Effects of ASL Rhyme and Rhythm on Deaf Children's Engagement Behavior and Accuracy in Recitation

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DEDICATION

I dedicate this dissertation to the Deaf ancestors who preserved and transmitted the gift of American Sign Language and to the future generations of Deaf people who will do the same.

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the domino effect: a cumulative effect produced when one event initiates a succession of similar events. – compare RIPPLE EFFECT (Merriam-Webster, 2019).

I have people to profoundly thank for bringing me to this work. I will be naming people in the successive order of events, all of which, if done without, would have altered my heart-path in exploring the role of ASL rhyme and rhythm in children's lives.

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ABSTRACT

Given the novelty of ASL in Deaf education, there is still much to explore about the specific techniques used to foster Deaf children's language development. The use of ASL rhyme and rhythm with young Deaf children is one of the approaches that remain understudied. This single-subject study compared the effects of rhyming and non-rhyming conditions of ASL stories on the engagement behavior and accuracy in recitation of 10 Deaf children between the ages of three and six years old in an ASL/English bilingual early childhood classroom. With the application of an alternating treatments design with initial baseline, it is the first experimental research of its kind on ASL rhyme and rhythm. Baseline data revealed the lack of handshape rhyme awareness in participants and informed the decision to provide an intervention as an added condition to examine the effects of explicit instruction on increasing engagement behavior and accuracy in recitation. There were four phases in total: baseline, handshape rhyme awareness intervention, alternating treatments, and preference. Visual analysis and total mean and mean difference procedures were employed to analyze results. Overall, the rhyming condition was the favorable treatment in increasing imitating behavior during viewing. The rhyming condition also prompted an increased number of words signed correctly and words signed in the correct order during recitation. Other variables such as having larger vocabulary knowledge, age-appropriate language skills, higher handshape rhyme awareness, and being older also impacted the results. This handshape rhyme awareness intervention should be taken into consideration for future replications.

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CHAPTER ONE :
INTRODUCTION AND GENERAL INFORMATION

Statement of the Problem

Deaf children are at risk for severe language delay, not necessarily because they do not hear but rather because the people surrounding them are often unable to provide them with appropriate access to language. While there are multiple approaches to support language development among young children, many are not appropriate for the Deaf population and can have detrimental consequences. Over the years, different strategies, models, and theories have been developed to address this problem. In recent years, the bilingual philosophy utilizing American Sign Language (ASL) to support the natural development of linguistic skills among young Deaf children has emerged as a viable solution. Given the novelty of ASL in Deaf education, there is still much to explore about the specific techniques needed to foster Deaf students' language development. The use of ASL rhyme and rhythm with young Deaf children is one of the approaches that remain understudied.

Rationale

It is well documented that hearing children benefit from the use of rhythmic and rhyming spoken language (e.g. nursery rhyme and Dr. Seuss), especially if paired with spoken language phonological awareness activities (Brown, 2014; Bryant, Maclean, & Bradley, 1990; Moritz, Yampolsky, Papadelis, Thomson, & Wolf, 2013). For Deaf children, it has been noted in recent studies that—rather than spoken language-only approaches—they benefit from ASL/English-based approaches as these approaches can lead to better language and literacy skills (Clark et al., 2016; Hall, 2017; Henner, Caldwell-Harris, Novogrodsky, & Hoffmeister, 2016; Humphries et al., 2016; Mayberry, 2007; Mellon et al., 2015). To date, however, there is a lack of research on

the role of ASL rhyme and rhythm in supporting language development of Deaf children. Nevertheless, teachers of the Deaf are beginning to incorporate ASL phonological features into their classroom instruction (Crume, 2013; Mitchiner & Gough, 2017). Easterbrooks (2017) paints a powerful picture of why teachers are already implementing such practices. "Teachers don't have time to wait for absolute answers from researchers because they have their students for 180 short days in a school year, not for decades… and *children can't wait*" (Easterbrooks, p. 4, 2017). Accordingly, a new enterprise, "Hands Land: ASL Rhymes and Rhythms," was formed in response to teachers, parents, and mentors' enthusiasm for additional educational resources and training on the uses of ASL rhyme and rhythm. Due to the growing popularity of the use of ASL rhyme and rhythm in the classroom, there is a need for a formalized study on the effectiveness of this approach. While a wide range of research questions surrounding this topic is warranted, the purpose of this study is specifically to examine the effects of ASL rhyme and rhythm on Deaf children's engagement behavior and accuracy in recitation.

Background and Justification

Language Acquisition

Most children are able to acquire their native language unconsciously and effortlessly during their early formative years. Successful language acquisition comes from abundant experiences of meaningful, natural, and enjoyable language input. Language input through the ears, eyes, and/or hands enables young children to naturally absorb and store lexicon and meaning in their brains (Chomsky, 1965). Once young children associate language with their experiences, they develop a desire to communicate and begin to attempt to express themselves through language output (Gass & Mackey, 2006). With a consistent and rich language

environment, typical language development can take its course. For this reason, opportunities for language input and output should be plentiful, encouraging, and fun. The importance of creating a language-rich environment to foster successful language acquisition in young children is highlighted in many early childhood programs. Multiple language approaches are used to spark children's affinity with language, and singing is among them (Danielson, 2000; Mullen, 2017).

Rhyme and Rhythm

When we look at the prevalence of its use in many (if not all) cultures, it is evident that rhyme and rhythm are a fun and enjoyable experience for both children and adults alike. Hamm, Nettl, and Byrnside (1975) said, "There is no culture known to man, no single civilization of the past, that does not have its own body of music" (p. 71). Anecdotal evidence found in early childhood programs, children television shows, and familial uses also demonstrate the ways children are captivated with rhyme and rhythm. Given the high importance of incorporating activities that include rhyme, rhythm, and phonological awareness in early childhood education, many hearing children receive further specialized training in these areas in addition to the abundance of natural exposure and prior experience with rhyme and rhythm (Kuppen & Bourke, 2017; Lim & Chew, 2017; Patscheke, Degé, & Schwarzer, 2016). Rhyme and rhythm can provide fun and meaningful learning experiences when teaching young children about transitions, rules, emotions, family names, animals, days of the week, colors, numbers, and the alphabet. If we were to visit a typical preschool classroom, we would find the teacher and children singing a good morning song to kick off their day. This is an example of such a song:

"Good morning! Good morning!
How are you?
Good morning! Good morning!

How are you?

How are you on this special day?

We are glad you came to play!

Good morning! Good morning!

How are you?"

Singing would continue throughout the day. When it is time to clean up after an activity, the teacher would often commence a clean-up song to motivate children. The song below is an example:

"Clean up, clean up

That's what I say

Clean up, clean up

Put stuff away

Story time, story time

Come my way

Story time, story time

That's what I say"

During circle time for storytelling, the teacher would often sing a song about paying attention, reminding children to keep their hands to themselves and their eyes on the teacher. Here's an example:

"Are you criss-cross?

Are you criss-cross?

Are your eyes watching?

Are your ears listening?

Are your lips closed?

Are your hands still?

Are your feet quiet?

Story time, it's time to listen

Story time, it's time to listen"

Before the snack time, a song like the one below is heard to get children to wash their hands:

"This is the way we wash our hands

Wash our hands

Wash our hands

This is the way we wash our hands

Wash our hands

Wash our hands

Before we eat our food."

And singing a goodbye song is a positive way to end the day:

"Happy day is over.

It's time to say

Good bye.

Good bye.

Yes…

Happy day is over.

It's time to say

Good bye.

Good bye."

Expanding on these anecdotes, research shows that using rhyme and rhythm with young children goes beyond the simple veil of fun. According to literature, there seems to be an interrelationship between music, rhyme, rhythm, language, and literacy. These relationships were found to positively affect other prominent developmental areas such as attention (Baleghizadeh & Dargahi, 2010), engagement (Sandberg, Hansen, & Puckett, 2013), motivation (Lo & Li, 1998), language acquisition (Schön et al., 2008), vocabulary (Read, 2014), memory (Wallace, 1994), metalinguistics (Cazden, 1974), and social-emotions (Bodden, 2010). Hence, music is commonly used in many early childhood classroom functions for the purpose of promoting positive language growth and learning (Bryant et al., 1990; Moritz et al., 2013). When people sing, rhyme and rhythm are typically part of the tune in practically all languages.

How Rhythm is Formed

Rhythm is the pattern found either through sound and/or the body. Pattern has a repetitive consistency within the framework of meter consisting of beats produced through musical instruments and/or syllables in language (Cooper & Meyer, 1960). With spoken language-based songs, rhythm often exists in stressed and unstressed syllables (Burling, 1966). For example, the constant switch between stressed and unstressed syllables can be heard in this cadence: "Humpty Dumpty sat on a wall, Humpty Dumpty had a great fall." Linguists agree that syllables do exist in signed language with the sonority, or pulses, of the segments in signs (Liddell, 1984; Perlmutter, 1993; Wilbur & Nolen, 1986). Movement of signs is considered the primary method of producing syllables, which can be unstressed and stressed through holds. Movement of signs can also be manipulated through the speed and tempo of signing. Furthermore, body and head movements are moved in sync with the signs to demonstrate consistent visual beats and patterns (Perlmutter, 1993). These movements can be complemented with musical instruments, like a

drum, or be entirely independent from such influence. While rhythm can be separate from language itself, rhyme, on the other hand, is always related to language as discussed below.

How Rhyme is Formed

Rhyme is formed when phonemes in a language are manipulated to create repetition. Phonology is a linguistic term to explain how languages can be broken down into small units without meaning (phonemes), and how they can be put together to produce meaning—such as specific sounds in spoken language or parameters in signed language (Odden, 2005; Stokoe, Casterline, & Croneberg, 1965). With spoken language phonology, rhyme can be analyzed by identifying similar sounds used repeatedly in different words (Maclean, Bryant, & Bradley, 1987). There are multiple ways to repeat sounds in words such as alliteration, end rhyme, and syllable (Dowker, 1989). Alliteration is the repetition of the same kind of sound produced at the beginning of words. These two lines are popular examples of alliteration in nursery rhyme: "Peter Piper picked a peck of pickled peppers" and "She sells seashells by the seashore." End rhyme is the repetition of the same kind of sound produced at the end of words. These lines in the Humpty Dumpty song have end rhyme: "Humpty Dumpty sat on a wall. Humpty Dumpty had a great fall." Syllable is an unbroken segment in parts of a spoken word that has consonants and vowels. Rhyming through the use of two syllables in each word can be found in this line in the Betty Botter song: "Bitter batter better." In fact, these three words also have alliteration (b-) and end rhyme (-tter). The auditory features of rhyming in songs and stories are not always accessible to Deaf children because they are sound-based. Therefore, the use of signed language rhyme and rhythm has the potential of making a greater impact on a Deaf child's access to language and fostering their overall language acquisition. This makes it necessary to have a clearer understanding of ASL phonology and how it relates to ASL rhyme.

ASL Phonology

It was not until approximately sixty years ago that ASL was recognized as a legitimate language. William Stokoe was the pioneering linguist who asserted that ASL is indeed full-fledged language in 1960s. Through his work, he identified and documented the fundamental linguistic structures of ASL—including phonology. More specifically, he classified the phonological units of ASL into three parameters: handshape, location, and movement. He went on to develop the first ASL dictionary categorizing words based on their phonological parameters (Stokoe et al., 1965). Expanding on Stokoe's work, subsequent research has determined that there are five parameters in total. The fourth and fifth parameters are: palm orientation (where the palms of the hands are orientated in the signs) and non-manual markers (facial expressions and body movements) (Liddell, 1984; Stokoe, 1991; Valli & Lucas, 2000). Accordingly, handshape, location, movement, palm orientation, and occasionally non-manual markers are embedded in all signed words. By manipulating one of the parameters, such as handshape, and repeatedly using the same parameter in different words, a rhyme is produced (Valli, 1990). For example, the signed words - 'BLACK,' 'MOUSE,' and 'BORED' - share the same "1" handshape (an extended index finger and other fingers closed into a fist). By signing "BLACK - MOUSE - BORED," in a sentence, the visual rhyme of using the same "1" handshape could arguably be considered as equivalent to the sound rhyme of "p" found in "Peter Piper picked a peck of pickled peppers." Rhyming in ASL is not limited only to the handshape parameter. Signed words that share same location, movement, palm orientation, or non-manual markers can be turned into rhyme too. With the location parameter, all of the signed words in this sentence "COW - DEER - HORSE - RABBIT - DONKEY" share same location on the forehead and can become a form of rhyme if incorporated into the repeated patterns of the

sentences. With the movement parameter, rhyme is found in signs that share same movement such as the up-and-down movement found in these signs: “HAT - SCHOOL - CHAIR - WORK.” Such examples of the use of ASL rhyme is akin to the kind of phonology play that has been found to be critical for language development in hearing children. For this reason, a better understanding of if, and how, Deaf children could gain similar kinds of linguistic and cognitive advantages as hearing children through ASL rhyme and rhythm is needed.

Rhyme Lost in Translation

Since there is no standard ASL or bilingual curriculum available for teachers to use in Deaf education, teachers typically follow standardized English-based curriculums for their classroom instructional activities. Because English-based songs and rhyming activities are heavily incorporated in these curricula, Deaf education teachers either attempt to sign English-based songs or just skip them altogether. The problem with signing songs in English is that the linguistic and cognitive benefit of exposing Deaf children to rhyme and rhythm is often lost in translation (Mather & Winston, 1998). What rhymes in English does not rhyme in ASL and vice versa. For example, if a teacher translated the English song into ASL and signed “She sells seashells down by the seashore,” no ASL rhyme could be found in any of the signs for these words. Furthermore, the “s” emphasis on sound is often lost on the Deaf child, making the entire utterance meaningless. Inversely, if a teacher translated the ASL song into English and spoke “BLACK - MOUSE - BORED,” no English rhyme could be found in any of these spoken words and the linguistic benefit of this phonological play in ASL would be lost on a non-signer. This shows how the linguistic allure of both ASL and English rhyme can easily get lost in translation, robbing it of its intended impact on the child. For these reasons, rhyme and rhythm, or phonological play, are inherently language specific. Investigations are needed to better

understand and delineate ASL rhyme and rhythm and their functions in all areas that pertain to language acquisition.

Purpose of the Study

There are significant gaps in the literature related to the effects of ASL rhyme and rhythm on Deaf children's language development in general, and on engagement and recitation skills specifically. The purpose of this research is to examine engagement behavior and accuracy in recitation among Deaf children when exposed to rhyming and non-rhyming ASL stories. More specifically, this study compared the effects of ASL videos containing stories with rhyme and rhythm and those without rhyme and rhythm on Deaf children's ability to be engaged in the experience and recite with high accuracy. These two areas of inquiry were investigated through experimental research in an ASL/English bilingual early childhood classroom.

Design of the Study

Single Subject Research

The definition of single subject research was formerly operationalized by Murray Sidman in 1966 in his book called *Tactics of Scientific Research: Evaluating Experimental Data in Psychology*. This book was revolutionary in shifting people's thinking regarding research design. Sidman (1966) argued that it was not appropriate for a group study to take place if functional relations cannot be discovered in individuals. Single subject research involves methodically collecting baseline data on a specific phenomenon that is operationally defined to obtain accurate data. The target behavior is then looked at through a rigorous measurement presented as data points to observe how often the behavior happens. During the intervention phase, repeated measures of the target behavior, typically at least five data points, are tracked until stability is

generated to portray a trend (Gast, 2010). Single subject research is a popular method for low-incidence populations (Kratochwill et al., 2013) and deemed desirable for experimental studies done on the Deaf population (Easterbrooks, 2017). Since the purpose of single subject research is to find a functional relation between independent and dependent variables, it is necessary to take on one of these research approaches to obtain data: reversal/withdrawal, multiple baseline, or alternating treatments.

Alternating Treatments Design

Alternating treatments design was first proposed by Barlow and Hayes in 1979 to corroborate the concerns shared by single case design proponents about the practice of researchers administering two or more treatments to different subject groups and then comparing the outcomes. The problem with this approach is that, given the sheer variation of humans, it is not possible for any group of subjects to be exactly the same. The challenge is then exacerbated with conducting group research on low incidence and highly diverse populations such as Deaf people. Barlow and Hayes (1979) suggested a solution that seizes the benefits of single subject design by giving two or more treatments to the same individual and then documenting the effects on target behaviors. The main feature of this design is the quick alternation of two different conditions to allow a direct comparison between two treatments and offset potential confounding factors. Specifically for this study, alternating treatments design with an initial baseline phase was employed to investigate the functional relation between rhyming and non-rhyming ASL stories and engagement behavior and accuracy in recitation in Deaf children between three and six years old.

Evidence-Based Practice

What Works Clearinghouse (WWC) developed standards in 2013 in an attempt to centralize and formalize the procedure of determining whether a specific educational strategy or practice is considered evidence-based. WWC endeavors to answer the question "what works in education?" by creating high-quality standards for research design, assessing existing research evidence, and disseminating information to the stakeholders (What Works Clearinghouse, 2016). There are three levels of evidence based on the number of studies producing evidence for certain practices and whether the outcomes were consistent within and across studies in diverse populations. First, a minimal level of evidence is established when at least one study meets the WWC standards and shows evidence of the success of the practice. Second, a moderate level of evidence is identified when a few studies meet the WWC standards and provide evidence that the practice improves outcomes. Third, a strong level of evidence is determined when multiple studies meet the WWC standards with consistent evidence that the practice is effective even for diverse student populations. To attain the status of a strong level of evidence, there needs to be a minimum of five single case design research conducted by three different research teams with at least 20 participants across all studies. Currently, no evidence-based practice exists for the education of Deaf students (Antia, Guardino, & Cannon, 2017). This study was set forth to adhere the quality indicators of the WWC standards.

Definition of Terms

Communities are shaped and connected by their shared sensory, social, cultural, linguistic, and lived experiences. The politics of labelling and identifying people are complex, sensitive, and can be ever-changing. Ongoing dialogues prevail within marginalized communities such as Deaf people, Blind people, Disabled people, People of Color, and LGBT,

regarding identity politics and labels that have been attributed to them. There is value in listening to and honoring the preferred identities of the individual members of these communities. While there may be a consensus within communities in how they want to be identified, this information may not be known to outsiders or the mainstream narrative. For this reason, it is important to recognize that the mainstream narrative in which academia largely takes part is governed by a specific population: white, hearing, abled, cisgender, heterosexual scholars. Following the mainstream narrative can be disempowering to marginalized communities' voices and movements. In this dissertation, I attempt to listen to the leaders, advocates, and members of these communities and use specific terms to describe them according to their preferences and requests.

Deaf

People with various hearing levels and speaking capabilities but do not hear enough to be considered "hearing". They may or may not use spoken language and/or hearing technology such as hearing aids or cochlear implants. Regardless of hearing levels or uses of spoken language and/or hearing technology, Deaf people identify with the Deaf communities, use signed languages, and share the common Deaf experience. This population includes Deaf people who may be considered hard of hearing according to their audiograms (Holcomb, 2013; Leigh, 2009).

Disabled

People with intellectual, sensory, or physical inabilities or incapabilities of varying levels. The Disabled identity, contrary to mainstream view, is taken as a flagship of pride for many Disabled people. They consider themselves as members of a social and cultural group. For example, many Little People, Blind, Autistic, and Deaf people regard their disability as a

valuable and rewarding experience and do not necessarily want to be fixed or cured. However, the extent to which Disabled people identify with the disability culture hinges on their own disability identity development. Disabled people are not a homogenous group; rather, they live in distinct socio-cultural communities arising from their shared identities. Disabled people are often unified in their shared experience of marginalization from social structures, attitudes, and practices, and in their fight to end discrimination and environmental barriers (Hahn & Belt, 2004; Lawson, 2001; Sinclair, 2013). To remain disability-centric, the Disabled label will be used when referring to Disabled people in this dissertation.

People with Disabilities

Even though disability culture advocates and disability studies scholars have disputed the people-first language, this label continues to be promoted and used by people in the mainstream and in academia. The fundamental disagreements about the meaning and significance of these identities can be attributed to differing paradigms in various theoretical frameworks such as the socio-cultural and medical models. The socio-cultural perspective is a newer model of disability and was previously described in the Disabled section. The medical perspective is the traditional model where people with disabilities are viewed as inferior, broken, and needing a cure. When citing researchers' work in this dissertation, their use of people-first labels (people with disabilities) or identity first labels (Disabled people) will not be changed (Dunn & Andrews, 2015; Johnstone, 2004; Lynch, Thuli, & Groombridge, 1994). Otherwise, Disabled people will be identified as such and the term used accordingly.

Signed Language

While there are hundreds of signed languages in use around the world, American Sign Language (ASL) is the language of most Deaf communities in the United States and Canada (outside of Quebec). There are some variations to American Sign Language such as Black ASL in Black Deaf communities and Pro-Tactile ASL in Deaf/Blind communities. Some signed languages from other countries are used by Deaf people migrating to United States. When the term "signed language" is used in this dissertation, it usually means American Sign Language in the context of United States unless stated otherwise (Holcomb, 2013).

Subjectivity, Positionality, and Reflexivity

Language of This Dissertation

I struggle to deliver my work in a language, English, that is historically oppressive and currently poorly accessible to Deaf people. The fact that I am doing this work in English is problematic as the majority of people I study, who would have direct impact from my study, and who would benefit most from my study would benefit more fully if I presented the work in ASL. The fact that this document is presented in English first before ASL demonstrates my position of power and privilege as one who is able to "speak" the same language of the dominant group, and aligns my paper with them, as readers, over the intended audience: Deaf people and professionals who use ASL (Singleton, Jones, & Hanumantha, 2017). In spite of my English language privilege, I am still submerged under the same system of oppression as my Deaf peers who use ASL as their preferred language. In order to enter the field of academia, I am required by default to do things according to the dominant group's terms and use English to present information about Deaf people and American Sign Language. This is an example of how my identities

intersect and overlap through the privileged and oppressed statuses I embody as a Deaf critical researcher.

Journey into Deaf Education

I am a product of the Deaf education system. I attended a Deaf school all my life and graduated from the California School for the Deaf in Fremont. I obtained a Bachelor's degree in International Education and Development from Gallaudet University, the world's only cultural and heritage liberal arts university for Deaf students. I received my Master's degree in Deaf education from National University, a predominantly hearing university that provides degrees online. There, it was my first experience facing the reality that Deaf students were perceived through the lens of loss and repair. For example, I received homework assignments where I had to describe ways to convince an uncooperative Deaf child to wear hearing aids or strategies to persuade parents to give their Deaf child cochlear implants. This approach conflicted with my beliefs that the point of "Deaf" education was to create an environment where deafness would not be pathologized but rather viewed as a natural characteristic of a whole child. This positive view was cultivated and entrenched in the history of my Deaf family full of esteemed educators. However, when it comes to Deaf students, the field of special education typically focuses on correcting physiological characteristics through medical paradigms and normative methods.

When I began my professional career in 2011, I landed a teaching job at a Deaf school with a philosophy that differed from the typical, traditional methods of educating Deaf children which is the adoption of the medical model. By contrast, teachers at the school where I worked provided Deaf children access to regular academic content through both languages— ASL and English, and incorporated Deaf cultural practices. It was at this school that I obtained my first formal training in bilingual education through the ASL/English Bilingual Professional

Development (AEBPD) project. Yet, when I was a first-year teacher in the early childhood department, I found most of the curriculum and resources given to me to be hearing-based and incongruent with my Deaf students' cultural and linguistic needs. I learned that many teachers at the school as well as my colleagues from other Deaf schools across the nation were similarly frustrated with the paucity of knowledge and information on Deaf-centric pedagogy and ASL/English bilingual resources. Fortunately, the school was supportive of teachers exploring new pedagogical techniques, creating innovative resources, and applying them to the classroom. With this support, I started experimenting with new teaching approaches that incorporate music and language play through Deaf-centric lens. It was then when I saw that ASL rhyme and rhythm and ASL phonological awareness had the potential to have meaningful, positive impact on language and academic outcomes in Deaf children.

Wanting to further expand on this work, I created a new enterprise along with two other co-founders in 2015 called "Hands Land: ASL Rhymes and Rhythms". We wanted to respond to teachers, parents, and mentors' enthusiasm for more educational resources and training on the uses of ASL rhyme and rhythm. The primary goal of Hands Land was to have a Deaf team of native ASL users create original ASL rhyme and rhythm videos specifically for young children. My team started a fundraising campaign, garnered over 160 funders and raised over $12 thousand dollars to support this project. With this support, we produced 30 professional quality ASL rhyme and rhythm videos (www.handsland.com, 2018). While the work continued to bring positive responses from the Deaf community, I was unsatisfied with the lack of empirical data, academic knowledge, and advanced information about this phenomenon. For this reason, I decided to pursue a Ph.D. in Theory and Practice in Teacher Education at the University of Tennessee in 2015.

As a member of the Deaf community involved in the research process, I was able to bring the Deaf voice in creating research questions, designing research, and interpreting findings. This research was done "with" or even "by" rather than "on" Deaf individuals, leveraging the cultural capital and funds of knowledge of the Deaf community (Singleton et al., 2017).

This Research

When contemplating my positional reflexivity to this research, I recognize that I am very close to the topic and to the people I study. The Deaf community is small, and it is hard to come across Deaf people who do not know my family's contributions to the field. While I believe I am the best person to do this work because of my experience, expertise, and passion, I could be predisposed by the generational trauma I might have acquired from growing up in the Deaf community. For example, eugenics, linguicism, and audism played a big part in my upbringing, which will be elaborated on in the literature review of Deaf education. I am cognizant that I might be too personally invested in the work towards the liberation of Deaf people. I am aware that I could be unconsciously biased toward answers and conclusions that would support my own experiences and beliefs. Notwithstanding, it is my goal to remain focused on making sure that this and subsequent research is sound. With that said, I still believe there are epistemic advantages in my positionality within this fieldwork as a person who has earned my way into this role from my ongoing involvement in the collective struggle for better access and pedagogy in Deaf education (Graham & Horejes, 2017). The emic view as an insider, as opposed to the etic view, puts me in a unique position where I am able to share consciousness with my participants with my background as a Deaf child, a teacher of the Deaf, and a member of a Deaf family. Ultimately, the goal is to further our understanding of Deaf people's innate use of signed language to support future children's language access, experience, and development.

CHAPTER TWO :

LITERATURE REVIEW

Deaf people's linguistic and cultural contributions to the world are valuable and should be part of Deaf students' experience in schools. However, educational practices used with Deaf students have historically been developed by hearing professionals based on their language (English), model (medical), and epistemology (phonocentric) focal points (Holcomb, 2010; Ladd, 2003). Currently, hearing people make up approximately 80% of educators and 85% of administrators in the field of Deaf education (Simms, Rusher, Andrews, & Coryell, 2008) and still dictate the discourse on how Deaf children best learn (Johnson & McIntosh, 2008). Consequently, only 27% of Deaf students are in educational environments where signed language is used (Gallaudet Research Institute, 2011). Therefore, Deaf children's relationship with language and music has been largely based on non-Deaf people's modus operandi (Darrow, 1989; Darrow, 1993; Darrow & Heller, 1985). For example, music plays an essential role in hearing children's language acquisition process (Hutchins, 2018), and phonological awareness is deemed vital and necessary for hearing children to learn to read (Bolduc, 2009; Ehri et al., 2001). This reality for hearing children has been generalized to Deaf individuals, resulting in Deaf children attempting to adhere to hearing-based approaches of interacting with language and music (Bauman, 2004; Darrow, 1993; Hauser, O'Hearn, McKee, Steider, & Thew, 2010). Deaf cultural practices such as the use of ASL rhyme and rhythm can be found in Deaf families and Deaf communities (Bahan, 2006; Holcomb, 2013); yet, they are nonexistent in most Deaf education programs. Due to the long history of ASL and Deaf culture being suppressed in Deaf education in favor of spoken English and/or English signed systems, the cultural practices of

ASL rhyme and rhythm are not recognized nor are they used by most educators of the Deaf (Golos, Moses, Roemen, & Cregan, 2018; Johnson & McIntosh, 2008; Ladd, 2003).

