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CAN ASL-GLOSS BE USED AS AN INSTRUCTIONAL TOOL TO TEACH WRITTEN ENGLISH TO THE DEAF?

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CAN ASL-GLOSS BE USED AS AN INSTRUCTIONAL TOOL TO TEACH
WRITTEN ENGLISH TO THE DEAF?

BY

EMMA RATHKEY

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
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OF

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ABSTRACT

This study addressed the use of ASL-gloss as a potential method for improving reading ability and comprehension for those with profound deafness through the use of the Gray Silent Reading Test (GRST). ASL-gloss can be described as a written form of American Sign Language. Research suggests that on average, individuals who are deaf are reading at about a third- to fifth-grade level. Presently, there is limited research on the effects of using ASL-gloss with students who are deaf. Participants ($n = 31$) self-reported as having a profound hearing loss, used ASL as their primary or preferred language, and were over the age of 18. They received the GSRT in English, ASL-gloss, or ASL. Mean differences were analyzed to determine if glossing might produce higher comprehension scores and support the use of an ASL-glossing system as an instructional method in early education. Results did not suggest higher comprehension scores for ASL-gloss or ASL. Results did not support ASL-gloss as an effective method for increased level of comprehension in adults affiliated with Gallaudet University.

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“Our greatest weakness lies in giving up. The most certain way to succeed is always to try just one more time” – Thomas Edison

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INTRODUCTION

Statement of the Problem

This study addressed reading comprehension in students who are deaf and possible potential alternative teaching methods for learning written English. Currently, on average, students who are deaf are reading at about a third- to fifth-grade level (Cawthon, 2001; Luetke-Stalman & Nielsen, 2003; Musselman, 2000; Qi & Mitchell, 2011; Van Cleve, 1985). The possibility of using ASL-gloss (written form of American Sign Language) as a teaching method for teaching individuals who are deaf was examined. Currently, there is no research examining if this would be a successful option to improve reading levels and text comprehension for students who are deaf and hard-of-hearing (d/hh).

Justification and Significance

Individuals with hearing loss may classify themselves into a number of different categories. These may include, among others, hard-of-hearing, deaf, Deaf, prelingually deaf, and postlingually deaf. The Deaf, with an uppercase D, see themselves as a unique ethnic group. They have their own collective name, feeling of community, norms for behavior, distinct values, culture-specific knowledge, customs, social structure, kinship, language, art forms, and history (Lane, 2005). The Deaf community even has been acknowledged to have the highest rate of endogamous marriages of any ethnic group with an estimated 90% of marriages occurring inside the Deaf community (Lane, 2005). Another noteworthy variation for the Deaf community is that approximately 90% of all deaf children are born to hearing parents (Klerk, 1998). Deaf children born to hearing

parents have many implications for professionals. These children may be without a primary language, culture, or appropriate services and accommodations throughout most of their childhood and adolescence. Typically, socialization into Deaf culture for children of hearing parents, if it occurs, begins much later than any other ethnic group; Typically it occurs when the deaf child meets other deaf children in school (Johnson & Erting, 1989; Lane, 2005).

Due to the delay in acquiring a primary language, it often takes deaf students longer to acquire their second language, written English, than typical hearing students. Through reviewing the history of deaf education, many shifts have occurred with instructional methods, from language choice to school placement to a lack of research-based interventions. Unfortunately, based on the average current academic achievement levels for the deaf, they typically lag behind their hearing peers. This research is important as ways to reduce the achievement gap that currently exists must be considered.

American Sign Language

The official language of the Deaf is known as American Sign Language (ASL). ASL has been characterized as a formal language with a unique grammatical and syntactical structure with no written form (Kalivoda et al., 1997; Lane, Hoffmeister, & Bahan, 1996). Those unfamiliar with sign language may believe it is spoken English expressed on the hands (Lane et al., 1996). ASL, however, has rules specific to the language.

ASL differs from English grammatically (Lane et al, 1996; Stewart & Akamatsu, 1988; Wolbers, Graham, Dostal, & Bowers, 2014). It exists in space, takes advantage of

spatial reasoning to convey messages, and uses facial features to add significant meaning to the message (Lane et al., 1996). These facial features have been defined as “facial grammar.” They help to explain emotions, sentence format (e.g., wh- questions, yes/no questions, conditional sentences), and to emphasize time (Lane et al., 1996; Stewart & Akamatsu, 1988; Wolbers et al., 2014). Additionally, ASL is a classifier language, meaning that a person, vehicle, or animal can have classifiers that place noun referents into groups (Martin & Sera, 2006). Classifiers use handshapes associated with specific size or shape. The movement and placement of a classifier handshape can be used to convey information about the noun. For example, after introducing a person, you may use a CL-1 (CL = classifier; 1 = ASL number 1) to show where that person walked or where they were positioned in space.

A notable difference that exists between English and ASL is that English relies on word order, but ASL does not to convey meanings (Lane et al., 1996). When children who are D/deaf are learning ASL, they tend to favor the particular word order subject-verb-object, similar to English. As they become more comfortable with the language, however, they relax the order by moving the topic to the front position object-subject-verb (Lane et al., 1996). For example, the sentence ‘mom buy soda,’ a more common English translation, would translate to ‘soda mom buy’ - the more common ASL translation.

Spoken languages rely on word order to provide information on incorporating to whom verb action is occurring; however, in ASL, some verbs, such as give, ask, and take are explained through movements that incorporate who is doing the action to whom through the direction in which the sign moves (Lane et al., 1996). Another difference is

that ASL characteristically introduces a topic at the beginning of the sentence, whereas in English, the topic can be introduced in many parts of the sentence. Finally, for many signs, (chair and sit; drive and car) the noun and verb are represented through the same sign. The difference is that nouns have a double movement (Lane et al., 1996).

The language additionally has rules for constructing words from sets of combining elements and for binding those words together to form sentences (Lane et al., 1996). ASL does follow the grammar of the heavily inflected spoken languages but the inflections are conveyed at the same time. ASL frequently involves changes in the way the verb moves through space. English will extend a basic verb with suffixes and prefixes for tense changes (Lane et al., 1996). Like other languages, ASL has a rich system of pronouns. Pronouns in ASL are not concerned with noun classifications, such as gender and number, as other spoken languages are, but instead many pronouns are concerned with shapes and sizes (Lane et al., 1996). Due to these differences, some individuals when first introduced to ASL criticize the language for having verbs only in present tense, limited number of nouns, and one sign for a meaning that may have several words in English (Lane et al., 1996).

Regardless of the differences in structure of ASL and English, research has indicated language acquisition in ASL follows similar stages of development as it would in English (Lane et al., 1996). From about the age of 7-10 months children learning sign language begin in the stage of “babbling” followed by the first-word stage (12-18 months) where they can sign a simple word such as eat, milk, and hello. The two-word utterances are occurring at approximately the same age in both children around 18-22 months, and finally by around 22-36 months, children can modify words and understand

some rules for creating sentences as they would using spoken English (Lane et al., 1996). The acquisition of pronouns among children who are deaf and those who are hearing also emerges at approximately the same age (20 months). For example, these children are making similar pronoun errors such as saying “you” when meaning “I.” The first mastering of ASL grammar (e.g., verb agreement and use of directional verbs) appears around three years old in children with hearing loss and deafness. As can be shown, when a language is presented to children who are deaf that is effective (e.g., ASL), the children can progress with language acquisition at similar rates to their hearing peers. As ASL is a different language from English, however, we must evaluate the progression of teaching for the deaf and the methods that have been both effective and ineffective.

The Start of Deaf Education

In 1815, Thomas Gallaudet travelled to Europe in hopes of obtaining information to start a school for the deaf in the United States. After graduating from Yale University, Gallaudet moved home to discover that the daughter of his new neighbors was deaf (Lou, 1988). He found himself having difficulty communicating with her and became curious with how to educate the deaf. He travelled to England to observe oral instructional methods, developed by the Braidwood family, that were being used to teach the deaf and found himself to be unimpressed. He later viewed an exhibition on sign language by the Institut National des Jeune Sourds-Muet (National Institution for Deaf-Mutes), the first school for the deaf established in Paris (Lou, 1988). While at the exhibition, Gallaudet saw how beneficial sign was for learning and asked Laurent Clerc, a teacher at the school, to return with him to the United States to become the first teacher at what would be the first school for the deaf in the United States. The school was established in

Hartford, Connecticut in 1817 and named the Connecticut Asylum for the Education and Instruction of Deaf and Dumb Persons (Lou, 1988).

The curriculum that was used in the early schools for the deaf was based on the curriculum that had been developed in Paris, albeit with a few modifications (Moores, 1992). The first modification was the development of a mode of communication. This mode of communication, and its variations, is the primary language of the deaf today: American Sign Language (ASL). ASL evolved as a combination of French Sign Language, American Sign Language, and Martha's Vineyard Sign Language. ASL is not a universal language; each country has its own signed language (Steward & Akamatsu, 1988). After the Connecticut Asylum for the Education and Instruction of Deaf and Dumb Persons, now known as the American School for the Deaf, was established, the only mode of instruction was ASL (Lou, 1988). ASL was so important to the Deaf community that the population of the American School for the Deaf felt that, in 1835, every teacher of the deaf must be fluent in the language (Moores, 1992).

With the promise of ASL came the existence of an abundance of schools for the deaf. From 1817 to 1867, 24 residential schools for the deaf were built, with an average of one school opening per year from 1844 to 1860. Until 1867, when the Pittsburgh Day School and the Boston Day School were established, the only schools for the deaf were residential (Moores, 1992). It seemed that deaf education was on the rise in America and with this rise came attention towards the Deaf community.

History of ASL

Signed languages date back hundreds of years. In America, there were distinct influencers that led to the development of what is now regarded as American Sign Language. These influencers are the occupants of Deaf communities around the U.S., such as Chilmark on Martha's Vineyard and Laurent Clerc's teachings at the American School for the Deaf. A comparison of dictionaries of modern day French Sign Language (FSL) and ASL has found as high as 58% similar signs in a sample of 87 signs (Lane et al., 1996). The research determined that the majority of signs with similar meanings resembled one another in the two different languages (Woodward, 1978). Such high similarities suggest that Laurent Clerc's influence in his teachings to create a united signed language for the United States was strong. The differences that emerged to make ASL sway from FSL can be attributed to the children that arrived at the American School for the Deaf with their own manual communication (Lane et al., 1996).

The first European settlement on Martha's Vineyard occurred in 1644 and virtually ceased in 1710 when most of the land had been settled (Groce, 1985). In the 19th century, it was estimated that one American in every 5,728 was born deaf; however, on the Vineyard one in every 155 was born deaf (Groce, 1985). Alexander Graham Bell spent much of his career researching hearing loss and deafness. Born to a deaf mother, Bell was set on making her life more enjoyable and focused on finding a cure for her disability. Bell eventually focused his efforts to Martha's Vineyard and discovered, based on unpublished historical data, that the Vineyard had the highest concentration of deafness in the United States (Groce, 1985). For other areas in New England with a high concentration of deafness, many of those families could be traced in some way as being

related to those living on the Vineyard (Groce, 1985). Genealogy research shows that many families living on Martha's Vineyard were descendants of a small group of isolated parishes in the county of Kent in a small area known as the Weald (Groce, 1985). Due to the marriages among the same families for many years on the Vineyard, it is believed that a recessive gene for deafness began with those living in the Kentish Weald. As immigration had primarily ceased by 1710, marriages were occurring among those with the same ancestors and thus keeping the deaf gene alive.

Due to the high proportion of deafness on the island, all inhabitants learned both English and the Vineyard's signed language (Groce, 1985). Deafness was viewed as something that could happen to any family, which increased the incentive for all islanders to know the language. Communication on the island in public was typically conducted in sign language as none of the Vineyarders who were deaf could read lips (Groce, 1985). Additional history from the census shows that in the 19th century all but one deaf Vineyarder over the age of 16 could read and write English. It was reported that the one person who was illiterate, was a man who struggled with mental illness and a possible intellectual disability. Even he attended, however, the Hartford School for the Deaf for one year (Groce, 1985).

The largest single group of students at the Hartford School for the Deaf came from Martha's Vineyard. As they had a developed signed form of communication their language ended up being combined with that of Clerc's FSL to help create ASL. As early as 1834, a single signed dialect was recognized in the schools for the Deaf in the United States (Lane et al., 1996). The rate of deafness began to decrease, however, and eventually their signed communication was eliminated on the Vineyard. This was due to

the many residential schools for deaf education around the United States. Vineyarders were no longer marrying other Vineyarders as young students began to meet deaf people from all around the United States. This led to the reduction of the Kentish Weald deafness gene and reduced the deaf population on Martha's Vineyard.

As the 1850s began, curiosity in oral methods of instruction for those with deafness began. A majority of people believed that if deaf children were in a hearing environment their speech and language skills would develop and they would then become well-adjusted members of the hearing society (Moore, 1992). The first two oral schools, the Lexington School in New York and the Clarke School for the Deaf in Massachusetts, were opened in 1867. The initial purpose for establishing these schools was to serve children who identified as hard-of-hearing who were prelingually deaf (Lou, 1988). The success of those individuals may have helped to promote the influx of oralism in the United States. This along with the reduction of Kentish Weald deafness began the decrease of ASL in the hearing and deaf populations, along with a change in how deaf education was viewed.

Oralism in the United States

Oralism became the dominant and preferred method for instruction in the United States during the 1880s (Lou, 1988). Oralism can be defined as instruction through oral or written language without the assistance of any sign language (Longmore, 1987). By 1870, the schools for the deaf had over 40% of their teaching staff identifying as deaf. As oralism swept the country this percentage declined rapidly and by 1917 deaf teachers made up less than 15% of teaching staff (Tucker, 2011). The height of oralism was partially due to the strong emphasis on oralism at the 1880 Second International Congress

on the Education of the Deaf. The International Convention of 1880 was held in Milan, Italy, and almost 90% of delegates in attendance were from Italy and France (Moores & Moore, 2011). The convention passed several resolutions, two of which are noted here:

1. Given the incontestable superiority of speech over signs in restoring deaf mutes to society and in giving them a more perfect knowledge of language, the oral method ought to be preferred.
2. Considering that the simultaneous use of speech and signs has the disadvantage of injuring speech, lip-reading, and precision of ideas, the pure oral method ought to be preferred (Lane et al., 1996, p. 61; Moores & Moore, 2011, pp. 5-6).

The five members of the US delegation voted against these resolutions stating that the conference was not representative of educators of the deaf from around the world and thus the procedures for passing resolutions were undemocratic (Moores & Moore, 2011). The delegates' fight for keeping ASL as the teaching method, however, did not have any effect on how the majority of educators in the United States felt about oralism.

The height of oralism and the shift away from ASL can also be attributed to Alexander Graham Bell (Lou, 1988). A supporter of oralism, Bell felt that the use of sign language would prevent the development of oral skills and therefore limit intelligence (Lou, 1988). Bell additionally believed that having residential schools brought together the deaf who would then intermarry and have deaf children (Tucker, 2011). Bell's primary goal with oralism, apart from enhancing oral skills, was to eliminate the deaf population (Klerk, 1998). What Bell was unaware of when making these claims, is that 90% of all deaf children are born to hearing parents (Klerk, 1998).

By the turn of the 20th Century, oralism was the instructional method used in most of the day schools, class programs, and private residential schools (Lou, 1988). To put this shift into perspective, in 1904 approximately 18% of deaf students outside of state residential schools were taught using oralism and in 1917 that percentage rose to above 30% (Lou, 1988). By 1919, nearly 80% of students who were deaf in the United States were being taught without any use of sign language (Pray & Jordan, 2010). The shift to oralism was so prominent that, in 1927, Gallaudet University, the first University for the deaf, discouraged their students from considering a teaching career because employment prospects were so rare (Lou, 1988).

Day, Fushfeld, and Pintner (1928) published what was the largest and most comprehensive in situ study of programs for deaf history. They analyzed teacher background, governance structure, student characteristics, physical facilities, and student achievement scores of 29 public residential schools and 13 public day schools for the 1924-1925 academic year in a national survey. It was discovered that the mode of instruction used in day schools was 97% oral; in the residential schools, 62% of students were taught orally. As was stated by Day et al. (1928), “the oral method is not considered good for dull pupils (p. 270).” Thus the only students who were not taught orally at these schools had been deemed unintelligent after being unsuccessful academically throughout elementary school with the use of oralism. Currently, oralism is still an instructional method used in certain schools for the d/hh, but as education evolved so has the primary method of teaching.

Total Communication Emerges

Beginning in the 1960s in the United States, total communication became a primary method of instruction. Total communication can be defined as ASL simultaneously used with speech. Evidence demonstrating the failure of oral methods for deaf students had emerged and a new system was being tried. For example, in 1965, Boatner (as reported in Evans, 1982) found that more than 30% of the deaf-student population was illiterate and that 60% of deaf students who did not obtain their high-school degree were functioning at a fifth-grade academic level or below. It also was discovered that most of the 5% of students who were able to reach a tenth-grade level or better were hard of hearing or became deaf later in life, a stark contrast to Martha's Vineyard years prior. There was also evidence emerging showing that deaf children with deaf parents, who used ASL as their primary language, were achieving higher academically than deaf children with hearing parents (Lou, 1988). This was an important finding because it suggested that the early use of ASL was not associated with a delay or inhibition of speech or intellectual development as previously thought. The finding also highlighted the importance of using ASL in education.

