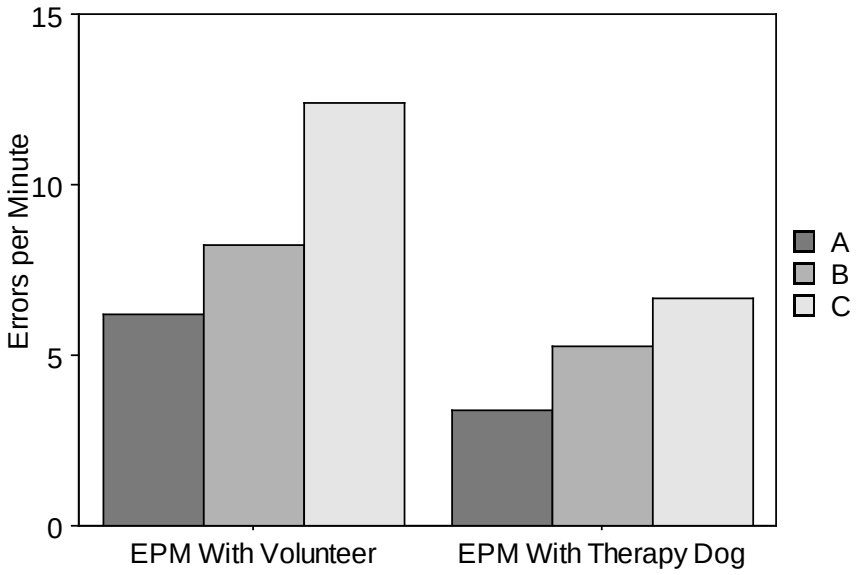
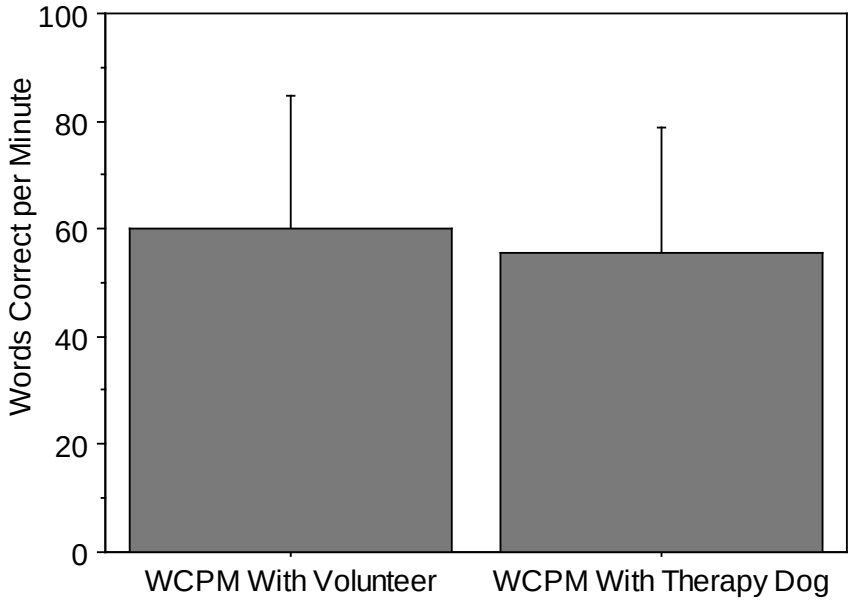


Figure 8. Individual number of errors made per minute. EPM = errors per minute, and A, B, C = Participant A, Participant B, and Participant C.



Paired t-test
Hypothesized Difference = 0

	Mean Diff.	DF	t-Value	P-Value
WCPM With Volunteer, WCPM With Thera...	4.517	2	1.722	.2271

Figure 9. Mean words read correct per minute. WCPM = words correct per minute.