History of Deaf Education

The start of Deaf education in the United States was chiefly shaped by Deaf people themselves. The first school for the Deaf in the United States was co-founded in 1817 by a Deaf person, and subsequently a total of 24 schools for the Deaf were established in the 1800s with the involvement of Deaf individuals (Gannon, 2011). Graduates from these schools were often highly literate and accomplished in life as writers, artists, and philosophers. Some others went on to become administrators and teachers with the goal of preparing additional generations of well-educated Deaf people (Gannon, 2011; Ladd, 2003). In 1864, Gallaudet University, the only signing university designed to award college degrees to Deaf students, was established in response to the growing number of intelligent Deaf people wanting to pursue higher education (Gannon, 2011).

In spite of the remarkable accomplishments by these schools, this Deaf-centric approach to educate Deaf children was challenged in 1880 at the infamous Second International Congress on Education of the Deaf (ICED) conference, commonly known as the Milan conference (Gannon, 2011). At the conference attended by 164 delegates from various parts of the world, only one delegate was Deaf (Humphries, & Padden, 2009). Consequently, the Deaf voice was silenced with several hearing-centric resolutions passed urging the elimination of signed language in schools. More specifically, one of the resolutions read:

> (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 that the oral method ought to be preferred to signs; and (2) considering that the simultaneous use of speech

> and signs has the disadvantage of injuring speech, lipreading, and precision of ideas, that the pure oral method ought to be preferred (Moores, 2010, p.25).

Consequently, the use of signed language in schools for the Deaf began to disappear from the schools with active suppression by the school officials. Students caught using signed language had their hands tied together or struck with a ruler (Gannon, 2011; Holcomb, personal communication; O'Connell & Deegan, 2014). O'Connell and Deegan (2014) interviewed Deaf people and collected anecdotes:

> We signed behind [our teacher's] back, but one of us got caught. She got very cross and told us to stop signing. She used a stick to slap me on the hand. It was very sore. I was shocked. She said this was to teach us not to sign (p.1).

With the removal of signed language along with Deaf teachers and administrators from schools, the number of Deaf people with fully acquired language plummeted (Gannon, 2011; Ladd, 2003). In 1869, 41% of educators of the Deaf were Deaf, and the number went down to 12% by 1960 (Lane, 1989). In Deaf educators' place, hearing professionals took over and had complete institutional authority over Deaf people's lives. Ladd (2003) described this era as "Virtually all post-1880 discourses about Deaf people have been conceived, controlled, and written by people who were not themselves Deaf" (p. 83). The post-1880 educational experience of Deaf children was so poor that the federal government convened a special commission to study the state of Deaf education. In its conclusion, it proclaimed that "The American people have no reason to be satisfied with their limited success in educating deaf children and preparing them for full participation in our society" (Babbidge, 1965).

This report prompted a renewed interest in bringing back signed language to the classroom, beginning with a new push called *Total Communication* (Convention of American

Instructors of the Deaf, 1971). This shift back to Deaf-centric approaches in educating Deaf children was featured in the proceedings of the 45th meeting of the Convention of American Instructors of the Deaf in 1971:

> Only in recent times have a few schools experimented with fingerspelling to be used along with speech and speechreading. No one has dared to teach the deaf as the great majority of deaf themselves believed it should be done, i.e. using all means of communication and especially the language of signs (p. 523).

Roy Holcomb was a strong advocate for a Deaf-centric pedagogical approach to remedy the terrible state of Deaf education and became known in the field as the father of the Total Communication philosophy (Scouten, 1984). Holcomb was a hard-of-hearing person who was educated at the Texas School for the Deaf and grew up witnessing many of his Deaf peers struggling academically without the support of signed language. Holcomb pursued a career in Deaf education primarily to push for the inclusion of signed language in the classroom and at homes with young Deaf children, an educational philosophy deemed radical at the time (Barnum, 1984; Convention of American Instructors of the Deaf, 1971). He argued that Total Communication enabled differentiated instruction to promote flexibility in the use of communication methods including signing, speech, fingerspelling, and writing to meet each Deaf child's unique learning and communicative needs. Holcomb urged teachers to "communicate with the deaf in any ways you can—stand on your head, if necessary" because Deaf children need "everything and then some" for their education (Convention of American Instructors of the Deaf, 1972, p. 524).

Signed language was once again used with young Deaf children in certain Deaf-based educational programs for the first time since the pre-Milan era. However, with the programs

operated by hearing professionals, signing was mostly restricted to contrived Signed Exact English rather than American Sign Language, a natural language that is commonly used by Deaf people outside the school setting. Eventually, the practice shifted toward a fuller inclusion of American Sign Language in the classroom with the emergence of the ASL-English bilingual movement in the 1990s led by Deaf educators and their allies (Humphries, 2013). This movement continues today with many schools for the Deaf adopting the bilingual model to educate their students with a strong emphasis on developing both ASL and English.

The participants at the 21st International Congress on Education of the Deaf conference in Vancouver in 2010 made a statement of apology to the international Deaf communities for the ill-conceived resolutions made at the 1880 conference. The organization acknowledged the devastating harm the resolutions had on Deaf people's education, language, and quality of life for over a hundred years (Moores, 2010). The statement of apology read:

> 1. Removed the use of sign language from educational programmes for the deaf around the world
>
> 2. Contributed detrimentally to the lives of deaf citizens around the world
>
> 3. Led to the exclusion of deaf citizens in educational policy and planning in most jurisdictions of the world
>
> 4. Prevented deaf citizens from participation in government planning, decision making and funding in areas of employment training, re-training and other aspects of career planning
>
> 5. Hindered the abilities of deaf citizens to succeed in various careers and has prevented many of them from following their own aspirations
>
> 6. And prevented the opportunity for many deaf citizens to fully demonstrate their

> cultural and artistic contributions to the diversity of each nation
>
> Therefore, we reject all resolutions passed at the ICED Milan conference in 1880… we acknowledge and sincerely regret the detrimental effects of the Milan conference. And therefore, we call upon all nations of the world to remember history, and ensure that education programmes accept and respect all languages and forms of communication (Moore, 2010, p. 310).

The formal apology marks a significant event in Deaf history as it affirms the rising tides of change to the approaches, methods, and attitudes that have historically marginalized signed language, Deaf culture, and Deaf people from Deaf education. Deaf people are once again involved in Deaf education, leading to innovative Deaf-centered approaches that include the use of ASL for teaching and learning. The use of ASL rhyme and rhythm started to flourish, which will be discussed in depth later.

Language, Culture, and Power

Bourdieu (1984) was a French theorist who explored the subtle and abstruse ways power is created and maintained in societies. According to Bourdieu (1984), there are different social fields in which all people take part within a network of positions driven by power dynamics that are malleable but inherent in all societal functions. He defined some influential factors in the socialization process such as *doxa* and *capital* that result in the maintenance of power imbalance, working to the advantage of the dominant culture.

The term "doxa" (Bourdieu, 1984, p. 471) was used to describe the existence of socialized norms, beliefs, and opinions deep-seated in society that people take as fact. Doxa is a part of the socialization process, typically unconscious, that naturally takes place when individuals interact with their families, obtain informal and formal education, and live amongst

people in the society. People often adopt the script that was passed onto them through family and society. Because of this, they believe their behaviors and ways of thinking are axiomatically correct. As cultures change and grow over time, what is commonly perceived as "truth" changes too. Looking at the societal changes in United States, for example, there are considerable shifts of what is considered as normal or common sense over the past few hundred years. For example, approaches to education (and even who "deserves" to be educated) are rarely questioned by the majority group. Other examples include religious ideology and its place in society, the status of women, and how white people justified the enslavement of Black people by labeling them subhuman. These examples are among the doxas or social consensuses of how things should be in the history that continue to shape today's society. In the same spirit, society has framed Deaf people as having a hearing impairment that begets limitations and tragedies. It is this medical framework that establishes a trajectory of audiological and aural/oral interventions in an attempt to help Deaf individuals arrive at socially constructed norms established and promoted by a hearing-dominated society. It may be why many hearing medical professionals continue to encourage families not to sign with their Deaf children despite the dearth of empirical evidence supporting this advice.

Bourdieu (1986) used the capital theory to analyze how people navigate, maintain, or influence social and institutional affairs through various types of resources. Capital includes economic, cultural, social, and symbolic resources that ascertain a person's position of power and privilege in the social life. These resources can either increase or decrease the person's social mobility. Members of marginalized groups, including Deaf people, often experience disenfranchisement due to not having the same kind of capital as the dominant group. For example, in the U.S. the capitals of white middle-class hearing people are often the standard, and

therefore, oppressive to those who are not white, middle-class, and hearing. Because these individuals usually are indoctrinated from a very early age to wear certain types of clothes, speak a certain type of language, and demonstrate certain types of mannerisms according to the norms of the white hearing-dominated establishment, they have more advantages in navigating society than those who did not experience similar socialization processes. After seeing those people being accorded privileges and thereby leading better lives, it is easy to attribute these advantages to whiteness and ability to hear and mistakenly believe that white hearing people's skin color, hearing and speaking abilities, choice of clothing, language use, and mannerisms are biologically and inherently superior. When members of the dominant group are unaware of how their behaviors and thoughts are biased towards their own personal interests and experiences, they commonly invest in and defend the status quo through various forms of capital (or resource) that advance their objectives. For example, with the cultural capital of a person speaking English, holding a degree from an Ivy League school, driving a Toyota Prius, owning Apple products, wearing Outdoor Performance Apparel brand clothing, and traveling to Mexico for vacations, their social mobility increases as these things symbolize competency that is very specific to white hearing culture and its status quo. In a similar vein, hearing people's ways of experiencing and understanding the world are typically attached to their sense of hearing. They often cannot fathom existence without relying on sound for guidance. Consequently, the ideology specifically shared by hearing people defines what is considered all-important, necessary, desirable, and even normal to function in the society. This, by itself, circumstantially advances the salience of sound and constructs the narratives of inferiority related to the Deaf experience (Hauser et al., 2010). As a result, the cultural, social and linguistic capital of Deaf individuals who do not use spoken English as their primary mode of communication is reproached by many. On the other hand,

Deaf people who manage to learn how to use spoken English and are able to access sound through technology such as hearing aids or cochlear implants have increased social mobility, worth, and respect as human beings in the larger society. This phenomenon is steeped in the educational system, which aims to increase students' social mobility through the lens of the dominant group.

Bourdieu (1984) linked his ideas of doxa and capital to education, which becomes the driving force of the reproduction of power imbalance. Bourdieu talked about people's tendency to condemn working class parents when their children struggle in school. Bourdieu argued that it was the fault of the education system, not the working-class culture, for poor performance among students from working class backgrounds. In this sense, the education system maintains the dominant group's superiority over minority or marginalized groups by legitimating the dominant culture's doxa and capital. The more the students are able to follow the dominant culture, the more likely they will succeed. Conversely, if the student's behavior, thinking, work, or even clothing style differs from the dominant culture, the student is frowned upon and ostracized. It is important to note that the existence of doxa and capital in educational settings is often subliminal with professionals carrying unchallenged assumptions in their work. They do not necessarily understand how their behaviors or decisions might have done unintentional harm to minority or marginalized communities because they genuinely believe they are in the right, adhering to the status quo. Ultimately, students from these communities, including those who are Deaf, often suffer from linguistic and cultural deprivation in education (Bourdieu, 1984).

Bourdieu's (1984) analysis of power can be linked to the history of Deaf education. Hearing people's doxa of navigating the world through sound defines what is considered normal and acceptable. Hearing people are often considered the "Deaf experts" even though they are

usually sorely detached from the real Deaf experience. In spite of this, hearing people's doxa becomes the central focus of the Deaf education system. As a result, Deaf people throughout history experience language deprivation (Hall, Levin, & Anderson, 2017), maltreatment (Schenkel et al., 2014), and feelings of shame and inferiority (Kushalnagar et al., 2011). This comment made by a hearing parent of a Deaf child in 1898 is a representation of hearing doxa that continues to pervade today:

> He [a teacher of the deaf] warned us not to use nor to allow any signs, and never to understand them. Cheered by his encouragement, we groped our way. We knew no signs, not even the manual alphabet; and there is not a single member of my family who knows the manual alphabet today. Our little girl does not know it. She was forced, therefore, to resort to articulation if she would know anything (Hubbard, 1898, p.22).

Instead of recognizing how hearing-centric or oral-only approaches have detrimental effects on Deaf children, some hearing people believe being Deaf itself is to blame for Deaf people's shortcomings in literacy and life (Pisoni et al., 2008). Arnold, a researcher in the field of deafness, makes another good example of hearing doxa. In his published article, Arnold (1982) said, "It is concluded that the main problem facing deaf children and their teachers is deafness itself, and not any particular educational philosophy and group of methods such as Oralism" (p. 1). More current examples of hearing doxa can be found in the controversy that was brought to public light in 2016. Nyle DiMarco is a Deaf star who mesmerized the world by winning the top prize on two popular television reality shows: "America's Next Top Model" and "Dancing With the Stars." He used his celebrity status to correct the misinformation being dispensed by medical professionals and educators about the limited value of using signed languages with Deaf children. "There are 70 million Deaf people worldwide and only 2% of them have access to

education in sign language," DiMarco stressed in an interview with the Washington Post. An epitome of hearing doxa, Meredith Sugar, president of the Alexander Graham Bell Association for the Deaf and Hard of Hearing, wrote an open letter entitled "Dispelling Myths About Deafness" in response to the editorial in the Washington Post. She contested DiMarco's claims about the ongoing language deprivation experienced by so many Deaf children. According to Sugar, who is not Deaf herself, "What it means to be 'deaf' has changed." In the letter, Sugar asserted that all Deaf children can learn how to hear and speak just like their hearing peers and should not be given access to ASL. Furthermore, she stated that the use of ASL is on the decline and that it hinders spoken language development. This statement by Sugar demonstrates how in Deaf education there continues to be hearing people promoting their doxa as facts that are implied to be "common sense" without empirical evidence.

Even today, hearing people have the institutional power to impose what they consider important and assert their perception as truth. Their power has translated into the grand narrative of mainstream society and within Deaf education. Hearing people frame the acquisition of their own culture as the benchmark of success and establish it as the basis for knowledge in the Deaf education system. The success of Deaf students is then measured by how closely they resemble the capitals or norms of the hearing population -- their ability to speak and hear, for example. Deaf students continuing not to be allowed to use ASL in the majority of classrooms today is an indicator of such oppression coming from the influence of hearing doxa. This reality is in spite of documented failures of such practice where Deaf students leave schools poorly educated (Marschark & Hauser, 2011; Mayberry, del Giudice, & Lieberman, 2011; Mellon et al., 2015; Traxler, 2000).

Paulo Freire presents a critical theory in education that the oppressed cannot be liberated if they rely on the pedagogy of their oppressors. Only the oppressed have the power to liberate themselves because only they can truly understand the need for liberation. Once the oppressed gain knowledge of the course of history, they can translate this knowledge into action by developing their own educational practices to sustain their language, culture and values, and ultimately end oppression (Freire, 1972). However, implementing such an emancipatory model of education requires some leverage in power on an institutional level. Freire proposes that marginalized groups start inching towards liberation by setting up small educational projects to develop practices that can liberate the oppressed, and eventually, change society for better.

Re-Birth of Bilingual Education

In the 1990s, a growing number of Deaf teachers, principals, and administrators were hired in several Deaf schools in the United States, resulting in a small shift of power dynamics (Humphries, 2013). These Deaf professionals intuitively knew the importance of Deaf culture and ASL for Deaf children and endeavored to bring bilingual-bicultural education to their schools. This was in spite of the exclusion of Deaf culture and ASL in their teacher preparation programs. When they began their professional careers as classroom teachers, they entered uncharted waters and relied on intuitive knowledge, skills, and information as they implemented new educational practices in their schools. Nover & Everhart (2004) said:

> It is important to note that teacher preparation models exist for hearing bilingual educators of spoken languages and for ESL teachers; but not until recently for ASL/English bilingual educators of deaf students. In fact, the Council of Education of the Deaf (CED), the national professional association that accredits the 70 teacher education

> programs serving deaf students, only added the new ASL/ English bilingual specialization in recent years (pg. 3).

These Deaf pioneers and their hearing allies, such as Nover and Everhart, turned to in-service trainings to advance their understanding of bilingual theories, strategies and methodologies, and their applications to Deaf learners. A group of Deaf educators and hearing allies received a five-year grant in the 1990s to formalize the growing interest in Deaf-centric pedagogy. They documented effective pedagogical approaches that utilize Deaf culture, ASL, and bilingual education. Into their fifth year, the Center on ASL/English Bilingual Education and Research (CAEBER) was established. Nover and Everhart provided formal training activities on ASL-English bilingualism to some Deaf schools that were ready and willing to undergo the fundamental change in their educational philosophy. This project is known as ASL/English Bilingual Professional Development (AEBPD) and is considered a groundbreaking effort to improve the quality of Deaf education (Nover & Andrews, 1999).

With a growing interest in this new development, Strong and Stuckless (1995) identified leading bilingual programs for Deaf children in the United States and gathered information from nine schools on their progress towards implementing ASL-English bilingualism. One of the nine schools involved was the California School for the Deaf in Fremont. There, a bilingual/bicultural task force was formed with the goal of creating foundations for Deaf students to gain access to ASL and Deaf studies as academic content areas. As part of their work, they created a mission statement that required teachers to be fluent in both ASL and written English. In addition, they were expected to possess deep understandings of the cultural and linguistic richness of Deaf people. Strong and Stuckless (1995) wrote in their report:

> Creation of a bilingual/bicultural program is going forward somewhat slowly at CSDF; after five years, there is still no program in operation. However, it is fair to say that a solid foundation has been laid so that, when the time comes to introduce the program into the classroom, parents, teachers, students, and the Deaf community will be fully informed and in favor (p. 86).

In a similar manner, The Learning Center in Massachusetts underwent a lengthy process to transform their pedagogical philosophy and approaches to make the school more Deaf-centric. The transformation was not easy as there were strong disagreements between Deaf and hearing staff that required the presence of cultural meditators to address the perceptions of these two groups. Strong and Stuckless (1995) explained:

> This process is seen as a 10-year proposition and consequently remains in progress… The presence of a program of "cultural meditation" suggests that this transition is not without its struggles and differences of opinion. Ahead now is the further development of classroom curriculum, the formal establishment of bilingual classrooms… (p. 88)

The Indiana School for the Deaf (ISD) encountered similar struggles with their transition. A group of staff formed a bilingual/bicultural committee to challenge the administration's devaluation of Deaf culture, ASL, and bilingualism. The conflict was resolved through mediation that led to the creation of two bi-bi coordinator positions. Through these positions, long-term plans were outlined to steer the school towards a major transformation of educational philosophy and teaching approaches. Strong and Stuckless (1995) outlined some of the new bilingual principles at ISD:

> ...to enhance ASL literacy through the provision of adult linguistic role models; the study of the grammar, history, and traditions of ASL; and the creative use of ASL for artistic

> expression… develop student curricula in ASL literacy, English literacy, spoken English, and Deaf studies (p. 87).

There are common threads among these schools and other programs transitioning to ASL-English bilingual institutions. They include the importance of getting "buy-ins" from hearing staff and administration, hiring additional Deaf staff and Deaf leaders, supporting the value of students having fluency in both ASL and English, and honoring Deaf culture as a critical pedagogical technique. In these schools, Deaf students are given access to ASL literature and literacy and have opportunities to reflect on their Deaf identities with Deaf teachers guiding the way (O'Brien & Placier, 2015; Strong & Stuckless, 1995).

It has been 25 years since California School for the Deaf in Fremont, The Learning Center, Indiana School for the Deaf and other pioneering schools began their work to improve the quality of their education through the application of the bilingual approach. They are considered the original bastions of ASL-English bilingual education and often serve as a model for other schools that are now open and willing to explore Deaf pedagogy. Bilingualism in Deaf education is still relatively new and highly contested even with its 25-year history. Best practices are still evolving with new understandings, and knowledge in effective teaching strategies is emerging day by day. The budding use of ASL rhyme and rhythm with young Deaf children as a means to solidify their language base is one area that warrants further exploration.

ASL Rhyme and Rhythm

Rhyme and rhythm are considered critical foundations for early language development of all children, regardless of their hearing status. Yet, rhyme and rhythm in ASL have been conspicuously absent from the Deaf education setting. This is in spite of its use among Deaf families and within the Deaf community. With an interest in capitalizing on cultural and

linguistic tools available in the Deaf community to improve the quality of education for Deaf students, attention is being given to ASL rhyme and rhythm as a possible critical link to successful early language development for young Deaf children. Albeit little is known about the presence of ASL rhyme and rhythm in Deaf education, there is documented evidence about the playful use of ASL among adults in the Deaf community. Bahan (2006) explained:

> The cadence of songs usually springs from the way signs are formed (e.g., phonology/morphology) and is visually pleasing…. Although it is difficult to prove, percussion signing may have originated in the DEAF WORLD rather than being modified from the oral medium (p. 34).

Cultural artifacts captured on film can be used to identify linguistic features critical in ASL rhyme and rhythm. A Deaf filmmaker, Charles Krauel, filmed one of the earliest recorded performances of ASL rhyme and rhythm in the 1920s (Supalla, 1994). In this one-of-a-kind black and white footage two Deaf persons are seen at a football game clapping and swaying their bodies from right to left while signing in a 1-2, 1-2-3 rhythmic percussion:

> BOAT - BOAT - BOAT BOAT BOAT
>
> DRINK - DRINK - DRINK DRINK DRINK
>
> ENJOY - ENJOY - ENJOY ENJOY ENJOY.

Rhythm in ASL can be observed through the repetition of certain body movements that supplement the signs in this video (Supalla, 1994). As described in the introduction chapter, ASL rhythm is the pattern found in the movements of the body and signs to create consistent visual beats. In “The Boat Song” of 1920s, in addition to the synchronized body movements and signs, there are visual patterns in the holds of signs “BOAT” “DRINK” and “ENJOY.” Interestingly,

there is no identifiable rhyme in the handshape of these signs ‘boat’, ‘drink’, and ‘enjoy’ as they do not share any similar phonological features.

Gallaudet University’s fight song is another long-standing and probably the most well-known ASL song, especially among Gallaudet students and alumni. Like the boat rendition above, the Gallaudet fight song also uses the 1-2, 1-2-3 percussion pattern made with loud drum beats:

OUR - ENEMIES - FEAR FEAR FEAR

WHY? WE - DESTROY DESTROY DESTROY

GROUP - TOGETHER - PRACTICE PRACTICE PRACTICE

CHALLENGE - CHALLENGE - FIGHT FIGHT FIGHT

WHISTLE - HEAR NONE - WHY WHY WHY?

OH - WE - DEAF DEAF DEAF.

Bahan (2006), who is himself Deaf, described watching original ASL percussion songs being recited by Deaf people at different events such as the Deaf Way II conference in 2002 and local churches. He observed how these songs incorporated the 1-2, 1-2-3 cadence with some variations. Bahan (2006) said:

> Percussion signing may not be as widespread as it used to be in the early part of the twentieth century, but it is far from gone, and it may be riveting in situations that involve the need for sense of unity among a group (p. 36).

These historical documents of original ASL rhyme and rhythm being used by Deaf people demonstrate the cultural value of this practice in the Deaf community. There needs to be a greater understanding of their effectiveness on Deaf children’s language acquisition and learning given that ASL rhyme and rhythm have recently entered the realm of Deaf education. This

addition to Deaf education is especially critical because many Deaf children do not have access to the Deaf community or have much contact with Deaf teachers or native signers. The systematic barriers in accessing ASL and Deaf culture make the phenomenon of Deaf children engaging with ASL rhyme and rhythm sparse and unique. In the next sections, we will examine the population of Deaf people and circumstances of modern medical, scientific, and early intervention systems that shape Deaf children's lives.

Deaf Population

Approximately three in one thousand babies are identified as Deaf (National Institute on Deafness and Other Communication Disorders, 2005). The etiology of deafness varies greatly from individual to individual, originating from various sources including genetics, illness, harmful noises, or age. A predominant prenatal source of Deaf babies is genetics where both parents carry some kind of deafness-related genes including certain syndromes such as Usher's Syndrome and Waardenburg Syndrome. Other contributing factors to babies being born Deaf are side effects of medication taken by the pregnant person or babies being born prematurely. There are cases where the hearing becomes affected during childbirth due to complications or viral infections such as CMV. Others become Deaf later in life due to diseases such as meningitis, or serious illnesses such as high fever, or being affected from constant exposure to loud noises. Clearly, deafness can happen at any period of a person's life. Each Deaf person's experience with deafness is unique as the range of hearing ability varies from one person to the next as well as their physical ability to discriminate distinct sounds regardless of their hearing level. Likewise, there is no consistent pattern among Deaf people in their ability to benefit from assistive devices such as hearing aids and cochlear implants as the variables as discussed previously have far reaching implications on the usefulness of such devices.

While there are interventions, devices, or surgeries that allow Deaf people some access to sound along with requisite long-term intensive therapies, the most common barrier to a typical language development is restricted access to language. Full access to language is especially important during the critical period of language acquisition that occurs during the first few years in a child's life. Not giving a child full access to language is now known as language deprivation, which is common among Deaf children (Hall, 2017). The prevalence of this issue can be attributed to the fact that more than 95% of Deaf children are born into hearing families. Most of these families choose not to use any form of signed language. Less than 8% of Deaf children have access to signed language at home (Gallaudet Research Institute, 2011). Consequently, many of these Deaf children suffer from language deprivation as they struggle to gain access to spoken language used by their families.

Language Trajectories

There are multiple categorical groups of Deaf children that put them on different language trajectories towards becoming users of ASL, English, and/or other languages. Although there are variations in Deaf children's language experiences, for the sake of discussion on language acquisition, a simplified list is provided to highlight critical distinct characteristics of this particular population. It is important to keep in mind that this list is not exhaustive. The groups in the Deaf population include: Deaf individuals of hearing parents who do not sign, Deaf individuals of hearing parents who do sign (of varying levels), and Deaf individuals of Deaf parents who do sign. According to the National Institute on Deafness and Other Communication Disorders (2014), approximately 40% of Deaf children today have cochlear implants; therefore, the use of the technology, participation in speech and listening training, and their innate abilities also factor into their overall language development if they are in non-signing environments. For

families who choose spoken language as the only route for their Deaf children, it may be months or years before language in any form begins to take shape (Lederberg, Schick, & Spencer, 2013; Levine, Strother-Garcia, Golinkoff, & Hirsh-Pasek, 2016).