Legislative Changes

Beginning in the 1960s in the United States, there were many governmental changes that would help Americans who were deaf succeed academically. The first was the move away from oralism. Following this, was the establishment of the Rehabilitation Act of 1973 and the Education for All Handicapped Children Act of 1975 (Public Law 94-142), which has since evolved to become the Individuals with Disabilities Education Act (IDEA) (Tucker, 2011). These laws allowed for more equality between the deaf and

the hearing populations, including the opportunity for the deaf to attend graduate school at Gallaudet University. Additionally, in 1990, the Americans with Disabilities Act (ADA) was enacted that worked towards ending the discrimination against individuals who are deaf and the notion that the deaf were less qualified and less intelligent (cf. Section 504 of Rehabilitation Act of 1973). With these improvements in place, almost 90% of all children who were deaf were being educated in public-school programs or public residential schools (Moore, 1992).

Since the development of PL 94-142, the right to a free, appropriate public education in the least restrictive environment has changed the way in which education is conceptualized. One such change has been that students who are deaf are now educated in an integrated setting with hearing students. Statistics from fall 2004 showed that nearly 90% of deaf and hard-of-hearing students who received special-education services under IDEA were spending a portion of their day in classrooms with hearing students (Mitchell & Karchmer, 2010).

Academic Achievement with the Deaf

When children who are deaf are born to hearing parents, they are often at a disadvantage. Their hearing parents usually have a different ethnocultural identity and a different language. Regardless of hearing status, a significant number of parents do not know how to advocate for their child(ren) in the schools, community, or courts (Lane, 2005). Children who are deaf/hard-of-hearing form a heterogeneous group and the differences among them are greater than their hearing peers (Marschark & Hauser, 2012). Deaf children are considered fortunate when their hearing parents are fluent in ASL. Additionally, in Deaf communities or where deafness is common, deafness is

conceptualized simply as a trait of the person rather than as a disability (Lane, 2005; Lane, Pillard, & French, 2000).

Typically, socialization into Deaf culture for children of hearing parents, if it occurs, begins much later than any other ethnic group, usually when the Deaf child meets other Deaf children in school (Johnson & Erting, 1989; Lane, 2005). Deaf children generally are not exposed to effective communication until they enter a formal school setting (Kalivoda et al., 1997). Unfortunately, the later ASL is acquired as a first language for deaf children, the higher the frequency of errors in both ASL comprehension and production (Boudreault & Mayberry, 2006; Mayberry, 2007). Many students enter school with a three-year delay in language skills and, following enrollment, display slow rates of performance improvement (Cawthon, 2001). Children who are not exposed to a fluent language model often begin preschool with gaps in both language and literacy skills (Freel et al., 2011; Mayberry, 2007; Mayberry, del Guidice, & Liberman, 2011; Mayer, 2007). Early language exposure seems to be a crucial component to reducing these gaps and achieving higher language proficiency. Those children who are exposed to ASL later in life have a lower likelihood of developing native-like proficiency in ASL and also tend to struggle more with English (Mayberry, 2007). As compared to their hearing peers who are learning by language use, students who are deaf are typically still learning a language (Freel et al., 2011). This leads to even further delays and problems with literacy (Chamberlain & Mayberry, 2008; Mayer, 2007). Data across decades have shown that most Deaf students are only reading at about a third- to fifth-grade level (Cawthon, 2001; Luetke-Stalman & Nielsen, 2003; Musselman, 2000; Qi & Mitchell, 2011; Traxler, 2000, Van Cleve, 1985). Approximately 30% of students are leaving

school functionally illiterate (Marschark et al., 2002). Thus, for children who are deaf who are at risk for both language and literacy failure, a higher quality and greater quantity of both language and literacy exposure are important for early literacy development (Mayer, 2007; Musselman, 2000; Williams, 2004).

Through review of second-language acquisition, Cummins (1984) estimated that it takes a student only about two years to acquire informal language skills; however, it takes approximately five to seven years to develop cognitive-academic language proficiency. Because Deaf students are not routinely exposed to grammatically correct English until school age, they are not likely to even begin developing needed proficiency until at least the fifth grade (Luetke-Stalman & Nielsen, 2003). As of 2003, Gallaudet University, the only university for the Deaf, only requires a minimum of a fifth-grade reading level for the Deaf to be accepted (Luetke-Stalman & Nielsen, 2003).

Language delays generally lead to poor overall academic success and difficulties in classroom communication (Cawthon, 2001). It is not just reading that students who are deaf and hard of hearing seem to lag behind in with regards to their hearing peers. Evidence exists that students who are deaf and hard of hearing may have more difficulty than their hearing peers in learning all material taught to them (Schick, Williams, & Kupermintz, 2005). Deaf students demonstrate significant delays in writing when compared to their hearing peers (Rosen, Hartman, & Wang, 2017). Writing of students who are deaf has been shown to be similar to students who use English as a second language (Kalivoda et al., 1997). They will incorporate features of ASL (e.g., lexical and syntactic features of ASL that may include glossing, adjectives, plurality and adverbs, conjunctions, and topicalization (i.e., establishing a topic at the beginning of a sentence)

into their writing just as uni-modal bilinguals (Wolbers, Bowers, Dostal, & Graham, 2014). Their writing typically consists of short sentences with simple verb forms, few conjoined independent clauses, simple vocabulary, and few subordinate clauses (Maxwell & Falick, 1992; Paul, 2009; Wolbers, 2008). Research conducted with mathematics found that students who are deaf were achieving at low levels in computation and problem solving (Allen, 1995; Ansell & Pagliaro, 2006; Marschark & Everhart, 1999; Traxler, 2000) and early mathematics (Kritzer, 2009). This is due to the fact that everyday routine and communicative experiences are key to cognitive development according to the language socialization approach (Allen & Anderson, 2010). Children who are deaf whose parents support early development through the use of signs, however, appear to have linguistic, social, and academic advantages during the early years (Knoors & Marschark, 2012). Thus, evidence exists that deaf children with deaf parents, who used ASL as their primary language, were achieving higher academically than deaf children with hearing parents (Lou, 1988). Additional research has found that there is a positive correlation between signing skills and reading skills: children with hearing loss who both had parents who were deaf and had greater fluency levels in ASL were more successful in reading and more easily acquired words that correspond to frequently used ASL signs and phrases (Hoffmeister & Caldwell-Harris, 2014; Griffith & Ripich, 1988; Knoors & Marschark, 2012; Kritzer, 2009, Mayer, 2007). A positive correlation also has been found between signing skills and reading comprehension: The more fluent one is with ASL the higher comprehension will be when reading (DeLana, Gentry & Andrews, 2007; Strong & Prinz, 1997, Hoffmeister, 2000). A study by

Singleton et al. (2004) also discovered that ASL fluency appears to have a positive impact on writing and is a predictor of mathematics ability (Kritzer, 2009b).

During the first few years of reading instruction, most students' vocabulary and reading skills grow significantly. Children, who are deaf, follow similar trajectories with literacy development as their counterparts who can hear (Mayer, 2007). After this initial introduction to the written language, specifically during the middle-school years, however, stagnation occurs and their reading skills with regards to phoneme production, vocabulary, and syntax tend to fall significantly behind their hearing peers (Cawthon, 2001; Knoors & Marschark, 2012; Yoshinaga-Itano & Downey, 1996; Yoshinaga-Itano et al., 1996). One reason the stagnation may occur is because of English print and phrases that are more complex. Students who are deaf have been shown to struggle with idiomatic phrases and lack understanding of their meaning. Unfortunately for those who are deaf, idioms are found in books at the very beginning levels of reading, such as 'give in' or 'throw up' (Hoffmeister & Caldwell-Harris, 2014; Orlando & Shulman, 1989). Another example where those who are deaf struggle is with polysemies, or a phrase or word with several meanings. Kuntze's (2004) study found that when those who are deaf were interpreting written English polysemies, such as the phrase "look for these," the Deaf would sign LOOK and FOR instead of one simpler ASL sign meaning TO-SEARCH-FOR (Hoffmeister & Caldwell-Harris, 2014). Finally, with writing, students who are deaf may struggle with the use of passive constructions, pronouns, conjunctions, determiners, and conditional verbs such as "could" or "should" (Wolbers, 2008). In English, use of prepositions is typically determined by what sounds most contextually appropriate, meaning that for some teachers, it may be challenging to set forth clear-cut

rules to aid in learning (Wolbers, 2008). Teachers with proper training and good ASL skills may be able to explain the more complex parts of the English language, such as the polysemies and idioms. Deaf children tend to struggle more with reading and writing, not spelling, when it comes to English print (Kyle & Harris, 2006; Mayer, 1998), suggesting that learning how to convey the written language should be a focus for instructors. In contrast, Boswers, Dostal, McCarthy, Schwartz, and Wolbers (2016) found that the spelling skills of students who were deaf were not commensurate with the skills of their peers who could hear. A comprehensive integrative instructional method for all three areas may be most effective for learning. Those students who do not have a strong grasp of ASL may struggle more with understanding these complex explanations in the written language.

A long-standing concern is how to teach reading and writing effectively to the deaf. Students are meeting the standards compared to their hearing peers up until around the fourth grade. Mayer (2007) wants to know when the language learning trajectories of children who are deaf begin to draw apart from learners who can hear to the extent that the outcomes are so divergent. It appears that research suggests that once students enter middle school, little literacy progress is made (Wolbers, 2008). Due to this, more attention needs be paid to how the development of spoken and/or signed English relates to literacy development in the d/hh (Paul, 1998; 2003).

Teaching the English Language in D/HH

Consistent research shows that, academically, deaf students are lagging behind their hearing peers. As this has remained unchanged for years, what methods have been used to try to close the gap? Learners who are deaf do not have the same benefits of

auditory ability of their peers who can hear have. They are constrained by severely restricted access to the English spoken language input and in many cases by the delay in the onset of learning the English language (Berent et al., 2007). Prior history shows that when deaf education began in the 1800s, deaf adults did not have the same academic gap as they do now. One reason for that may be that the use of ASL was so prevalent among families. Today, it has been found that a prerequisite for the development of strong English skills is a strong foundation in ASL (Bailes, 2001; Hoffmeister & Caldwell-Harris, 2014; Griffith & Ripich, 1988; Knoors & Marschark, 2012; Kritzer, 2009, Lou, 1988; Mayer, 2007). As simple exposure to the English language is unlikely for deaf children, educators need to engage in a “cultivated transfer” (Bailes, 2001) where connections between the languages and modalities are being taught. Attention needs to be paid especially to complex elements of the English language such as polysemous words and phrasal translations (Hoffmeister & Caldwell-Harris, 2014).

Wang and Williams (2014) reviewed meta-analyses that were published between 2000 and 2014 on reading research with the d/hh population. They found only five qualitative meta-analyses meeting their criteria that had been published between the 14 years. Studies addressing the use of phonics instruction or guided oral reading with deaf readers were non-existent between the years of 1970 to 2001 (Schirmer & McGough, 2005). Of the 22 studies published from 1963 to 2003 that addressed evidence-based literacy practices, no two examined the same dimension of literacy (Luckner et al., 2005/2006). From the available data, Luckner et al. (2005/2006) were unable to conduct group comparison studies or draw any conclusions. Large effect sizes suggested promise with particular teaching methods; however, no studies from 1963-2003 or the 52 studies

reviewed in separate research by Luckner and Handley (2008) met the 2003 U.S.

Department of Education Institute for Education Sciences criteria for providing evidence for the effectiveness of the instructional strategy. This suggests that it is unlikely that the instructional methods being used would result in effective teaching methods for reading as none provided evidence for its effectiveness nor have they been replicated.

The results from Wang and Williams (2014) showed that there are not enough high-quality intervention studies for students who are d/hh with children who are learning how to read. A majority of studies that are conducted to evaluate reading abilities are conducted with college students – an easily accessible but potentially biased sample. Review of research from 2000-2013 found only 21 intervention studies over the 13-year period, or less than two articles published per year (Paul et al., 2013). Wang and Williams (2014) divided the research based on constructs that contribute to successful reading. For phonemic awareness, they discovered that either the research was too limited or the methodology was too weak to allow for conclusions (Luckner et al., 2005/2006; Schirmer & Gough, 2005). Results with reading fluency showed limited support for the use of independent oral reading as an effective measure (Wang & Williams, 2014). Tentative evidence supported using computer programs to teach vocabulary explicitly (Luckner & Cooke, 2010; Schirmer & Gough, 2005; Wang & Williams, 2014). Finally, teaching morphology rules as a method for increased literacy outcomes and comprehension strategies lacked sufficient quality to draw conclusions on effectiveness (Wang & Williams, 2014). As not enough evidenced-based practices exist for children and adolescents who are d/hh to have high quality interventions that will promote and support literacy learning in this population (Wang & Williams, 2014), it is no surprise

that children who are d/hh are graduating high school with reading levels well below their hearing peers.

Evidence suggests that the use of multi-media or presenting information through a visual mode, helps children who are deaf to develop in various skill areas such as literacy and language (Corina & Singleton, 2009; Golos & Moses, 2013; Hoffmeister, 2000; Morford & Mayberry, 2000; Rathman, Wolfgang, & Morgan, 2007). A range of modalities presented through media, such as sign, print, or auditory, can influence children's language and literacy development (Golos & Moses, 2013). Children who are deaf who have been exposed to multi-media in ASL that is educationally oriented have shown an increase in targeted vocabulary in both printed English and ASL (Golos & Moses, 2011).

Scott and Hoffmeister (2017) evaluated the role that academic English plays in reading comprehension for middle- and high-school students. Academic language can be defined as the language used in schooling that is necessary in order to be successful in secondary and post-secondary education (Schleppegrell, 2001). Early research by Cummins (1984) defined two broad constructs of language: basic interpersonal communication skills (BICS) and cognitive academic language proficiency (CALP). CALP tends to be more authoritative than BICS. In order to understand further academic language, Core Academic Language Skills (CALS) was operationalized to refer to a constellation of high-utility language skills that correspond to linguistic features of academic tests. It was hypothesized that CALS could help to predict reading comprehension (Uccelli et al., 2014). It is also suggested that many students who are d/hh are exposed directly to English CALP through written text before having developed BICS

in spoken English and even in ASL (Mayer, 2009). Scott and Hoffmeister (2017) compared a standardized reading-comprehension assessment, an academic English-proficiency assessment, a word-reading fluency assessment, and an ASL-proficiency assessment among 41 students who were d/hh. Results showed that as compared to their hearing peers, they were performing below grade level for all the English assessments. When comparing the participants within study, however, they discovered that ASL proficiency was a reliable predictor of reading comprehension. Additionally, results showed that students who were Caucasian tended to outperform their non-Caucasian peers in reading comprehension, ASL proficiency, and academic English proficiency. Thus, more work needs to be done to find replicable instructional methods for those who are d/hh to start closing the gap. This study attempts to address those needs by presenting an instructional method for evaluation. Specifically, this study focuses on reading comprehension.

Importance of the Research

Many individuals who are deaf view written English as utilitarian, a necessary tool for participation in U.S. social institutions, as it is the language of both government and business (Harmon, 2007). Understanding written English is seen as a way to participate in the American society. In regards to medical care, being able to understand many medical documents, consent forms, or health flyers requires a literacy level of at least the eleventh grade (Harmer, 1999). One study found that 114 medical centers in the U.S. had informed consent forms written at a 10.6 grade level (Gournaris, 2009). Another study by Zazove et al. (1992) discovered that the majority of participants reported that when attempting to exchange written notes (if an interpreter was not

present), the doctor's writing was often illegible or at a level beyond the literacy skills of the patient. Patients who are deaf with low literacy skills find it more difficult to present questions and concerns to their doctors and may leave feeling more confused than when they arrived (Harmer, 1999). Society should begin considering proposing intervention ideas that may work towards improving the reading of the deaf or reducing required reading levels of standard documents, such as the medical ones noted here.

As children who are deaf may not be starting their formal schooling with the same knowledge as their hearing peers, it has been suggested that the curriculum used for instruction also may need to differ accordingly to adapt to the needs of these students (Kritzer, 2009). It may be that the foundation of deaf education needs to be in sign language to gain fluency in one language (ASL) prior to trying to learn a second (written English). This theory has already been presented here as a predictor for many academic outcomes that would align a student who is deaf with a counterpart who can hear. We also know that when students who are deaf are taught orally, teachers spend most of their time conducting repetitions or oral drills for some comprehension to occur (Van Cleve, 1985) rather than focusing on appropriate instructional methods to increase learning. Suggestions that have been initially researched to aid in understanding the English language for those with different degrees of deafness include: the Language Experience Approach (LaSasso & Mobley, 1997; McAnnally et al., 1999; Schiermer, 1994) and Morning Message (MM) (Wolbers, 2008). However, there are no concrete conclusions on best practices.