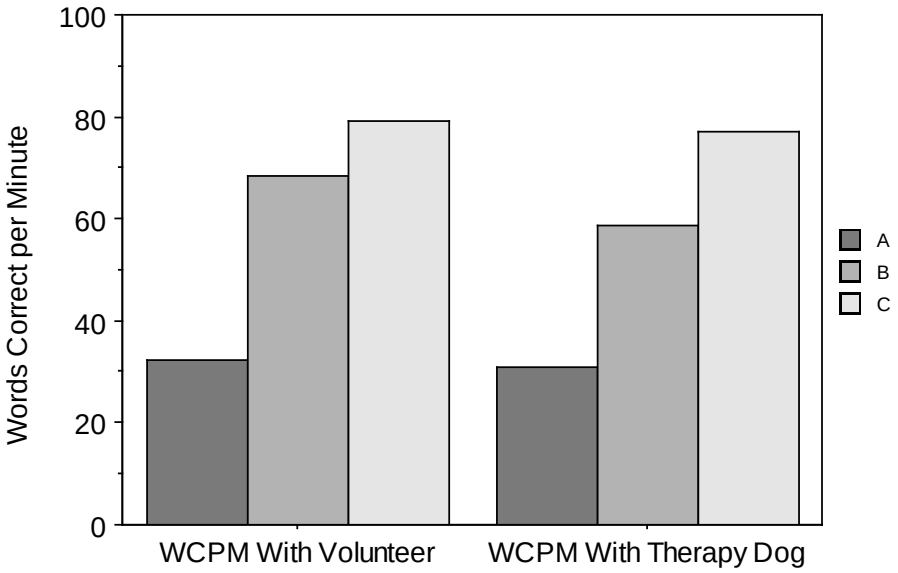


Figure 10. Individual words read correct per minute. WCPM = words correct per minute, and A, B, C = Participant A, Participant B, and Participant C.

Appendix A

DATE

Re: Using Therapy Dogs to Improve Reading Fluency of Children Who are Deaf or Hard of Hearing: Is it Effective? By: Jacklyn Litzinger

Dear Parent,

I am writing to let you know about an opportunity for your child to participate in a research study about reading to therapy dogs to improve reading fluency. I am a 2nd year Deaf Education graduate student in the Program in Audiology and Communication Sciences at Washington University School of Medicine. This research study is part of my independent study. My advisor is Lynda Berkowitz, co-principal at Central Institute for the Deaf.

This study is investigating whether reading to therapy dogs will improve reading fluency of children who are deaf or hard of hearing, who are learning listening and spoken language. There is some current research examining this topic in children with typical hearing, but it has not been investigated in children who are deaf or hard of hearing. There are several programs across the country that involve letting children read to therapy dogs.

This is a 12 week study. If your child participates, he/she will be given an assessment using the Accelerated Reader program, one already used at CID. He/she will also participate in an interview about his/her attitude towards reading. Your child will read to a peer or volunteer for approximately 20 minutes one day a week for 6 weeks after school. Then, your child will get to read to a trained, certified therapy dog from C.H.A.M.P Assistance Dogs, Inc. for approximately 20 minutes one day a week for an additional 6 weeks after school at Central Institute for the Deaf. The study is 12 weeks in total, with 12 reading sessions. During week 6, and at the end of the 12 week study, your child will again be given an assessment using Accelerated Reader. This assessment will be used to examine the rate of growth of reading comprehension during the duration of the study. Your child will only be compared to him/herself. Your child will be interviewed at the end of the study to assess whether his/her interest and attitude of reading changed over the course of the study, and whether he/she liked the program. Your child's teacher will be interview as well. A running record will be kept by the investigator while your child reads to track reading fluency.

This study will take place after school hours to minimize the disruption of other activities, and to prevent your child from being pulled out of class. This will require your child to stay after 3:00 PM.

There are no known benefits to the study, but by allowing your child to participate in this study, he/she will receive additional one-on-one reading outside of reading in class, 240 minutes in

total. It will allow for possible effective low cost, complimentary intervention that could lead to new supplementary reading programs for children who are deaf or hard of hearing, who are learning listening and spoken language. This study has a potential to lead to future research.