Hearing technologies and language acquisition in spoken language. Deaf children immersed in environments that only use spoken language, even with amplification such as hearing aids or cochlear implants (CIs) and intensive therapies, may have restricted access to language. Limited language access makes normal language development a challenge for these children (Lederberg et al., 2013; Pisoni et al., 2008). For this reason, some language acquisition researchers are interested in learning more about the language development of the population that is not given any exposure to signed language while growing up. Pisoni and his colleagues (2008) wrote:

> Deaf children with CIs represent a unique and unusual clinical population because they provide an opportunity to study brain plasticity and neural reorganization after a period of auditory deprivation and a delay in language development. In some sense, the current research efforts on deaf children with CIs can be thought of as the modern equivalent of the so-called "forbidden experiment" in the field of language development but with an unusual and somewhat unexpected and positive consequence. The forbidden experiment refers to the proposal of raising a child in isolation without exposure to any language input in order to investigate the effects of early experience on language development. These kinds of isolation experiments are not considered ethical with humans although they are a common experimental manipulation with animals to learn about brain development and neural reorganization in the absence of sensory input (p. 6).

As described by the researchers, Deaf children without access to signed language often experience delays due to not having adequate language access in spoken language. This adversity may be reduced when hearing aids or cochlear implants are introduced to these children; yet, a normal language development is still far from reach for many of them. Determining what constitutes a successful language outcome in the Deaf population is highly subjective and biased towards certain ideologies. For example, some people may consider implants a success if Deaf children are able to access some sounds and speak some words even with severe language delays (Beadle et al., 2005). Conversely, other people consider language delays in Deaf children unnecessary, avoidable, and a form of injustice. They believe Deaf children should be meeting age-appropriate language milestones through a language that is fully accessible to them such as signed language (Humphries et al., 2012).

The conflicting ideologies and definitions of success can be discerned in the work done by Beadle and Humphries's research teams on the Deaf population. Beadle et al. (2005) conducted a longitudinal study on 30 Deaf adults who had cochlear implants for at least 10 years. It was reported that 27% of the sample experienced failure in their cochlear implant devices nine or more times during the 10-year timeframe. It took between two weeks and five years for these Deaf individuals to have their malfunctioned implants replaced. Even though device failures were frequent, Beadle's research team (2005) observed that all individuals had successful re-implantations. They felt the results showed promise in the success of cochlear implants with 60% of the sample being able to use the phone with a familiar voice and 33% to 50% continuing to show improvements in their hearing and speaking abilities over time. To the contrary, Humphries' research team (2016) did not find these types of findings optimistic. They examined studies on language acquisition in Deaf children with cochlear implants and were disturbed by

the data. Deaf children were found to be struggling to meet language milestones and achieve normative speech, language, and communication even with hearing aids or cochlear implants and after years of rehabilitative training. They concluded that implanted Deaf children are at a higher risk for language deprivation, especially if they were not given access to signed language during their early years. Beadle et al. (2005) and Humphries et al. (2016)'s drastically diverse conclusions and interpretations from similar findings show how people can have different ideas of what it means for Deaf individuals to be successful in their language development. Regardless of how one interprets "success," it does not change the fact that Deaf children experiencing language deprivation are prevalent. Inadequate language input during early years has very serious and lasting consequences in the structures of the brains of children.

Penicaud et al. (2013) conducted research using MRIs to scan activity in Deaf people's brains to better understand the language function of the brain. They found that language deprivation causes structural changes in the anatomical organization of the brain and permanently affects functional language processing. In other words, the language parts of the brain, without adequate stimulation during the critical years of language acquisition between zero and three years old, will atrophy. The implication is that Deaf children from non-signing families run the risk of experiencing physical obstacles in their brains which will prevent them from acquiring and using any languages fluently, including signed language.

The empirical evidence stands in contrast to the long-standing assumption (doxa) that signed language is something any individual can easily acquire and become fluent in later in life. This unsubstantiated assumption is often promoted by hearing specialists such as doctors, audiologists, and educators as they routinely caution against parents using signed language with their Deaf babies in spite of a growing body of research showing the dire consequences of

families following such risky advice (Henner et al., 2016; Humphries et al., 2016; Mayberry, Chen, Witcher, & Klein, 2011). To this end, Hall (2017) urged parents and professionals to be aware that a "cochlear implant is currently unreliable as a standalone first-language intervention for the deaf child… the lifelong consequences of language deprivation are too far-reaching, from early childhood to adulthood…" (p. 3). Yet, the resistance towards signed language ensues.

To summarize, success in meeting language milestones is highly variable in the population of Deaf children in spoken language-only environments (Davidson, Geers, Blamey, Tobey, & Brenner, 2011; Lund, 2016; Miller, 1997; Pisoni et al., 2008). Deaf children are improperly and unnecessarily obstructed in their language development over the course of their lifetime due to insufficient systemic support and accountability during the critical time of language acquisition. Such language deprivation may cause permanent damage to Deaf individuals' executive function skills and cognitive development, hindering them from attaining language fluency and higher-order thinking skills commensurate with their age level.

Language acquisition in signed language. All children, hearing or Deaf, need full and rich access to language during their first years in order for natural language processing to develop and progress in their brains (Guasti, 2017; Saxton, 2017). Language processing in the brain is not reliant on sound and transcends all modalities (Petitto et al., 2016). The emergence of signed language research gave a clearer picture of how phonological processing works as it relates to language acquisition in the Deaf population. Petitto's research team (2016) presented a concept called "universal phonology," which is the biological ability to process linguistic information based on its units, patterns, and structures. According to Petitto and her colleagues (2016), the human brain segments the sequence of language, spoken or signed, into pieces of phonological units for the purpose of interpreting and connecting linguistic information to

meaning. The process of segmentation naturally materializes in the brain as long as language input is early and accessible. There is a strict maturational timetable during infants' first years that includes the critical development of phonological processing in the brain in order to access overall language and literacy skills later in life. Infants need to be exposed to signed language, which is made of parameters (handshape, location, movement, palm orientation, and non-manual markers), or smallest units of ASL phonology, that are combined to create full signed words.

In 1990, for the first time there was an exhaustive study on Deaf children's acquisition of handshapes. Braem (1990) looked into motor development in young children and identified four stages of handshape development with 23 handshapes. It was discovered that Deaf babies acquire "basic" handshapes such as B, A, S, O, C, and 1 first before learning "complex" handshapes later due to the development of fine motor skills. As their fine motor skills develop, toddlers are able to produce more complex handshapes such as W, R, T, and 7. Other studies have affirmed Braem's proposed stages of handshape development (Cheek, Cormier, Repp, & Meier, 2001; Siedlecki & Bonvillian, 1993). Oftentimes during the course of early language development, babies would sign words using correct location and movement but incorrect handshape due to the complexity of motor skills involved in producing certain handshapes. An example of this developmentally appropriate phonological error would be using the "S" handshape while signing "PLAY" instead of the "Y" handshape used by older children and adults (Chamberlain, Morford, & Mayberry, 1999).

Handshape errors in young children are common and normal for language acquisition as observed in the study done by Siedlecki and Bonvillian (1993). The researchers filmed nine children of Deaf parents between six and eighteen months old every month for a year. All children were hearing except for one. Results showed that children used signs with correct

location with 83.5% accuracy, correct movement with 61.4% accuracy, and correct handshape with 49.8% accuracy. Infant motor development enables children to use correct location more often than other parameters such as movement or handshape because the motor skill associated with location is more gross-based than fine-based. This information is significant in understanding that ASL development in infants is linked to phonology processing along with motor development, which is inherent in all "true" languages (Chomsky, 1957). Studies like this reveal some kind of sequential structure in phonology development, laying the groundwork for future researchers to test Deaf children's language acquisition in ASL. Subsequent research shows that Deaf children exposed to signed language from birth meet universal language milestones just like hearing children do with babbling and then producing one word sign, two-word sign combinations, sentences, and beyond (Anderson & Reilly, 2002; Meier, 2016). Since hand coordination develops earlier than the acquisition of vocal skills, babies in a signing environment can communicate with their hands four months before they can begin to use their speech. For this reason, some hearing parents have found it advantageous to use baby signs with their hearing babies as this practice allows earlier communication (Pizer, Walters, & Meier, 2007). As such, babies that sign can produce noun signs when they reach one year old, and then emotion signs as early as 15 months. At 18 months old, babies from signing homes know over 450 signs. At two years old, it is not uncommon for Deaf toddlers to produce two- and three-word signs such as "I – DON'T – WANT" or "DON'T – LIKE – FOOD." Language acquisition in signed language is almost identical to hearing children learning how to speak. What is important here is that language researchers agree that there is a time limit to having a normal language development, regardless if signed or spoken, that transpires during the first years of an infant's life (Guasti, 2017; Saxton, 2010).

Early exposure to signed language. Mayberry and her colleagues have done monumental work accumulating empirical evidence over 20 years, stressing the risks of not having early exposure to signed language for Deaf individuals. Mayberry and Fischer (1989) conducted two studies comparing signed language processing in 16 Deaf adults who acquired signed language at different times in their lives. Eight Deaf adults had early exposure to signed language in their childhood while the remaining eight had learned signed language between nine and sixteen years old. This study was among the first of its kind focusing on the effects of initial age of language acquisition on ASL receptive and expressive skills. In the first study, Deaf people watched narratives in signed language and signed along simultaneously what was signed to them. Non-native signers struggled on this task and appeared to have some kind of difficulty with language processing. They were unable to incorporate correct phonological parameters in the signs, comprehend the meaning of the signs, and replicate sign production accurately. In the second study, Deaf adults were given two sets of ASL sentences, one set of ungrammatical ASL sentences with scrambled words and one set of ASL sentences with proper grammar. While viewing the signed sentences, non-native signers paid more time and attention to identifying phonological parameters of the words and associating them to the meaning of each word. They stalled frequently, impeding their ability to process and integrate the whole meaning of sentences. In contrast, native signers immediately processed signs as they were shown and understood the meaning of sentences without much difficulty. This finding became the groundwork of Mayberry's lifelong exploration into the impact of not having early exposure to signed language on Deaf people's language abilities.

As a follow up, Mayberry and Eichen (1991) looked at the linguistic structures in 49 Deaf adults' ASL usage. This group of Deaf adults acquired signed language as their first language

between birth and thirteen years old and used signed language for an average of 42 years. The researchers found that Deaf adults who accessed signed language earlier in life had more sophisticated linguistic structure in their language use and better sign recognition abilities. This was another indication of the age of signed language acquisition having a lasting impact on language outcomes later in life.

Mayberry (1993) expanded on her previous findings in a different study looking into the ability of 36 Deaf adults to memorize and recite long and complex sentences in ASL. The researcher compared the results of Deaf adults who learned ASL as their first language at various ages in their lives with Deaf adults who were born hearing, became Deaf later in life, and learned ASL as their second language. There were significant differences in performance on language processing tasks pertaining to memory. Hearing people who became Deaf and learned ASL as a second language later in life did better on the ASL tasks than those who were born Deaf but learned ASL later in life. However, Deaf people who had early access to ASL demonstrated superior performance. This finding adds to the accumulated research on the critical period of language acquisition theory, evidencing the impact of the timing of first language acquisition on ASL proficiency.

Mayberry et al. (2011) turned to neuroscience to investigate the effects of age of acquisition on the organization of language processing in the brain. Twenty-two Deaf adults with varying ages of initial language acquisition were recruited for this study. Some language tasks such as ASL sentence processing were replicated from a previous study (Henner et al., 2016) with some new tasks added. In one of the tasks, Deaf participants were asked to look at ASL sentences and determine whether they were grammatical. In another task, Deaf participants were asked to determine whether the last sign of the sentence was made with one hand or two hands.

All of the tasks were conducted in the fMRI scanner, and data was analyzed by comparing activation patterns through neuroimaging. The results showed that the organization of language processing in the brains of Deaf adults who had late first language acquisition was stagnant and atypical. Based on this finding, the researchers suggested that the claim of Deaf people's poor language skills being primarily due to their deafness is erroneous (Beadle et al., 2005; Pisoni et al., 2008). Rather, the late onset of language acquisition is to be blamed for poor language performance among Deaf people. More recently, new evidence to support the critical period of language acquisition theory was found in a large research study done by Henner and his colleagues.

Henner et al. (2016) investigated a large pool of data of over 600 Deaf students to see if there is a critical window of language acquisition time period and if this window closes at a certain age. Their research question also included whether or not outcomes were different among Deaf students who had early experience with ASL at home with parents and those who learned ASL in school. Their results showed that those who were exposed to ASL from birth had the best language outcomes. The second best was those who were exposed to ASL before six years old. The third best was those who acquired ASL in schools before 12 years old. The main takeaway of this study is the 'language window' or the critical period of language acquisition does close at certain periods of age, even for ASL. With this information, the implications for language learning for Deaf babies are profound, given the fact that many of them are not given complete access to a language, including signed language. Not only does late first language acquisition affect the ability to become fluent in ASL, English development is impacted as well.

Mayberry and Lock (2003) wanted to know the effects of early acquisition of language on English skills. Fifty-four Deaf adults were asked to pick a photo that best matched the

sentence given to them and perform a grammatical judgment task where they answered "yes" or "no" to English grammatical and ungrammatical sentences. Individuals who were able to successfully acquire language during their early years, whether spoken or signed, attained near-native performance on the tasks. In contrast, individuals who had little or no access to language during their early years struggled on all of the English grammatical measures even though they used English for many years in their daily lives. This finding pinpoints the lasting impact of language deprivation on the brain that many Deaf people experience.

Goldin-Meadow and Mayberry (2001) published a review of literature on how Deaf children learn to read. They said, "The first step in turning deaf children into readers appears to be to make sure they have a language… most surprisingly, knowing any language helps children learn to read even if it is not the language captured in print" (p. 226). However, just knowing a language does not always suffice as evidenced by some hearing children who have full access to spoken language, are fluent in it, but still struggle with reading skills (McArthur & Castles, 2017). The process of mapping a native language to a written language is a whole different ball game for both hearing and Deaf children alike. On a side note, it has been suggested in several studies on bilingual methods that ASL can be successfully bridged to English in print through strategies that utilize codeswitching (Andrews & Rusher, 2010), fingerspelling (Stone, Kartheiser, Hauser, Petitto, & Allen, 2015), and bridging and chaining (Ausbrooks-Rusher, Schimmel, & Edwards, 2012). There needs to be more research in order to consider these approaches effective or evidence-based.

While it is clear that Deaf children need early and accessible language acquisition to make typical language development possible, the benefits of early exposure to signed language also spill over to other pertinent areas of development such as cognition (Neville et al., 1998),

literacy (Freel et al., 2011), parent-child relationships (Loots, Devisé, & Jacquet, 2005), self-esteem (Desselle, 1994), social-emotions (Vaccari & Marschark, 1997), quality of life (Kushalnagar et al., 2011), mental health (Hall et al., 2017) and identity (Leigh, 2009). Hall, Levin and Anderson (2017) explained that Deaf children suffering from language deprivation may experience a long-term impact on their behavioral health with a poorer quality of life and higher levels of emotional distress. Approximately 75% of Deaf persons with psychiatric symptoms in an inpatient unit had language dysfluency (not fluent in their first or best language). The researchers (2017) said:

> Language deprivation occurs in the deaf population primarily as a function of medical and education policies. These policies are generally created without the inclusion of deaf people and are the ones in which sign language has been—and is—excluded as a primary or complementary language intervention option for deaf children (p. 7).

Alas, this harrowing phenomenon is not new. Mr. Ernest Dusuzeau, a Deaf teacher who taught at the National Institution in Paris in 1900s provides powerful imagery of language deprivation, "The Deaf person deprived of the sign language is like the bird with its wings clipped" (School items, 1917, p. 392).

A foundation in research built by previous researchers provides a solid and balanced understanding of issues surrounding language deprivation and language acquisition in the Deaf population. The re-birth of bilingualism in Deaf education opens up a grand and almost untrodden field of inquiry regarding Deaf-centric approaches used with Deaf children. There is a need to better understand the role of ASL rhyme and rhythm in education given the historical and current presence of this practice in Deaf culture and Deaf community and their growing popularity in bilingual Deaf schools.

The Role of Music

A study done by Darrow (1993) examined the role of music in Deaf culture and collected data to "either substantiate or refute the writings of hearing authors regarding the value of music to the deaf…" (p. 95). Data was collected by sending questionnaires to a random sample of 300 people through the National Telephone Directory for TDD Users and videotaped interviews with a random sample of Deaf people. The results from the questionnaire reported that 52.5% of the respondents who have attended music classes in the past enjoyed activities that incorporated singing and/or signing songs. Almost half of the respondents said they liked moving or dancing to music in addition to listening to music. Out of all 300 respondents, 21.3% said they still participated in singing or signing songs in their adulthood. However, the majority of Deaf people (57.3%) said they were not involved with music at all. The last question in the questionnaire was about the level of importance of music. Almost half of the Deaf respondents who identified with the Deaf culture said music was not important at all. Conversely, 42.9% of Deaf respondents who identified with the hearing culture said music was very important. Those who identified with both cultures had mixed responses with 29.4% feeling music was not important at all, 25.5% feeling it was of little importance, 27.5% feeling it was somewhat important, and 17.6% feeling it was very important. The researcher concluded that hearing authors are wrong in their insistence that music as defined by hearing culture and standards is valuable to Deaf people. Darrow (1993) said, "Perhaps we can improve our education of these students by acknowledging and being sensitive to the characteristics of their culture" (p. 109). Hearing people's ways of accessing and appreciating music are, indeed, not optimal to many Deaf individuals' access or preference. Therefore, a point of departure needs to be established in understanding what construes as Deaf-centric ways of accessing rhyme and rhythm that involve visual beats and

signed language. In light of limited literature in this area, a small number of researchers have attempted to study or describe parts of rhyme and rhythm in ASL from different angles such as sensory perception, phonological awareness, linguistics, and education.

Signed Language Rhyme and Rhythm and Deaf Learners

The cultural and linguistic phenomenon of ASL rhyme and rhythm is not foreign to adults immersed in Deaf culture and communities, but it is novel for Deaf children in educational contexts. Deaf educators are beginning to use ASL rhyme and rhythm in early childhood programs to foster language acquisition and preserve cultural and language tools that are deemed important to the Deaf community. Thus, there is scant literature on the uses of ASL rhyme and rhythm with Deaf children. Nonetheless, just like how most young hearing children are discernibly hooked to spoken rhyme and rhythm, Deaf children appear to be just as hooked to visual-based rhyme and rhythm. Whereas research shows that ASL does have its own ways of generating rhyme and rhythm through phonological play, body movements, and holds in signs, their relevance to language acquisition is largely unknown.

Allen, Wilbur, and Schick (1991) conducted an experiment to capture adults' perception of rhythm in ASL. Five Deaf adults, five hearing codas (hearing people with Deaf parents) fluent in ASL, and five non-signing hearing adults were recruited for this study. These adults viewed five short ASL narratives and tapped to the rhythm of the signs. It was discovered that the rhythm of the signs was perceived and identified through repeated signs, signs with varying stresses, and final signs. Differences in tapping were found between Deaf adults fluent in ASL and non-signers. What can be drawn from this study is there seems to be a consensus on what is perceived as rhythm in ASL, and that native signers have a greater perception of the subtleties of rhythm.

Clayton Valli, a Deaf person famous for his ASL poetry, did his dissertation in 1993 examining the role of eye gaze, body shift, head shift, handshapes, and movement in creating rhyme and rhythm. He identified signed language equivalents to spoken language's linguistic structures for rhyme and rhythm. He argued that ASL poetry had meters that could be found in the movement and hold patterns in signs. In addition to his analysis of ASL rhyme and rhythm, he looked at ASL strategies used by Deaf teachers teaching ASL poetry to Deaf children. He observed that the ASL strategies that included the use of rhyme and rhythm employed by some teachers helped Deaf children do better with understanding, memorizing, and creating ASL poetry. His analysis was prominent because his findings created a new scientific knowledge, allowing for future research to build upon his work.

Mather and Winston (1998) did a case study and compared five teachers' story-reading methods as they read and signed an English book consisting of English rhymes to Deaf students between three and five years old. After analyzing five teachers' approaches to story reading, the researchers found that four teachers read the story directly from the book, signed in English order verbatim and used their voice simultaneously, fully adhering to the principles of sound-based patterns of English. Only one teacher translated the English story into ASL and provided a dynamic equivalent of the spoken rendition using accurate spatial mapping and visual intonation, converting sound patterns to visual patterns. ASL rhyme and rhythm were demonstrated in the visual patterns through the use of repeated handshape, location, and movement in signs. The crux of the matter is this teacher was the only one considered to be fluent in ASL. With this finding, the researchers shared their concerns about Deaf children not having quality access to language:

> Most teachers of Deaf students are hearing speakers of English who have learned some amount of signing or ASL through courses in their university programs… As language

> models for many Deaf children, they can provide a complete language model only if they themselves are fluent in ASL. Any signed communication method used without spatial structuring will be incomplete and ineffective as a language model (p. 208).

This research finding reinforces the knowledge that many teachers of the Deaf are not modeling prominent features of ASL in their instruction due to their lack of fluency in the language.

Smith and Jacobowitz (2004) published an article in Deaf Studies Today! explaining that rhymes could be formed by playing with the smallest units in the linguistic structure of signed words. They shared information about a new DVD and book coming out on handshape awareness geared for young children. These materials were created in response to the ongoing challenges of teachers not having appropriate materials and curriculum in ASL for Deaf children. Consequently, these Deaf children lack exposure, experience, and opportunities to express themselves artistically through ASL poetry, stories, and performances. Smith and Jacobowitz (2004) remarked, "By teaching Deaf students about ASL handshape rhyme, this may enhance not only their expressive abilities, but also their appreciation of the beauty of ASL as the natural language of the Deaf community" (p. 304). In recent years, with ASL resources and trainings becoming increasingly available to teachers of the Deaf, some teachers are implementing these practices in their classrooms.

Crume (2013) reported that some teachers in a bilingual Deaf school were experimenting with ASL activities in their classrooms. These teachers sought to increase handshape awareness in Deaf children through lessons that promoted handshape play. One of the teachers shared in an interview that they used ASL rhyme and rhythm with preschoolers by repeating signs with the same handshape in rhythmic movements. Crume (2013) observed this practice in the classroom:

> In sign rhythm activities, teachers incorporate the repetitive use of signs together with clapping or patting on knees. The sign rhythm activities allowed deaf students to learn specific handshapes in signs in a pattern that made learning fun. This provided the deaf students a similar benefit that hearing preschool children enjoy when they incorporate movement and gesture in songs (p. 99).

Crume found that those teachers used these activities frequently regardless of the age of their students which ranged from eighteen months old to five years old. The teachers remarked in the interview that sign rhythm activities were the most beneficial for students with limited language because they would become engaged and motivated to try signing. In my personal communication with Crume, he said future research needs to examine the effects of ASL rhyme and rhythm and ASL phonological awareness on various areas of development in young Deaf children (Crume, personal communication, September 30, 2015). Such investigation had already been initiated in Di Perri's dissertation.

Di Perri (2004) collected data on ASL phonological awareness, including handshape rhyme awareness, in 29 Deaf students between four and eight years old with typical language development. During the handshape identification task, the examiner showed a picture of a common noun, and the Deaf student gave the signed word for that picture and then pointed to the matching handshape on the handshape chart. This task paralleled to identifying a sound in a spoken word. During the handshape categorization task, the Deaf student viewed a video of a signer giving three different signs with the same rhyming handshape. Then, the Deaf student pointed to the matching handshape rhyme on the handshape chart. This task was similar to identifying rhyming sound across a set of spoken words. Di Perri found that her participants performed comparably well across handshape tasks regardless of age. Although the number of

participants in her study was too small to make generalizations, the researcher concluded that Deaf children between four and eight years old are able to perform at ceiling levels in the tasks of handshape identification and handshape categorization. What is significant about this finding is that Deaf children were able to accomplish the ASL phonological awareness tasks without previous interventions. Investigations into signed language rhyme and rhythm were also conducted overseas in France.

Blondel and Miller (2001) studied the uses of nursery rhymes in French Sign Language (LSF). They said, "… nursery rhymes exist in sign languages. They are part of language games, along with tongue-twisters, lullabies, riddles, and so on. As far as we know, they are created by deaf adults for children" (p. 29). The researchers identified the phonological parameters required for creating rhyme; they were handshape, location, movement, and non-manual markers. These rhyming parameters were frequently incorporated in LSF poems and nursery rhymes. In LSF, just like ASL, rhythm can be formed by maintaining the flow and manipulating the transitions of signs to make the initial parameter (i.e. handshape, location, movement) of the sign match the previous or subsequent signs. Syllables are also found in the movements and holds in signs. The researchers described rhymes as the repetition of phonological parameters in signed words. Apparently, there is not any difference between ASL and LSF in their features of rhyme and rhythm. The researchers underlined a concern they had about the superiority of the dominant language in early childhood education curricula for Deaf children and the benefits of nursery rhymes being lost in translation. They said, "…many nursery rhymes in our corpus are adaptations from those existing in the spoken French language, an inevitable consequence of living in an oral-centric environment" (p. 30). In spite of this, the researchers positively noted that there were some universal commonalities that can be appreciated across spoken French and

LSF in the songs that transcended language differences such as themes being about seasons, colors, days of the week, animals, and numbers. This research exhibits that similar principles of visual-based rhyme and rhythm exist in other signed languages that are not ASL, and that the phenomenon of its use with Deaf children is also under study by researchers outside of the United States.

In conclusion, there is still an extremely limited number of qualitative and quantitative studies done on Deaf children's experiences with rhyme and rhythm. It can be concluded that studies specific to the effects of using ASL rhyme and rhythm with Deaf children are greatly needed. That aside, a lot can be learned from the literature concerning spoken language rhyme and rhythm and hearing children, which may exemplify the importance for Deaf children to develop similar language and cognition skills.

Spoken Language Rhyme and Rhythm and Hearing Learners

Hearing babies are first exposed to rhyme and rhythm when they are in the womb. Several studies found that the brains of hearing babies can begin recognizing patterns in sound and spoken language prior to birth (Hepper & Shahidullah, 1994; Moon & Fifer, 2000; Partanen, Kujala, Tervaniemi, & Huotilainen, 2013). To produce evidence, an experimental study was conducted with an intervention group and a control group of mothers in their last trimester of pregnancy. In the intervention group, the "Twinkle, Twinkle Little Star" nursery rhyme was played at a high volume five times every week. After birth, the babies in the intervention group and control group were tested, and then they were tested again four months later. Hearing babies in the intervention group had significantly higher neural responsiveness to the sounds of the melody when listening to the "Twinkle, Twinkle Little Star" nursery rhyme, and this was still true even four months later (Partanen et al., 2013). Repeated access to rhyme and rhythm in the

womb build early neural representations in the infant's brain of certain sounds, melodies, and patterns of language.