ASL-Gloss as an Instructional Method

As previously explained, ASL has no written form; it is a visual language. To create a “written” document, however, instructors of ASL have developed what can be termed “ASL-gloss.” Glossing is not a translation, but a description of what would be signed. ASL-gloss is a teaching method for individuals who can hear to better understand the grammatical and structural differences of ASL as compared to English. ASL-gloss can then be understood as ASL in written form. When initially viewed, ASL-gloss appears to contain many errors in English usage and grammar (Kalivoda et al., 1997). ASL-gloss does not contain any English at all but instead follows the rules and grammatical structure of ASL (Kalivoda et al., 1997). When used correctly, a person can read the ASL-glossed sentence and, from it, sign the sentence in perfect ASL grammar. For children who are deaf who use ASL as their primary language, their challenge is that written English does not represent the language they are signing (Mayer, 2007). English print was never designed to represent ASL and vice versa (Mayer, 2007). Many of the proposals for making connections between the two languages are actually English based and do not represent a bridge between languages but instead are representations of different forms of English (Mayer 2007).

Currently, there is limited discussion of ASL-gloss in the literature as anything other than a teaching method for hearing individuals learning the grammatical structure of ASL. There have been few researchers who have investigated creating a written form for ASL. Discussion differs as to which style of writing would be more beneficial: Alphabetic or iconographic (Grushkin, 2017). Attempts have been made to create a written form of signed language with one of the earliest being Roch-Ambroise Bebian

(iconographic style) (Grushkin, 2017). In the 1970s, Valerie Sutton created SignWriting (iconographic) that consisted of drawn symbols that represented handshapes, orientations, movements, and locations. Robert Arnold created Si5s (iconographic), Adrean Clark developed ASLwrite (iconographic), a variation on Si5s, and Grushkin developed SignScript (iconographic) (Grushkin, 2017). It does not appear that any of these iconographic writing styles have been applied in an educational setting to promote reading acquisition.

Although ASL-gloss is embraced in the field of ASL instruction, only one known study on its use has been published and the results were positive (Supalla, Cripps, & Byrne, 2017). Buisson (2007) found that ASL students who had the opportunity to learn the language with ASL-gloss performed better with ASL than those without gloss. Although this study looked at mastery of ASL, it supports the potential benefits of utilizing gloss. A limitation of glossing is that it lacks the gestures and facial expressions in traditional ASL that help to convey meaning. It is not often a true one-to-one translation and adjustments often have to be made (Grushkin, 2017). Supalla, McKee, and Cripps (2014) developed a system for writing ASL based on ASL graphemes called ASL-phabet. It is made up of 32 graphemes, which represent the 3 phonological parameters of handshape, location, and movement. Up to 8 graphemes may be necessary to write a word in ASL. The authors envisioned this as a starter system toward acquiring English.

An Arizona charter school created a bilingual dictionary called the “Resource Book” that translated between the ASL-phabet and ASL-gloss. This allowed deaf children to look up unknown gloss words by reading the ASL word equivalent (Supalla

et al, 2017). The teachers used the gloss system to measure deaf oral reading using running records. As the children were able to sign word for word (“oral” reading) the teachers were able to measure the accuracy of their reading (Suppalla et al, 2017). The research has not been conducted yet for understanding the longitudinal benefits of the system employed by the charter school or how this may generalize to comprehending written English, but Supalla and Blackburn (2003) believe that deaf students would no longer need to utilize ASL-gloss when reading by the end of fourth grade for those who demonstrated reading fluency.

ASL-gloss and bridging to written English instruction also may be limited as researchers have a shallow understanding of how ASL can work to support literacy development in young deaf children (Mayer, 2007). There is no evidence indicating that a written alphabetic approach is effective in supporting linguistic transfer between signed and spoken language in teaching the deaf to read and write (Mayer, 2017). Overall, the research is currently lacking as presently it does not support or refute this method for learning to read and write. Mayer (2017) is hesitant to support that this would be a successful route to literacy; however, does believe that it may be a supportive bridge for some bilingual learners as there is no evidence either to support or to reject the hypothesis.

The Present Study

As noted, there are many discrepancies and challenges with teaching and measuring reading with students who are deaf. This study aimed to see if ASL-gloss, that is, ASL in written form, had an effect on comprehension through a standardized silent reading test. If there is a significant effect, it may imply some methods for teaching

reading in early stages of schooling to serve as an introduction for those with hearing loss to comprehend written English. In order to further assess reading comprehension in the D/deaf, this study compared reading measures in students who are deaf in written English, ASL-gloss, and ASL. This method previously has not been evaluated with use on reading comprehension for those who are deaf. This study was proposed to try to find new instructional methods (or at least be able to discard ineffective methods) when teaching those with hearing loss how to begin to read. The following hypothesis was proposed: There will be a main effect for language format. Individuals will have significantly higher silent reading quotient scores in the ASL format as compared to both ASL-gloss and written English. Additionally, individuals will have significantly higher silent reading quotient scores on ASL-gloss as compared to written English.

METHODS

Participants

Participants consisted of individuals at least 18 years old who self-reported having a profound, unaided hearing loss, including the absence of cochlear implants (90 db lost or greater in the better ear) and who used ASL as their primary or preferred language. All participants were members of or affiliated with Gallaudet University located in Washington, D.C. The research was approved by both The University of Rhode Island's and Gallaudet University's Institutional Review Boards (IRB). Participants were recruited through posting a recruitment flyer on Gallaudet University's Daily Digest announcement service (see Appendix A). Daily Digest distributes email announcements at 5 a.m. through a daily email service. These announcements also can be found on the University's website. Submissions may run up to five days prior to requiring re-submission. As per Daily Digest requirements, all submissions must be for campus-sponsored activities only.

Thirty-one individuals completed the research. Of those 31 participants, nine identified as male, 21 as female, and one as "Other." A total of 61.3% self-reported as Caucasian, 12.9% as Hispanic/Latino, and 6.5% reported as "Other." African American/Black and Asian/American Asian were each 3.2%, or one participant, of the total sample. Four participants identified as having more than one ethnicity by marking more than one category. These included one participant reporting as African American/Black and American Indian/Alaskan; Caucasian and Asian/American Asian and American Indian/Alaskan; Hispanic/Latino and African American/Black; and Caucasian and Hispanic/Latino. With regard to parental hearing status, 58.1% reported both parents as hearing and 41.9% reported both parents as d/Deaf. Participants were

asked to identify their primary and preferred language(s). Those frequencies are reported in Table 1. There were some participants who voluntarily chose to select more than one response and are represented in the following table through the “English and ASL” and “English and Other” categories.

Table 1

Primary and Preferred Languages

	Primary Language	Preferred Language
English	5	3
ASL	22	16
English and ASL	4	11
English and Other	0	1
Total	31	31

As all participants had an affiliation with Gallaudet University, information regarding their age and role were also obtained. Participants ranged in age from 18-58 years with 51.9% of participants being younger than 30 years. Four participants omitted this item. Most participants were graduate students (45.2%). Undergraduate students consisted of 25.8% of the total sample and “Other” represented 29.0%. According to Gallaudet University’s website, as of Fall 2017, there were 1,129 enrolled undergraduate students and 449 graduate students. This includes degree/non-degree and full- and part-time students. Updated information has not been published for the Fall 2018 nor does the university provide data as to percentages regarding students’ hearing status.

All participants who met exclusionary criteria had an equal opportunity for participation. In order for inclusion in this research, they must have been members of Gallaudet University. All participants were treated ethically according to principles established by the American Psychological Association (APA, 2017) and University of Rhode Island's and Gallaudet University's IRBs.

Materials

Demographics Questionnaire. Participants were asked to report their gender, age, ethnicity, primary and preferred language, year at university, parental hearing status, and age of acquiring ASL (see Appendix B).

Gray Silent Reading Tests (GSRT): Silent Reading Comprehension. This measure required participants to read a short passage of text and then answer five multiple-choice comprehension questions. The test was normed on a sample of 1,400 people aged 7 to 25 in 32 states (Wiederholt & Blalock, 2000). The measure consists of two parallel forms (Form A & Form B), each containing 13 developmentally sequenced reading passages with five multiple-choice questions. Each form yields raw scores, grade equivalents, age equivalents, percentiles, and a Silent Reading Quotient. Administration time, per form, takes approximately 15-20 minutes. Reliability was demonstrated using alternate forms and time sampling with reliability coefficients all at or above 0.97. Validity was assessed using measures of criterion prediction, such as age prediction and group differentiation. The summary of the validity results suggest that the GSRT may be used as a valid measure of silent reading comprehension and is appropriate to use with individuals for whom other tests might be biased (Wiederholt & Blalock, 2000).

Forms A and B were transcribed into ASL-gloss and translated into ASL by the investigator. Participants received a copy of both Form A and Form B in one of the three language formats (ASL-gloss, English, ASL). Form A and B were not administered in the same format to the same participant. Which forms they received were determined at random. For example, a portion of the participants received Form A transcribed in ASL-gloss with Form B in English and another portion received Form B transcribed in ASL-gloss with Form A in English. Forms A and B were translated into ASL, including the comprehension questions, resulting in a portion of participants viewing a video as either Form A or B along with one format of the form written in English or ASL-gloss.

Due to past research that students who are D/deaf and hard of hearing typically do not read above a 3rd to 5th grade level, all participants began the GSRT on Story 1 and concluded with Story 8. This decision was made for numerous reasons. ASL-gloss is not a true language nor is there any published consistencies across how to write directional signs, classifiers, or facial expressions. ASL-gloss typically is used as a teaching method for hearing individuals learning ASL, thus there has not been much research dedicated to its use or significance. As the GSRT stories became more complex, the ASL counterpart would include more gestures, directional verbs, classifiers, facial expressions/communication, and use of finger-spelling. As the before-mentioned ASL components are hard to portray in a written language, there was a large potential of key components and meanings of the story being lost or eliminated as stories become more complex and descriptive aiding in the decision to which stories would be administered. Participants were not first engaged in instruction on understanding components of ASL-gloss and it could not be guaranteed that they would understand abbreviations or

particular terminology used when teaching ASL and using ASL-gloss in hearing instruction. As participants were not required or expected to have been exposed to ASL-gloss, it could not be guaranteed that they would comprehend advanced components successfully. Stories 1-8 allowed for some complexity but not enough that transcribing the stories resulted in loss of meaning within the ASL-gloss format.

According to the GSRT manual, when group administration is chosen as the administration method, it is recommended that all participants age 9 (or that would be theoretically in the 4th grade) read stories 1-8 (Wiederholt & Blalock, 2000). As mentioned previously, research consistently places the average reading level for d/Deaf or hard-of-hearing individuals at the third- to fifth-grade, thus aiding in the determination of stories received by all participants. It seemed that it would be best to focus on ASL-gloss as a potential instructional-tool for teaching d/Deaf children how to read and focus on comprehension when presented to a younger age range.

Preferred Format Questionnaire. This questionnaire was a simple open-ended item asking which form they received was easier to comprehend and why (see Appendix C). This question was of importance mainly for those who received the ASL-gloss forms to see if ASL-gloss was an appropriate method for teaching those who are deaf and hard of hearing.

Procedure

All sessions were conducted on campus at Gallaudet University in the psychology department located on the fourth floor of the Hall Memorial Building. Participants were asked to read and to sign an informed-consent form (see Appendix D). Once participants consented, they were given the instructions for the GSRT. Participants were randomly

assigned two of the three formats (ASL-Gloss, English, or video ASL). Forms were administered at random, with both forms available in all three formats. The Preferred Format Questionnaire and Demographics Questionnaire followed the completion of both GSRT forms. After completing the tasks, participants received a debriefing form (see Appendix E). Depending on which forms participants received, participation ranged from 30-75 minutes. All participants received \$30 for participation.

RESULTS

The results begin with reporting demographic information, including age, primary and preferred language, educational status, parental hearing status, and age of acquiring ASL. Analyses of the results of the GSRT scores are reported. Preferred format is discussed and form preferences are explained.

Demographics Questionnaire

In the demographics questionnaire, participants were given the opportunity to identify their gender. As reported previously in the Methods section, nine participants identified as male, 21 as female, and one as other. Participants ranged in age from 18-58 years with 51.9% of participants being younger than 30 years. The mean age of participants was 31.15 years ($SD = 9.71$). Four participants omitted this item. A total of 61.3% self-reported as Caucasian, 12.9% as Hispanic/Latino, and 6.5% reported as “Other.” African American/Black and Asian/American Asian were each 3.2%, or one participant, of the total sample. Four participants identified as having more than one ethnicity by marking more than one category. These included one participant reporting as African American/Black and American Indian/Alaskan; Caucasian, Asian/American Asian and American Indian/Alaskan; Hispanic/Latino and African American/Black; and Caucasian and Hispanic/Latino. As noted in the previous description of participants (Table 1), they also had the opportunity to identify their preferred and primary languages.

Most participants were graduate students (45.2%). Undergraduate students consisted of 25.8% of the total sample and “Other” represented 29.0%. Of the “Other” category, participants identified themselves as alumni and staff. One participant did not provide a write-in response. These data are summarized in Table 2.

Table 2

Year in University

Year in University	<i>n</i>
Freshman	1
Sophomore	2
Junior	2
Senior	3
Graduate Student	14
Other	9
Total	31

With regard to parental hearing status, 58.1% reported both parents as hearing and 41.9% reported both parents as d/Deaf. None of the participants selected having just one parent who was d/Deaf. The reported age at which participants acquired ASL ranged from birth to 1 year all the way to age 19 years. Half of all participants that reported their age of acquiring ASL reported learning it by the age of 3 years. Table 3 presents reported ages and frequencies among the participants.

Table 3

Age of Acquiring ASL

Age in Years	<i>n</i>
0 - 1	8
1	4
2	2
3	1
4	3
5	2
7	1
10	2
12	2
15	3
16	1
19	1
Missing	1
Total	31

Deaf Reading Ability

Many students who are d/Deaf enter school with a three-year delay in language skills and, following enrollment, display slow rates of performance improvement (Cawthon, 2001). Children who are not exposed to a fluent language model often begin preschool with gaps in language and literacy skills (Freel et al., 2011; Mayberry, 2007;

Mayberry, del Guidice, & Liberman, 2011; Mayer, 2007). Children who are D/deaf who are exposed to ASL later in life have a lower likelihood of developing native-like proficiency in ASL and also tend to struggle more with English (Mayberry, 2007). Data across decades have shown that most students with deafness are only reading at about a third- to fifth-grade level (Luetke-Stalman & Nielsen, 2003; Cawthon, 2001; Musselman, 2000; Qi & Mitchell, 2011; Traxler, 2000, Van Cleve, 1985). Due to these data and the range of participants in age of acquiring ASL, age, and educational achievement, all raw scores were converted to a normalized standard score ($M = 100$; $SD = 15$) as if the participants were in the fourth grade. The objective of the research was not to determine current reading ability, but rather to evaluate comprehension through other potential reading methods, such as ASL-gloss.

Gray Silent Reading Test (GRST) Results

Participant Groups

Participants were randomly assigned to one of six groups. All participants read or viewed two parallel sets of stories (Form A and Form B) presented in two of the following ways: English, ASL, or ASL-gloss. Groups were then further divided with each form being available in all three ways. For example, for the participants in the English vs. ASL-gloss group, half the participants received Form A in English and Form B in ASL-gloss whereas the other half received Form B in English and Form A in ASL-gloss. The same occurred for those participants in the English vs. ASL group and the ASL-gloss vs. ASL group. The participant groups included in the design of the study appear in Table 4.

Table 4

Participant Groups

English vs. Gloss	English vs. ASL	Gloss vs. ASL
Group 1: Form A vs. Form B	Group 3: Form A vs. Form B	Group 5: Form A vs. Form B
Group 2: Form B vs. Form A	Group 4: Form B vs. Form A	Group 6: Form B vs. Form A

GSRT Forms

The GSRT includes two parallel forms (Form A and Form B). The GSRT produces five different types of scores, which include a raw score, age equivalent, grade equivalent, percentile, and a standard score called the Silent Reading Quotient (SRQ) (Wiederholt & Blalock, 2000). As both forms were used in the research, the SRQ was chosen to ensure standardization and interval-scale alignment among all participants. The manual provides a formula created by Anastasi and Urbina (1997) in order to calculate a difference score for use in determining efficacy with reading interventions in the school setting.

$$Difference\ Score = SD_{z\alpha} \sqrt{2 - r_{11} - r_{22}}$$

The standard deviation of the two forms is 15 and a significance level was set at .05. Based on their internal consistency reliability coefficients for Form A ($\alpha = .95$) and Form B ($\alpha = .94$), the minimal difference score between Form A and B was nine points (Wiederholt & Blalock, 2000). A score of nine or higher suggests that the difference is a reliable one. This method of analysis, however, is better suited to examining differences for individuals versus for groups. Instead, Wiederholt and Blalock (2000) recommended using an appropriate experimental design when examining group differences. This method was used to examine individual differences among scores.

When reviewing the differences among forms for each participant, 12 of the 31 participants evidenced difference scores of nine or greater between Form A and Form B. Of those administered forms comparing ASL-gloss and English, 5 of the 11 participants (45%) performed reliably worse ($p < .05$) on their ASL-gloss form. Three of the 10 participants (30%) that were administered English and ASL forms performed reliably worse ($p < .05$) on ASL. For those ten participants that received the ASL-gloss and ASL formats, two (20%) performed reliably worse ($p < .05$) on the ASL-gloss format and two (20%) performed reliably worse ($p < .05$) on the ASL format. At no point was an English score ($n = 21$) reliably lower than its comparison.