There are minimal risks associated with the therapy dogs such as scratches, bites, and infection. However, the handler will take precautions as set by CHAMP Assistance Dogs, Inc. and Central Institute for the Deaf to minimize any risks.

If your child is allergic to dogs or has a fear of dogs, he/she will not be able to participate in the study.

Your child is not required to participate, and will not be penalized if he/she chooses not to participate.

Agreement to be contacted or a request for more information does not obligate your child to participate in any study.

If you are interested please return the attached form and a signed copy of the consent form with the provided envelope by DATE. You may keep this letter and one copy of the consent form for your records.

If you would like additional information about this study please call or email Jacklyn Litzinger at 636-699-3664 or litzingerj@wusm.wustl.edu

Thank you for considering this research opportunity for your child.

_____

Jacklyn Litzinger
Graduate Student in Deaf Education
Program in Audiology and Communication Sciences

Screening Form for the Research Study "Using Therapy Dogs to Improve Reading Fluency of Children Who are Deaf or Hard of Hearing: Is it Effective?"

Child's name (first and last):_____

Parent's name (first and last): _____

Does your child have a dog allergy? Yes/No
If yes, please explain.
_____
_____
_____

Does your child have a fear of dogs? Yes/No
If yes, please explain.
_____
_____
_____

Which day of the week would work best for your child to stay after school?
_____
_____
_____

Please return this form with one signed copy of the consent form if you are interested in having your child participate in the study. Thank you!

Appendix B

Independent Study
Teacher interview

Therapy Dogs and Reading Fluency Pre-Study interview

1. Will the participant pick up a book and read in their free time? Will they check out a book during library visits and bring it home to read?

2. Does the participant often refuse to read or participate during reading time?

3. Does the participant read during silent reading?

4. Does the participant ask to read or volunteer to read during reading time, or throughout the school day?

5. Will the participant respond to comprehension questions at the end of a story?

Independent Study
Teacher interview

Therapy Dogs and Reading Fluency Mid-study Interview

1. Will the participant pick up a book and read in their free time? Will they check out a book during library visits and bring it home to read?

2. Does the participant often refuse to read or participate during reading time?

3. Does the participant read during silent reading?

4. Does the participant ask to read or volunteer to read during reading time, or throughout the school day?

5. Is the participant reading with more fluency than before participating in the study?

6. Will the participant respond to comprehension questions at the end of the story?

Independent Study
Teacher interview

Therapy Dogs and Reading Fluency Post-study Interview

1. Will the participant pick up a book and read in their free time? Will they check out a book during library visits and bring it home to read?

2. Does the participant often refuse to read or participate during reading time?

3. Does the participant read during silent reading?

4. Does the participant ask to read or volunteer to read during reading time, or throughout the school day?

5. Is the participant reading with more fluency than before participating in the study?

6. Will the participant respond to comprehension questions at the end of the story?

Independent Study
Participant interview

Therapy Dogs and Reading Fluency Pre-Study Interview

1. Do you like to read? Why/why not?

2. Do you like reading class? Why/why not

3. Do you like to read aloud? Why/why not?

4. Do you read in your free time?

5. What is your least favorite part about reading?

Independent Study
Participant interview

Therapy Dogs and Reading Fluency Mid-Study Interview

1. Do you like to read? Why/why not?

2. Do you like reading class? Why/why not

3. Do you like to read aloud? Why/why not?

4. Do you read in your free time?

5. What is your least favorite part about reading?

6. What do you like most about reading?

7. Do you like reading to the therapy dog (or the volunteer if not reading to the dog yet)?

   Why or Why not?

Independent Study
Participant interview

Therapy Dogs and Reading Fluency Post-Study Interview

1. Do you like to read? Why/why not?

2. Do you like reading class? Why/why not

3. Do you like to read aloud? Why/why not?

4. Do you read in your free time?

5. What is your least favorite part about reading?

6. What do you like most about reading?

7. Do you like reading to the therapy dog (or the volunteer if not reading to the dog yet)?

   Why or Why not?