Hahn, Benders, Snijders, and Fikkert (2018) tracked the length of time 39 nine-month-old infants listened to non-rhyming songs compared to rhyming songs using the head-turn technique. These children already had vast exposure to rhyme and rhythm in their daily environment prior to the study. They found no significant difference between rhyming and non-rhyming songs with infants listening a little longer to the non-rhyming song, indicating that infants needed to develop phonological awareness before gaining appreciation of the phonological patterns in the rhyming version. However, the fact that half of the infants in the study demonstrated preference for the rhyming song, suggesting that these infants might have had developed rhyme sensitivity and higher phonological processing compared to the other half. Investigations are still underway to pinpoint the developmental skill of distinguishing and appreciating rhymes in hearing infants. The examples provided above demonstrate how rhyme and rhythm are already an integral part of hearing babies' lives. Most hearing babies go through their early childhood having regular and consistent exposure to rhyme and rhythm in daycare centers, the public sphere, and at home.

Engaging in language play is natural to hearing children's language acquisition process as pieces of evidence can be found in anecdotes such as the one shared by Chukovsky. Chukovsky (1963) encapsulated hearing children's fascination with language and their tendency to make up rhyming words with a personal narrative of his four-year-old child playing and spontaneously screaming, "I'm a big, big rider! You're smaller than a spider!" (p. 64). Hearing children's natural use of language typically incorporates rhythm and melodies (Harp, 1988). Danielson (2000) gave another example of hearing children enjoying singing songs with a phonological spin on the words, "My captain went to sea, sea, sea. To see what he could see, see, see" (p. 10).

Hearing children's natural interest in language play may be the reason why rhyming words are commonly found in children books. Read, Macauley, and Furay (2014) looked through the top 100 children's books of all time in 2013 and found that 20 of them had rhyming words. This means not only do hearing children enjoy playing with language during their free time, they are also drawn to shared storybook reading experiences that include language play through rhyme. Instead of emphasizing on the content or semantics, Cazden (1974) argued, hearing children should be encouraged to use rhyme and rhythm for the sheer joy and fun that language play provides them. Certainly, a lot can be learned from observing hearing children's behaviors when exposed to music.

Moog (1976) observed over 500 children to identify developmental traits in music and found that one-third of hearing children between one and two years old started imitating the songs they were exposed to but without appropriate rhythm or pitches. When they reached three years old, many hearing children were able to sing the words and incorporate correct rhyme, rhythm, and pitches in their songs. Moog (1976) said, "…by the age of three most children are capable of imitative singing" (p. 43). The researcher also looked into movement and coordination of the children under the study and found developmental connection in the ability of children between four and six years old to imitate the body movements that match the rhythm of the songs. It would be interesting to look into whether Deaf children between three and six years old can spontaneously imitate ASL rhyme and rhythm with body movements without adult prompting.

Maclean et al. (1987) wanted to know the amount of knowledge three-year-old hearing children had regarding nursery rhymes. After giving 39 hearing children from different socioeconomic and social backgrounds five common nursery rhymes, all with the exception of

one child were able to recite some of the songs. It was concluded that most of the hearing children had some knowledge of nursery rhymes; however, their ability to memorize the songs in their entirety varied significantly. There were strong correlations between hearing children's knowledge of nursery rhymes and their performance on rhyme detection tasks. These high-performing children also had higher early reading skills, further indicating the interrelatedness of these three variables – nursery rhyme experience, rhyme sensitivity, and literacy. Exposure to nursery rhymes at home seems to be another contributing factor as hearing children with abundant experiences with singing nursery rhymes and playing language games at home reaped the most positive outcomes in nursery rhymes knowledge and rhyme sensitivity. The findings from this study were reinforced by another study done ten years later by Fernandez-Fein and Baker.

Fernandez-Fein and Baker (1997) looked into the relationships between 59 hearing children's home experiences and their sensitivity to rhyme. They asked hearing children to recite five different nursery rhymes when given the titles of the songs. The selected nursery rhymes, given their familiarity to and popularity among the children, were: "Twinkle, Twinkle Little Star", "Humpty Dumpty", "Jack and Jill", "Baa Baa Black Sheep", and "Hickory Dickory Dock". It was discovered that most hearing children had some knowledge of nursery rhymes and that hearing children from middle-income backgrounds had the most knowledge of nursery rhymes. It was reported that those hearing children from middle-income backgrounds were given more opportunities to participate in singing and rhyming games at home. There were correlations between frequent engagement with books, knowledge of nursery rhymes, and rhyme sensitivity. The hearing children who enjoyed engaging in singing more frequently had higher nursery rhymes knowledge and rhyme sensitivity. This study reinforces the body of knowledge on the

interrelationships of nursery rhyme experience, sensitivity to rhyme, and reading skills (Dunst & Gorman, 2011; Goswami & Bryant, 2016; Read & Regan, 2018).

Moyeda, Gómez, and Flores (2006) conducted a study to investigate the effects of a music intervention program with the goal of improving vocabulary among 30 five-year-old hearing children. The hearing children were split into three groups to obtain three different types of interventions twice a week for 40 minutes. One group received an intervention that focused on musical activities that incorporated phonological awareness such as remembering, repeating, and discriminating sounds. Another group obtained instruction through the standard curriculum of the school which happened to include some rhythm, songs, and games. The last group did not have any musical activities. The findings showed that the first group receiving intensive attention and training in music and phonological awareness had the most improved vocabulary. Reinforcing this finding, a meta-analysis study looked at how music training supports literacy and revealed that language and phonological awareness outcomes in children were greater with music exposure (Gordon, Fehd, & McCandliss, 2015). It seems like interventions in rhyme and rhythm (music) or phonological awareness that are independent from each other are not as effective as both working in tandem to improve language outcomes.

Bolduc and Lefebvre (2012) sought to explore the differences in outcomes when music and language are taught separately as opposed to taught together. They examined the effects of four different learning conditions on language, phonological, and musical processing skills in eight French kindergarten classes with 100 children between four and six years old. Each class was assigned to one of the four learning conditions: 1) music; 2) language; 3) combined [music and language]; and 4) passive listening. All hearing children participated in the weekly learning sessions for 40 minutes where they learned 10 nursery rhymes in French, but each group engaged

in different activities depending on their learning conditions. Children in the music group and combined (music and language) group showed significant improvements in their phonological processing skills compared to the other groups. The researchers concluded that there is value in reciting nursery rhymes, but that the benefits are even greater when they are supplemented with phonological awareness activities.

The study conducted by Patscheke et al. (2016) corroborates the previous study in the conclusion that while phonological awareness activities are beneficial for hearing children's language development, it was better if they were tied to music, and vice versa. Patscheke et al. (2016) wanted to see the impact music and phonological training had on phonological awareness among four- to six-year-old hearing children of immigrant families. Thirty-nine preschoolers were randomly assigned to three groups to obtain different types of interventions that took place three times a week for 20 minutes each. One group received music training along with phonological training. One group received phonological training only. One group served as the control and received sports training. Children in the music/phonological group and phonological group significantly increased their scores on the phonological awareness test. However, the effect size of the music/phonological group was much larger compared to the phonological group, further reinforcing other studies' findings about the efficacious combination of music and phonological awareness.

Franklin et al. (2008) recruited 12 young hearing adults who received music training before they were 10 years old and had at least nine years of ongoing music training. This population was compared with another population without any history of music therapy. The memory tasks given to both groups included recalling as many words after hearing a person read aloud words from a list and recalling as many capitalized letters in correct serial order after

reading sentences. The results showed the group with intensive music experience having better working memory capacity. This finding supplements the research on structural brain differences in musicians and non-musicians (Fujioka, Ross, Kakigi, Pantev, & Trainor, 2006; Ohnishi et al., 2001). The researchers suggested that music training starting in young hearing children may provide cognitive advantages, especially in the areas of memory. Music therapy that incorporates rhyme, rhythm, and songs is categorized as an emerging evidence-based practice (Wong et al., 2015). Such empirical findings have encouraged experts from the National Association for the Education of Young Children and the Music Educators National Conference to collaborate in the development of an early childhood curriculum so music could be included in all aspects of learning experiences (Kemple, Batey, & Hartle, 2004).

Disabled hearing children. The current literature shows that rhyme and rhythm can aid Disabled hearing children's literacy, language, and communication development. Blos (1974) highly recommended the use of rhyme and rhythm as an intervention to promote language development for young blind children. Rogow (1982)'s study suggested that rhyme and rhythm can enhance social interactions between parents or teachers and children with disabilities between 15 months and seven years old. Glenn and Cunningham (1984) found that the use of rhyme and rhythm increased children with disabilities' communicative behaviors. Yang (2016) looked into a home-based music therapy program to determine its impact on interactions between parents and young children with disabilities. It was discovered that not only did the music activities promote positive interactions between parents and their children with disabilities, their expressive language increased exponentially too. Dunst and Gorman (2011) did a meta-analysis review of 13 research studies on nursery rhymes and children with disabilities and presented a compelling conclusion. All children, regardless of differences in disability, age,

and gender, had positive outcomes in their literacy development if exposed to rhyme and rhythm. Moreover, the researchers compared the outcomes in their meta-analysis review with another research synthesis on children without disabilities (Dunst, Meter, & Hamby, 2011) and found that the relationships across language areas were very similar for children with and without disabilities. The only difference was that the effect size for the correlation between nursery rhymes and print-related skills was larger for children with developmental disabilities. In their conclusion, Dunst and Gorman (2011) said that the findings from the research synthesis "indicate that nursery rhymes experiences are one important kind of learning opportunity for enhancing the early literacy and language development of young children with or without disabilities or delays" (p. 5). All these findings reinforce the significance of the use of rhyme and rhythm in early childhood education with all children, Disabled and nondisabled. Clearly, the benefits are multifaceted and multilayered, impacting a wide variety of areas in child development.

Whether the findings associated with hearing children can be generalized to Deaf learners when signed language rhyme and rhythm are used instead of spoken language rhyme and rhythm is still a mystery. To begin the investigation, the effects of ASL rhyme and rhythm on engagement and recitation in Deaf children were explored in this study. The subsequent literature review will be on these specific variables in young children.

Variables

Attention, Engagement, and Imitation

Joint attention occurs when an individual's gaze follows the gaze of another person. Children as young as eleven or twelve months old engage in joint attention during coordinated activities to share experiences and develop emotional connections (Corkum & Moore, 1998).

Children are motivated to participate in joint attention behaviors because there is usually something interesting present when they direct their gaze towards where the adults are looking (Corkum & Moore, 1998). When there is a ball on the floor and the adult is looking at it, the child, building upon earlier developmental skills, notices the adult's gaze and adjusts their gaze to look at the ball too. Once both parties focus on the same thing and interact with the object of interest, this becomes a shared activity. Developing joint attention skills may be a precursor to being able to further engage in shared activities and acquire language (Charman et al., 2000). After both parties have joint attention on the ball, the adult may push the ball towards the child, and then the child attempts to push the ball back. Their joint attention is now a form of joint engagement.

Joint engagement is when children engage in the activity and copy adults' behaviors or actions toward objects of interest (Bakeman & Adamson, 1984). There are distinct types of joint engagement, such as supported joint engagement where children are engaging in a shared activity without much interaction with the other person or coordinated joint engagement where they are engaging in the activity and interacting with the person (Adamson, Deckner, & Bakeman, 2010). For example, supported joint engagement occurs when the child plays with a ball alongside the adult without directing their gaze on the adult. However, if the child plays with a ball alongside the adult and looks at the adult for communicative bids such as smiles, nods, gestures, or remarks, this is considered coordinated joint engagement. During children's first year, they develop joint attention skills and then engage in shared activities without language. This is called non-symbol-infused joint engagement, which is a common and integral part of language development in the first year of a child's life. Following the language development timetable, most children are unable to speak or sign their first words until the end of their first

year. In the meantime, they engage in shared activities and are exposed to repeated behaviors in adults. As children enter their second year and begin to attend to and understand language, they become more involved with symbol-infused joint engagement, which means engaging in shared activities that include language (Adamson, Bakeman, & Deckner, 2004). With the ball example, the child looks at the adult and waits for the adult to say something like "ball" before redirecting their gaze back to the ball. With joint attention and symbol-infused joint engagement, following the gradual building blocks of the developmental sequence, children begin to imitate words. After the adult says "ball," the child signs or speaks the word "ball" back to the adult. This is the stage where children imitate words, and eventually build up the skills to imitate whole sentences or even songs (Hanna & Meltzoff, 1993).

The developmental relationship between imitation and language seems to be innate with imitation as the forerunner (Hanna & Meltzoff, 1993; Piaget, 1966). For hearing children with language or communication struggles, imitation training is helpful in improving their skills (Ingersoll & Schreibman, 2006). In another study, hearing children with higher demonstrations of joint attention and imitation were shown to have increased socio-emotional engagement and communication skills (Mundy & Acra, 2012). Increased socio-emotional engagement, in turn, enriches language input and output, which are essential elements of language development. Thus, the early development of joint attention, joint engagement, and imitation are intimately interlinked in developing language and cognition that is critical for children's learning. Music has been found to increase attention, engagement, imitation, and interaction among hearing children, including those with disabilities (Gold, Voracek, & Wigram, 2004; Vaiouli, Grimmet, & Ruich, 2015).

Hearing disabled children. A single-subject mixed method study conducted by Vaiouli et al. (2015) looked into the effectiveness of a music intervention on the joint engagement abilities of three hearing kindergarteners with autism. Each student received a weekly one-on-one instruction from the researcher for ten minutes that lasted over a nine-month time period. Each music therapy session included a welcome song, a child-led part, an adult-led part, and a goodbye song. Actions that counted as joint engagement behaviors included the child's instances of focusing on the adult's face, responding to joint attention by shifting gazes, showing awareness and positive affect with smiles or nods, and initiating joint attention by exchanging looks between the object and the adult or pointing at or showing objects. The results of this multiple baseline study showed improvements in joint engagement behaviors in each of the three hearing children. The researchers interviewed teachers and parents and learned that there were also positive changes in the hearing children's communicative behaviors outside the intervention. These teachers and parents even started to incorporate singing in their daily activities because they saw how engaged the hearing children were. The researchers concluded that instruction using music, including rhyme, is a promising strategy for cultivating joint attention skills and enhancing joint engagement abilities in hearing children, especially young children with autism.

Using music as a tool to promote language, communication, and attention is also popular in the education of other groups of Disabled children (Gold et al., 2004; Perry, 2003). Perry (2003) conducted a qualitative study observing 10 hearing students with multiple disabilities during music therapy sessions. Through analyzing video recordings, the researcher saw that music activities enabled these children to have additional opportunities for joint attention, turn taking, and expressing language. It was observed that some of the hearing children exhibited behaviors of interest and attention during musical activities that they rarely demonstrate in

routine activities. Some hearing children elicited vocal and movement responses indicating joy and excitement. Some hearing children were able to maintain attention consistently for 10 to 15 minutes during the music therapy. Perry (2003) described the atmosphere of the music intervention regarding motivation, attention, and engagement:

> Motivational aspects of music therapy were important, both to children who found communication intrinsically motivating, and for those who showed less interest in communication. Consistent attention and engagement in the musical interaction were related to the interest and excitement involved. Creating interest and excitement in music often departed from a protoconversational model of music interaction, with the most exciting parts of the session involving playing and/or singing together (p. 239).

Complementary to this finding, a large effect was discovered in a meta-analysis on music therapy for hearing children and adolescents with developmental or behavioral disabilities related to attention and motivation (Gold et al., 2004). Increased attention and motivation seem to contribute to improved outcomes in language and behaviors in these children. These studies affirm the claim that both Disabled and nondisabled children benefit from activities that incorporate rhyme and rhythm.

Codes for engagement. Definitions of what is construed as joint attention and joint engagement have been established in various studies. They can be applied specifically to the goals of this study. Adamson et al. (2004) developed a symbol-infused joint engagement coding measurement for their experimental study. The codes were derived and modified from Communication Play Interaction Scenes (CPIS), a state-based coding scheme. In CPIS, eleven engagement state categories were established and defined. They included: unengaged, onlooking, person, object, supported joint, coordinated joint, symbol only, person-symbol, object-symbol,

symbol-infused supported joint, and symbol-infused coordinated joint. Of the eleven categories, only three were relevant to this study -- unengaged, person-symbol, and symbol-infused supported joint engagement states. Definitions for these three categories were extrapolated as codes for engagement in this study.

During the shared activity of viewing rhyming and non-rhyming ASL stories in class, participants' behavior was observed and measured based on engagement in which imitation can take part. Unengaged was defined as the participant appearing uninvolved with any specific individual, activity, or language related to the ASL story. The participant may be scanning the room, staring at blank space, or looking at other peers. Engaged by imitating was defined as the participant attending to the ASL video and signing along with the signer or attending to peers who are also engaged in the imitating behavior and signing along with them. Engaged by viewing was defined as the participant's eyes being on the signer in the ASL video or on peers who are imitating. To sum, codes derived from other studies were used for this study to measure Deaf children's engagement behavior while viewing rhyming and non-rhyming ASL stories on videos with their classroom teachers.

Recitation

Language processing model and memory. There is a language processing model called the dual-stream model that describes the manner in which the brain perceives and processes words phonologically (Hickok & Poeppel, 2007). The dual-stream model explains how a word could be processed quickly using segmental information such as syllables and individual phonemes when a person first hears the word. This model demonstrates how the human brain naturally breaks down words into smaller chunks for quick processing, and that this process is innate.

Craik & Lockhart (1972) examined how the brain processes linguistic information and devised *the levels of processing* model. The levels of processing model is a framework to better understand two different types of language processing—shallow and deep. There are distinct systems in which the brain encodes and processes linguistic information, and consequently, memory is operated differently. Shallow processing occurs when the phonological characters of language such as letters, sounds, or sign parameters are enciphered in the brain. This particular process can be tied to the anatomic functions of the dual-stream model as described by Hickok and Poeppel (2007). For example, children can process language phonetically without understanding the meaning of words. The patterned phonics in words make it possible for hearing children to memorize the songs with minimal effort, and mindlessly sing without worrying about the semantic meaning of words. While some studies suggest the value of tapping into shallow processing of language in increasing memory through rhyme and rhythm (Calvert, 2001; Calvert & Billingsley, 1998; Johnson & Hayes, 1987; Read et al., 2014), others believe otherwise (Hayes, Chemelski, & Palmer, 1982; Mulligan & Picklesimer, 2012). The opposing studies present data indicating that language activities that elicit deep processing of language are better for memory enrichment.

The task of deep processing requires the person to understand the meaning of the word and be able to link the word to other similar meanings or concepts. Craik and Lockhart (1972) suggested that exposing children to tasks that require deep processing will enhance their understanding of the words, which in turn will boost their memory. Several studies reinforced this hypothesis as their findings showed that people do better on recall and memory tasks after being exposed to stories with words they understand semantically (Craik & Lockhart, 1972; Epstein, Phillips, & Johnson, 1975; Gallo, Meadow, Johnson, & Foster, 2008).

Due to conflicting results regarding deep processing or shallow processing and their role in recollection, Mulligan and Picklesimer (2012) were skeptical about the assertion that "deep encoding enhances recollection" (p. 80). They wanted to see if there were any consistencies across studies to better understand the phenomenon of shallow and deep levels of processing and memory. They conducted several experiments where they asked participants questions that fell under the traditional shallow processing category (phonology) and other questions that were oriented to deep processing (semantics). The results showed that the participants did better on recalling phonetically similar words over semantically similar words in some rhyme recognition tests and did better on semantically similar words on other tests. The researchers concluded that recollection may improve with both shallow and deep processing, depending on the demands of the tasks. There is no consensus on which language processing model has a stronger effect on memory yet; however, both models seem to play a critical role that serves different purposes.

Similarly, there are some conflicting findings regarding young hearing children's retention of rhyming and prose passages. Hayes et al. (1982) investigated the effects of rhyming on 128 hearing children's retention of passages in five experimental studies. While most hearing children said they liked the rhyming version of the story better than the prose version, those who listened to the rhyming story had lower retention of the content than those who listened to the prose story. The researchers interpreted this result as an evidence of shallow processing of language not supporting memory in young children. They rationalized that this occurred because the hearing children were attending only to phonological components of the story instead of processing the content, causing memory to degenerate during the task. However, the hearing children were more drawn to rhyming stories, which may be an important factor considering attention and engagement. The researchers conducted the same experiment with adults and had

them recall the rhyming and prose passages. Interestingly, the adults did better in recalling the rhyming passages over prose passages. These findings beget mixed interpretations and implications. While Hayes and his colleagues' work has been known to debunk the belief that rhyme support young children's memory, new research studies continue to come out that contend Hayes' findings by differentiating and clarifying the distinction between remembering the content compared to reciting the words in the correct sequence (Georgiadou, Knight, & Dipper, 2015; Király, Takács, Kaldy, & Blaser, 2016; Mullen, 2017). These researchers provide evidence that exposing children to rhyme and rhythm have worthwhile benefits in building language processing and sequential memory capacity such as imitation, vocabulary, recitation, and other developmental areas in early childhood.

Nursery rhymes and memory. In the nursery rhymes literature, enhanced memory skills such as the ability to recite have been observed as a result of being exposed to songs repeatedly (Calvert & Billingsley, 1998; Calvert & Tart, 1993; Fernandez-Fein & Baker, 1997; Johnson & Hayes, 1987). In a study conducted by Calvert and Billingsley (1998), they looked at whether hearing children were able to recite songs without understanding the meaning of words. They showed an incomprehensible song in French and a comprehensible song in English on television to 48 English-speaking preschoolers and asked them to recite the song verbatim. It was discovered that repeated exposure to songs facilitated memorization skills as hearing children were able to successfully recite the incomprehensible French version of the song just like they recited the comprehensible English song. The metric structure of music seemed to help hearing children remember upcoming words by memorizing the number of beats in each line. However, there are some limitations to their findings. The biggest issue is they did not include songs with a prose condition in the study to compare the performance in contrast to the rhyming condition.

Notwithstanding, hearing children being able to recite songs without knowing or understanding the language itself makes a compelling finding.

Another study done by Calvert and Tart (1993) looked at multiple exposures to rhyming songs as compared to prose versions on television shows in a recall skill test among 19 undergraduate students. They found that repeated exposure to rhyming songs resulted in improved memory over prose versions both immediately and long term. Their study focused solely on songs presented through television shows, which has additional implications considering that language input through television is typically available in home settings. Although the study was done at the college level, it brings about questions of young children benefiting from frequent exposure to rhyme and rhythm through television shows. There is the potential of young children internalizing patterns and structures found in language informally and unconsciously without the live presence of an adult.

Read et al. (2014) conducted a group experimental study to see if rhyming words in shared storybook reading helped hearing children retain more words. They split 24 children aged two to four years old into two groups and had parents read either a rhyming or non-rhyming version of the same animal story to their child individually. Then, the hearing child was asked to name the animals they remembered from the story. The results showed that hearing children were able to retain more words in the rhyming condition, supporting the hypothesis that exposure to rhyme boosts word retention and vocabulary development.

Sheingold and Foundas (1978) conducted an exploratory study to examine the effects of rhyming and non-rhyming versions of stories on 24 five- and six-year-old hearing children's ability to accurately recall the details and provide correct picture sequence of the stories. More specifically, the researchers wanted to know if the presence of rhyme would impact memory.

Both versions (rhyming and non-rhyming) of each story had the same information but with rhyming words removed in the non-rhyming version. Some children listened to the rhyming version of Story 1 and then the non-rhyming version of Story 2 while others listened to the non-rhyming version of Story 1 and then the rhyming version of Story 2. Each of the story had approximately 24-30 lines. After the story was told, the child was asked five questions about the content of the story. Then, the child was asked to arrange the picture cards in the correct sequential order. The researchers found that hearing children did better with the rhyming version in both tasks. More hearing children also chose the rhyming version as their favorite over the non-rhyming version.

Johnson and Hayes (1987) examined the effects of rhyme on 64 preschoolers' recitation of stories by comparing their performance in reciting rhyming and non-rhyming versions of a short story. Both versions were similar in content but had different order of the lines in the stanza to remove the rhyming aspect in the non-rhyming version. Their dependent variable measures were the numbers of story words correctly recited and the number of story words recited in the correct presentation order. The researchers used a two-factor analysis of variance to analyze results. The results demonstrated that the rhyming version rather than the non-rhyming version increased verbatim recitation in correct sequential order. However, hearing children also did well with paraphrasing the non-rhyming version. It was concluded that it was an appropriate expectation for young children to be able to recite rhyming stories more accurately than non-rhyming stories in preschool. Yet, non-rhyming stories still served their purpose in facilitating comprehension and paraphrasing. This study provides evidence of different kinds of language processing and their distinct benefits when it comes to recitation and memory.

Theories That Inform This Study

Critical Social Theory and Critical Deaf Pedagogy

Current discussions on solutions to complex issues such as cultural and language deprivation in the Deaf population cannot be fully understood without knowing the history of the oppressed. The oppressed are encouraged to critically reflect on and examine all parts of their lives to better understand their collective history (Freire, 1972). The goal is to de-marginalize the oppressed by centering their experiences and seek avenues for transformation (Freire, 1972). Critical educational researchers like myself aim to inspect the multiplexity of oppression that is manifested in society on personal, cultural, and structural levels. For people involved in Deaf education, we attempt to find educational approaches that remove barriers and other stigmas associated with Deaf people, Deaf culture, and American Sign Language. This study contributes to the body of knowledge of Deaf history and Deaf pedagogy, which will help with identifying and ending the patterns that constructed oppression over time. When Deaf people have ownership of the research process, the spirit of inquiry and discovery can be used as part of the emancipatory effort to inform social policy and practice that bring equity to the Deaf community (Singleton et al., 2017).

The Ecological Approach: Music as a Tool for Language Acquisition

The ecological approach presents a rich theoretical framework to comprehend the symbiotic relationship between individuals and their environment (Gibson, 2014). There is an understanding that issues found in the human condition can be attributed to multiple factors such as psychological, cultural, social, political, and physical. With these factors under consideration, researchers and practitioners can explore interventions that address issues at hand such as the

role of music in language acquisition. Human experiences with language acquisition in relation to music are tied to sensory access and perception, cultural traditions, and social expectations and norms. Hearing children from around the world access music through their ears and typically move their bodies to it. However, each cultural group forms music that is often unique to their identity, language, and community. Frith (1998) said that music as a cultural symbol is intensely social and "both articulates and offers the immediate experience of collective identity" (p. 273). This study uses the ecological approach to investigate the interaction between ASL rhyme and rhythm and Deaf children's engagement through the eyes and hands and their ability to recite using signed language. Current literature on signed language rhyme and rhythm and Deaf learners is extremely limited, making this ecological approach in learning about music as a tool for language acquisition for the Deaf population unique.

Vygotsky

Children do not learn without meaningful social interactions with individuals who have more knowledge and experience than them. Vygotsky (1978) called this the *Zone of Proximal Development*, where interactions between children and adults can support growth in children's behavior, thought, and language. The types and norms of growth vary in each culture with children observing and participating in their social environments. This theoretical framework explains the process of transmitting a community of practice among Deaf adults to Deaf children through cultural-based activities such as viewing and reciting rhyming and non-rhyming ASL stories. Through activities introduced to them from people with more knowledge and experience, Deaf children can learn and internalize Deaf culture and signed language. In order to see and appreciate the patterns found in language play, the structures of language would need to be introduced to Deaf children. Vygotsky (1978) said that "there is no such thing as play without

rules" (p. 95). Rhyme and rhythm have rules that are laden with pattern and structure. A Deaf adult with knowledge can function as a Deaf cultural participant and enter the Deaf child's Zone of Proximal Development in teaching about the rules of ASL. The Deaf child then will observe, follow, and internalize the pattern and structure introduced to them such as viewing ASL videos, appreciating the existence of ASL rhymes, and reciting the ASL stories. Vygotsky (1978) said, "the mechanism of individual developmental change is rooted in society and culture" (p.7). By introducing the cultural practice of using ASL rhyme and rhythm to Deaf children in schools, their developmental behavior in engagement and recitation has the potential of change.