English/ASL-Gloss Paired Sample

The age of participants within the English and ASL-gloss group ranged from 21 to 58 years ($M = 32.4$, $SD = 11.20$). One of the eleven participants chose to omit age. Three of the participants identified as male, seven as female, and one as “other.” In order to evaluate if a difference among the paired GSRT scores existed, paired-samples t-test was considered. A paired-samples t-test has four main assumptions. The dependent variable must be continuous, the observations are “related” or “matched,” the difference in the dependent variables should be approximately normally distributed, and the dependent variable difference should not contain outliers. For those participants who received an English form in the English vs. ASL-gloss group, the English GRST score ranged from 94 to 128 ($M = 116.73$, $SD = 10.16$). English GSRT was non-normally distributed with skewness of -1.21 ($SE = 0.66$), and normal kurtosis of 1.29 ($SE = 1.28$), one outlier (94). The ASL-gloss GSRT score ranged from 89 to 125 ($M = 110.91$, $SD = 11.14$). ASL-gloss revealed a non-normal distribution with a skewness of -0.85 ($SE =$

0.66) and one outlier (89). Kurtosis of 0.28 ($SE = 1.28$) proved normal. When reviewing the difference, there was a positive skew of 0.77 ($SE = 0.66$), normal kurtosis of -0.33 ($SE = 1.28$) and no outliers.

As the data did not meet the assumptions of a paired-samples t-test, the Wilcoxon Signed Ranks test was used to analyze if there was a group difference between the English and ASL-gloss formats. The test showed that participants performed significantly better on reading comprehension on the English format ($z = -2.65, p = 0.008$). There was a moderate positive correlation between English and ASL-gloss ($r = 0.74, r^2 = .55, N = 11, p = 0.01$).

English/ASL Paired Sample

The age of participants within the English and ASL group ranged from 18 to 49 years ($M = 31.78, SD = 11.26$). One of the ten participants chose to omit age. Four of the participants identified as male and six identified as female. In order to evaluate if a difference among the paired GSRT scores existed, a paired-samples t-test was considered. For those participants who received an English form in the English vs. ASL group, the English GRST score ranged from 101 to 125 ($M = 111.60, SD = 6.35$). English GSRT was non-normally distributed with a slight skewness of -0.58 ($SE = 0.69$) and one outlier (125). The kurtosis of 1.85 ($SE = 1.33$) proved normal. The ASL GSRT scores ranged from 97 to 128 ($M = 108.60, SD = 8.58$). ASL revealed a non-normally distribution with skewness of 1.05 ($SE = 0.69$), kurtosis of 2.50 ($SE = 1.33$), and one outlier (128). When reviewing the difference, there was a slight positive skew of 0.65 ($SE = 0.69$), normal kurtosis of -1.19 ($SE = 1.33$), and no outliers.

Again, because the data did not meet the assumptions of a paired-samples t-test, the Wilcoxon Signed Ranks test was used to analyze if there was a group difference. The test showed that there was no significant difference between the GSRT scores of participants when presented with the English and ASL format ($z = -.973, p = 0.33$). There was no significant correlation between English and ASL ($r = 0.43, N = 10, p = 0.21$).

ASL-Gloss/ASL Paired Sample

Finally, the age of participants within the ASL-gloss and ASL group ranged from 21 to 39 years ($M = 28.88, SD = 5.94$). Two of the ten participants chose to omit age. Two of the participants identified as male and eight identified as female. In order to evaluate if a difference among the paired GSRT scores existed, a paired-samples t-test again was considered. For those participants who received an ASL-gloss form in the ASL-gloss vs. ASL group, the ASL-gloss GRST score ranged from 81 to 119 ($M = 103.3, SD = 12.69$). ASL-gloss GSRT was normally distributed with a skewness of -0.36 ($SE = 0.69$) and kurtosis of $-.99$ ($SE = 1.33$). The ASL GSRT score ranged from 79 to 125 ($M = 104.0, SD = 15.76$). ASL revealed a normal distribution with skewness of -0.46 ($SE = 0.69$) and kurtosis of -1.11 ($SE = 1.33$). No outliers were present in either reading format. When reviewing the difference, there was a negative skew of -0.91 ($SE = 0.69$), normal kurtosis of 0.81 ($SE = 1.33$), and one outlier (22). Wilcoxon Signed Ranks test showed that there was no significant difference between the GSRT scores of participants when presented with the ASL-gloss and ASL format, ($z = -0.561, p = 0.58$). There was a moderately strong positive correlation between ASL and ASL-gloss ($r = 0.72, r^2 = 52, N = 10, p = 0.02$).

One-Way Analysis of Variance

For further investigation of the data, the GSRT scores were evaluated based on reading format through a one-way analysis of variance (ANOVA). Assumptions for use of this analysis included normality, independence, and homogeneity of variance. English had the highest mean ($M = 114.29$, $SD = 8.75$, 95% CI = 110.30, 118.27) followed by ASL-gloss ($M = 106.33$, $SD = 11.97$, 95% CI = 100.89, 111.78) and ASL ($M = 106.30$, $SD = 12.57$, 95% CI = 100.42, 112.19). There was a statistically significant difference among groups as determined by a one-way ANOVA ($F(2,59) = 3.514$, $p = 0.036$, partial $\eta^2 = 0.106$). A Tukey post-hoc test, however, revealed no significant differences among the reading formats. This may be due to the statistical power or the p -value being close to the significance level. Student's t -tests also were conducted to compare the GSRT scores in reading format pairs (English, ASL-gloss, and ASL). There was a significant difference between the English ($M = 114.29$, $SD = 8.75$) and ASL-gloss ($M = 106.33$, $SD = 11.97$) scores, $t(40) = -2.457$, $p = 0.018$, as well as English and ASL ($M = 106.30$, $SD = 12.57$), $t(39) = 2.37$, $p = 0.023$. In both groups, the English GSRT comprehension score was higher. There was no significant difference between the ASL and ASL-gloss scores.

Preferred Format

Once participants completed the GSRT, they were asked to identify which of the two formats they preferred and why. Only two participants reported preferring ASL-gloss. Both those participants were in the group that received forms in ASL-gloss and ASL. Participants preferred the written language as they had the ability to review the stories when answering comprehension questions and time constraints were removed.

They both felt that, at times, the ASL videos were confusing due to signing accents and story order. Nineteen of the 31 participants preferred the English format. Of those nineteen, all 11 participants from the ASL-gloss and English group were included. None of the participants who received the forms in both ASL-gloss and English preferred the ASL-gloss format. The remaining eight participants preferred English over ASL. Ten participants chose their preferred method as ASL. Eight of those 10 were from the ASL and ASL-Gloss group and two were from the ASL and English group.

English vs. ASL-Gloss. Participants in all groups were asked to give an explanation of why a format was preferred. Within the English vs. ASL-Gloss subgroup, all participants preferred English over ASL-gloss. Participants reported that they felt ASL-gloss was jumbled, non-automatic, and required more time to comprehend the stories. Some felt that ASL-gloss resulted in a loss of context and details. One participant reported that, “continuously reading ASL-gloss is [a] tiring and unpleasant task.”

A portion of participants expressed that they viewed themselves as bilingual in both English and ASL. They reported that they preferred their written language in English and all visual/oral communication as ASL. One participant noted that the combination of the languages made reading more confusing as “...a balanced bilingual (learned both from an early age and fluent in both), both language(s) are separate and distinct in my brain. So, when reading English, I don’t think in ASL.” A few participants indicated that they signed in conjunction with reading ASL-gloss in order to aid their comprehension of the text. One participant said that ASL-gloss “forced me to pause and ‘sign’ aloud word by word in my mind which caused an unnatural reading pace and process to occur. Thus, the reading process became more of a translation process (or

interpreting) because I was switching English print into a visual language (ASL) in order to make sense of it.” Another acknowledged using a gloss system when communicating through text messages with friends but was not “used to reading ASL-gloss for stories [however,] was able to understand [the stories] by visualizing the signs in my mind.” During administration, it was observed that a few participants chose to sign to themselves while reading the ASL-gloss format.

English vs. ASL. There were re-occurring concerns mentioned about the ASL format in the comments made by participants in the English vs. ASL group. Participants reported one or more of the following: Signer’s accent was confusing; stories were presented out of order; participants could not clarify accent by asking questions; and/or they did not like the speed of signing. Some participants preferred being able to read the comprehension questions prior to the stories and felt it was easier to review the information when it was presented in the written format. One participant reported a preference for English and reported that “English has more detailed information than ASL, since some signs can be misunderstood especially when they have different meanings in regional areas... if I have to watch an ASL film or show, I turn subtitle or closed caption on.” Participants who preferred the ASL format stated they understood the overall ideas of the stories better, could more easily comprehend the information, and/or were more comfortable using ASL.

ASL vs. ASL-Gloss. Eight of the 10 participants in this group preferred the ASL format. Their reasons included that reading ASL-gloss was more confusing or complicated, especially when no prior introduction to the format had been conducted. One participant considered ASL-gloss “broken English,” whereas another reported that it

was challenging to understand due to the absence of facial expressions. Similar to the ASL-gloss comments in the earlier section, one participant reported “ASL-gloss doesn’t make sense if I don’t vision the words (English) into ASL in my head. It takes extra effort to do both reading and envisioning.” Only one participant reported that ASL-gloss could be a “neat way to ‘write’ ASL.” Overall, it appears that without prior introduction to ASL-Gloss, it was more tedious and confusing for the majority of the participants involved.

DISCUSSION

The purpose of the present study was to examine if ASL-gloss, that is, ASL in written form, had a positive effect on comprehension in order to assess potential methods for teaching reading in early stages of schooling as an introduction to written English. This study compared performance on reading measures in individuals who are deaf in written English, ASL-gloss, and ASL. This method had not previously been evaluated to assess reading comprehension for those who are deaf. This study was proposed to try to find new instructional methods (or discard ineffective methods) when teaching those with hearing loss written English language acquisition. The following hypothesis was proposed: Individuals will have significantly higher silent reading quotient scores on the GSRT in the ASL format as compared to both ASL-gloss and written English. Additionally, individuals will have significantly higher silent reading quotient scores on ASL-gloss as compared to written English.

The discussion begins with describing the implications of the demographics and how it may have influenced the overall findings. Next, the GSRT forms and mean difference scores are discussed. Each paired-samples t-test is described by the results of the overall mean differences. The preferred formats by participants are considered. Limitations of the study and directions for future research are addressed followed by concluding comments.

Demographics

Participants included individuals with an affiliation with Gallaudet University located in Washington, D.C. Participants were recruited through posting a recruitment flyer on Gallaudet University's Daily Digest announcement service. The group consisted

of 31 individuals with profound hearing loss. The reported age ranged from 18 to 58 years. The sample was fairly homogenous with the majority of participants being female with a primary and preferred language of ASL. The majority of participants were self-reported as Caucasian graduate females with hearing parents. Half of the participants reported acquiring ASL by the age of three years. When considering the distribution of education among participants, 45.2% reported as graduate students. These participants already would have completed at least four years of higher education in order to be accepted for a graduate degree. At the graduate level, academics become more rigorous and demanding, typically with an expectation of familiarizing oneself with academic journals and advanced textbooks. That level of education may require higher levels of critical thinking and a better understanding of written English. Although unexplored in the demographics questionnaire, there is a possibility that this level of education played a role in participants' preference for English, as these participants have been exposed to and required to have advanced comfort with written English to succeed in graduate studies.

GRST Forms and Difference Scores

The paired results were first analyzed by using the difference-score model presented in the GSRT manual. The manual states that a difference of nine points or greater between Forms A and B suggests a reliable difference in comprehension ability. When reviewing the differences among forms for each participant, 12 of the 31 participants evidenced difference scores of nine or greater between Form A and Form B. For those differences that existed, all participants performed higher on English in both the ASL/English and ASL-gloss/English groups. The results were mixed in the ASL/ASL-

gloss group with two of the ten participants performing higher on ASL and two of the ten performing higher on the ASL-gloss format. Nineteen participants (61.3%) did not evidence a reliable difference between their format scores. The majority of participants performed similarly between the formats; those that did not, performed better on the English version.

Paired Samples Tests

Participants were randomly assigned to one of six groups. All participants read or viewed two parallel sets of stories (Form A and Form B) presented in two of the following ways: English, ASL, or ASL-gloss. Wilcoxon Signed Ranks tests were conducted to see if differences existed due to a non-normal distribution of difference scores.

English/ASL-Gloss: Participants in this group performed better on the English format. The proposed hypothesis was not supported for higher comprehension scores when presented with ASL-gloss. There was a significant positive correlation between the ASL-gloss and English. Thus, those who performed higher on English also performed higher on ASL-gloss. The more a participant comprehended the stories in the English format, the more they comprehended and understood the stories when written in ASL-gloss.

English/ASL: Participants in this group performed similarly with ASL and English in their comprehension of the stories and there was no significant correlation between the formats. It is important to note that ASL was more likely to measure both comprehension and memory abilities of participants, rather than solely reading comprehension. Many participants did not utilize reviewing or rewinding the videos;

rather, they based their responses on what they remembered viewing in the ASL videos. Participants who received ASL formats were at a disadvantage in that most relied on their visual memory in order to respond to the comprehension questions; whereas the paper format allowed participants to review the text more easily and to use personal reading strategies to deduce answers for the comprehension questions. Additionally, as reported in the results, some participants felt that the ASL “accent” was confusing; stories were presented out of order; participants could not clarify the accent by asking questions; and/or they did not like the speed of signing. These factors identified by participants provide additional concerns when analyzing their ability to recall and to infer details from the stories. It is unknown if seeing the stories performed “live” would have offered different results.

ASL/ASL-Gloss: Participants in this group performed nearly identically on the ASL and ASL-gloss format. The participants scored similarly with their comprehension of the stories in each format. There was a moderately strong positive correlation between the formats, suggesting that as scores increased on the ASL format they also increased on the ASL-gloss format. The limitations mentioned previously regarding ASL placing demand on memory apply to participants in this group as well.

GSRT Language Format Comparison

There proved to be a reliable difference between language formats (ASL, ASL-gloss, and English) on investigation of all data as evidenced through an ANOVA. Student *t*-tests determined that a difference existed between English and both ASL and ASL-gloss. Overall, the reading comprehension score was higher on English, suggesting a stronger performance when presented with the stories in English. There was no difference

between ASL and ASL-gloss. In fact, the distribution of the comprehension scores was nearly identical when comparing ASL and ASL-gloss.

Summary of Primary Findings

The following hypothesis was proposed: There will be a main effect for language format. Individuals will have significantly higher silent reading quotient scores in the ASL format as compared to both ASL-gloss and written English. Additionally, individuals will have significantly higher silent reading quotient scores on ASL-gloss as compared to written English. The data supported a main effect for language; however, neither ASL nor ASL-gloss proved to be a better method for comprehension of written text in this study. Participants performed nearly identically when presented with the ASL and ASL-gloss formats. In each analysis of ASL-gloss and English, the English version presented with the higher scores, suggesting that ASL-gloss was not an effective way to improve comprehension for elementary-level text.

Participants did not evidence a higher silent reading quotient score in the ASL format as compared to ASL-gloss or English. A factor contributing to this may be that the ASL format relied more on memory than on comprehension. Those given paper formats were able to review written language when necessary for reminders of information they had previously read. Although the ASL format did allow for the ability to rewind the video, most participants chose not to re-watch portions of the stories that were viewed. A cognitive assessment of memory was not a prerequisite for participation and the range of memory abilities for participants was not assessed or identified. If a participant had challenges with visual or contextual memory, one may have had difficulty with being able to retain and recall portions of the stories in order to answer the comprehension

questions. It is important to understand that although ASL is a non-auditory language, not all people who are deaf rely on sign language for information processing (Rosen et al., 2017) and those presented with an ASL format may have evidenced more difficulty with the task due to other factors (e.g., visual memory, sustained attention). Additionally, focus sustainability and inattention were not evaluated at any time during the study. Each ASL video was approximately 30 minutes. During these 30 minutes, there was no respite and participants had to attempt to remain attentive to the video. For example, if a participant had a prior diagnosis of Attention-deficit/Hyperactivity Disorder (ADHD), either inattentive type or combined type, it may have resulted in them having a more difficult time with the ASL videos than a participant who did not have or was not suspected of having ADHD. As ASL is a visual language, when communicating one has to watch continually in order to see the entirety of the information being communicated. If during the administration of the videos, a participant looked away, some of the story may have been missed, which could have the potential to affect the ability to answer the comprehension questions. This could have had a negative effect on the overall score.

Preferred Format

When reviewing the results of the format preferences, only two participants preferred the ASL-gloss format. The other 19 participants who received ASL-gloss preferred either English or ASL. Participants stated reasons as to why they did not prefer ASL-gloss, such as that ASL-gloss was perceived as jumbled, non-automatic, and required more time to comprehend the stories. Some felt that with ASL-gloss there was a loss of context and details. As noted in the Results section, one participant felt that the combination of the languages made reading more confusing as "...a balanced bilingual

(learned both from an early age and fluent in both), both language(s) are separate and distinct in my brain. So, when reading English, I don't think in ASL." Overall, the results suggested that ASL-gloss was more of a tedious and confusing process for both reading and comprehension.