Conclusion

The exhaustive literature review on the history of Deaf education, language experiences of Deaf children, rhyme and rhythm, engagement, imitation, memory, and recitation prompt a wide range of research questions surrounding the role of ASL rhyme and rhythm in young Deaf children's lives. To date, there is a dearth of qualitative or quantitative research on ASL rhyme and rhythm, especially as they pertain to language development in Deaf children. Any experimental study conducted to explore the relationship between ASL rhyme and rhythm and other developmental areas in children will be significant in bringing novel knowledge and discussion to the field. The purpose of this research was to examine the effects of ASL rhyme and rhythm on Deaf children's engagement behavior and accuracy in recitation.

Research Questions

Based on the research reviewed, the research questions were:

1) What are the effects of rhyming and non-rhyming conditions of ASL stories on Deaf children's engagement behavior?

2) What are the effects of rhyming and non-rhyming conditions of ASL stories on Deaf children's accuracy in recitation?

3) What are the effects of handshape rhyme awareness instruction on Deaf children's engagement behavior and accuracy in recitation?

CHAPTER THREE :

METHOD

The purpose of this chapter is to discuss the quantitative methodology employed in this study to answer the research questions as they relate to engagement behavior and accuracy in recitation. The use of single case design with alternating treatments allows for a greater understanding of how Deaf children respond to two different stimuli—rhyming ASL stories and non-rhyming ASL stories. The information retrieved from this approach adds to the body of knowledge of potential evidence-based practices in the education of Deaf children. The applicability of the alternating treatments design is discussed below, along with detailed descriptions of participants, procedures, data analysis method, external validity, internal validity, and social validity.

Research Questions

This study sought to explore effective language approaches in increasing engagement behavior and accuracy in recitation by answering the following research questions:

RQ1: What are the effects of rhyming and non-rhyming conditions of ASL stories on Deaf children's engagement behavior?

RQ2: What are the effects of rhyming and non-rhyming conditions of ASL stories on Deaf children's accuracy in recitation?

RQ3: What are the effects of handshape rhyme awareness instruction on Deaf children's engagement behavior and accuracy in recitation in both rhyming and non-rhyming conditions?

Methodology Selected

A quantitative approach is appropriate when there is a desire to seek and understand relationships between variables (Creswell & Creswell, 2017). A quantitative approach was the best choice for this study considering that the investigation was on Deaf children's engagement behavior and accuracy in recitation when exposed to rhyming and non-rhyming ASL stories. Barlow and Hayes (1979) suggested a specific method called the *alternating treatments design*. The alternating treatments design capitalizes on the benefits of single subject research by giving two or more treatments to the same individual and then documenting the effects on target behaviors (Hains & Baer, 1989). The quick alternation of two different conditions allow for direct comparison between treatments, minimizing potential confounding factors.

According to What Works Clearinghouse (2016), the first step towards exploring any proposed concern in single subject research requires the researcher to collect baseline data points and provide evidence that the proposed concern is present before implementing the intervention phases. Deaf children viewed and recited two ASL stories — one with rhymes and rhythm and the other without — to collect baseline information about language theories that predict the significance of rhyme awareness in increasing engagement behavior and accuracy in recitation. After collecting data in the baseline phase, the proposed concern of Deaf children lacking rhyme awareness was identified, informing the next phase in providing handshape rhyme awareness intervention. Subsequently, alternating treatments of viewing and reciting rhyming and non-rhyming conditions of ASL stories were administered. Finally, the preference phase took place, using the treatment found to be superior in increasing engagement behavior and/or accuracy in recitation.

Horner et al. (2005) suggests that a functional relation is established when there are at least three consistent evidences of an effect at a minimum of three different points in time. This means the participant needed to show higher levels of engagement behavior during viewing and/or higher levels of accuracy in reciting the rhyming or non-rhyming condition of the ASL stories during the alternating treatments phase on at least three days' worth of attempts. However, What Works Clearinghouse (2016) published an even higher standard for assessing the levels of evidence of functional relation between independent and dependent variables specifically for alternating treatments design. While three or more data points are required to have sufficient data to identify a functional relation in visual analysis (Horner et al., 2005), WWC's criteria specified that four data points would meet their standards with some reservations or at least five data points would meet their standards without reservations in ascertaining evidence (What Works Clearinghouse, 2016). After data collection, only five participants in this study accumulated a minimum of four or more data points in recitation data. Most of them did not have sufficient engagement data to meet the WWC standard. Working with the recommendations mentioned above, it was determined that the participants included in the visual analysis would be those who had enough data points in their recitation data to meet the WWC standard (four or five data points) while having at least three or more data points in engagement data to meet the generic single subject design standard. Accordingly, the strength of evidence was reported only for the recitation data.

Population and Sample

Upon getting approval from the IRB from the University of Tennessee (See Appendix A), teacher, child, and family participants were recruited from an early childhood program at a state-funded Deaf school in the western region of the USA. This school was selected because of its

ASL-English bilingual status, high number of Deaf teachers, and strong emphasis on Deaf culture. In addition, the researcher attended the school as a student and was later a teacher in the early childhood education program. This longstanding relationship with the school and teachers made for a convenient sample. After the school's request form was submitted with a research proposal, permission was granted and communication with the principle began via email. A 30-minute presentation on the research project to the teachers was given in advance of the research start date. Teachers interested in participating in the study were asked to sign consent forms. Recruitment packets in English, ASL, and other languages of the families were given to the teachers. The teachers were responsible for delivering the packets to all families through their routine communication methods. Any questions the families had about the study were answered in person, by email, and by videophone—depending on families' preferred method of communication. Interested families were asked to complete the packet containing a consent form, a family background questionnaire, and a social validity questionnaire. If a family did not give consent for their child to participate in the study, no data was collected from their child.

Participants

No child was turned away from being able to participate in the study for any particular reason as long as they maintained regular attendance in school. The participants were 10 Deaf children between three and six years old with varying backgrounds in language level, race, gender, sex, disability, hearing status, familial hearing status, home language, and socio-economic status. Table 1lists characteristics for each student participant. The participants were selected based on their parents/guardians agreeing to participate in the study. Demographic information obtained from the teachers and families indicate that, of the 10 children, four were White, one was Latinx, one was Chinese, and two were of mixed race. The race of two children

was unknown. The oldest child was six years of age and was adopted two years ago and did not have any language when she moved to the United States. It was reported that one child had a schizencephalic cleft in the brain while the rest had no known additional disabilities. Six children were identified by their parents/guardians as female and the other four were identified as male. Primary languages used at home amongst families were ASL (n = 3), English (n = 3), English and ASL (n = 2), English and Spanish (n = 1), and ASL/other signed languages (n = 1). Five children had Deaf parents/guardians, and five children had hearing parents/guardians. The participants' Visual Communication Sign Language scores showed their language abilities according to developmental milestones. Three children had close to age-appropriate language development, three children were delayed in their language development by one year, and four children were very delayed by two or more years.

The teacher participants were two preschool teachers and a prekindergarten teacher. The preschool teachers worked as a team in a single classroom. Two teachers were native Deaf signers and a teacher was hearing and fluent in ASL. The teachers had various years of teaching experience ranging from five to twelve years. Table 2 lists characteristics for each teacher participant.

Table 1. Student Participants' Characteristics

Student Participants' Characteristics

Name	Class	Age	ASL	Vocab.	VCSL	Sex	Race	Disab.	P.H.S.	H.L.
Cole	P.S.	3.5	12 mos	5/23	1.4	M	Latino	None	H + H	Span. & Eng.
Lacey	P.S.	3.10	Birth	19/23	3.7	F	Asian	None	D + D	ASL
Haiden	P.S.	4.6	2 yrs	14/23	3.8	M	Mixed	Sch. Cleft.	H + H	Eng.
Daya	P.S.	4.6	3 yrs	10/23	2.7	F	White	None	H + H	Eng.
Tri	P.S.	4.8	3 yrs	19/23	3.6	M	White	None	H + H	Eng.
Zake	P.K.	4.9	Birth	22/23	4.4	F	White	None	D + D	ASL & Eng.
Yair	P.S.	4.10	Birth	16/23	2.4	M	Asian	None	D + D	ASL
Giada	P.K.	5.7	4 mos	21/23	4.5	M	White	None	H + H	ASL & Eng.
Jaslene	P.K.	5.10	Birth	21/23	4.5	M	Mixed	None	D + D	ASL
Lexie	P.K.	6.5	4 yrs (adop.)	14/23	2.8	F	Asian	None	D + D	ASL & Sign. Lang.

Notes. Names are pseudonyms to maintain confidentiality. P.S. = Preschool. P.K. = Prekindergarten. ASL = age of initial acquisition in American Sign Language. Adop. = adopted. Vocab. = scores from picture vocabulary assessment (See Appendix D). VCSL = scores from Visual Communication Sign Language assessment. M = male. F = female. Sch. Cleft. = schizencephalic cleft. Disab. = disability. P.H.S = Parental hearing status. D = deaf and H = hearing. H.L.. = home language. Span. = Spanish. Eng. = English. Sign. Lang. = foreign signed languages

Table 2. Teacher Participants' Characteristics

Teacher Participants' Characteristics.

Teacher	Class	H.S.	ASL	Years
1	P.S.	H	Fluent	6
2	P.S.	D	Native	5
3	P.K.	D	Native	12

Notes. P.S. = preschool. P.K. = prekindergarten. H.S. = Hearing status. H = hearing. D = deaf, ASL = fluency in American Sign Language. Years = years of teaching experience.

Setting

The study took place at an ASL-English bilingual Deaf school in the western region of the USA. The school had several hundred Deaf students and four departments on campus: early childhood education, elementary, middle school, and high school. The intervention was given separately to the whole preschool class and the whole prekindergarten class in the early childhood education building. There were 10 three- and four-year-old students in the preschool class. Of 10 students, six participated in the study. The prekindergarten class had seven students and the majority of them five years old—four of them participated in the study. Both classrooms consisted of a large four-walled room with learning centers dedicated to academic content areas such as math, science, reading, writing, and American Sign Language. Students were routinely seated in a semi-circle facing the Smartboard when they participated in the ASL center. A teacher in each classroom typically led the lesson and engaged with children in group and individual activities. To be consistent with the classroom routine, it was agreed that a teacher in each classroom, with my assistance, would introduce the rhyming and non-rhyming conditions of

ASL stories to the whole class, including students who did not participate in the study, during ASL time. After collecting engagement data, the participants were called individually to a private space next to the classroom where they were asked to recite the story. The private space, called the conference room, was a quiet and unused space with tables and chairs scattered around the room.

Materials

The family and teacher questionnaires, picture vocabulary assessment, and social validity surveys were developed specifically for this study. The family background questionnaire included questions about the Deaf child's demographic background regarding education, culture, language, hearing status, disabilities, and home communication (See Appendix B). This information was used to explore variables that might contribute to the participants' experience with ASL interventions. The teacher background questionnaire included questions about the teacher's identities, language skills, and teaching experience (See Appendix C). The picture vocabulary assessment consisted of printed pictures of the selected 22 out of 45 vocabulary from ASL Story 1 and ASL Story 2 (See Appendix D). The vocabulary words were: mouse, raccoon, rooster, zebra, deer, one, two, three, four, five, red, orange, yellow, green, blue, purple, worm, bison, whale, bird, shark, and skunk. In addition to the picture vocabulary assessment, each participant's Visual Communication Sign Language (VCSL) score was provided by the classroom teachers (Simms, Baker, & Clark, 2013). These scores had already been gathered prior to the study, as the Visual Communication Sign Language (VCSL) checklist was already being used by the teachers to document participants' development towards meeting language milestones throughout the year. The VCSL data was used to explore other variables that might have an impact on participants' engagement behavior and accuracy in recitation.

A total of five ASL videos were created for the intervention in this study. Each of the video recorded ASL stories was approximately one minute in length. The length of the final video shown to students, however, was approximately two minutes in length—as the story was viewed twice in immediate succession by the participants. The ASL stories and videos were created for this study by the researcher who is a Deaf person from a Deaf family that uses ASL as their native and primary language. The researcher used to be an ASL teacher in a Deaf school and has taught ASL courses to hearing and Deaf students in Universities. Additionally, the researcher is the co-founder of Hands Land, the only existing company that produces ASL rhyme and rhythm videos for young children. These experiences contributed to researcher's qualifications to develop the materials for this study. Prior to filming, each version of the story was rehearsed and memorized to ensure that they had same level of enthusiasm and natural flow. Both versions of the ASL stories were shown to a Deaf colleague who provided the inter-rater reliability and the classroom teachers. They all confirmed that the rhyming and non-rhyming versions of *Animals Crossing* and *Colorful Animals* were similar except for the order of the signs. To help make both versions appear more authentic to students expected experience with ASL videos in the classroom, pictures were edited into the video to supplement the signed words. For example, when the sign for MOUSE appeared in the video there was also a picture of an illustrated mouse near the signer present in the video.

In the *Animals Crossing* story, there were rhyming and non-rhyming versions of the same 6-line stanza about a person going for a walk on each day of the week, spotting different animals crossing their path. See Table 3 and Table 4 for the ASL glosses and Figure 1 and Figure 2 for the pictures of the signed words used in rhyming and non-rhyming versions of the *Animals Crossing* story. In the *Colorful Animals* story, there were rhyming and non-rhyming versions of

the same 6-line stanza about animals of different colors engaging in various activities. See Table 5 and Table 6 for the ASL glosses and Figure 3 and Figure 4 for the pictures of the signed words used in rhyming and non-rhyming versions of the *Colorful Animals* story. Both versions were similar in vocabulary and basic semantic content, but some of the words were ordered differently to eliminate rhyme and rhythm in the non-rhyming versions. Both versions had the same rate and inflection, were syntactically correct, and made sense semantically. There were five videos in total: a rhyming version and a non-rhyming version of *Animals Crossing*, a rhyming version and a non-rhyming version of *Colorful Animals*, and a rhyming only version of *Fun Day*. See Table 7 for the ASL gloss of the ASL story *Fun Day*.

The ASL videos were shown on an 87-inch interactive Smartboard connected to a 2015 Apple MacBook Pro laptop. To film engagement behavior, a GoPro Hero 3 camera was clamped to the bottom of the Smartboard providing an unobtrusive and low-profile method for capturing high-resolution wide-angle video of participants as they watched. To record participants' recitation, an Apple iPhone 6s was held by the hand and used for filming. The decision to use Apple iPhone 6s over other recording methods was made after inquiring with teachers and some parents about the participants' experience with the use of technology to film them. The teachers and parents said they used their phones to film the participants, and that these children were the most comfortable and familiar with signing directly into smartphones. The materials used in this study did not depart from what was typically used in the classroom outside the intervention.

Table 3. Rhyming Version of Animals Crossing

Animals Crossing

Rhyming Version
(1) SPOT - ONE - MOUSE - CROSSING (2) SEE - TWO - RACCOONS - CROSSING (3) JAW DROP - THREE - ROOSTERS - CROSSING (4) HAIR STAND - FOUR - ZEBRAS - CROSSING (5) SHOCK - FIVE - DEER - CROSSING (6) WALK – FINISH!



(1) "SPOT"(HS-1) - "ONE"(HS-1) - "MOUSE"(HS-1) - "CROSSING"(HS-1)



(2) "SEE"(HS-2) - "TWO"(HS-2) - "RACCOONS"(HS-2") - "CROSSING"(HS-2)



(3) "JAW DROP"(HS-3) - "THREE"(HS-3) - "ROOSTERS"(HS-3") - "CROSSING"(HS-3)



(4) "HAIR STAND"(HS-4) - "FOUR"(HS-4) - "ZEBRAS"(HS-4") - "CROSSING"(HS-4)



(5) "EYES POP"(HS-5) - "FIVE" (HS-4) - "DEER"(HS-4") - "CROSSING"(HS-4)



(6) "WALK"(HS-B) - "FINISH"(HS-5)

Figure 1. Rhyming Version of Animals Crossing

Table 4. Non-Rhyming Version of Animals Crossing

Animals Crossing

Non-Rhyming Version
(1) SHOCK - ONE - ROOSTER - CROSSING (2) JAW DROP - TWO - ZEBRA - CROSSING (3) SPOT - THREE - DEER - CROSSING (4) SEE - FOUR - MICE - CROSSING (5) HAIR STAND – FIVE – RACCOONS-CROSSING (6) WALK – FINISH!



(1)“EYES POP”(HS-5) - “ONE”(HS-1) - “ROOSTER”(HS-3) - “CROSSING”(HS-2)



(2) “JAWS DROP”(HS-3) - “TWO”(HS-2) - “ZEBRAS”(HS-4) - “CROSSING”(HS-1)



(3) “SPOT”(HS-1) - “THREE”(HS-3) - “DEER”(HS-5) - “CROSSING”(HS-2)



(4) “SEE”(HS-2) - “FOUR”(HS-4) - “MICE”(HS-1) - “CROSSING”(HS-1)



(5) “HAIR STAND”(HS-4) - “FIVE”(HS-4) - “RACCOONS”(HS-2) - “CROSSING”(HS-5)



(6) “WALK”(HS-B) - “FINISH”(HS-5)

Figure 2. Non-Rhyming Version of Animals Crossing

Table 5. Rhyming Version of Colorful Animals

Colorful Animals

Rhyming Version
(1) RED - WORM - WIGGLE - ASK (2) ORANGE - BISON - STOMP - GULP - (3) YELLOW - COW - CHEW - SILLY (4) GREEN - BIRD - SING - ZOOM (5) BLUE - SHARK - SWIM - TROUBLE (6) PURPLE - SKUNK - WALK - TAKE CARE



(1) “RED”(HS-1X) - “WORM”(HS-1X) - “WIGGLE”(HS-1X) - “ASK”(HS-1X)



(2) “ORANGE”(HS-CS) - “BISON”(HS-CS) - “STOMP”(HS-CS) - “GULP”(HS-CS)



(3) “YELLOW”(HS-CS) - “COW”(HS-CS) - “CHEW”(HS-CS) - “SILLY”(HS-CS)



(4) “GREEN”(HS-G) - “BIRD”(HS-G) - “SING” (HS-G) - “ZOOM”(HS-G)



(5) “BLUE”(HS-B) - “SHARK”(HS-B) - “SWIM”(HS-B) - “TROUBLE”(HS-B)



(6) “PURPLE”(HS-P) - “SKUNK”(HS-P) - “WALK”(HS-P) - “TAKE CARE”(HS-P)

Figure 3. Rhyming Version of Colorful Animals

Table 6. Non-Rhyming Version of Colorful Animals

Colorful Animals

Non-Rhyming Version
(1) RED - SKUNK - STOMP - ZOOM (2) ORANGE - WORM - SING - TROUBLE (3) YELLOW - SHARK - WIGGLE - TAKE CARE (4) GREEN - BISON - SWIM - SILLY (5) BLUE - COW - WALK - GULP (6) PURPLE - BIRD - CHEW - ASK



(1) “RED”(HS-1X) - “SKUNK”(HS-K) - “STOMP”(HS-S) - “ZOOM”(HS-G)



(2) “ORANGE”(HS-CS) - “WORM”(HS-1X) - “SING”(HS-5) - “TROUBLE”(HS-B)



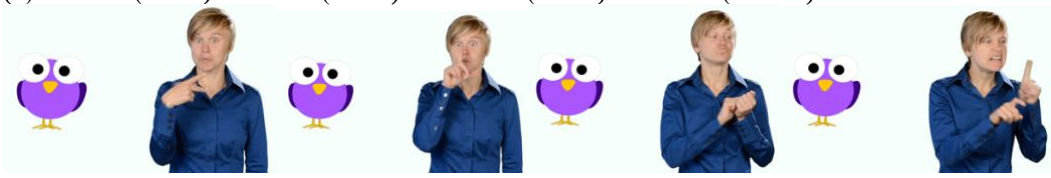
(3) “YELLOW”(HS-1X) - “SHARK”(HS-K) - “SWIM”(HS-S) - “TAKE CARE”(HS-G)



(4) “GREEN”(HS-G) - “BISON”(HS-CS) - “SWIM”(HS-B) - “SILLY”(HS-Y)



(5) “BLUE”(HS-B) - “COW”(HS-Y) - “WALK”(HS-K) - “GULP”(HS-CS)



(6) “PURPLE”(HS-P) - “BIRD”(HS-G) - “CHEW”(HS-Y) - “ASK” (HS-1X)

Figure 4. Non-Rhyming Version of Colorful Animals

Table 7. Rhyming Version of Fun Day

Fun Day

Rhyming
(1) WALK - WALK - SPOT
(2) OVER THERE - ONE - BAT – FLYING
(3) OVER THERE - TWO - FROGS – JUMPING
(4) OVER THERE -THREE - BUGS – CRAWLING
(5) OVER THERE -FOUR - RAINBOWS - IN THE SKY
(6) OVER THERE - FIVE - LEAVES – FALLING

Procedures

Variables

In order to meet the methodological rigor of single subject research, dependent and independent variables were operationally defined with clarity. The measurements of dependent variables must be precise, valid, replicable, and documented repeatedly over time to meet the quality indicators of single subject research (Horner et al., 2005). Likewise, independent variables must be precisely delivered and measured with fidelity.

Independent variables. ASL stories with rhyming and non-rhyming versions were the two treatment conditions used to measure the effects on participants' engagement behavior and accuracy in recitation.

Dependent variables. The four dependent variables in this study were: nonverbal engagement (viewing), verbal engagement (imitating), words recited correctly, and words recited in the correct order. The viewing behavior in nonverbal engagement was defined as eyes on the screen or eyes on peers (if their peers were signing in imitation of the source material). The imitating behavior in verbal engagement was defined as signing along with the signer in the video or peers using signed words associated with the ASL story. Disengagement was defined as

eyes off the screen, eyes off the signer, or signing words not associated with the ASL story. Disengagement by interruption was defined as teacher interruption, student interruption, or other external distractions interfering with the participant's ability to attend and/or engage with the independent variable. Words recited correctly was defined as repeating and signing aloud any words from the ASL story from memory, regardless of the sequence of words. Words recited in the correct order was defined as repeating and physically signing the words of the ASL story from memory in the correct sequence.

Data Collection

Prior to initiating the baseline sessions, family questionnaires were sent to families by putting the documents in the participants' backpacks and then collecting them the next day—which was the routine home-to-school communication. Teacher questionnaires were given and collected in person. The researcher-developed picture vocabulary assessment was administered to each participant individually. Each participant was asked to provide the signed words for the pictures they saw on the paper. For each picture, the researcher pointed to the image and then asked: "WHAT - THIS?" If the participant provided the correct signed word for the picture, each signed word counted as one point. If the participant signed "DO NOT KNOW," the assessment proceeded immediately to the next image. If the participant did not provide a signed word when prompted, a pause of five seconds was given before proceeding to the next picture. If the participant responded with an incorrect signed word, the researcher would again point to the picture and signed "WHAT – THIS?". This provided the participant an opportunity to look at the picture again and correct their mistake. If they did not provide the correct signed word during their second attempt, the next picture would be shown, and the assessment would continue. At the end of the assessment, the pictures the participant had incorrectly identified were reviewed a

second time and they were again prompted by pointing to the image and being asked: "WHAT - THIS?" If the participant gave a wrong response, no response, or signed "DO NOT KNOW", this response was not counted. Results from the researcher-made picture vocabulary assessment supplied background information on whether the participant already knew the target words in the ASL stories prior to the intervention. Classroom teachers also provided a copy of the participants' Visual Communication Sign Language (VCSL) scores, which provided information about their language skills. Vocabulary knowledge and language skills were looked at as potential factors in increasing participants' engagement behavior and accuracy in recitation in both conditions – rhyming and non-rhyming ASL stories.

A permanent product in the form of videotaping was used to collect data on engagement behavior and recitation data. Each observational session lasted approximately two minutes. Table 8 lists the steps to task analysis of engagement behavior. The videos collected for engagement behavior were immediately reviewed after each intervention session and a 5-second partial interval data recording procedure was used to indicate if the participant was engaged or disengaged. During the baseline phase, the coding was binary with each interval counted as either engaged (both verbal or nonverbal) ("e") or disengaged ("d"). There were noticeable differences in data analysis between those who were engaged through viewing and those who were engaged through imitating. Furthermore, it was observed that both teacher and student instigated interruptions occurred during viewing which interfered directly with some of the participants' engagement behavior. For this reason, it was decided that a more detailed notation system for the recording of the engagement behavior for the alternating treatments phase would be used to better disaggregate the data for documentation, analysis, discussion.

Table 8. Task Analysis of Engagement Behavior

Task Analysis of Engagement Behavior

Skill	Engagement Behavior
View the story	1. Eyes on the screen (engaged-viewing) 2. Eyes on the signers (engaged-viewing) 3. Imitate signing (engaged-imitating) 4. Eyes off the screen (disengaged) 5. Eyes off the signers (disengaged) 6. External distractions (disengaged-interruption)

The updated coding system documented each interval as engaged-viewing ("e-v"), engaged-imitating ("e-i"), disengaged ("d"), or disengaged-interruption ("d-i"). If the participant's eyes were on the video during the 5-second interval, "e-v" was marked on the recording sheet. If the participant imitated the signs at any time during the 5-second interval, "e-i" was marked on the recording sheet. If the participant's eyes were not on the video or signers (disengaged) at any point during the 5-second interval, "d" was marked on the recording sheet. If there were external distractions such as other staff waving their hands or students acting out, "d-i" was marked on the recording sheet and this interval was excluded from the final calculation. The final metric was calculated by dividing the total number of 5-second interval engagement behavior by the total intervals measured during a viewing session (n = 26-32).

Participants' accuracy in recitation were video recorded and measured using event recording procedures. Table 9 lists the steps to task analysis of words signed correctly and words signed in the correct order during recitation. The first part of analysis awarded a point for each word recited correctly from the ASL story, regardless of the sequence of the signed words. Here are a few examples of what would be counted as correct and incorrect. First, if a participant signed a word that was not part of the ASL story, no point was given for that signed word.

Table 9. Task Analysis of Recitation

Task Analysis of Recitation

Skill	Task Analysis
Recite the story verbatim	1. Signed the words correctly 2. Signed the words in the correct order

Second, if a participant used their entire body to perform "flying" instead of using the classifier handshape "1" that was used in the ASL story to demonstrate flying, this was defined as the word signed incorrectly, and no point was given. However, if the participant provided the correct signed word but used a wrong phonological parameter that was close enough to the actual signed word, this was acceptable, and a point was awarded. For example, if the participant used the "3" handshape while signing "RACCOON" instead of using the correct "2" handshape, this was counted as correct.

Providing points for words signed in the correct order during recitation was based on whether the words were signed in the correct sequence. For example, if the participant signed "ONE – MOUSE," this counted as the participant reciting two words in the correct order (2 points). If the participant signed "MOUSE – ONE," this counted as no words signed in the correct order (0 points). The number of words signed correctly and the number of words signed in the correct order in the rhyming condition and the non-rhyming condition were analyzed and compared to determine the preferred condition in increasing accuracy in recitation.

Alternating Treatments with Initial Baseline Design

There were four phases in this research design: (1) baseline, (2) handshape rhyme awareness intervention, (3) alternating treatments, and (4) preference. The procedure that took place during each phase is described below. To minimize confusion among participants in

reciting the rhyming and non-rhyming versions of the same story, it was decided that both versions would be shown in different phases to minimize threats to internal validity. The rhyming version of *Animals Crossing* was shown in the baseline phase while the non-rhyming version of *Animals Crossing* was shown in the alternating treatments phase. The rhyming version of *Colorful Animals* was shown in the alternating treatments phase while the non-rhyming version was shown in the baseline phase. See Figure 5.

1. Baseline phase. During the baseline phase, classroom teachers showed the rhyming and non-rhyming conditions of ASL Story 1. ASL Story 1 was presented in a whole class instructional format with the teacher following the intervention procedures as outlined. At the beginning of the period allocated, teachers prompted the entire class by informing them that it was "ASL time" and helped them transition to their seats in the front of the Smartboard. Students were told to be ready to view an ASL video on the Smartboard. After a teacher pressed "play" on the computer, they walked around and stayed behind the semi-circle where the students were seated. All teachers in this study were clearly instructed prior to the intervention that they were to do their best to not intervene with student behavior as the goal of this study was to capture whether the participants were engaged or disengaged with the ASL videos. After whole class instruction had completed, each participant went to a private and quiet space outside the room to view ASL Story 1 one more time on the laptop. Immediately after viewing, the participant was asked to recite the story to their best ability. Feedback about the accuracy of their performance was not given. During the non-rhyming condition of ASL Story 1, the procedure was repeated identical to the rhyming condition as described above. The only difference between both conditions was the presence of rhyme and rhythm in the rhyming condition of the ASL Story 1.

1. Baseline: ASL Story 1	2. Handshape Rhyme Awareness Intervention	3. Alternating Treatments: ASL Story 2	4. Preference: ASL Story 3
Rhyming: Animals Crossing ***Non-Rhyming:*** Colorful Animals	***Lesson #1:*** Animals Crossing ***Lesson #2:*** Colorful Animals	***Rhyming:*** Colorful Animals ***Non-Rhyming:*** Animals Crossing	***Rhyming/Non-Rhyming:*** Fun Day

Figure 5. ASL Stories Used in Each Phase

There was not an observable bifurcation in most students' engagement behavior and accuracy in recitation after two weeks of baseline alternating treatments sessions in both conditions. Through visual observation it was observed that students appeared unaware of the existence of handshape rhymes in the rhyming condition of ASL Story 1. Students did not provide the signed words with matching handshapes found in sentences in the stanza while reciting the rhyming condition. Rather, they were randomly tossing out any signed words they could remember from both conditions. Comments from the teachers corroborated this observation that the students had very little exposure to ASL rhyme and rhythm, including handshape rhyme awareness, which could cause the existence of presence of the rhyme and rhythm within the video to be unknown or invisible to them. Visual analysis of baseline data raised the concern of participants lacking handshape rhyme awareness and this evidence led to the decision to implement the handshape rhyme awareness intervention.

2. Handshape rhyme awareness phase. A third question was added to the study based on the proposed concern stemming from the visual analysis of baseline data. The third question was: What are the effects of handshape rhyme awareness instruction on Deaf children's engagement behavior and accuracy in recitation? The added condition was two 20-minute lessons on handshape rhyme awareness given by the researcher using a Keynote presentation on the Smartboard. The lessons were similar to what would be found in programs that teach rhyme

recognition in spoken language. The first lesson focused on the handshapes used in the *Animals Crossing* story (1, 2, 3, 4, and 5). The first slide presented a chart of different handshapes on the Smartboard (see Figure 6). The instructor raised their hand to create the individual handshape "1" and looked for the handshape on the chart and pointed at it. The next slide displayed an individual picture of handshape "1" (see Figure 7). Using a "thinking out loud" approach, different signed words that used the "1" handshape were demonstrated. Students were invited to share other signed words with the "1" handshape, if they could think of any, with the class. The next slide played a video clip of four signed words sharing the same handshape taken from the first line of the rhyming condition of ASL Story 1 (see Figure 8). The students were asked: "What same handshape was used for all of the signed words in the video?". After their responses were fielded, the instructor again emphasized that all of the signed words ("SPOT - ONE – MOUSE - CROSSING") shared the same "1" handshape. The next slide presented the handshape chart again and the instructor raised a hand to create the individual handshape "2" and indicated the handshape on the chart. The next slide showed an individual picture of handshape "2". See Figure 9. Using a "thinking out loud" approach, different signed words that used the "2" handshape were demonstrated. Students were invited to share other signed words with the "2" handshape, if they could think of any, with the class. The next slide played a video clip of four signed words sharing the same handshape taken from the second line of the rhyming condition of ASL Story 1 (see Figure 10). The students were asked: "What same handshape was used for all of the signed words in the video?". After their responses were fielded, the instructor emphasized that all of the signed words ("SAW - TWO – RACCOON - CROSSING") used the same "2" handshape. This instructional approach was repeated for the remaining of the handshapes used in the rhyming condition of ASL Story 1 (handshapes "3", "4", "5"). After each handshape was

reviewed individually, images of all handshape rhymes were shown in the correct sequence (see Figure 11). The instructor recited the story but sabotaged each line by replacing a rhyming signed word with a non-rhyming one. After reciting each line, the instructor paused to allow students to catch the mistake the instructor made and provide a correction. Finally, students viewed the video of the rhyming condition of ASL Story 1 in its entirety. While the video was playing, the instructor stood off to the side of the screen and raised their hand in the handshapes that corresponded to signed words in video simultaneously as further reinforcement.

In the second lesson focused on the handshapes used in the *Colorful Animals* story ("X", "S", "Y", "G", "B", and "P"). The same lesson plan and format was used as described above. See Appendix I and J for step by step instruction and outline of the intervention.



Figure 6. American Sign Language Handshape Chart

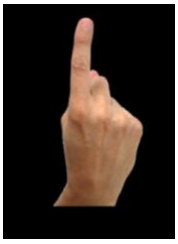


Figure 7. Handshape "1"



(1) “SPOT” (HS-1) “ONE” (HS-1) “MOUSE” (HS-1) “CROSSING” (HS-1)

Figure 8. “1” Handshape Rhyme



Figure 9. Handshape “2”



(2) “SPOT” (HS-2) “TWO” (HS-2) “RACCOONS” (HS-2) “CROSSING” (HS-2)

Figure 10. “2” Handshape Rhyme



Figure 11. Recall Rhyming Signed Words

3. Alternating treatments phase. Following the handshape rhyme awareness intervention, alternating treatments of ASL Story 2 took place to determine effects the intervention had on engagement behavior and accuracy in recitation. Classroom teachers showed the rhyming and non-rhyming condition of ASL Story 2 for two weeks on alternating days. The procedure itself was identical to the baseline phase—however, different ASL source videos were used. During the rhyming condition of ASL Story 2, teachers told the whole class that it was

ASL time and gathered students to their seats in the front of the Smartboard. A teacher asked students if they were ready to view new ASL videos and recite the stories after. The teacher pressed "play" on the computer and then stood behind the students and remained quiet. Afterwards, each participant was asked to go to the conference room with the researcher to view ASL Story 2 again on a laptop and then, immediately after, the participant was asked to recite what they just viewed. No comments were given about their performance. During the non-rhyming condition of ASL Story 2, the procedure was same as the rhyming condition. Both treatments were alternated on each day for two weeks.

4. Preference phase. Identifying the preferred condition involved analyzing the engagement behavior and accuracy in recitation in the alternating treatments phase. After the preferred treatment was identified through visual analysis, the least effective condition was discontinued, and the more effective treatment was replicated on subsequent days using a new story. The most effective condition was defined as a bifurcation of the amount of correct words recited in the sequence data paths. According to Gast (2010), bifurcation is the separation in the data path of at least three consecutive points in visual analysis. If both conditions, however, were judged to be equally effective, then the amount of words signed in the correct order was examined to identify the more preferred condition. If both conditions were found to be equally effective again, then engagement behavior was examined to determine the more preferred condition. If both conditions resulted in similar engagement levels, then social validity was next in order to choose the preferred treatment. During the preference phase, the more effective treatment, either the rhyming or non-rhyming condition of ASL Story 3, was implemented for a week. Considering the great variability in Deaf children's language abilities ranging from limited language to near fluent, it was determined that attaining a specific percentage or number of

correct words recited would not be included in the acquisition criteria. For practical purposes, instead of halting the intervention based on specific acquisition criteria, the intervention began and ended within a learning unit. A learning unit lasted approximately two weeks for this age population. After viewing the same videos for two weeks in a row, children of this age are likely ready for new materials.

5. Maintenance phase. Four weeks post completion of the intervention, participants were supposed to recite both versions of the two stories again. This would have provided information about Deaf children's long-term memory and recitation skills. However, the school closed for summer break. No maintenance data was collected in this study. See Figure 12 and Figure 13 for complete intervention schedules.

Data Analysis

The growing popularity of reporting effect size in single subject research necessitates a greater understanding of best practices in analyzing data in alternating treatments design. Based on several meta-analyses, approximately 10% of overall single subject research used alternating treatments design (Hammond & Gast, 2010; Shadish & Sullivan, 2011; Smith, 2012). Although

Week	Phase	Monday	Tuesday	Wednesday	Thursday
1	Baseline	***Rhyming:*** Animals Crossing	***Rhyming:*** Animals Crossing	***Non-Rhyming:*** Colorful Animals	***Non-Rhyming:*** Colorful Animals
2	Baseline	***Rhyming:*** Animals Crossing	***Non-Rhyming:*** Colorful Animals	***Rhyming:*** Animals Crossing	***Non-Rhyming:*** Colorful Animals
3	Handshape Rhyme Awareness Intervention	***Rhyming:*** Animals Crossing	**Handshape Rhyme Awareness Intervention**	**Handshape Rhyme Awareness Intervention**	***Rhyming:*** Colorful Animals
4	Alternating Treatments	***Non-Rhyming:*** Animals Crossing	***Rhyming:*** Colorful Animals	***Non-Rhyming:*** Animals Crossing	***Rhyming:*** Colorful Animals
5	Alternating Treatments	***Non-Rhyming:*** Animals Crossing	***Rhyming:*** Colorful Animals	***Non-Rhyming:*** Animals Crossing	***Rhyming:*** Colorful Animals
6	Preference	***Rhyming or Non-Rhyming:*** Fun Day	***Rhyming or Non-Rhyming:*** Fun Day	***Rhyming or Non-Rhyming:*** Fun Day	***Rhyming or Non-Rhyming:*** Fun Day

Figure 12. Preschool Intervention Schedule

Week	Phase	Monday	Tuesday	Wednesday	Thursday	Friday
1	Baseline	***Rhyming:*** Animals Crossing	***Rhyming:*** Animals Crossing	***Non-Rhyming:*** Colorful Animals	***Non-Rhyming:*** Colorful Animals	***Rhyming:*** Animals Crossing
2	Baseline	***Non-Rhyming:*** Colorful Animals	***Rhyming:*** Animals Crossing	***Non-Rhyming:*** Colorful Animals	***Rhyming:*** Animals Crossing	***Non-Rhyming:*** Colorful Animals
3	Handshape Rhyme Awareness Intervention	***Rhyming:*** Animals Crossing	**Handshape Rhyme Awareness Intervention #1**	**Handshape Rhyme Awareness Intervention #2**	***Rhyming:*** Colorful Animals	
4	Alternating Treatments	***Non-Rhyming:*** Animals Crossing	***Rhyming:*** Colorful Animals	***Non-Rhyming:*** Animals Crossing	***Rhyming:*** Colorful Animals	***Non-Rhyming:*** Animals Crossing
5	Alternating Treatments	***Rhyming:*** Colorful Animals	***Non-Rhyming:*** Animals Crossing	***Rhyming:*** Colorful Animals	***Non-Rhyming:*** Animals Crossing	***Rhyming:*** Colorful Animals
6	Preference	***Rhyming or Non-Rhyming:*** Fun Day	***Rhyming or Non-Rhyming:*** Fun Day	***Rhyming or Non-Rhyming:*** Fun Day	***Rhyming or Non-Rhyming:*** Fun Day	***Rhyming or Non-Rhyming:*** Fun Day

Figure 13. Prekindergarten Intervention Schedule

popular in other single subject designs such as multiple baselines, challenges were reported in using statistical models to measure effect size in alternating treatments designs. A recent study looked at 47 alternating treatments studies from 2010 to 2015 and found that 76% of the studies used visual analysis, 72% used mean and mean difference, 51% used variability (e.g. range), 31% used sessions to attain criterion, and 10% used PND. Information can be derived from the fact that most researchers do not use IRD, PND, and Tau-U to measure effect size in alternating treatments design. Insights from meta-analyses along with What Works Clearinghouse's criteria for procedures and standards on alternating treatments design informed the decision to use visual analysis and the total mean and mean difference in this study (What Works Clearinghouse, 2016).

Visual analysis procedures were employed to examine the results of the intervention conditions. Visual analysis of single subject data addresses two questions: "(1) Did behavior change in a meaningful way, and (2) if so, to what extent can that change in behavior be attributed to the independent variable" (Cooper, Heron, & Heward, 2007, p. 149). Six indicators were used to evaluate within-phase and between-phase data patterns to judge the extent of the effects of the intervention: (a) level, (b) trend, (c) variability, (d) immediacy of the effect, (e)

overlap, and (f) consistency of data patterns across similar phases (Kratochwill et al., 2013; What Works Clearinghouse, 2016). Level was assessed by looking at the mean of the data points within a phase. Trend was identified by creating a slope of the data points within a phase with a best-fit straight line and can be decreasing, increasing, or zero. Variability was determined by the data points that varied around the best-fit straight line. Immediacy of effect was the magnitude of change in level, trend, or variability between the data points in the baseline phase and the alternating treatments phase. Consistency of data pattern across phases showed the extent to which phases with same conditions demonstrate similar data patterns. Examination of within- and between data patterns using these six indicators informed the decision regarding the existence of causal relation and the strength of its evidence (Lane & Gast, 2014).

If a causal relation was identified, then the strength of evidence was measured following WWC standards. Strong evidence was marked when there were at least three demonstrations of the treatment effect with no non-effects. Moderate evidence was identified when there were three demonstrations of an effect but at least one demonstration of a non-effect. An example of non-effect was the demonstration of high variability with no clear data patterns within the baseline or alternating treatments phases. What Works Clearinghouse (2016) acknowledges the challenges of identifying effects and non-effects given the unique structure of alternating treatments design and proposes, "Comparing the overall means across conditions helps verify that the intervention has an actual effect" (p. 33).

The total mean and mean difference procedures were conducted for the group of participants who met the visual analysis inclusion criteria. Then, the results of total mean and mean difference were also reported for the whole group including the excluded participants. In addition, other group variables, such as age and language skills, that may impact overall results

in both conditions were also investigated through the total mean and mean difference. Finally, information derived from social validity questionnaires and interviews were shared to explore the significance of this type of intervention.

Procedural Integrity

Teachers involved in this study received one hour of consultation on administering the whole class intervention with integrity. The steps were: (1) Show the video on the Smartboard, (2) Tell students to be ready to view an ASL story, (3) Click "Play," (4) Move away from the Smartboard, stay behind the students, and refrain from intervening (See Appendix G). The researcher was present at all sessions and provided immediate feedback when teachers did not achieve fidelity. Procedural integrity was rated based on two possible scores for each step of the procedure: a "1" to indicate the step in the intervention was implemented according to plan or a "0" to indicate the step was implemented differently than planned or not implemented at all. There was a comment section next to each step where a description of events was recorded as seen. Procedural integrity was calculated session by session and then an overall average was computed by adding the total amount of the planned teacher behavior that was successfully executed and dividing it with the total amount of planned teacher behavior (Ledford & Gast, 2014). Finally, the number was multiplied by 100 to report the percentage of procedural integrity. In 42 sessions, 155 teacher behaviors out of 168 of the total amount of planned teacher behaviors were successfully executed for a total of 92% procedural integrity. Thirteen of the 42 sessions had 75% fidelity due to teachers intervening in students' misbehaviors and not meeting the fourth step: "move away from the Smartboard, stay behind the students, and refrain from intervening."

The second part to the intervention did not include classroom teachers as participants were individually brought by the to the conference room to re-watch the ASL story and recite it to camera. The steps were: (1) Prompt a participant to come to the conference room, (2) Sign "READY - WATCH - VIDEO - AGAIN," (3) Click "Play," (4) View the video quietly until the end, (5) Sign "READY - SIGN – ALL - FROM BEGINNING TO END," (6) Film the participant using an iPhone while the researcher displayed a pleasant and consistent facial disposition (7) When the participant finishes, sign "yay" (See Appendix G). All of the 194 recitation sessions met the procedural integrity with 100% fidelity.

Inter-Rater Reliability

The reliability of the participant data was established through the inter-rater agreement of 90% accuracy or above. Another Deaf colleague fluent in ASL with a doctoral degree and an updated CITI certificate, as required by the IRB, reviewed at least 20% of the video data of occurrence intervals of task engagement, 20% of the video data of number of words recited correctly, and 20% of the video data of number of words recited in the correct order for each participant. See Figure 14.

Visual Analysis Participants	**Engagement Behavior**		**Words Signed Correctly**		**Words Signed in the Correct Order**	
	Total % of Intervals Observed by Both Raters	***Total % of Inter-Rater Agreement***	***Total % of Words Observed by Both Raters***	***Total % of Inter-Rater Agreement***	***Total % of Words Observed by Both Raters***	***Total % of Inter-Rater Agreement***
Daya	22%	95%	26%	98%	26%	98%
Yair	20%	96%	21%	97%	21%	99%
Giada	23%	97%	33%	98%	33%	94%
Jaslene	22%	97%	39%	98%	39%	97%
Lexie	21%	97%	38%	96%	38%	98%
Participants	**Engagement Behavior**		**Words Signed Correctly**		**Words Signed in the Correct Order**	
	Total % of Intervals Observed by Both Raters	***Total % of Inter-Rater Agreement***	***Total % of Words Observed by Both Raters***	***Total % of Inter-Rater Agreement***	***Total % of Words Observed by Both Raters***	***Total % of Inter-Rater Agreement***
Cole	27%	90%	44%	91%	44%	94%
Haiden	23%	92%	25%	99%	25%	98%
Lacey	21%	94%	44%	98%	44%	99%
Tri	26%	95%	34%	94%	34%	97%
Zake	29%	92%	40%	94%	40%	94%

Figure 14. Overall Inter-Rater Agreement

For engagement, if both observers provided the same score ("e-v" = viewing, "e-i" = imitating, "d" = disengaged, "d-i" = disengaged due to external interruption) for each interval, this was counted as an agreement. If the interval was scored differently between both observers, this was considered a disagreement. If there were disagreements, both observers viewed the video again and di cussed their observations until an agreement was reached. The amount of agreements was divided by the total number of intervals and then multiplied by 100 to report the percentage of inter-rater reliability for each participant. The mean inter-rater agreement for each participant across conditions was Daya, 95%; Yair, 96%; Giada, 97%; Jaslene, 97%; Lexie, 97%; Cole, 90%; Haiden, 92%; Lacey, 94%; Tri, 95%; and Zake, 92%. Out of 4,355 intervals, the other inter-rater observed 30% of the intervals (1,291 intervals). Out of 1,291 intervals that we both observed, there were 1,221 agreements. The total mean percentage of inter-rater agreement for the occurrence intervals of task engagement was 95%. See Figure 15 for a disaggregation of inter-rater agreement on engagement by participant, phase, and condition.

For recitation, if both observers provided the same score (whether the participant signed the word correctly or in the correct order) for each word in the story, this counted as an

Visual Analysis Participants	Baseline Phase		Alternating Treatment Phase		Preference Phase
	Rhyming	Non-Rhyming	Rhyming	Non-Rhyming	Rhyming
Daya	96%	DNR	93%	DNR	DNR
Yair	96%	DNR	96%	DNR	DNR
Giada	92%	98%	100%	94%	DNR
Jaslene	98%	100%	95%	100%	DNR
Lexie	100%	100%	94%	DNR	DNR
Participants	Baseline Phase		Alternating Treatment Phase		Preference Phase
	Rhyming	Non-Rhyming	Rhyming	Non-Rhyming	Rhyming
Cole	90%	100%	79%	100%	DNR
Lacey	90%	DNR	98%	DNR	DNR
Haiden	97%	DNR	75%	DNR	DNR
Tri	96%	DNR	93%	DNR	DNR
Zake	88%	91%	97%	DNR	DNR

Note: DNR = did not rate

Figure 15. Engagement: Inter-Rater Agreement by Phase and Condition

agreement. If both observers scored differently for the word observed, this was considered a disagreement. Again, if there were any disagreements, both observers discussed their observations until they reached an agreement. The sum of the total observable word count was divided by the total words counted in agreement to determine the percentage of inter-rater reliability.

The mean inter-rater agreement for each participant across conditions for words signed correctly was Daya, 98%; Yair, 97%; Giada, 98%; Jaslene, 98%, Lexie, 96%, Cole, 91%; Haiden, 99%; Lacey, 98%; Tri, 94%; and Zake, 94%. Out of 4,576 words, the other inter-rater observed 34% of the words (1,567 words). Out of 1,567 words that we both observed, there were 1,516 agreements. The total mean percentage of inter-rater agreement for the words signed correctly in recitation was 96%. See Figure 16 for a disaggregation of inter-rater agreement on words signed correctly by participant, phase, and condition.

The mean inter-rater agreement for each participant across conditions for words signed in the correct order was Daya, 98%; Yair, 99%; Giada, 94%; Jaslene, 97%, Lexie, 98%, Cole, 94%; Haiden, 98%; Lacey, 99%; Tri, 97%; and Zake, 94%. Out of 1,567 words that we both observed, there were 1,516 agreements. The total mean percentage of inter-rater agreement for the words

Visual Analysis Participants	Baseline Phase		Alternating Treatment Phase		Preference Phase
	Rhyming	Non-Rhyming	Rhyming	Non-Rhyming	Rhyming
Daya	100%	96%	100%	96%	DNR
Yair	92%	100%	98%	DNR	DNR
Giada	97%	99%	DNR	DNR	DNR
Jaslene	98%	98%	DNR	DNR	DNR
Lexie	97%	96%	DNR	DNR	DNR
Participants	Baseline Phase		Alternating Treatment Phase		Preference Phase
	Rhyming	Non-Rhyming	Rhyming	Non-Rhyming	Rhyming
Cole	93%	90%	DNR	DNR	DNR
Lacey	97%	99%	DNR	DNR	DNR
Haiden	99%	100%	DNR	DNR	DNR
Tri	92%	96%	100%	92%	DNR
Zake	84%	100%	96%	DNR	DNR

Note: DNR = did not rate

Figure 16. Words Signed Correctly: Inter-Rater Agreement by Phase and Condition

signed correctly in recitation was 97%. See Figure 17 for a disaggregation of inter-rater agreement on words signed in the correct order by student, phase, and condition.

Social Validity

Social validity has long been used in the field of applied behavior analysis to explore interventions that produce outcomes desirable for the society. Quality indicators within single-case research for social validity include four components (Horner et al., 2005). First, the dependent variables must "have high social importance." Second, the independent variables must be practical in their cost, accessibility, and application in real life "contexts across meaningful periods of time." Third, stakeholders such as teachers and parents would "choose to continue use of the intervention procedures after formal support is removed." Fourth, there needs to be a sufficient effect size that meets "the defined, clinical need" (Horner et al., p. 172, 2005).

The researcher-made social validity questionnaire for families and teachers was a 21-item Likert scale ranging from strongly disagree to strongly agree (see Appendix E and Appendix F).

Visual Analysis Participants	Baseline Phase		Alternating Treatment Phase		Preference Phase
	Rhyming	Non-Rhyming	Rhyming	Non-Rhyming	Rhyming
Daya	100%	94%	100%	100%	DNR
Yair	100%	100%	98%	DNR	DNR
Giada	93%	94%	DNR	DNR	DNR
Jaslene	98%	97%	DNR	DNR	DNR
Lexie	98%	98%	DNR	DNR	DNR
	Baseline Phase		Alternating Treatment Phase		Preference Phase
Participants	Rhyming	Non-Rhyming	Rhyming	Non-Rhyming	Rhyming
Cole	97%	92%	DNR	DNR	DNR
Lacey	98%	100%	DNR	DNR	DNR
Haiden	97%	100%	DNR	DNR	DNR
Tri	92%	100%	100%	96%	DNR
Zake	84%	100%	96%	DNR	DNR

Note: DNR = did not rate

Figure 17. Words Signed in the Correct Order: Inter-Rater Agreement by Phase and Condition

There were six categories in the questionnaire: knowledge, experience and uses, implementation, language development, preference and skills, and recommendations. A few examples of the items are: “I was familiar with ASL rhyme and rhythm prior to this research”, “I have access to ASL rhyme and rhythm videos at home”, “Signing along with ASL rhyme and rhythm videos is easy for me”, and “ASL rhyme and rhythm videos are good resources for families”. The questionnaire in English or Spanish was sent to families through regular school-to-home communication.

The teachers involved in this study were queried before and after each session on a daily basis to receive their insights on the social validity of this practice and provide feedback as needed for fidelity. After the study was done, post-intervention interviews with each teacher were undertaken that lasted approximately 45-minutes. This was an opportunity for the teachers to talk about their experiences with the intervention and their thoughts about the uses of ASL rhyme and rhythm. Results of the social validity questionnaire and interview are shared in-depth in the next chapter.

CHAPTER FOUR :

RESULTS

The effects of ASL rhyme and rhythm on 10 Deaf children's engagement behavior and accuracy in recitation are examined and reported here. The research questions were: (1) What are the effects of rhyming and non-rhyming conditions of ASL stories on Deaf children's engagement behavior? (2) What are the effects of rhyming and non-rhyming conditions of ASL stories on Deaf children's accuracy in recitation? (3) What are the effects of handshape rhyme awareness instruction on Deaf children's engagement behavior and accuracy in recitation in both conditions? Individual performance was analyzed using a visual analysis that looks at the level, trend, variability, immediacy of the effect, and consistency of data patterns within condition and between phases. Group performance was also investigated through the mean and mean difference between both conditions and phases. Variables such as age, language ability, and vocabulary knowledge that may impact overall results were looked at. Finally, information derived from social validity questionnaires and interviews were explored to learn more about the significance of this type of intervention.

Visual graphs showing participant performance in the rhyming and non-rhyming conditions with data overlapped for visual comparison are presented below. Due to missing data on the following participants, Cole, Lacey, Haiden, Zake, and Tri, the results reported for visual analysis only include participants who have enough data to meet this study's criteria (three or more data points for engagement data and four or data points for recitation data). The total mean and mean difference are reported for both the five visual analysis participants and the whole group of 10 participants. The order of participants is listed based on age, starting with the youngest.

Visual Analysis Results

Daya

Engagement behavior. See Figure 18 for the visual graph on Daya's engagement behavior.

Baseline.