Limitations

There are numerous limitations to this study, many relating to the processes for standardization. The GSRT has not been standardized on the deaf and hard of hearing and the test does not have normative data for this population. The silent reading quotients may not reflect the true ability score in those who are deaf. This is a common theme and a standard challenge faced when working with different assessment measures within this population (Krouse & Braden, 2011; Wechsler, 2003; Wechsler, 2014). A key goal was to see if high levels of reading comprehension are better achieved through ASL-gloss, and the lack of normative data was not being used to draw instructional implications for any deaf individuals.

To the researcher's knowledge, the GSRT has never before been transcribed into ASL-gloss. ASL-gloss is not a true translation as there is no true written form for ASL and transcriptions can vary stylistically. If replicated, a new gloss format may be slightly different resulting in a lack of standardization across different researchers. When evaluating creating written ASL, researchers have begun to develop different stylistic approaches on how to capture glossing. Controversy exists as to whether an alphabetic or iconographic written language system would prove more beneficial for transcription (Grushkin, 2017). Some, such as Grushkin (2017), feel that glosses are a more problematic way to create a written signed language as there is often not a true one-to-

one correspondence in meaning across languages, especially with the grammatical differences that exist between English and ASL. Adjustments in the translations may need to occur, including finding a way to incorporate classifiers, facial grammar, and directional information. The current glossing for this research did not incorporate these aspects of adjustment. Supalla et al. (2017) address the problems that Grushkin states by acknowledging the differences among signed and written languages and the potential benefits of a written language. They feel the value and potential benefits of ASL-gloss merit attention from a research perspective, even with the lack of support from many researchers (e.g., Grushkin, 2017; Humphries & MacDougall, 2000; Lane, Hoffmeister, & Bahan, 1996; Neidle, Kegl, MacLaughlin, Bahan, & Lee, 2000; Slobin, 2008).

An Arizona charter school with an enrollment of deaf students developed an ASL-gloss system that expanded simple gloss to convey particular words, action verbs, classifiers, or facial grammar (as reported by Supalla et al., 2017 from a previous Supalla, Wix, & McKee, 2001, publication). A “*Resource Book*” was developed that allowed students to look up and to identify unknown gloss words that were presented in their texts. A system such as this would have given more definitive conclusions in the use of an ASL-gloss as a bridge to learning written English rather than a simple translation. In the present study, participants were not first engaged in instruction on understanding components of ASL-gloss. It is unknown if the participants had any prior exposure to the glossing system chosen for this research.

Another consideration for a written ASL is that for many pronominal forms, there is no distinguishing differential in signs. Supalla et al. (2017) suggest avoiding pronouns in all writing and create a word or character that would represent the conjunction of ASL

and English. For the method used in the Arizona Charter School, Supalla et al. (2017) wrote pronouns as “IX = ___.” The blank space was replaced with the number that corresponded to the appropriate pronoun (e.g., 1 = you). In addition, they suggest the use of underlining or bolding text to convey facial grammar. The current translation did not include any formatting changes to the text for pronouns or facial grammar. This is an interesting consideration for future potential research as it is unknown if this would have supported an increased or reduced understanding of the text presented in this research due to a lack of prior exposure.

The GSRT has also never been translated and standardized in ASL. If this were to be replicated, the videos may differ across researchers or regions of the country. Some participants noted that they found videos to be confusing due to the signing accents presented. It would have been best to consult with Certified Deaf Interpreters (CDIs), professors, ASL instructors, and deaf individuals for determining the most effective and comprehensible way to present the stories in ASL. Best practice should be that deaf individuals have the opportunity to converse with an interpreter prior to working with them, so that any questions about signing accents and/or signing preference (e.g., ASL, Signed Exact English) can be solved. Unfortunately, this was not an option due to the videos being previously recorded. An additional limitation to the video forms is that many participants relied on their visual memory to respond to the questions. The written forms do not necessarily require tapping into short-term or working memory, as the participant was able to refer back to the text in order to obtain an answer either directly or through inference. One participant reported a preference to read all questions prior to the story as a strategy for comprehension. This was not an option for participants given the

ASL format. They were required to answer the questions as they were presented in ASL. No directions were given to participants that restricted them from rewinding the videos; however, based on the amount of time it took most participants to complete the study, many chose to rely on their memory when answering the comprehension questions. The reliance on memory may be a confounding variable that was unable to be addressed through this research. Additionally, as also discussed previously, the demand on focus may have proved problematic. Participants were required to sustain their attention for approximately 30-minutes while they watched the eight stories and accompanying comprehension questions. If participants were to look away from the videos for even a brief period of time, they may have lost valuable information that would have aided in their ability to answer the comprehension questions. Additionally, as mentioned earlier, the exclusionary criteria and demographic questionnaire did not take into consideration any potential deficits or difficulties with either attention or memory.

The results did not support higher comprehension when being presented with ASL-gloss or ASL. The results for ASL-gloss and ASL were nearly identical. Both these formats had the limitation of lack of exposure. Participants did not first get the opportunity to converse with the signer of the stories, nor did they have an introduction to ASL-gloss as a written language. With exposure, it is unknown if scores would have been different. Even with exposure, however, this would not eliminate the interfering factor of ASL being partially a measure of memory rather than solely reading comprehension that was measured using English and ASL-gloss formats.

An interpreter was not present during the sessions due to limitations with available funding for this project along with difficulty scheduling interpreters on short

notice. The interpreting office at Gallaudet University has a number of requirements for hire. First, availability of interpreters is prioritized for academic classes over availability for other campus events. Each interpreter ranges in cost, starting at \$255 with services requiring a 2-hour minimum. Scheduling conflicts among interpreters and research participants would have added an additional challenge, as interpreters must also be requested at least a week in advance. There are opportunities for interpreters outside of the University but they typically charge a travel fee, increasing the price for each hour session with a participant. Often, participants would provide same-day or next-day availability, which eliminated the possibility of securing interpreters. During the sessions, if participants had questions, they had to communicate with the researcher whose skills are only conversational. Importantly, however, concerns with communication in ASL were not apparent nor made known by any participants, and participants appeared to understand the directions of the study with questions being suitably answered.

Due to the lack of professional interpreters, participants were required to read and sign the consent form for participating in this research. If participants had questions or were unsure of the information presented in the consent form, they needed to communicate with the researcher for clarification. Based on the interactions with each participant, very few questions arose and most were related to the compensation involved with participation. The consent form was written and approved by University of Rhode Island and Gallaudet University's IRB at a reading level higher than the third- to fifth-grade level, potentially suggesting that some information may have been misunderstood. The information was not provided for all participants in their primary or preferred

language, and cultural considerations and accommodations, although respected and evaluated, may not have been met for all participants.

Implications and Future Directions

During the 19th century, prior census data showed that all but one deaf inhabitant on Martha's Vineyard was able to read and write English by the age of sixteen years (Groce, 1985). As historical reports reveal that most people at the time were fluent in both English and the Island's form of sign language, children were exposed to both languages early in their development. Today, 90% of deaf children are born to hearing parents, many of whom are not fluent in any form of signed language. Due to this, parents are not able to engage their children in the linguistic interactions that help scaffold language development (Mayer, 2017). These same children are entering formal schooling without a fully formed first language (Mayer & Leigh, 2010) and typically have not developed early reading skills when they enter kindergarten (Supalla et al., 2017). Children who have stronger language development tend to be more successful at both language onset and later development with formal literacy (Mayer & Trezek, 2015; Paul et al., 2013). An overall restoration of how our nation chooses to educate the deaf may lead to more success in both literacy and writing, as seen through the experiences of people growing up on Martha's Vineyard and more recent research promoting early signed language development. Since the implementation of PL 94-142, the right to a free, appropriate public education in the least restrictive environment has changed the way education is conceptualized. Instead of classrooms and residential schools for the deaf and hard-of-hearing that were prevalent in the 1800s and early 1900s, 57% of deaf students are now taught exclusively in general-education school settings with hearing

students. A majority of the remaining groups are taught in resource rooms or self-contained classrooms in public schools. Spoken language only is used 53% of the time in teaching, and spoken language with signed support or cues is used 17% of the time (Gallaudet Research Institute, 2011).

There is an immediate need to re-evaluate the way we educate the D/deaf in the United States. Research must continue to evaluate and to improve on developing and implementing early instructional methods for education. Although the results of this study did not support ASL-gloss as a better method when compared to English, they did support similar scores as when viewing ASL. An argument can be made to support the need for further investigation into using ASL-gloss as an introductory method to learning written English. The research would require more of a longitudinal design to allow for an introduction to the format prior to assessment. If a written form of ASL were developed, it would have to first be piloted with instructors who would be willing to introduce it, preferably, into their pre-kindergarten or kindergarten curriculum. Those instructors would need to complete extensive coursework in order to learn both to read and to write the new system prior to being able to teach it to students. Rosen et al. (2017) noted that if a written form of ASL were to be created and utilized in both schools and teacher-preparation programs, the writing system would require not only the schools and educators to support the new practice of written communication, but also American society.

Longitudinal research would be imperative to monitor and measure success. This form of research would include its own limitations and downfalls, such as sufficient monetary support and increased incentives to retain educators and participants over a

period of time. The benefit, if the written format proved effective, would be to reduce overall costs as the least expensive and easily distributed form of communication is through written language. For example, at a doctor's office, fact sheets, insurance paperwork, diagnoses, and visit summaries could be transcribed into written ASL, potentially resulting in fewer interpreters required for dissemination of information. If written ASL were simply a building block toward better comprehension of written English, then a similar outcome would be present. English could remain as the written format but become a more useful and appropriate method for presenting information.

When considering a written ASL, research debates whether to use iconographic scripts or alphabetic scripts for creating written ASL with researchers having used both (Arnold, 2013; Grushkin, 2017; Suppala, McKee, & Cripps, 2014). Future research may wish to evaluate the benefits of each and compare ease of use toward development of an accepted format. Logographic script requires more visual memory over alphabetic scripts (Tzeng & Hung, 1988) and visual memory often tends to be a strength for Deaf individuals (Grushkin, 2017) suggesting that perhaps an iconographic script would be more easily understood. This is currently just conjecture and no data have been collected on the benefits in the Deaf community in either format. The materials used in this dissertation were written using an alphabetic script and did not achieve better comprehension of the presented stories. Participants were not given advanced introduction to the alphabetic ASL-gloss and may or may not have had exposure to the system previously. In the future, researchers may wish to spend a few weeks teaching participants about possible iconographic and alphabetic scripts and compare and contrast the benefits and downfalls of each individual writing system. This may have the potential

to allow for a bridge to better comprehending written English, and if not, it would allow for other benefits within the American system, some of which were mentioned previously.

If a written language were to be developed, researchers would have to consider how much of an alignment of ASL and English would be appropriate with the ASL-glossing system and consider if this system would even have instructional implications. ASL differs from the sequential nature of most spoken languages (Mayer, 2017), thus researchers would have to consider how to transcribe ASL in the most appropriate format to link ASL and English to create a new glossing system. Using ASL-gloss as a bridge to English might not require as much consideration about how to transcribe classifiers, directional verbs/nouns, and facial expressions but it would require thorough reasoning and understanding of the relationship between English and ASL for conveying meaning when creating a written format.

An interesting consideration is that a number of participants identified their bilingualism within the comments. Future research should consider the way ASL and written English is neurologically represented when considering a writing system. In 2005, Children of Deaf Adults (CODAs) were identified in order to research bimodal bilingualism (Emmorey, Borinstein, & Thompson). Bimodal bilingualism differs from unimodal bilingualism, the bilingualism most often assumed when talking about bilingualism, in that bimodal (speech-sign) bilinguals have two possible output channels – vocal tract and hands. Although not all people who are deaf supplement signs with speech, it is the idea that bimodal bilinguals can engage in both simultaneously without requiring one to be suppressed. A unimodal bilingual must halt one language in order to

use the other. Children of Deaf Adults (CODAs) were asked to watch a brief video and summarize the information. Ten of the 11 participants summarized the videos using both English and ASL. Results suggested that ASL-English bilinguals produce code-blends, rather than code-switches. The bimodal bilinguals did not stop speaking to sign nor did they stop signing to speak. Throughout the study, they produced sign and speech simultaneously when in a bilingual mode of communication (Emmorey, Borinstein, & Thompson, 2005). Although the current research only targeted deaf adults, it may be of importance to consider the type of bilingualism (unimodal vs. bimodal) and its neuropsychological concomitants for those fluent in both English and ASL, as when reading the ASL-gloss format, some participants were observed signing simultaneously while reading. When considering an iconographic or alphabetic approach for a written ASL, the impact of being a bimodal bilingual and associated neuropsychological representation with each language may help the overall effectiveness and potential impact of the language.

As ASL-gloss did not prove effective, alternative methods should be considered for improving reading. A few participants indicated that they viewed themselves as being bilingual in both written English and ASL. An understanding of how they became successfully bilingual may be more beneficial for researchers when considering strategies for improving outcomes for reading with the deaf. If connections and conclusions can be drawn from qualitative research regarding the path to bilingualism, this may provide instructional implications for deaf education. Being able to target and to identify successful measures could reduce the need for further pursuing options that exhibit mixed research and lack a common strategy (e.g., glossing formats).

Another consideration would relate to early-intervention efforts. As research shows that those who have mastery in their first language (ASL) are more likely to find greater success with academics (Cawthon, 2001; Freel et al., 2011; Lou, 1988; Mayberry, 2007; Mayberry, del Guidice, & Liberman, 2011; Mayer, 2007), programs should be developed to target early-intervention efforts towards introducing a primary language. Part of these efforts may include parent-training groups that review some of the published research supporting language development and the benefits it has for a deaf child's academic future. If children were to enroll in school already fluent in a language, more instructional time could be devoted to supporting reading development.

This may have been one reason why, in the 19th century, individuals with any form of deafness showed more positive outcomes with academic success. Students were being educated while being immersed in deaf culture and language. Since the development of PL 94-142, the right to a free, appropriate public education in the least restrictive environment has changed the way in which education is conceptualized. Although these legislative changes provide positive access to many students with disabilities, a counter argument could be made for children who are deaf. The submersion into deaf language and culture might further build language development and, in turn, provide academic gains. Research could again be conducted comparing personal statements, preferences, and academic achievement of students in different educational environments. These environments could include general-education settings in public-school classrooms, resource rooms for the d/hh, and even separate state schools for the deaf. Regardless of how education progresses, data consistently show that a fully formed first language (such as ASL) may be a foundation for greater academic achievement.

Concluding Remarks

The hypotheses of the present study were not fully supported. The similarity between ASL and ASL-gloss may warrant further study to support deaf children in their educational success. Regardless of how instructors try to increase reading comprehension levels of the deaf, we know that deaf children of deaf adults and deaf children with proficiency in ASL outperform their deaf peers in written language skills, both through writing and reading (Grushkin, 2017; Krashen, 1996; Mayer & Trezek, 2015; Paul, Wang, & Williams, 2013). Researchers should continue to investigate and to propose alternative methods for further development of reading competency as the results of this study did not support the use of ASL-gloss as an effective method for reading. The most straightforward and successful methods may require our country and education-policy forerunners to recognize that history has identified educational methods, prior to 1880, that produced the best possible outcomes in reading for children with profound deafness, such as promoting ASL fluency in ASL school and classrooms prior to English development.

REFERENCES

- Allen, T. E. (1995). Demographics and national achievement levels for deaf and hard of hearing students: Implications for mathematics reform. In C.H. Dietz (Ed.), *Moving toward the standards: A national action plan for mathematics education reform for the deaf* (pp. 41-49). Washington, DC: Pre-College Programs, Gallaudet University.
- Allen, T.E. & Anderson, M. L. (2010). Deaf students and their classroom communication: An evaluation of higher order categorical interactions among school and background characteristics. *Journal of Deaf Studies and Deaf Education, 15*(4), 334 – 347. doi: 10.1093/deafed/enq034.
- American Psychological Association (2017). Ethical principles of psychologists and code of conduct. Retrieved from: <https://www.apa.org/ethics/code/>.
- Anastasi, A., & Urbina, S. (1997). *Psychological testing* (7th ed.). Upper Saddle River, NJ: Prentice-Hall.
- Ansell, E., & Pagliaro, C.M. (2006). The relative difficulty of signed arithmetic story problems for primary level deaf and hard-of-hearing students. *Journal of Deaf Studies and Deaf Education, 11*, 153-170.
- Arnold, R. (2013). *Introduction to Si5s* [Video]. Retrieved from YouTube website: <https://www.youtube.com/watch?v=vxrNAIdCr3s>.
- Bailes, C.N. (2001). Integrative ASL-English language arts: Bridging paths to literacy. *Sign Language Studies, 1*(2), 147-174. doi: 10.1353/sls/2001/0002.
- Berent, G. P., Kelly, R. R., Aldersley, S., Schmitz, K. L., Khalsa, B. K., Panara, J., & Keenan, S. (2007). Focus-on-form instructional methods promote deaf college

- students' improvement in english grammar. *Journal of Deaf Studies and Deaf Education*, 12(1), 8-24. doi: 10.1093/deafed/enl009.
- Boatner, E. B. (1965, November). The need of a realistic approach to the education of the deaf. In *joint convention of the California Association of Parents of Deaf and Hard of Hearing Children, California Association of Teachers of the Deaf and Hard of Hearing, and the California Association of the Deaf*.
- Boudreault, P. & Mayberry, R.I. (2006). Grammatical processing in american sign language: Age of first-language acquisition effects in relation to syntactic structure. *Language and Cognitive Processes*, 21(5), 608-635.
- Bowers, L. M., Dostal, H., McCarthy, J. H., Schwartz, I., & Wolbers, K. (2016). An analysis of deaf students' spelling skills during a year-long instructional writing approach. *Communication Disorders Quarterly*, 37(3), 160-170. doi: 10.1177/1525740114567528.
- Buisson, G. J. (2007). Using online glossing lessons for accelerated instruction in ASL for preservice deaf education majors. *American Annals of the Deaf*, 152(3), 331-343.
- Cawthon, S. W. (2001). Teaching strategies in inclusive classrooms with deaf students. *Journal of Deaf Studies and Deaf Education*, 6(3), 212-225.
- Chamberlain, C., & Mayberry, R. (2008). ASL syntactic and narrative comprehension in skilled and less skilled adult readers: Bilingual-bimodal evidence for the linguistic basis of reading. *Applied Psycholinguistics*, 29, 368-388.