Within the rhyming condition in baseline phase. Daya viewed the rhyming condition of ASL Story 1 on five different days. Initially, Daya demonstrated high levels of engagement occurrence intervals for two consecutive sessions. Then, there was a decreasing trend before increasing again for the last two consecutive sessions. The range of percentages for Daya's engaged behaviors was between 57% and 100%. The mean percentage of Daya's engagement occurrence intervals demonstrated that Daya viewed 80% of the time, imitated 6% of the time, and was disengaged 14% of the time.

Within the non-rhyming condition in baseline phase. Daya viewed the non-rhyming condition of ASL Story 1 on three different days. Initially, Daya displayed a high level of engagement occurrence intervals but then demonstrated a decreasing trend. The range of percentages for Daya's engaged behaviors was between 50% and 91%. The mean percentage of Daya's engagement occurrence intervals showed that Daya viewed 73% of the time, imitated 1% of the time, and was disengaged 26% of the time.

Between rhyming and non-rhyming conditions in baseline phase. Overall, Daya was more engaged in the rhyming condition (80%) over the non-rhyming condition (73%). Daya also imitated more in the rhyming condition (6%) over the non-rhyming condition (1%). The range of percentages for Daya's engagement occurrence intervals in the rhyming condition was at a

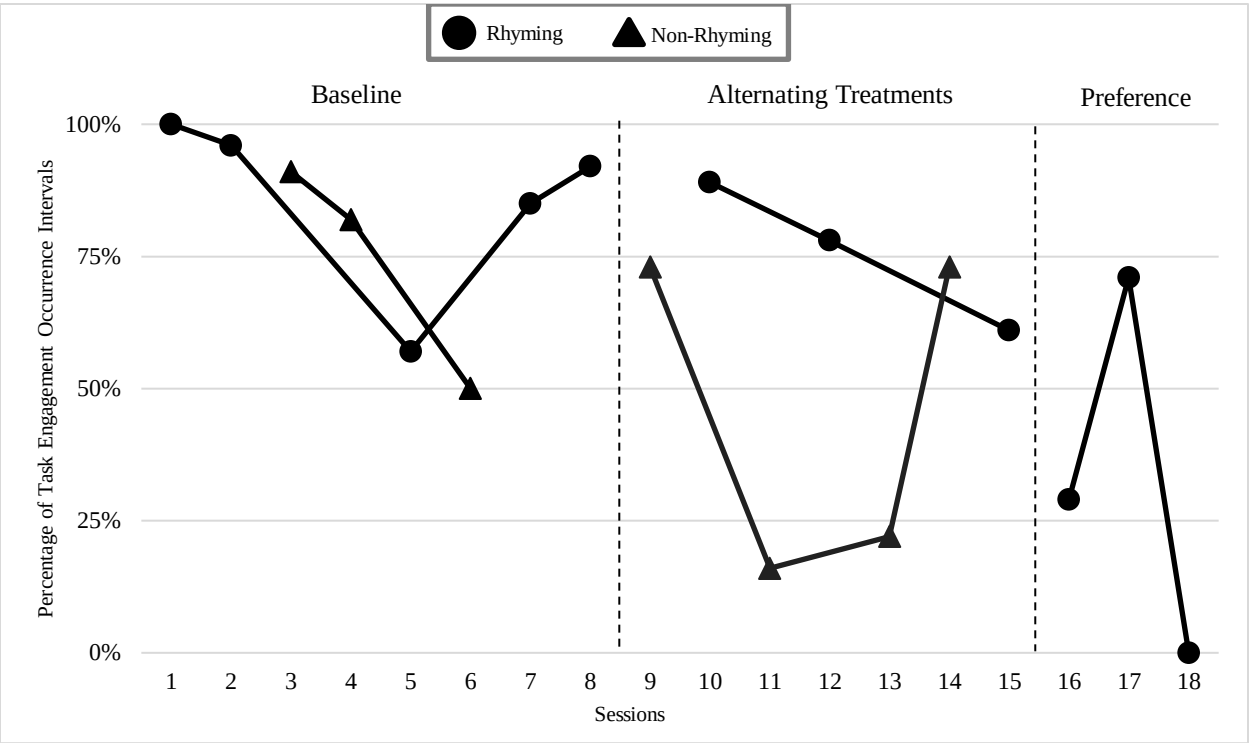


Figure 18. Daya's Percentage of Task Engagement Occurrence Intervals

higher level (between 57% and 100%) compared to the non-rhyming condition (between 50% and 91%).

Alternating treatments.

Within the rhyming condition in alternating treatments phase. Upon the completion of handshape rhyme awareness intervention, Daya viewed the rhyming condition of ASL Story 2 on four different days. Across sessions, Daya displayed extremely variable and unstable levels of engagement occurrence intervals. The range of percentages for Daya's engaged behaviors was between 16% and 73%. The mean percentage of Daya's engagement behaviors indicated that Daya viewed 46% of the time, imitated 0% of the time, and was disengaged 54% of the time.

Within the non-rhyming condition in alternating treatments phase. Daya viewed the non-rhyming condition of ASL Story 2 on three different days. Daya's engagement was stable, starting at the high level with a decreasing trend that ended at the moderate level. The range of

percentages for Daya's engaged behaviors was between 61% and 89%. The mean percentage of Daya's engagement behaviors demonstrated that Daya viewed 76% of the time, imitated 0% of the time, and was disengaged 24% of the time.

Between rhyming and non-rhyming conditions in alternating treatments phase. After receiving handshape rhyme awareness intervention and, upon introduction of the alternating treatments phase, Daya demonstrated extremely variable levels of engagement occurrence intervals in the rhyming condition but had a stable level with a decreasing trend in the non-rhyming condition. Overall, Daya was less engaged in the rhyming condition (46%) over the non-rhyming condition (76%). Daya did not imitate once in either condition (0%). There was no clear separation of data paths making to conclude a more efficacious condition.

Preference.

Within the rhyming condition in preference phase. Daya viewed the rhyming condition of ASL Story 3 on three different days. Daya's pattern of engagement occurrence intervals continued to be unpredictable given its extreme variability across three consecutive sessions at low and moderately high levels. The range of percentages for Daya's engaged behaviors was between 0% and 73%. The mean percentage of Daya's engagement behaviors demonstrated that Daya viewed 33% of the time, imitated 1% of the time, and was disengaged 66% of the time.

Strength of evidence. Functional relation could be found in the effects of rhyming and non-rhyming conditions on Daya's engagement behavior as Daya demonstrated varying levels of engaged behaviors across sessions and phases. However, the superior treatment in increasing Daya's engagement behaviors could not be identified. In fact, there were some demonstrations of effects in the opposite direction with decreasing engagement after repeatedly viewing the ASL

videos. Data presented do not meet What Works Clearinghouse's standard for moderate or strong evidence.

Recitation: Words signed correctly. See Figure 19 for the visual graph on Daya's performance in reciting the words correctly.

Baseline.

Within the rhyming condition in baseline phase. Daya recited the rhyming condition of ASL Story 1 on five different days. At first attempt in the baseline, Daya demonstrated a low level of percentage of words signed correctly at 16%. Across the sessions, Daya displayed a pattern with low variability with an increasing trend. The range of percentages for Daya signing the words correctly was between 16% and 36%. Overall, Daya's mean of words signed correctly in the baseline phase was 25%.

Within the non-rhyming condition in baseline phase. Daya recited the non-rhyming condition of ASL Story 1 on five different days. Daya started at the low level with signing 21% of the words correctly. Across the sessions, Daya had a stable pattern in the percentage of words signed correctly with an increasing trend. The range of percentages for Daya signing the words correctly was between 21% and 25%. Overall, Daya's mean of words signed correctly in the baseline phase was 23%.

Between rhyming and non-rhyming conditions in baseline phase. Daya's level, trend, and variability between both conditions in the baseline were similar with the rhyming condition being slightly superior by 2%. There was a separation of data paths between both conditions of a small magnitude across two consecutive sessions. The range of percentages for Daya's words signed correctly in the rhyming condition was at a higher level (between 16% and 36%) compared to the non-rhyming condition (between 21% and 25%).

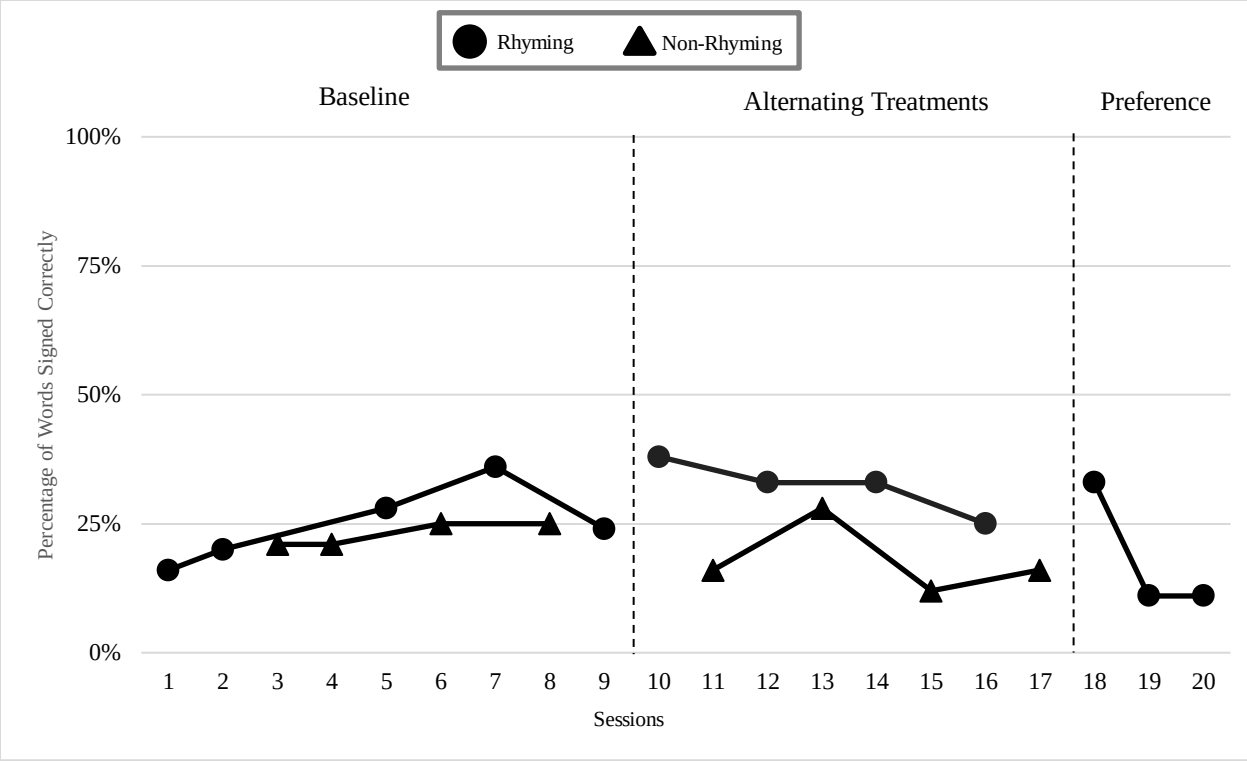


Figure 19. Daya's Percentage of Words Signed Correctly in Recitation

Alternating treatments.

Within the rhyming condition in alternating treatments phase. When handshape rhyme awareness intervention concluded, Daya recited the rhyming condition of ASL Story 2 on four different days. Daya started at the moderately low level with signing 38% of the words correctly. Across the sessions, Daya demonstrated a stable pattern in the percentage of words signed correctly with a decreasing trend. The range of percentages for Daya signing the words correctly was between 25% and 33%. Overall, Daya's mean of words signed correctly in the alternating treatments phase was 32%.

Within the non-rhyming condition in alternating treatments phase. Daya recited the non-rhyming condition of ASL Story 2 on four different days. At first attempt, Daya demonstrated a low level of percentage of words signed correctly at 16%. Across the sessions, Daya had a

variable pattern in the percentage of words signed correctly, remaining in the low level. The range of percentages for Daya's words signed correctly was between 12% and 28%. Overall, Daya's mean of words signed correctly in the alternating treatments phase was 18%.

Between rhyming and non-rhyming conditions in alternating treatments phase. After receiving handshape rhyme awareness intervention and, upon introduction of the alternating treatments phase, Daya's level, trend, and variability between both conditions in the baseline remained in the moderately low level with the rhyming condition being superior by 14%. There was a separation of data paths between both conditions of a small magnitude that was consistent across the phase. The range of percentages for Daya's words signed correctly in the rhyming condition was at a higher level (between 25% and 33%) compared to the non-rhyming condition (between 12% and 28%).

Preference.

Within the rhyming condition in preference phase. Daya recited the rhyming condition of ASL Story 3 on three different days. In the first session, Daya produced a moderately low level of percentage of words signed correctly at 33%. There was a decreasing trend with Daya signing 11% of the words correctly in the last session. The range of percentages for Daya signing the words correctly was between 11% and 33%. Overall, Daya's mean of words signed correctly in the preference phase was 19%.

Strength of evidence. A functional relation could be found in the effects of rhyming and non-rhyming conditions on Daya's words signed correctly in the recitation task as Daya successfully produced some words signed correctly. The rhyming condition was identified as the superior treatment in increasing Daya's words signed correctly. The overall mean levels between baseline and alternating treatments phases demonstrate a difference in visual effect, providing

evidence that handshape rhyme awareness intervention also had an effect on increasing Daya's words signed correctly in the rhyming condition. Data presented meet What Works Clearinghouse's standard for moderate evidence.

Recitation: Words signed in the correct order. See Figure 20 for the visual graph on Daya's performance in reciting the words in the correct order.

Baseline.

Within the rhyming condition in baseline phase. Daya recited the rhyming condition of ASL Story 1 on five different days. In the beginning, Daya started at a low level with 8% of the words signed in the correct order for three consecutive sessions. Then, Daya demonstrated an increasing trend in signing the words in the correct order that reached to 16% in the last session. The range of percentages for Daya signing the words in the correct order was between 8% and 16%. Overall, Daya's mean percentage of words signed in the correct order in the baseline phase was 11%.

Within the non-rhyming condition in baseline phase. Daya recited the non-rhyming condition of ASL Story 1 on four different days. At first attempt, Daya demonstrated a low level of percentage of words signed in the correct order at 8%. Then, Daya displayed a stable pattern with an increasing trend that reached to 21% in the last session. The range of percentages for Daya signing the words in the correct order was between 8% and 21%. Overall, Daya's mean percentage of words signed in the correct order in the baseline phase was 16%.

Between rhyming and non-rhyming conditions in baseline phase. Daya's level, trend, and variability between both conditions in the baseline were similar with the non-rhyming condition being slightly superior by 5%. The range of percentages for Daya's words signed in the correct order in the rhyming condition (between 8% and 16%) was similar to the non-rhyming condition

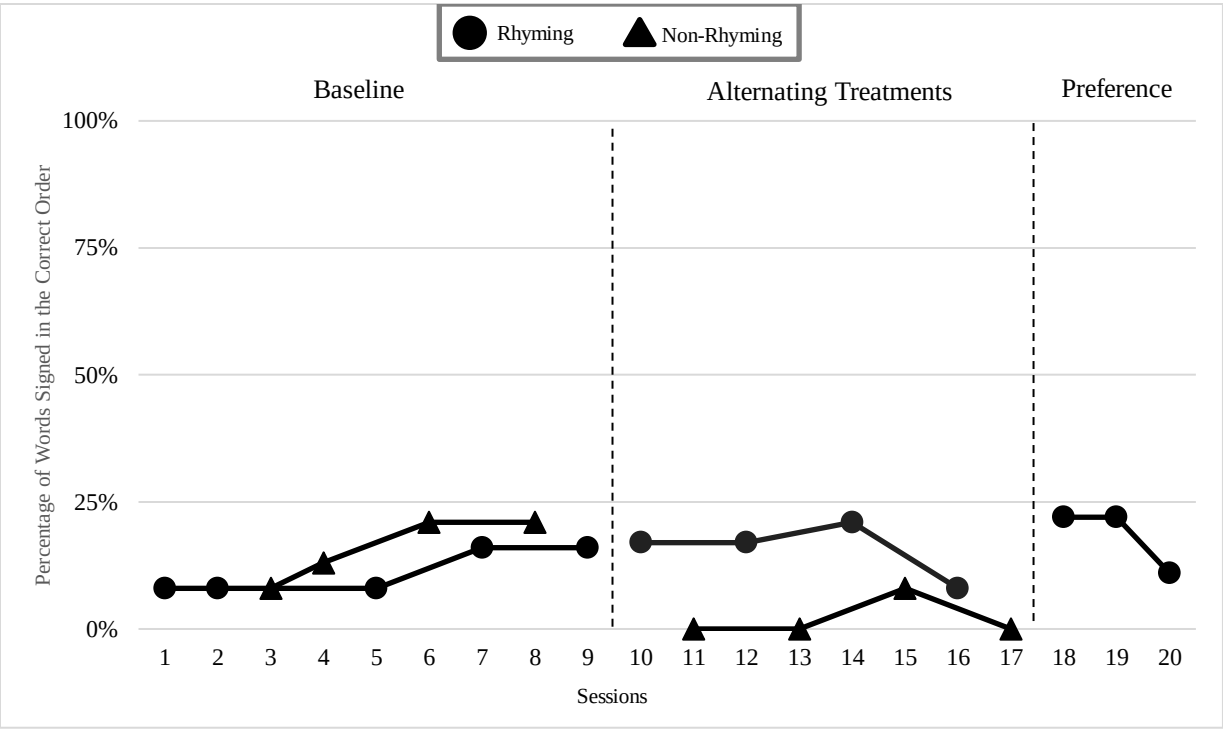


Figure 20. Daya's Percentage of Words Signed in the Correct Order in Recitation

(between 8% and 21%). A small magnitude of separation was found in the data paths between both conditions, favoring the non-rhyming condition.

Alternating treatments.

Within the rhyming condition in alternating treatments phase. After handshape rhyme awareness intervention ended, Daya recited the rhyming condition of ASL Story 2 on four different days. In the first two sessions, Daya produced a low level of percentage of words signed in the correct order at 17%. Across the sessions, Daya demonstrated a relatively stable pattern of words signed in the correct order with low variability. The range of percentages for Daya signing the words in the correct order was between 8% and 21%. Overall, Daya's mean percentage of words signed in the correct order in the alternating treatments phase was 16%.

Within the non-rhyming condition in alternating treatments phase. Daya recited the non-rhyming condition of ASL Story 2 on four different days. In the first two sessions, Daya

remained at the base level with 0% of words signed in the correct order. Then, Daya signed 8% of the words in the correct order in a session before returning to 0% in the last session. The trend was mostly zero at the base level. The range of percentages for Daya signing the words in the correct order was between 0% and 8%. Overall, Daya's mean percentage of words signed in the correct order in the alternating treatments phase was 2%.

Between rhyming and non-rhyming conditions in alternating treatments phase. After receiving handshape rhyme awareness intervention and, upon introduction of the alternating treatments phase, Daya's level, trend, and variability between both conditions in the alternating treatments were similar with the rhyming condition being superior by 14%. The range of percentages for Daya's words signed in the correct order in the rhyming condition was at a higher level (between 17% and 21%) compared to the non-rhyming condition (between 0% and 8%). There was a consistent but small separation of the data paths between both conditions, with the rhyming condition remaining in the higher level.

Preference.

Within the rhyming condition in preference phase. Daya recited the rhyming condition of ASL Story 3 on three different days. In the beginning, Daya produced a low level of percentage of words signed in the correct order at 22%. Daya displayed a decreasing trend in the percentage of words signed in the correct order that went down to 11% in the last session. The range of percentages for Daya signing the words in the correct order was between 11% and 22%. Overall, Daya's mean percentage of words signed in the correct order in the preference phase was 19%.

Strength of evidence. A functional relation could be found in the effects of rhyming and non-rhyming conditions on Daya's words signed in the correct order in the recitation task as Daya signed some words in the correct order. The rhyming condition was identified as the

superior treatment in increasing Daya's words signed in the correct order. The overall mean levels between baseline and alternating treatments phases demonstrate a difference in visual effect, providing evidence that handshape rhyme awareness intervention also had an effect on increasing Daya's words signed in the correct order in the rhyming condition. Data presented meet What Works Clearinghouse's standard for moderate evidence.

Yair

Engagement behavior. See Figure 21 for the visual graph on Yair's engagement behavior.

Baseline.

Within the rhyming condition in baseline phase. Yair viewed the rhyming condition of ASL Story 1 on five different days. For the first two consecutive sessions, Yair displayed a moderately high level of engagement occurrence intervals. Then, Yair's percentage of engagement occurrence intervals increased to the ceiling before decreasing to the moderately high level again. There was a mostly zero trend with small variability. The range of percentages for Yair's engagement occurrence intervals was between 80% and 100%. The mean percentage of Yair's engagement occurrence intervals demonstrated that Yair viewed 54% of the time, imitated 32% of the time, and was disengaged 14% of the time.

Within the non-rhyming condition in baseline phase. Yair viewed the non-rhyming condition of ASL Story 1 on five different days. Yair demonstrated a moderately high level of engagement occurrence intervals with an increasing trend that was stable. The range of percentages for Yair's engagement occurrence intervals was between 62% and 82%. The mean

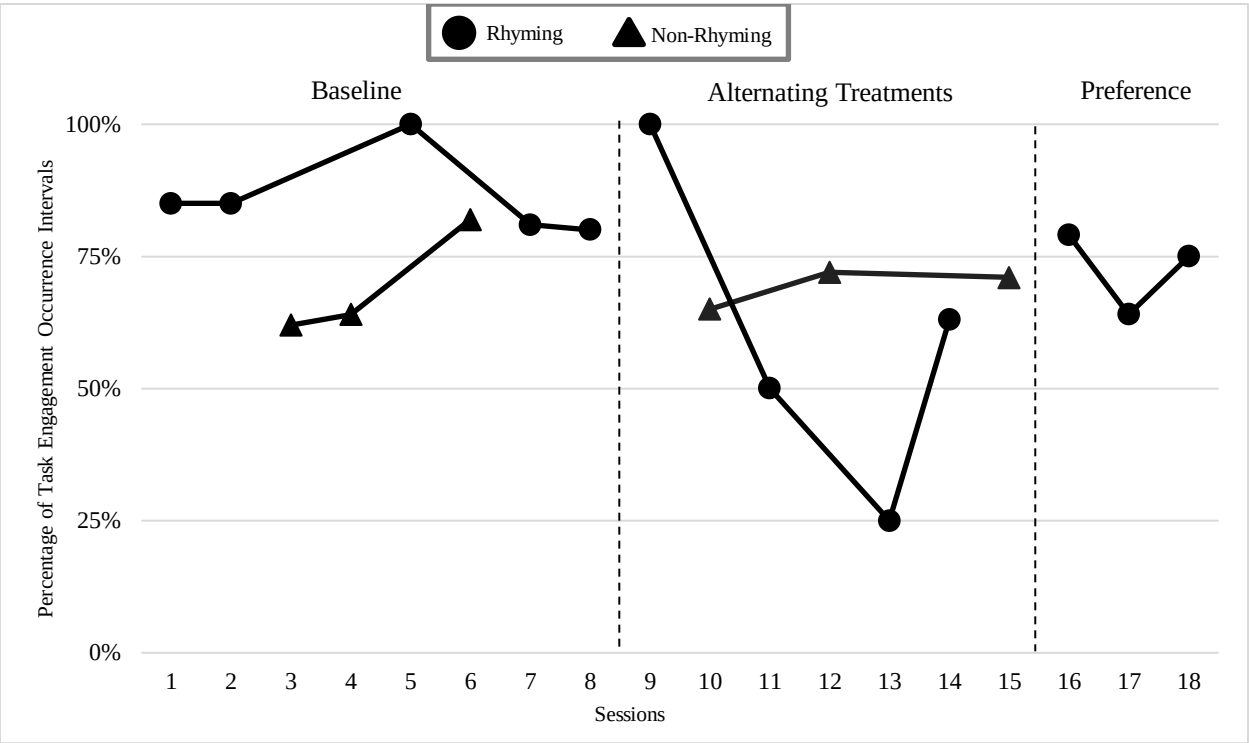


Figure 21. Yair's Percentage of Task Engagement Occurrence Intervals

percentage of Yair's engagement occurrence intervals showed that Yair viewed 66% of the time, imitated 3% of the time, and was disengaged 31% of the time.

Between rhyming and non-rhyming conditions in baseline phase. Overall, Yair was more engaged (86%) in the rhyming condition over the non-rhyming condition (69%). Yair also imitated more in the rhyming condition (32%) over the non-rhyming condition (3%). The range of percentages for Yair's engagement occurrence intervals in the rhyming condition was at a higher level (between 80% and 100%) compared to the non-rhyming condition (between 62% and 82%). A small magnitude of separation was present, favoring the rhyming condition.

Alternating treatments.

Within the rhyming condition in alternating treatments phase. Upon the completion of handshape rhyme awareness intervention, Yair viewed the rhyming condition of ASL Story 2 on four different days. Yair displayed extremely variable levels of engagement occurrence intervals

that were unstable across four consecutive sessions. The range of percentages for Yair's engagement occurrence intervals was between 25% and 100%. The mean percentage of Yair's engagement occurrence intervals indicated that Yair viewed 53% of the time, imitated 6% of the time, and was disengaged 41% of the time.

Within the non-rhyming condition in alternating treatments phase. Yair viewed the non-rhyming condition of ASL Story 2 on three different days. Yair displayed a moderately high level of engagement occurrence intervals that was stable across three consecutive sessions with an increasing trend. The range of percentages for Yair's engagement occurrence intervals was between 65% and 72%. The mean percentage of Yair's engagement occurrence intervals demonstrated that Yair viewed 69% of the time, imitated 0% of the time, and was disengaged 31% of the time.

Between rhyming and non-rhyming conditions in alternating treatments phase. After receiving handshape rhyme awareness intervention and, upon introduction of the alternating treatments phase, Yair exhibited extremely variable levels of engagement occurrence intervals in the rhyming condition but had a stable level in the non-rhyming condition. Overall, Yair was less engaged (61%) in the rhyming condition over the non-rhyming condition (69%). Yair imitated a little in the rhyming condition (6%) but did not imitate once in the non-rhyming condition (0%). There was no clear separation of data paths making to conclude a more efficacious condition.

Preference.

Within the rhyming condition in preference phase. Yair viewed the rhyming condition of ASL Story 3 on three different days. Yair displayed a moderately high level of engagement occurrence intervals that was variable across three consecutive sessions. The trend of Yair's engagement occurrence intervals was variable and remained in moderate-high level. The range

of percentages for Yair's engagement occurrence intervals was between 73% and 85%. The mean percentage of Yair's engagement occurrence intervals demonstrated that Yair viewed 28% of the time, imitated 47% of the time, and was disengaged 25% of the time.

Strength of evidence. Functional relation could be found in the effects of rhyming and non-rhyming conditions on Yair's engagement behavior as Yair demonstrated varying levels of engaged behaviors across sessions and phases. However, since great variability was present, data were not sufficient to determine a confident index of level and trend. Data presented do not meet What Works Clearinghouse's standard for moderate or strong evidence.

Recitation: Words signed correctly. See Figure 22 for the visual graph on Yair's performance in reciting the words correctly.

Baseline.