- Corina, D., & Singleton, J. (2009). Developmental social cognitive neuroscience: Insights from deafness. *Child Development, 80*(4), 952-967. doi: 10.1111/j.1467-8624.2009.01310.x.
- Cummins, J. (1984). *Bilingualism and special education: Issues in assessment and pedagogy*. Avon (England): Multilingual Matters.
- Day, H.E., Fusfeld, I.S., & Pintner, R. (1928). *A Survey of American Schools for the Deaf, 1924-1925: Conducted under the Auspices of the National Research Council*. United States: The National Research Council.
- DeLana, M. Gentry, M.L., & Andrews, J. (2007). The efficacy of ASL/English bilingual education: Considering public schools. *American Annals of the Deaf, 152*(1), 73-87. doi: 10.1353/aad.2007.0010.
- Emmorey, K., Borinstein, H. B., & Thompson, R. (2005). Bimodal bilingualism: Code-blending between spoken english and american sign language. In J. Cohen, K. McAlister, K. Rolstad, & J. MacSwan (Eds.), *ISB4: Proceedings of the 4th International Symposium on Bilingualism* (663-673). Somerville, MA: Cascadilla Press.
- Evans, L. (1982). *Total Communication: Structure and Strategy*. Washington, D.C.: Gallaudet College Press.
- Freel, B.L., Clark, M.D., Anderson, M.L., Gilbert, G., Musyoka, M.M., & Hauser, P.C. (2011). Deaf individuals' bilingual abilities: American sign language proficiency, reading skills, and family characteristics. *Psychology, 2*, 18-23. doi: 104236/psych.2011.21003.

- Gallaudet Research Institute. (2011). *Regional and national summary report of data from the 2009-10 Annual Survey of Deaf and Hard of Hearing Children and Youth*. Washington, D.C.: Gallaudet University.
- Golos, D.B., & Moses, A.M. (2011). How teacher mediation during video viewing facilitates literacy behaviors. *Sign Language Studies*, 12(1), 76-99.
- Golos, D.B., & Moses, A.M. (2013). Developing preschool deaf children's language and literacy from an educational media series. *American Annals of the Deaf*, 158(4), 411-425. doi: 10.1353/aad.2013.0039.
- Gournaris, M. J. (2009). Preparation for the delivery of telemental health services with individuals who are deaf: Informed consent and provider procedure guidelines. *JADARA*, 43(1), 34-51.
- Griffith, P.I. & Ripich, D.N. (1988). Story structure recall in hearing-impaired, learning-disabled, and non-disabled children. *American Annals of the Deaf*, 133, 43-50.
- Groce, N.E. (1985). *Everyone Here Spoke Sign Language: Hereditary Deafness on Martha's Vineyard*. Cambridge, MA: Harvard University Press.
- Grushkin, D. A. (2017). Writing signed languages: What for? What form? *American Annals of the Deaf*, 161(5), 509-527. doi: 10.1353/aad.2017.0001.
- Harmer, L. M. (1999). Health care delivery and deaf people: Practice, problems, and recommendations for change. *Journal of Deaf Studies and Deaf Education*, 4(2), 73-110.
- Harmon, K. (2007). Writing deaf: Textualizing deaf literature. *Sign Language Studies*, 7(2), 200-207. doi: 10/1353/sls.2007.0002.

- Hoffmeister, R. J. (2000). A piece of the puzzle: ASL and reading comprehension in deaf children. In C. Chamberlain, J. Morford, & R. Mayberry (Eds.), *Language Acquisition by Eye* (pp. 143-163). Mahwah, NJ: Erlbaum.
- Hoffmeister, R. J. & Caldwell-Harris, C. L. (2014). Acquiring English as a second language via print: The task for deaf children. *Cognition*, 132, 229 – 242.
- Humphries, T., & MacDougall, F. (2000). “Chaining” and other links: Making connections between American Sign Language and English in two types of school settings. *Visual Anthropology Review*, 15(2), 84-94.
- Johnson, R. E., & Erting, C. (1989). Ethnicity and socialization in a classroom for Deaf children. In C. Lucas (Ed.), *The sociolinguistics of the Deaf community* (pp. 41-84). New York, NY: Academic Press.
- Kalivoda, K. S., Higbee, J. L., & Brenner, D. C. (1997). Teaching students with hearing impairments. *Journal of Developmental Education*, 20(3), 10-12, 14, 16.
- Klerk, A. (1998). Deaf identity in Adolescence: The Rotterdam deaf awareness program. In A. Weisel (Ed.), *Issues Unresolved: New Perspectives on Language and Deaf Education* (pp. 206 – 214). Washington, DC: Gallaudet University Press.
- Knors, H. & Marschark, M. (2012). Language planning for the 21st century: Revisiting bilingual language policy for deaf children. *Journal of Deaf Studies and Deaf Education*, 17(3), 291 - 305. doi: 10.1093/deafed/ens018.
- Krashen, S. (1996). The case against bilingual education. In J Alatis, C. Strahle, M. Ronkin, & B. Gallenberger (Eds.), *Linguistics, language acquisition, and language variation: Current trends and future prospects* (pp. 55-69). Washington, DC: Georgetown University Press.

- Kritzer, K. L. (2009a). Barely started and already left behind: A descriptive analysis of the mathematics ability demonstrated by young deaf children. *Journal of Deaf Studies and Deaf Education, 14*(4), 409-421.
- Kritzer, K.L. (2009b). Families with young deaf children and the mediation of mathematically-based concepts within a naturalistic environment. *American Annals of the Deaf, 153*(5), 474-483. doi: 10.1353/aad.0.0067.
- Krouse, H.E. and Braden, J.P. (2011). The Reliability and Validity of WISC-IC Scores with Deaf and Hard-of-Hearing Children. *Journal of Psychoeducational Assessment, 29*(3), 238-248.
- Kyle, F., & Harris, M. (2006). Concurrent correlates and predictors of reading and spelling achievement in deaf and hearing school children. *Journal of Deaf Studies and Deaf Education, 11*, 273-288.
- Lane, H. (2005). Ethnicity, ethics and the deaf-world. *Journal of Deaf Studies and Deaf Education, 10*(3), 291-310. doi: 10.1093/deafed/eni030.
- Lane, H., Hoffmeister, R. & Bahan, B. (1996). *A Journey into the Deaf-World*. San Diego: Dawn Sign Press.
- Lane, H., Pillard, R., & French, M. (2000). Origins of the American Deaf-World: Assimilating and differentiating societies and their relation to genetic patterning. *Sign Language Studies, 1*, new series, 17-44.
- Longmore, P.K. (1987). Uncovering the hidden history of people with disabilities. *Reviews in American History, 15*(3), 355-364.

- Lou, M.W. (1988). The history of language use in the education of the deaf in the United States. In M. Strong (Ed.), *Language Learning and Deafness* (pp.75-98). New York, NY: Cambridge University Press.
- Luckner, J.L., & Cooke, C. (2010). A summary of the vocabulary research with students who are deaf or hard of hearing. *American Annals of the Deaf*, 155(1), 38-67.
- Luckner, J.L. & Handley, C.M. (2008). A summary of the reading comprehension research undertaken with students who are deaf of hard of hearing. *American Annals of the Deaf*, 153(1), 6-36.
- Luckner, J.L., Sebold, A.M., Cooney, J., Young III, J., & Muir, S.G. (2005/2006). An examination of the evidence-based literacy research in deaf education. *American Annals of the Deaf*, 150(5), 443-456.
- Luetke-Stalhaman, B. & Nielsen, D. C. (2003). The contribution of phonological awareness and receptive and expressive English to the reading ability of deaf students with varying degrees of exposure to accurate English. *Journal of Deaf Studies and Deaf Education*, 8(4), 464 – 484. doi: 10.1093/deafed/eng028.
- Martin, A. J., & Sera, M. D. (2006). The acquisition of spatial constructions in american sign language and english. *Journal of Deaf Studies and Deaf Education*, 11(4), 391-402.
- Marschark, M, & Everhart, V. (1999). Problem-solving by deaf and hearing students: Twenty questions. *Deafness and Education International*, 1, 65-82.
- Marschark, M. & Hauser, P. (2012). *How deaf children learn: What parents and teachers need to know*. New York, NY: Oxford University Press.

- Marschark, M., Lang, H., & Albertini, J. (2002). *Educating deaf students: From research in practice*. New York: Oxford University Press.
- Maxwell, M. M., & Falick, T. G. (1992). Cohesion and quality in deaf and hearing children's written English. *Sign Language Studies*, 77, 345-371.
- Mayberry, R. (2007). When timing is everything: Age of first-language acquisition effects on second-language learning. *Applied Psycholinguistics*, 28, 537-549. doi: 10.1017/S0142716407070294.
- Mayberry, R., del Giudice, A.A., & Lieberman, A.M. (2011). Reading achievement in relation to phonological coding and awareness in deaf readers: A meta-analysis. *Journal of Deaf Studies and Deaf Education*, 16(2), 164-188. doi: 10.1093/deafed/enq049.
- Mayer, C. (1998). Deaf children learning to spell. *Research in the Teaching of English*, 33, 158-180.
- Mayer, C. (2007). What really matters in the early literacy development of deaf children. *Journal of Deaf Studies and Deaf Education*, 12(4), 411-431. doi: 10.1093/deafed/enm020.
- Mayer, C. (2009). Issues in second language literacy education with learners who are deaf. *International Journal of Bilingual Education and Bilingualism*, 12(3), 325-334. doi: 10.2167/beb324/0.
- Mayer, C. (2017). Written forms of signed languages: A route to literacy for deaf learners? *American Annals of the Deaf*, 161(5), 552-559. doi: 10.1353/aad.2017.0005.

- Mayer, C. & Leigh, G. (2010). The changing context for sign bilingual education programs: Issues in language and the development of literacy. *International Journal of Bilingualism and Bilingual Education*, 13(2), 175-186.
- Mayer, C. & Trezek, B.J. (2015). *Early literacy development in deaf children*. New York, NY: Oxford University Press.
- McAnally, P. L., Rose, S., & Quigley, S. P. (1999). *Reading practices with deaf learners*. Austin, TX: Pro Ed, Inc.
- Mitchell, R.E., & Karchmer, M.A. (2010). Demographics and achievement characteristics of deaf and hard-of-hearing students. In M. Marschark & P.E. Spencer (Eds.), *Oxford Handbook of Deaf Studies, Language, and Education* (pp.21-37). Oxford: Oxford University Press.
- Moore, D.F. (1992). An historical perspective on school placement. In T.N. Kluwin, D.F. Moore, & M.G. Gaustad (Eds.), *Toward Effective Public School Programs for Deaf Students: Context, Process, & Outcomes* (pp. 7-29). New York, NY: Teachers College Press.
- Moore, D.F. & Moore, A. (2011). International congresses on the education of the deaf, 1878 to 2005. In D.F. Moore (Ed.), *Partners in Education. Issues and Trends from the 21st International Congress on the Education of the Deaf* (pp.3-19). Washington, DC: Gallaudet University Press.
- Morford, J.P., & Mayberry, R.I. (2000). A reexamination of “early exposure” and its implications for language acquisition by eye. In C. Chamberlain, J. Morford, & R. Mayberry (Eds.), *Language Acquisition by Eye* (pp. 111-128). Mahwah, NJ: Erlbaum.

- Musselman, C. (2000). How do children who can't hear learn to read an alphabetic script? A review of the literature on reading and deafness. *Journal of Deaf Studies and Deaf Education*, 5(1), 9-31.
- Neidle, C.J., Kegl, J., MacLaughlin, D., Bahan, B., & Lee, R.G. (2000). *The syntax of American Sign Language: Functional categories and hierarchical structure*. Cambridge, MA: MIT Press.
- Orlando, A., & Shulman, B. (1989). Severe-to-profound hearing impaired children's comprehension of figurative language. *Journal of Childhood Communication Disorders*, 12(2), 157-165.
- Paul, P. (1998). *Literacy and deafness: The development of reading, writing, and literate thought*. Needham Heights, MA: Allyn & Bacon.
- Paul, P. (2003). Processes and components of reading. In M. Marschark & P. Spencer (Eds.), *Handbook of deaf studies, language and education* (pp 97 – 109). New York: Oxford University Press.
- Paul, P. V. (2009). *Language and deafness* (4th ed.). Sudbury, MA: Jones & Bartlett
- Paul, P., Wang, Y., & Williams, C. (2013). *Deaf students and the qualitative similarity hypothesis: Understanding language and literacy development*. Washington, D.C.: Gallaudet University Press.
- Pray, J. L. & Jordan, I. K. (2010). The deaf community and culture at a crossroads: Issues and challenges. *Journal of Social Work in Disability and Rehabilitation*, 9, 168-193. doi: 10.1080/1536710X.2010.493486.

- Qi, S. & Mitchell, R.E. (2011). Large-scale academic achievement testing of deaf and hard-of-hearing students: Past, present and future. *Journal of Deaf Studies and Deaf Education*, 17, 1-18. doi: 10.1093/deafed/enr028.
- Rathman, C., Wolfgang, M., & Morgan, G. (2007). Narrative structure and narrative development in deaf children. *Deafness and Education International*, 9(4), 187-196.
- Rosen, R.S., Hartman, M.C., & Wang, Y. (2017). “Thinking-for-writing”: A prolegomenon on writing signed languages. *American Annals of the Deaf*, 161(5), 528-536. doi: 10.1353/aad.2017.0002
- Schick, B., Williams, K., Kupermintz, H. (2005). Look who’s being left behind: Educational interpreters and access to education for deaf and hard-of-hearing students. *Journal of Deaf Studies and Deaf Education*, 11(1), 3-20. doi: 10.1093/deafed/enj007.
- Schirmer, B. R. (1994). *Language and literacy development in children who are deaf*. New York: Macmillan Publishing Company.
- Schirmer, B.R., & McGough, S.M. (2005). Teaching reading to children who are deaf: Do the conclusions of the national reading panel apply? *Review of Educational Research*, 75(1), 83-117.
- Schleppegrell, M. (2001). Linguistic features of the language of schooling. *Linguistics and Education*, 12(4), 431-459.
- Scott, J.A., & Hoffmeister, R.J. (2017). American sign language and academic english: Factors influencing the reading of bilingual secondary school deaf and hard of

- hearing students. *Journal of Deaf Studies and Deaf Education*, 22(1), 59-71. doi: 10.1093/deafed/enw065.
- Singleton, J.L., Morgan, D., DiGello, E., Wiles, J., & Rivers, R. (2004). Vocabulary use by low, moderate, and high ASL-proficient writers compared to hearing ESL and monolingual speakers. *Journal of Deaf Studies and Deaf Education*, 9(1), 86-103. doi: 10.1093/deafed/enh011.
- Slobin, D. I. (2008). Breaking the molds: Signed languages and the nature of human language. *Signed Language Studies*, 8(2), 114-130.
- Stewart, D. A. & Akamatsu, C. T. (1988). The coming of age of American sign language. *Anthropology and Education Quarterly*, 19(3), 235 – 252.
- Strong, M., & Prinz, P.M. (1997). A study of the relationship between American sign language and English literacy. *Journal of Deaf Studies and Deaf Education*, 2(1), 37-46. doi: 10.1093/oxfordjournals.deafed.a014308.
- Supalla, S. J. & Blackburn, L. (2003). Learning how to read and bypassing sound. *Odyssey*, 5(1), 50-55.
- Supalla, S. J., Cripps, J.H., Byrne, A. P. J. (2017). Why american sign language gloss must matter. *American Annals of the Deaf*, 161(5), 540-551. doi: 10.1353/aad.2017.0004.
- Supalla, S. J., McKee, C., & Cripps, J. H. (2014). *An overview on the ASL-phabet*. Tucson, AZ: Gloss Institute.
- Traxler, C. B. (2000). The Stanford achievement test, 9th edition: National norming and performance standards for deaf and hard-of-hearing students. *Journal of Deaf Studies and Deaf Education*, 5, 337-348.

- Tucker, J.E. (2011). The bedrock of deaf education in North America: Center schools. In D. Moores (Ed.), *Partners in Education. Issues and Trends from the 21st International Congress on the Education of the Deaf* (pp.31-37). Washington, DC: Gallaudet University Press.
- Tzeng, O., & Hung, D. (1988). Orthography, reading, and cerebral function. In D. de Kerckhove & C. Lumsden (Ed.). *The alphabet and the brain: The lateralization of writing* (pp. 273 – 290). New York, NY: Springer.
- Uccelli, P., Barr, C.D., Dobbs, C.L., Galloway, E.P., Meneses, A., & Sanchez, E. (2014). Core academic language skills: An expanded operational construct and a novel instrument to chart school-relevant language proficiency in preadolescent and adolescent learners. *Applied Psycholinguistics*, 36(5), 1077-1109. doi: 10.1017/S014271641400006X.
- Van Cleve, J. V. (1985). No Sign of Education. *History of Education Quarterly*, 25(4), 499-506.
- Wang, Y. & Williams C. (2014). Are we hammering square pegs into round holes?: An investigation of the meta-analyses of reading research with students who are d/deaf or hard of hearing and students who are hearing. *American Annals of the Deaf*, 159(4), 323-345.
- Wechsler, D. (2003). *Technical and interpretive manual for the Wechsler Intelligence Scale for Children* (4th ed.). San Antonio, TX: Psychological Corporation.
- Wechsler, D. (2014). *Technical and interpretive manual for the Wechsler Intelligence Scale for Children* (5th ed.). San Antonio, TX: Psychological Corporation.

- Wiederholt, J. L. & Blalock, G. (2000). *Gray Silent Reading Tests (GSRT): Manual*. Lutz, FL: PAR Inc.
- Williams, C. (2004). Emergent literacy of deaf children. *Journal of Deaf Studies and Deaf Education*, 9(4), 352-365. doi: 10.1093/deafed/enh045.
- Wolbers, K.A., (2008). Using balanced and interactive writing instruction to improve the higher order and lower order writing skills of deaf children. *Journal of Deaf Studies and Deaf Education*, 13(2), 257-277.
- Wolbers, K. A. (2008). Using balanced and interactive writing instruction to improve the higher order and lower order writing skills of deaf students. *Journal of Deaf Studies and Deaf Education*, 13(2), 257-277. doi: 10.1093/deafed/enm052.
- Wolbers, K.A., Bowers, L. M., Dostal, H. M., & Graham, S. C. (2014). Deaf writers' application of American sign language knowledge to English. *International Journal of Bilingual Education and Bilingualism*, 17(4), 410-428.
- Wolbers, K. A., Graham, S. C., Dostal, H. M., & Bowers, L. M. (2014). A description of ASL features in writing. *Ampersan*, 1, 19-27.
- Woodward, J. (1978). Historical basis of american sign language. In P. Siple (Ed.). *Understanding Language Through Sign Language Research*. New York: Academic Press.
- Yoshinaga-Itano, C., & Downey, D. M. (1996). Development of school-aged deaf, hard-of-hearing, and normally hearing students' written language. *The Volta Review*, 98(1), 3-7.

Yoshinaga-Itano, C., Snyder, L.S., & Mayberry, R. (1996). How deaf and normally hearing students convey meaning within and between written sentences. *The Volta Review*, 98(1), 9-38.

Zazove, P., Niemann, L. Gorenflo, D., Carmack, C., Mehr, D., Coyne, J., & Antonucci, T. (1993). The health status and health care utilization of deaf and hard-of-hearing persons. *Archives of Family Medicine*, 2(7), 745-752.

Appendix A

Recruitment Flyer for Participation

PARTICIPANTS NEEDED for a research study conducted by Dr. W. Grant Willis, Department of Psychology and Emma Rathkey, M.A., from the University of Rhode Island.

This one-session study investigates different methods of reading. The session takes approximately 45-60 minutes. If you are deaf, have a profound uncorrected hearing loss use ASL as your primary or preferred language, and are at least 18 years of age, please email **erathkey@gmail.com** for more information. Eligible participants will receive \$30 for participation in the study. This research has been approved by The University of Rhode Island Institutional Review Board and the Institutional Review Board at Gallaudet University.

Contact Emma Rathkey at erathkey@gmail.com

Appendix B

Demographics Questionnaire

Based on the following statements, please check the answer that best describes you:

1. Gender: Male Female Other: _____

2. Year in University:

- a. Freshman
- b. Sophomore
- c. Junior
- d. Senior
- e. Graduate Student
- f. Other: _____

3. Age: _____

4. Ethnicity

- a. Caucasian
- b. Asian / American Asian
- c. African American/Black
- d. Hispanic/Latino
- e. Pacific Islander
- f. American Indian/Alaskan
- g. Other: _____

5. Preferred Language

- a. English
- b. ASL
- c. Other: _____

6. Primary Language (the one you use most often)

- a. English
- b. ASL
- c. Other: _____

7. Parental Hearing Status

- a. Both d/Deaf
- b. One d/Deaf
- c. Both hearing

8. Age of Acquiring ASL? _____

Appendix C

Preferred Format Questionnaire

After completing both forms, which format did you prefer? Why?

Format English: This format was written in English. The form in English is the original test given to measure reading comprehension.

Format ASL-Gloss: This format was made to follow the structure of American Sign Language (ASL). ASL-Gloss is not a real written language but used as a way to teach people the grammar of ASL.

Preferred Form: ____ English ____ ASL-Gloss

Why?

After completing both forms, which format did you prefer? Why?

Format ASL: This video was presented in American Sign Language.

Format ASL-Gloss: This format was made to follow the structure of American Sign Language (ASL). ASL-Gloss is not a real written language but used as a way to teach people the grammar of ASL.

Preferred Form: ____ ASL ____ ASL-Gloss

Why?

After completing both forms, which format did you prefer? Why?

Format English: This format was written in English. The form in English is the original test given to measure reading comprehension.

Format ASL: This video was presented in American Sign Language.

Preferred Form: ____ English ____ ASL

Why?

Appendix D

Informed Consent

BACKGROUND

You have been asked to take part in a research study described below. Before you decide to participate, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether you want to volunteer to take part in this study. W. Grant Willis, Ph.D. from the Psychology Department at the University of Rhode Island is the Principal Investigator of this research study. If you have more questions later, call 973-945-9431 or email emma_rathkey@my.uri.edu, and Emma Rathkey, M.A. from the Psychology Department at the University of Rhode Island, the person mainly responsible for this study will discuss them with you.

The purpose of this project is to investigate reading and language comprehension in different formats with individuals with a profound, unaided hearing loss, including the absence of cochlear implants (90 db lost or greater in the better ear), who use American Sign Language (ASL) as their preferred or primary language.

STUDY PROCEDURE

You are one of about 60 students who will be asked to respond to read short stories and answer questions. There are no right or wrong answers, just answer what you think is true. To participate, you must be 18 years of age, have a profound uncorrected hearing loss, and use American Sign Language (ASL) as a preferred or first language. Your participation should last about 45-60 minutes.

RISKS

There are minimal risks associated with participating in this research. You may not wish to answer personal questions about your family history and language usage. These risks are similar to those you experience when discussing personal information with others. If the survey raises any issues, concerns, or distress, we urge you to contact the local Counseling Center at Gallaudet University (Video Phone: 202-250-2300/TTY: 202-651-6080) for availability or for suggestions of local mental health counselors.

BENEFITS

You may not receive any direct benefits from taking part in this study. Taking part in the study may help develop a greater understanding of reading teaching methods in the future. Some people may find participation in this research informative and personally beneficial.

CONFIDENTIALITY

Participation in this project is confidential and anonymous. Your information will not be shared with any organizations. Your name will never be collected and therefore cannot be connected with your data. Research summaries will combine all the information collected. No individual information will be reported. Data will be stored in locked filing cabinets. Only the investigators will have access to the data. You consent to the publication of the results collected and know that your identity will remain protected.

Your name will be kept with this form only. In publications, your name will be removed.

PERSON TO CONTACT

This study is being conducted by Emma Rathkey under the direct supervision of W. Grant Willis at the University of Rhode Island. If you have any questions or concerns

about this study, please contact Ms. Rathkey at 973-945-9431 or emma_rathkey@my.uri.edu or Dr. Willis at 401-874-4245 or wgwillis@uri.edu.

Institutional Review Board: Contact the Institutional Review Board (IRB) if you have questions regarding your rights as a research participant. Also, contact the IRB if you have questions, complaints or concerns which you do not feel you can discuss with the investigator. The University of Rhode Island IRB may be reached by phone at (401) 874-4328 or by e-mail at researchintegrity@etal.uri.edu. The research has additionally been approved by the IRB at Gallaudet University. They can be reached by videophone at (202) 250-2472 or by email at IRB@Gallaudet.edu.

Vice President for Research and Economic Development: You may also contact the Vice President for Research and Economic Development by phone at (401) 874-4576.

VOLUNTARY PARTICIPATION

The decision whether or not to take part in this study is up to you. It is understood that you may refuse to answer any questions as you see fit, and that you may withdraw from this study at any time without penalty.

COSTS AND COMPENSATION TO PARTICIPANTS

This project is being funded by Emma Rathkey and the University of Rhode Island.

There will be no costs to you, except your time spent taking the survey. All participants will receive \$30 for their time. Completion of the study is not required for payment.

CONSENT

By signing this consent form, I confirm I have read the information in this consent form and have had the opportunity to ask questions at any time. I also understand that my decision to complete the reading assessments means that I understand the information

provided and agree to participate in this research study. I will be given a signed copy of this consent form. I voluntarily agree to take part in this study.

Printed Name of Participant

Signature of Participant

Date

Printed Name of Person Obtaining Consent

Signature of Person Obtaining Consent

Date

Appendix E

Debriefing Form

First and foremost, thank you for participating in this research on reading and language comprehension. Emma Rathkey, M.A., a School Psychology student, at the University of Rhode Island, developed the research idea. This research, titled “Can ASL-Gloss Be Used As An Instructional Tool To Teach English to the Deaf?” is being conducted in order to fulfill requirements for a doctoral degree in Psychology. I was interested in determining if ASL-gloss could have some benefit when teaching the deaf the English written language. The main function of this research is primarily exploratory.

My hypotheses are as follows: (a) There will be a main effect for language format. Students will have significantly higher silent reading quotient scores in the ASL format as compared to both ASL-gloss and written English. (b) Students will have significantly higher silent reading quotient scores on ASL-gloss as compared to written English. I would appreciate it if you refrain from sharing your experience in the study until the end of the year when the study has been completed.

If you are interested in this topic and want to read the literature in this area, please contact me, Emma Rathkey at erathkey@gmail.com or at (973) 945-9431. The University of Rhode Island Institutional Review Board (IRB) approved this study, and any additional questions regarding the research can be directed to the Vice President for Research, at (401) 874-4328, or at 70 Lower College Road, Suite 2, University of Rhode Island, Kingston, Rhode Island. Gallaudet University Institutional Review Board (IRB) also approved this study. They can be reached by videophone at (202) 250-2472 or by email at IRB@Gallaudet.edu.

Listed below are a few more sources you may wish to consult to learn more about this topic:

Hoffmeister, R. J. & Caldwell-Harris, C. L. (2014). Acquiring English as a second language via print: The task for deaf children. *Cognition*, 132, 229 – 242.

Lane, H., Hoffmeister, R. & Bahan, B. (1996). Form and Function in ASL. *A Journey into the Deaf-World*. San Diego: Dawn Sign Press.

Luetke-Stalhman, B. & Nielsen, D. C. (2003). The contribution of phonological awareness and receptive and expressive English to the reading ability of deaf students with varying degrees of exposure to accurate English. *Journal of Deaf Studies and Deaf Education*, 8(4), 464 – 484. doi: 10.1093/deafed/eng028.

BIBLIOGRAPHY

- Allen, T. E. (1995). Demographics and national achievement levels for deaf and hard of hearing students: Implications for mathematics reform. In C.H. Dietz (Ed.), *Moving toward the standards: A national action plan for mathematics education reform for the deaf* (pp. 41-49). Washington, DC: Pre-College Programs, Gallaudet University.
- Allen, T.E. & Anderson, M. L. (2010). Deaf students and their classroom communication: An evaluation of higher order categorical interactions among school and background characteristics. *Journal of Deaf Studies and Deaf Education, 15*(4), 334 – 347. doi: 10.1093/deafed/enq034.
- American Psychological Association (2017). Ethical principles of psychologists and code of conduct. Retrieved from: <https://www.apa.org/ethics/code/>.
- Anastasi, A., & Urbina, S. (1997). *Psychological testing* (7th ed.). Upper Saddle River, NJ: Prentice-Hall.
- Ansell, E., & Pagliaro, C.M. (2006). The relative difficulty of signed arithmetic story problems for primary level deaf and hard-of-hearing students. *Journal of Deaf Studies and Deaf Education, 11*, 153-170.
- Arnold, R. (2013). *Introduction to Si5s* [Video]. Retrieved from YouTube website: <https://www.youtube.com/watch?v=vxrNAIdCr3s>.
- Bailes, C.N. (2001). Integrative ASL-English language arts: Bridging paths to literacy. *Sign Language Studies, 1*(2), 147-174. doi: 10.1353/sls/2001/0002.
- Berent, G. P., Kelly, R. R., Aldersley, S., Schmitz, K. L., Khalsa, B. K., Panara, J., & Keenan, S. (2007). Focus-on-form instructional methods promote deaf college

- students' improvement in english grammar. *Journal of Deaf Studies and Deaf Education*, 12(1), 8-24. doi: 10.1093/deafed/enl009.
- Boatner, E. B. (1965, November). The need of a realistic approach to the education of the deaf. In *joint convention of the California Association of Parents of Deaf and Hard of Hearing Children, California Association of Teachers of the Deaf and Hard of Hearing, and the California Association of the Deaf*.
- Boudreault, P. & Mayberry, R.I. (2006). Grammatical processing in american sign language: Age of first-language acquisition effects in relation to syntactic structure. *Language and Cognitive Processes*, 21(5), 608-635.
- Bowers, L. M., Dostal, H., McCarthy, J. H., Schwartz, I., & Wolbers, K. (2016). An analysis of deaf students' spelling skills during a year-long instructional writing approach. *Communication Disorders Quarterly*, 37(3), 160-170. doi: 10.1177/1525740114567528.
- Buisson, G. J. (2007). Using online glossing lessons for accelerated instruction in ASL for preservice deaf education majors. *American Annals of the Deaf*, 152(3), 331-343.
- Cawthon, S. W. (2001). Teaching strategies in inclusive classrooms with deaf students. *Journal of Deaf Studies and Deaf Education*, 6(3), 212-225.
- Chamberlain, C., & Mayberry, R. (2008). ASL syntactic and narrative comprehension in skilled and less skilled adult readers: Bilingual-bimodal evidence for the linguistic basis of reading. *Applied Psycholinguistics*, 29, 368-388.

- Corina, D., & Singleton, J. (2009). Developmental social cognitive neuroscience: Insights from deafness. *Child Development*, 80(4), 952-967. doi: 10.1111/j.1467-8624.2009.01310.x.
- Cummins, J. (1984). *Bilingualism and special education: Issues in assessment and pedagogy*. Avon (England): Multilingual Matters.
- Day, H.E., Fusfeld, I.S., & Pintner, R. (1928). *A Survey of American Schools for the Deaf, 1924-1925: Conducted under the Auspices of the National Research Council*. United States: The National Research Council.
- DeLana, M. Gentry, M.L., & Andrews, J. (2007). The efficacy of ASL/English bilingual education: Considering public schools. *American Annals of the Deaf*, 152(1), 73-87. doi: 10.1353/aad.2007.0010.
- Emmorey, K., Borinstein, H. B., & Thompson, R. (2005). Bimodal bilingualism: Code-blending between spoken english and american sign language. In J. Cohen, K. McAlister, K. Rolstad, & J. MacSwan (Eds.), *ISB4: Proceedings of the 4th International Symposium on Bilingualism* (663-673). Somerville, MA: Cascadilla Press.
- Evans, L. (1982). *Total Communication: Structure and Strategy*. Washington, D.C.: Gallaudet College Press.
- Freel, B.L., Clark, M.D., Anderson, M.L., Gilbert, G., Musyoka, M.M., & Hauser, P.C. (2011). Deaf individuals' bilingual abilities: American sign language proficiency, reading skills, and family characteristics. *Psychology*, 2, 18-23. doi: 104236/psych.2011.21003.

- Gallaudet Research Institute. (2011). *Regional and national summary report of data from the 2009-10 Annual Survey of Deaf and Hard of Hearing Children and Youth*. Washington, D.C.: Gallaudet University.
- Golos, D.B., & Moses, A.M. (2011). How teacher mediation during video viewing facilitates literacy behaviors. *Sign Language Studies, 12*(1), 76-99.
- Golos, D.B., & Moses, A.M. (2013). Developing preschool deaf children's language and literacy from an educational media series. *American Annals of the Deaf, 158*(4), 411-425. doi: 10.1353/aad.2013.0039.
- Gournaris, M. J. (2009). Preparation for the delivery of telemental health services with individuals who are deaf: Informed consent and provider procedure guidelines. *JADARA, 43*(1), 34-51.
- Griffith, P.I. & Ripich, D.N. (1988). Story structure recall in hearing-impaired, learning-disabled, and non-disabled children. *American Annals of the Deaf, 133*, 43-50.
- Groce, N.E. (1985). *Everyone Here Spoke Sign Language: Hereditary Deafness on Martha's Vineyard*. Cambridge, MA: Harvard University Press.
- Grushkin, D. A. (2017). Writing signed languages: What for? What form? *American Annals of the Deaf, 161*(5), 509-527. doi: 10.1353/aad.2017.0001.
- Harmer, L. M. (1999). Health care delivery and deaf people: Practice, problems, and recommendations for change. *Journal of Deaf Studies and Deaf Education, 4*(2), 73-110.
- Harmon, K. (2007). Writing deaf: Textualizing deaf literature. *Sign Language Studies, 7*(2), 200-207. doi: 10/1353/sls.2007.0002.

- Hoffmeister, R. J. (2000). A piece of the puzzle: ASL and reading comprehension in deaf children. In C. Chamberlain, J. Morford, & R. Mayberry (Eds.), *Language Acquisition by Eye* (pp. 143-163). Mahwah, NJ: Erlbaum.
- Hoffmeister, R. J. & Caldwell-Harris, C. L. (2014). Acquiring English as a second language via print: The task for deaf children. *Cognition*, 132, 229 – 242.
- Humphries, T., & MacDougall, F. (2000). “Chaining” and other links: Making connections between American Sign Language and English in two types of school settings. *Visual Anthropology Review*, 15(2), 84-94.
- Johnson, R. E., & Erting, C. (1989). Ethnicity and socialization in a classroom for Deaf children. In C. Lucas (Ed.), *The sociolinguistics of the Deaf community* (pp. 41-84). New York, NY: Academic Press.
- Kalivoda, K. S., Higbee, J. L., & Brenner, D. C. (1997). Teaching students with hearing impairments. *Journal of Developmental Education*, 20(3), 10-12, 14, 16.
- Klerk, A. (1998). Deaf identity in Adolescence: The Rotterdam deaf awareness program. In A. Weisel (Ed.), *Issues Unresolved: New Perspectives on Language and Deaf Education* (pp. 206 – 214). Washington, DC: Gallaudet University Press.
- Knors, H. & Marschark, M. (2012). Language planning for the 21st century: Revisiting bilingual language policy for deaf children. *Journal of Deaf Studies and Deaf Education*, 17(3), 291 - 305. doi: 10.1093/deafed/ens018.
- Krashen, S. (1996). The case against bilingual education. In J Alatis, C. Strahle, M. Ronkin, & B. Gallenberger (Eds.), *Linguistics, language acquisition, and language variation: Current trends and future prospects* (pp. 55-69). Washington, DC: Georgetown University Press.

- Kritzer, K. L. (2009a). Barely started and already left behind: A descriptive analysis of the mathematics ability demonstrated by young deaf children. *Journal of Deaf Studies and Deaf Education, 14*(4), 409-421.
- Kritzer, K.L. (2009b). Families with young deaf children and the mediation of mathematically-based concepts within a naturalistic environment. *American Annals of the Deaf, 153*(5), 474-483. doi: 10.1353/aad.0.0067.
- Krouse, H.E. and Braden, J.P. (2011). The Reliability and Validity of WISC-IC Scores with Deaf and Hard-of-Hearing Children. *Journal of Psychoeducational Assessment, 29*(3), 238-248.
- Kyle, F., & Harris, M. (2006). Concurrent correlates and predictors of reading and spelling achievement in deaf and hearing school children. *Journal of Deaf Studies and Deaf Education, 11*, 273-288.
- Lane, H. (2005). Ethnicity, ethics and the deaf-world. *Journal of Deaf Studies and Deaf Education, 10*(3), 291-310. doi: 10.1093/deafed/eni030.
- Lane, H., Hoffmeister, R. & Bahan, B. (1996). *A Journey into the Deaf-World*. San Diego: Dawn Sign Press.
- Lane, H., Pillard, R., & French, M. (2000). Origins of the American Deaf-World: Assimilating and differentiating societies and their relation to genetic patterning. *Sign Language Studies, 1*, new series, 17-44.
- Longmore, P.K. (1987). Uncovering the hidden history of people with disabilities. *Reviews in American History, 15*(3), 355-364.

- Lou, M.W. (1988). The history of language use in the education of the deaf in the United States. In M. Strong (Ed.), *Language Learning and Deafness* (pp.75-98). New York, NY: Cambridge University Press.
- Luckner, J.L., & Cooke, C. (2010). A summary of the vocabulary research with students who are deaf or hard of hearing. *American Annals of the Deaf*, 155(1), 38-67.
- Luckner, J.L. & Handley, C.M. (2008). A summary of the reading comprehension research undertaken with students who are deaf of hard of hearing. *American Annals of the Deaf*, 153(1), 6-36.
- Luckner, J.L., Sebold, A.M., Cooney, J., Young III, J., & Muir, S.G. (2005/2006). An examination of the evidence-based literacy research in deaf education. *American Annals of the Deaf*, 150(5), 443-456.
- Luetke-Stalhaman, B. & Nielsen, D. C. (2003). The contribution of phonological awareness and receptive and expressive English to the reading ability of deaf students with varying degrees of exposure to accurate English. *Journal of Deaf Studies and Deaf Education*, 8(4), 464 – 484. doi: 10.1093/deafed/eng028.
- Martin, A. J., & Sera, M. D. (2006). The acquisition of spatial constructions in american sign language and english. *Journal of Deaf Studies and Deaf Education*, 11(4), 391-402.
- Marschark, M, & Everhart, V. (1999). Problem-solving by deaf and hearing students: Twenty questions. *Deafness and Education International*, 1, 65-82.
- Marschark, M. & Hauser, P. (2012). *How deaf children learn: What parents and teachers need to know*. New York, NY: Oxford University Press.

- Marschark, M., Lang, H., & Albertini, J. (2002). *Educating deaf students: From research in practice*. New York: Oxford University Press.
- Maxwell, M. M., & Falick, T. G. (1992). Cohesion and quality in deaf and hearing children's written English. *Sign Language Studies*, 77, 345-371.
- Mayberry, R. (2007). When timing is everything: Age of first-language acquisition effects on second-language learning. *Applied Psycholinguistics*, 28, 537-549. doi: 10.1017/S0142716407070294.
- Mayberry, R., del Guidice, A.A., & Lieberman, A.M. (2011). Reading achievement in relation to phonological coding and awareness in deaf readers: A meta-analysis. *Journal of Deaf Studies and Deaf Education*, 16(2), 164-188. doi: 10.1093/deafed/enq049.
- Mayer, C. (1998). Deaf children learning to spell. *Research in the Teaching of English*, 33, 158-180.
- Mayer, C. (2007). What really matters in the early literacy development of deaf children. *Journal of Deaf Studies and Deaf Education*, 12(4), 411-431. doi: 10.1093/deafed/enm020.
- Mayer, C. (2009). Issues in second language literacy education with learners who are deaf. *International Journal of Bilingual Education and Bilingualism*, 12(3), 325-334. doi: 10.2167/beb324/0.
- Mayer, C. (2017). Written forms of signed languages: A route to literacy for deaf learners? *American Annals of the Deaf*, 161(5), 552-559. doi: 10.1353/aad.2017.0005.

- Mayer, C. & Leigh, G. (2010). The changing context for sign bilingual education programs: Issues in language and the development of literacy. *International Journal of Bilingualism and Bilingual Education*, 13(2), 175-186.
- Mayer, C. & Trezek, B.J. (2015). *Early literacy development in deaf children*. New York, NY: Oxford University Press.
- McAnally, P. L., Rose, S., & Quigley, S. P. (1999). *Reading practices with deaf learners*. Austin, TX: Pro Ed, Inc.
- Mitchell, R.E., & Karchmer, M.A. (2010). Demographics and achievement characteristics of deaf and hard-of-hearing students. In M. Marschark & P.E. Spencer (Eds.), *Oxford Handbook of Deaf Studies, Language, and Education* (pp.21-37). Oxford: Oxford University Press.
- Moore, D.F. (1992). An historical perspective on school placement. In T.N. Kluwin, D.F. Moore, & M.G. Gaustad (Eds.), *Toward Effective Public School Programs for Deaf Students: Context, Process, & Outcomes* (pp. 7-29). New York, NY: Teachers College Press.
- Moore, D.F. & Moore, A. (2011). International congresses on the education of the deaf, 1878 to 2005. In D.F. Moore (Ed.), *Partners in Education. Issues and Trends from the 21st International Congress on the Education of the Deaf* (pp.3-19). Washington, DC: Gallaudet University Press.
- Morford, J.P., & Mayberry, R.I. (2000). A reexamination of “early exposure” and its implications for language acquisition by eye. In C. Chamberlain, J. Morford, & R. Mayberry (Eds.), *Language Acquisition by Eye* (pp. 111-128). Mahwah, NJ: Erlbaum.

- Musselman, C. (2000). How do children who can't hear learn to read an alphabetic script? A review of the literature on reading and deafness. *Journal of Deaf Studies and Deaf Education*, 5(1), 9-31.
- Neidle, C.J., Kegl, J., MacLaughlin, D., Bahan, B., & Lee, R.G. (2000). *The syntax of American Sign Language: Functional categories and hierarchical structure*. Cambridge, MA: MIT Press.
- Orlando, A., & Shulman, B. (1989). Severe-to-profound hearing impaired children's comprehension of figurative language. *Journal of Childhood Communication Disorders*, 12(2), 157-165.
- Paul, P. (1998). *Literacy and deafness: The development of reading, writing, and literate thought*. Needham Heights, MA: Allyn & Bacon.
- Paul, P. (2003). Processes and components of reading. In M. Marschark & P. Spencer (Eds.), *Handbook of deaf studies, language and education* (pp 97 – 109). New York: Oxford University Press.
- Paul, P. V. (2009). *Language and deafness* (4th ed.). Sudbury, MA: Jones & Bartlett
- Paul, P., Wang, Y., & Williams, C. (2013). *Deaf students and the qualitative similarity hypothesis: Understanding language and literacy development*. Washington, D.C.: Gallaudet University Press.
- Pray, J. L. & Jordan, I. K. (2010). The deaf community and culture at a crossroads: Issues and challenges. *Journal of Social Work in Disability and Rehabilitation*, 9, 168-193. doi: 10.1080/1536710X.2010.493486.

- Qi, S. & Mitchell, R.E. (2011). Large-scale academic achievement testing of deaf and hard-of-hearing students: Past, present and future. *Journal of Deaf Studies and Deaf Education*, 17, 1-18. doi: 10.1093/deafed/enr028.
- Rathman, C., Wolfgang, M., & Morgan, G. (2007). Narrative structure and narrative development in deaf children. *Deafness and Education International*, 9(4), 187-196.
- Rosen, R.S., Hartman, M.C., & Wang, Y. (2017). “Thinking-for-writing”: A prolegomenon on writing signed languages. *American Annals of the Deaf*, 161(5), 528-536. doi: 10.1353/aad.2017.0002
- Schick, B., Williams, K., Kupermintz, H. (2005). Look who’s being left behind: Educational interpreters and access to education for deaf and hard-of-hearing students. *Journal of Deaf Studies and Deaf Education*, 11(1), 3-20. doi: 10.1093/deafed/enj007.
- Schirmer, B. R. (1994). *Language and literacy development in children who are deaf*. New York: Macmillan Publishing Company.
- Schirmer, B.R., & McGough, S.M. (2005). Teaching reading to children who are deaf: Do the conclusions of the national reading panel apply? *Review of Educational Research*, 75(1), 83-117.
- Schleppegrell, M. (2001). Linguistic features of the language of schooling. *Linguistics and Education*, 12(4), 431-459.
- Scott, J.A., & Hoffmeister, R.J. (2017). American sign language and academic english: Factors influencing the reading of bilingual secondary school deaf and hard of

- hearing students. *Journal of Deaf Studies and Deaf Education*, 22(1), 59-71. doi: 10.1093/deafed/enw065.
- Singleton, J.L., Morgan, D., DiGello, E., Wiles, J., & Rivers, R. (2004). Vocabulary use by low, moderate, and high ASL-proficient writers compared to hearing ESL and monolingual speakers. *Journal of Deaf Studies and Deaf Education*, 9(1), 86-103. doi: 10.1093/deafed/enh011.
- Slobin, D. I. (2008). Breaking the molds: Signed languages and the nature of human language. *Signed Language Studies*, 8(2), 114-130.
- Stewart, D. A. & Akamatsu, C. T. (1988). The coming of age of American sign language. *Anthropology and Education Quarterly*, 19(3), 235 – 252.
- Strong, M., & Prinz, P.M. (1997). A study of the relationship between American sign language and English literacy. *Journal of Deaf Studies and Deaf Education*, 2(1), 37-46. doi: 10.1093/oxfordjournals.deafed.a014308.
- Supalla, S. J. & Blackburn, L. (2003). Learning how to read and bypassing sound. *Odyssey*, 5(1), 50-55.
- Supalla, S. J., Cripps, J.H., Byrne, A. P. J. (2017). Why american sign language gloss must matter. *American Annals of the Deaf*, 161(5), 540-551. doi: 10.1353/aad.2017.0004.
- Supalla, S. J., McKee, C., & Cripps, J. H. (2014). *An overview on the ASL-phabet*. Tucson, AZ: Gloss Institute.
- Traxler, C. B. (2000). The Stanford achievement test, 9th edition: National norming and performance standards for deaf and hard-of-hearing students. *Journal of Deaf Studies and Deaf Education*, 5, 337-348.

- Tucker, J.E. (2011). The bedrock of deaf education in North America: Center schools. In D. Moores (Ed.), *Partners in Education. Issues and Trends from the 21st International Congress on the Education of the Deaf* (pp.31-37). Washington, DC: Gallaudet University Press.
- Tzeng, O., & Hung, D. (1988). Orthography, reading, and cerebral function. In D. de Kerckhove & C. Lumsden (Ed.). *The alphabet and the brain: The lateralization of writing* (pp. 273 – 290). New York, NY: Springer.
- Uccelli, P., Barr, C.D., Dobbs, C.L., Galloway, E.P., Meneses, A., & Sanchez, E. (2014). Core academic language skills: An expanded operational construct and a novel instrument to chart school-relevant language proficiency in preadolescent and adolescent learners. *Applied Psycholinguistics*, 36(5), 1077-1109. doi: 10.1017/S014271641400006X.
- Van Cleve, J. V. (1985). No Sign of Education. *History of Education Quarterly*, 25(4), 499-506.
- Wang, Y. & Williams C. (2014). Are we hammering square pegs into round holes?: An investigation of the meta-analyses of reading research with students who are d/deaf or hard of hearing and students who are hearing. *American Annals of the Deaf*, 159(4), 323-345.
- Wechsler, D. (2003). *Technical and interpretive manual for the Wechsler Intelligence Scale for Children* (4th ed.). San Antonio, TX: Psychological Corporation.
- Wechsler, D. (2014). *Technical and interpretive manual for the Wechsler Intelligence Scale for Children* (5th ed.). San Antonio, TX: Psychological Corporation.

- Wiederholt, J. L. & Blalock, G. (2000). *Gray Silent Reading Tests (GSRT): Manual*. Lutz, FL: PAR Inc.
- Williams, C. (2004). Emergent literacy of deaf children. *Journal of Deaf Studies and Deaf Education*, 9(4), 352-365. doi: 10.1093/deafed/enh045.
- Wolbers, K.A., (2008). Using balanced and interactive writing instruction to improve the higher order and lower order writing skills of deaf children. *Journal of Deaf Studies and Deaf Education*, 13(2), 257-277.
- Wolbers, K. A. (2008). Using balanced and interactive writing instruction to improve the higher order and lower order writing skills of deaf students. *Journal of Deaf Studies and Deaf Education*, 13(2), 257-277. doi: 10.1093/deafed/enm052.
- Wolbers, K.A., Bowers, L. M., Dostal, H. M., & Graham, S. C. (2014). Deaf writers' application of American sign language knowledge to English. *International Journal of Bilingual Education and Bilingualism*, 17(4), 410-428.
- Wolbers, K. A., Graham, S. C., Dostal, H. M., & Bowers, L. M. (2014). A description of ASL features in writing. *Ampersan*, 1, 19-27.
- Woodward, J. (1978). Historical basis of american sign language. In P. Siple (Ed.). *Understanding Language Through Sign Language Research*. New York: Academic Press.
- Yoshinaga-Itano, C., & Downey, D. M. (1996). Development of school-aged deaf, hard-of-hearing, and normally hearing students' written language. *The Volta Review*, 98(1), 3-7.

Yoshinaga-Itano, C., Snyder, L.S., & Mayberry, R. (1996). How deaf and normally hearing students convey meaning within and between written sentences. *The Volta Review*, 98(1), 9-38.

Zazove, P., Niemann, L. Gorenflo, D., Carmack, C., Mehr, D., Coyne, J., & Antonucci, T. (1993). The health status and health care utilization of deaf and hard-of-hearing persons. *Archives of Family Medicine*, 2(7), 745-752.