Within the rhyming condition in baseline phase. Yair recited the rhyming condition of ASL Story 1 on five different days. At first attempt, Yair demonstrated a moderately low level of percentage of words signed correctly at 28%. Across the sessions, Yair displayed a stable pattern in words signed correctly with an increasing trend that reached to 80%. The range of percentages for Yair signing the words correctly was between 28% and 80%. Overall, Yair's mean of words signed correctly in the baseline phase was 52%.

Within the non-rhyming condition in baseline phase. Yair recited the rhyming condition of ASL Story 2 on four different days. In the first two sessions, Yair displayed a moderately low level of percentage of words signed correctly at 25%. Then, Yair had a stable pattern in words signed correctly with an increasing trend that reached to 58%. The range of percentages for Yair signing the words correctly was between 25% and 58%. Overall, Yair's mean of words signed correctly in the baseline phase was 41%.

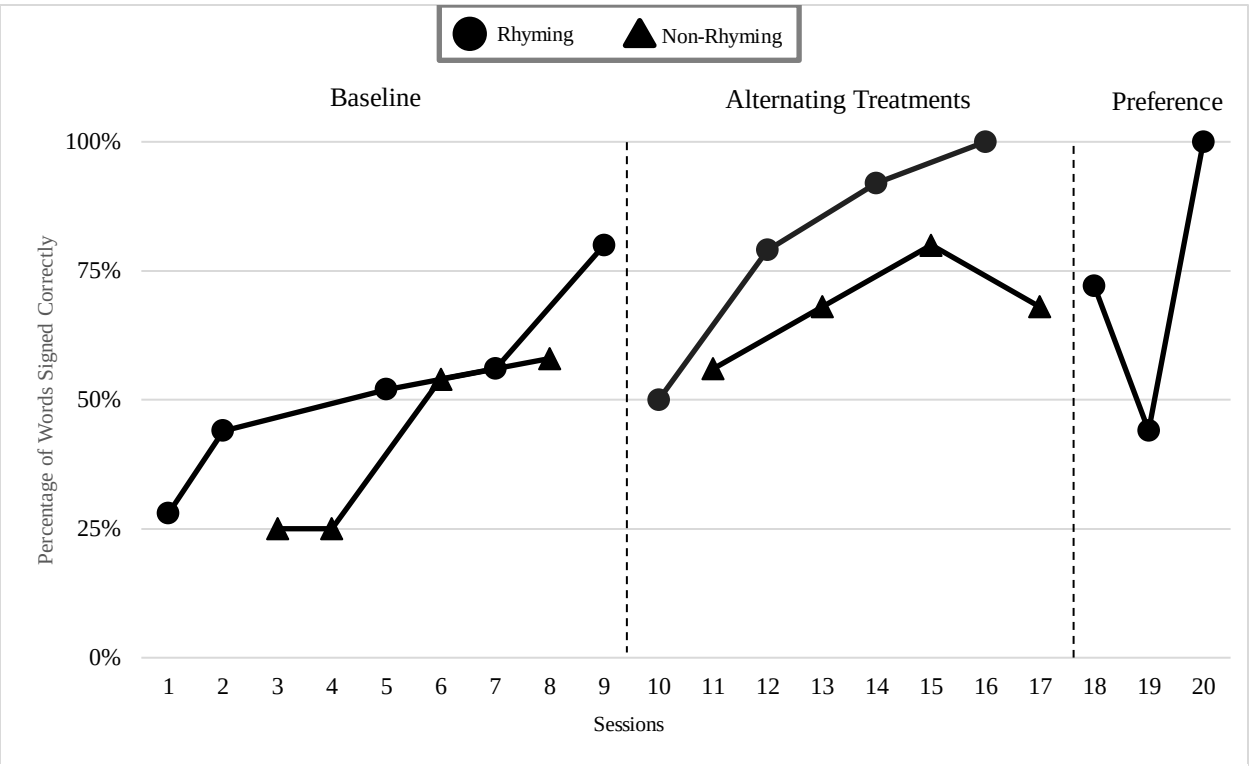


Figure 22. Yair's Percentage of Words Signed Correctly in Recitation

Between rhyming and non-rhyming conditions in baseline phase. Yair's level, trend, and variability in the data paths between both conditions were similar with the overall mean of the rhyming condition being 11% higher than the non-rhyming condition. Both data paths had increasing trends that were stable. The range of percentages for Yair's words signed correctly in the rhyming condition was at a higher level (between 28% and 80%) compared to the non-rhyming condition (between 25% and 58%).

Alternating treatments.

Within the rhyming condition in alternating treatments phase. When handshape rhyme awareness intervention concluded, Yair recited the rhyming condition of ASL Story 2 on four different days. At first attempt, Yair produced a moderate level of percentage of words signed correctly at 50%. Across the sessions, Yair demonstrated a stable pattern with an increasing trend

that reached to the ceiling at 100%. The range of percentages for Yair signing the words correctly was between 50% and 100%. Overall, Yair's mean of words signed correctly in the alternating treatments phase was 80%.

Within the non-rhyming condition in alternating treatments phase. Yair recited the non-rhyming condition of ASL Story 2 on four different days. In the first session, Yair exhibited a moderate level of percentage of words signed correctly at 56%. Across the sessions, Yair had a stable pattern with an increasing trend that reached to 80% before decreasing to 68% in the last session. The range of percentages for Yair signing the words correctly was between 56% and 80%. Overall, Yair's mean of words signed correctly in the alternating treatments phase was 68%.

Between rhyming and non-rhyming conditions in alternating treatments phase. Yair's level, trend, and variability between both conditions in the alternating treatments phase were similar with the rhyming condition being superior by 12%. There was a separation in data paths between both conditions of a small magnitude in the beginning that became greater across sessions. The range of percentages for Yair's words signed correctly in the rhyming condition was at a higher level (between 50% and 100%) compared to the non-rhyming condition (between 56% and 80%).

Preference.

Within the rhyming condition in preference phase. Yair recited the rhyming condition of ASL Story 3 on three different days. At first attempt, Yair produced a moderately high level of percentage of words signed correctly at 72%. Then, Yair yielded a variable pattern in the percentage of words signed correctly with 44% in the second session, which increased to the ceiling at 100% in the third session. The range of percentages for Yair signing the words

correctly was between 72% and 100%. Overall, Yair's mean of words signed correctly in the preference phase was 72%.

Strength of evidence. A functional relation could be found in the effects of rhyming and non-rhyming conditions on Yair's words signed correctly in the recitation task. The rhyming condition was identified as the superior treatment in increasing Yair's words signed correctly. The overall mean levels between baseline and alternating treatments phases demonstrate a difference in visual effect, providing evidence that handshape rhyme awareness intervention also had an effect on increasing Yair's words signed correctly in the rhyming condition. Data presented meet What Works Clearinghouse's standard for moderate evidence.

Recitation: Words signed in the correct order. See Figure 23 for the visual graph on Yair's performance in reciting the words in the correct order.

Baseline.

Within the rhyming condition in baseline phase. Yair recited the rhyming condition of ASL Story 1 on five different days. Yair started at the base level with 0% of words signed in the correct order. Across the sessions, Yair displayed a relatively stable pattern with an increasing trend that reached to the moderate level at 52%. The range of percentages for Yair signing the words in the correct order was between 0% and 52%. Overall, Yair's mean of words signed in the correct order in the baseline phase was 21%.

Within the non-rhyming condition in baseline phase. Yair recited the non-rhyming condition of ASL Story 1 on four different days. Yair started at the base level across two consecutive sessions with 0% of words signed in the correct order. Next two sessions, Yair displayed an increasing trend with low variability that reached to a moderate level at 50%. The

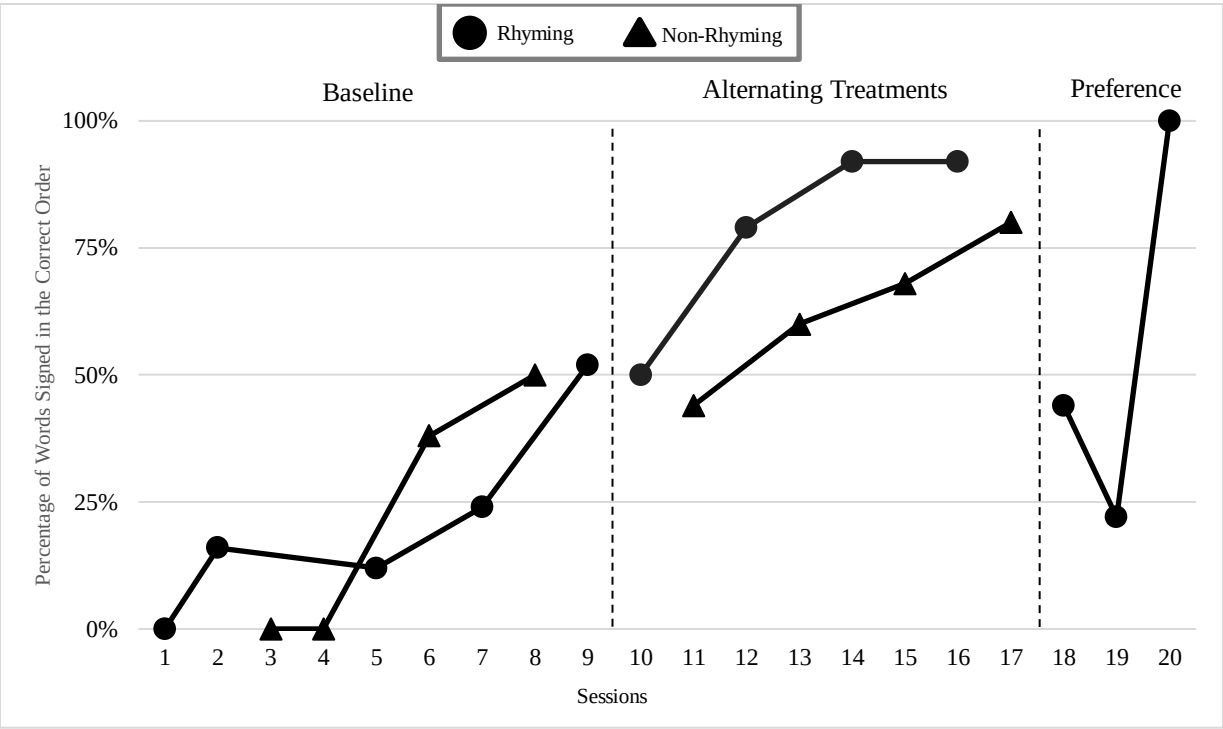


Figure 23. Yair's Percentage of Words Signed in the Correct Order

range of percentages for Yair signing the words in the correct order was between 0% and 50%. Overall, Yair's mean of words signed in the correct order in the baseline phase was 22%.

Between rhyming and non-rhyming conditions in baseline phase. Yair's level, trend, and variability between both conditions in the baseline were similar. The range of percentages for Yair's words signed in the correct order in the rhyming condition (between 0% and 52%) was comparable to the non-rhyming condition (between 0% and 50%). There was not a clear separation in data paths between both conditions.

Alternating treatments.

Within the rhyming condition in alternating treatments phase. When handshape rhyme awareness intervention ended, Yair recited the rhyming condition of ASL Story 2 on four different days. In the beginning, Yair produced a moderate level of percentage of words signed in the correct order at 50%. Across the sessions, Yair demonstrated a stable pattern with an

increasing trend that reached to the high level at 92%. The range of percentages for Yair signing the words in the correct order was between 50% and 92%. Overall, Yair's mean of words signed in the correct order in the alternating treatments phase was 78%.

Within the non-rhyming condition in alternating treatments phase. Yair recited the non-rhyming condition of ASL Story 2 on four different days. In the first session, Yair demonstrated a moderate level of percentage of words signed in the correct order at 44%. Across the sessions, Yair had a stable pattern with an increasing trend that reached to 80% in the last session. The range of percentages for Yair signing the words in the correct order was between 44% and 80%. Overall, Yair's mean of words signed in the correct order in the alternating treatments phase was 63%.

Between rhyming and non-rhyming conditions in alternating treatments phase. Yair's level, trend, and variability between both conditions were similar with the rhyming condition being superior by 15%. The range of percentages for Yair's words signed in the correct order in the rhyming condition was at a higher level (between 50% and 92%) compared to the non-rhyming condition (between 44% and 80%). There was a clear and consistent separation in the data paths of moderate magnitude between both conditions, with the rhyming condition remaining in the higher level.

Preference.

Within the rhyming condition in preference phase. Yair recited the rhyming condition of ASL Story 3 on three different days. At first attempt, Yair produced a moderate level of percentage of words signed in the correct order at 44%. Then, Yair displayed a variable pattern in the percentage of words signed in the correct order with 22% in the second session, which increased to the ceiling at 100% in the third session. The range of percentages for Yair signing

the words in the correct order was between 22% and 100%. Overall, Yair's mean of words signed in the correct order in the preference phase was 56%.

Strength of evidence. A functional relation could be found in the effects of rhyming and non-rhyming conditions on Yair's words signed in the correct order in the recitation task. The rhyming condition was identified as the superior treatment in increasing Yair's words signed in the correct order. The overall mean levels between baseline and alternating treatments phases demonstrate a difference in visual effect, providing evidence that handshape rhyme awareness intervention also had an effect on increasing Yair's words signed in the correct order in the rhyming condition. Data presented meet What Works Clearinghouse's standard for moderate evidence.

Giada

Engagement behavior. See Figure 24 for the visual graph on Giada's engagement behavior.

Baseline.

Within the rhyming condition in baseline phase. Giada viewed the rhyming condition of ASL Story 1 on five different days. Giada displayed high and stable levels of engagement occurrence intervals that reached the ceiling in the middle of the phase and remained there for the subsequent sessions. The range of percentages for Giada's engagement occurrence intervals was between 77% and 100%. The mean percentage of Giada's engagement occurrence intervals exhibited that Giada viewed 35% of the time, imitated 59% of the time, and was disengaged 6% of the time.

Within the non-rhyming condition in baseline phase. Giada viewed the non-rhyming condition of ASL Story 1 on five different days. With an exception of the third session, the level

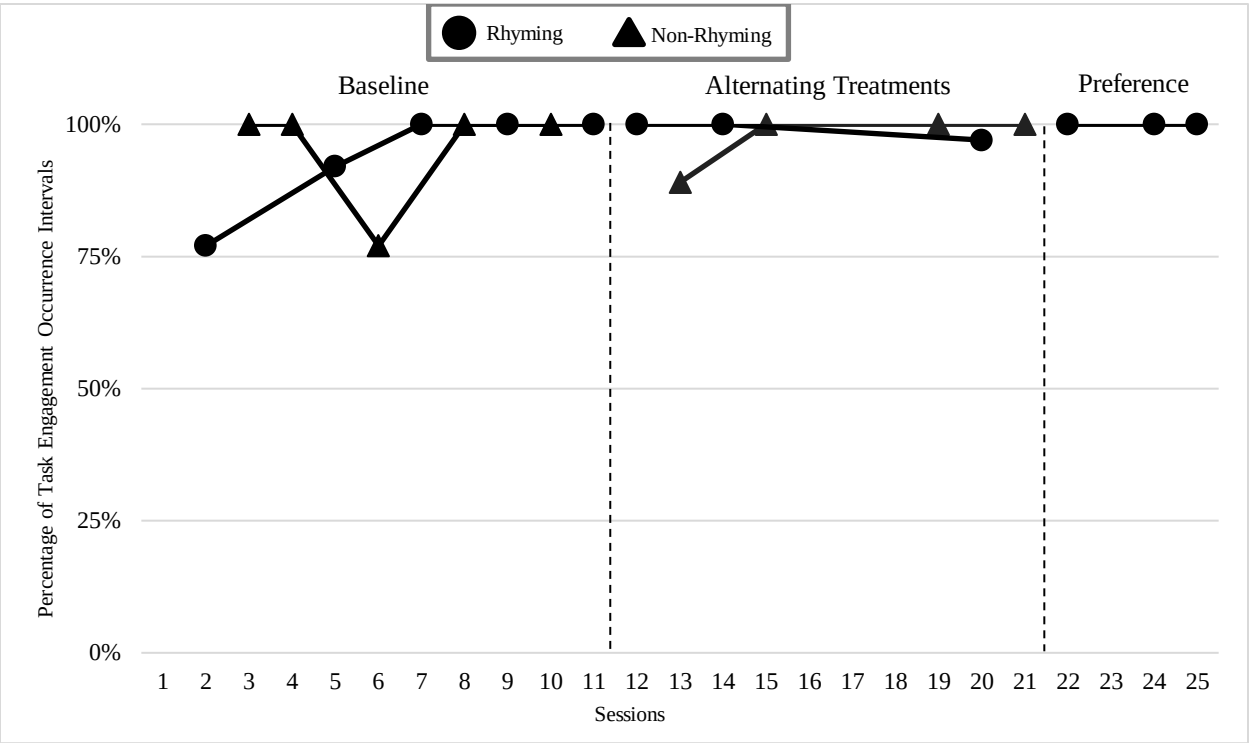


Figure 24. Giada's Percentage of Task Engagement Occurrence Intervals

of Giada's engagement occurrence intervals remained at the ceiling. The range of percentages for Giada's engagement occurrence intervals was between 77% and 100%. The mean percentage of Giada's engagement occurrence intervals indicated that Giada viewed 46% of the time, imitated 49% of the time, and was disengaged 5% of the time.

Between rhyming and non-rhyming conditions in baseline phase. Overall, Giada's level, trend, and variability of engagement occurrence intervals between both conditions were comparable with an overall mean of 94% in the rhyming condition and an overall mean of 95% in the non-rhyming condition. Giada remained in the high level in both conditions with a stable trend and low variability. Giada imitated more in the rhyming condition (59%) over the non-rhyming condition (49%).

Alternating treatments.

Within the rhyming condition in alternating treatments phase. After handshape rhyme awareness intervention ended, Giada viewed the rhyming condition of ASL Story 2 on four different days. Giada demonstrated high and stable levels of engagement occurrence intervals that mostly remained at the ceiling (zero trend) across the phase. The range of percentages for Giada's engagement occurrence intervals was between 97% and 100%. The mean percentage of Giada's engagement occurrence intervals indicated that Giada viewed 0% of the time, imitated 99% of the time, and was disengaged 1% of the time.

Within the non-rhyming condition in alternating treatments phase. Giada viewed the non-rhyming condition of ASL Story 2 on four different days. With an exception of one session, Giada's engagement occurrence intervals had a zero trend and remained in the ceiling level. The range of percentages for Giada's engagement occurrence intervals was between 89% and 100%. The mean percentage of Giada's engagement occurrence intervals demonstrated that Giada viewed 24% of the time, imitated 73% of the time, and was disengaged 3% of the time.

Between rhyming and non-rhyming conditions in alternating treatments phase. After receiving handshape rhyme awareness intervention and, upon introduction of the alternating treatments phase, Giada maintained high and stable levels of engagement occurrence intervals in both conditions. Overall, Giada was similarly engaged in the rhyming condition (100%) and the non-rhyming condition (97%). Giada imitated more in the rhyming condition (100%) compared to the non-rhyming condition (73%). There was no separation of data paths in both conditions.

Preference.

Within the rhyming condition in preference phase. Giada viewed the rhyming condition of ASL Story 3 on three different days. Giada displayed high and stable level of engagement

occurrence intervals that remained in the ceiling (zero trend) across the phase. The mean percentage of Giada's engagement occurrence intervals demonstrated that Giada viewed 3% of the time, imitated 97% of the time, and was disengaged 0% of the time.

Strength of evidence. Functional relation could be found in the effects of rhyming and non-rhyming conditions on Giada's engagement behavior. The pattern indicated that both conditions were comparable in increasing Giada's levels of engagement occurrence intervals. The rhyming condition was superior in increasing the imitating behavior. Data presented do meet What Works Clearinghouse's standard for moderate evidence.

Recitation: Words signed correctly. See Figure 25 for the visual graph on Giada's performance in reciting the words correctly.

Baseline.

Within the rhyming condition in baseline phase. Giada recited the rhyming condition of ASL Story 1 on four different days. In the first session, Giada demonstrated a moderately high level of percentage of words signed correctly at 68%. Across the sessions, Giada displayed a stable pattern with an increasing trend that reached to the ceiling in the last session. The range of percentages for Giada's words signed correctly was between 68% and 100%. Overall, Giada's mean percentage of words signed correctly in the baseline phase was 86%.

Within the non-rhyming condition in baseline phase. Giada recited the non-rhyming condition of ASL Story 1 on five different days. At first attempt, Giada displayed a moderate level of percentage of words signed correctly at 54%. Across the sessions, Giada had a variable pattern with an increasing trend that reached to 100% in the last session. The range of percentages for Giada's words signed correctly was between 17% and 100%. Overall, Giada's mean percentage of words signed correctly in the baseline phase was 65%.

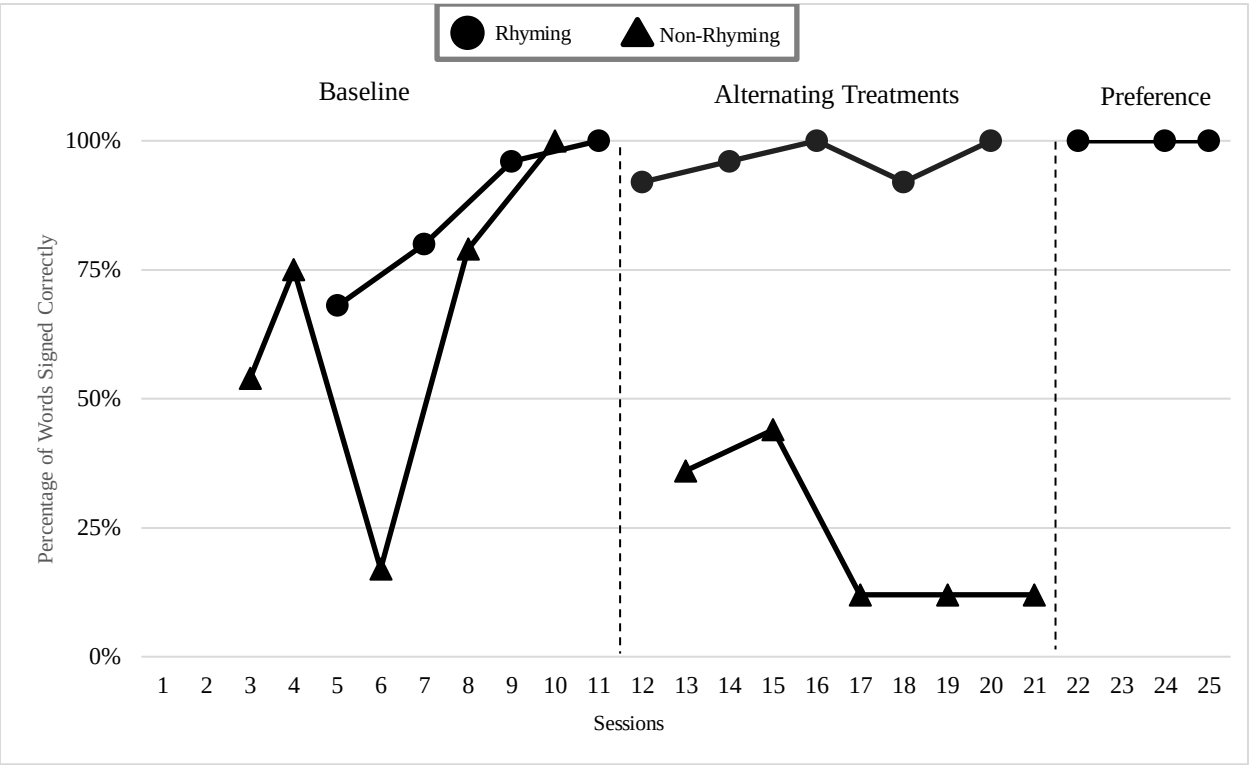


Figure 25. Giada's Percentage of Words Signed Correctly

Between rhyming and non-rhyming conditions in baseline phase. Giada's level, trend, and variability in data paths between both conditions had some differences. In the rhyming condition, Giada started at a moderately high level and demonstrated a stable pattern (increasing trend) in improving in the percentage of words signed correctly. In the non-rhyming condition, Giada started at a moderate level and had a variable pattern in signing the words correctly. By the end of the baseline, Giada received 100% in signing the words correctly in both conditions. The range of percentages for Giada's words signed correctly in the rhyming condition was at a higher level (between 68% and 100%) compared to the non-rhyming condition (between 17% and 100%).

Alternating treatments.

Within the rhyming condition in alternating treatments phase. Upon the completion of handshape rhyme awareness intervention, Giada recited the rhyming condition of ASL Story 2 on five different days. In the first session, Giada produced a high level of percentage of words signed correctly at 92%. Across the sessions, Giada demonstrated a stable pattern with an increasing trend that reached to the ceiling at 100%. The range of percentages for Giada signing the words correctly was between 92% and 100%. Overall, Giada's mean percentage of words signed correctly in the alternating treatments phase was 96%.

Within the non-rhyming condition in alternating treatments phase. Giada recited the non-rhyming condition of ASL Story 2 on five different days. In the beginning, Giada demonstrated a moderately low level of percentage of words signed correctly at 36%. Across the sessions, Giada had a variable pattern with a decreasing trend that reached to 12%. The range of percentages for Giada signing the words correctly was between 12% and 44%. Overall, Giada's mean percentage of words signed correctly in the alternating treatments phase was 23%.

Between rhyming and non-rhyming conditions in alternating treatments phase. Giada's level, trend, and variability in data paths between both conditions demonstrated a great magnitude of separation with the rhyming condition being superior. In the rhyming condition, Giada started at the high level (92%) and demonstrated a stable pattern (increasing trend) in improving in the percentage of words signed correctly. In the non-rhyming condition, Giada started at the moderately low level (36%) and then did not increase above 44% in signing the words correctly across sessions. The range of percentages for Giada's words signed correctly in the rhyming condition was at a higher level (between 92% and 100%) compared to the non-rhyming condition (between 17% and 44%).

Preference.

Within the rhyming condition in preference phase. Giada recited the rhyming condition of ASL Story 3 on two different days. At first attempt, Giada hit the ceiling level and signed all of the words signed correctly. The zero trend continued in the ceiling level with Giada signing all of the words correctly for the rest of the sessions. Overall, Giada's mean percentage of words signed correctly in the preference phase was 100%.

Strength of evidence. A functional relation could be found in the effects of rhyming and non-rhyming conditions on Giada's words signed correctly in the recitation task. The rhyming condition was identified as the superior treatment in increasing Giada's words signed correctly. The overall mean levels between baseline and alternating treatments phases demonstrate a difference in visual effect, providing evidence that handshape rhyme awareness intervention also had an effect on increasing Giada's words signed correctly in the rhyming condition. Data presented meet What Works Clearinghouse's standard for moderate evidence.

Recitation: Words signed in the correct order. See Figure 26 for the visual graph on Giada's performance in reciting the words in the correct order.

Baseline.

Within the rhyming condition in baseline phase. Giada recited the rhyming condition of ASL Story 1 on four different days. Giada started at a moderate level with 56% of words signed in the correct order. Across the sessions, Giada displayed a stable pattern with an increasing trend that reached to the ceiling at 100%. The range of percentages for Giada's words signed in the correct order was between 56% and 100%. Overall, Giada's mean percentage of words signed in the correct order in the baseline phase was 77%.

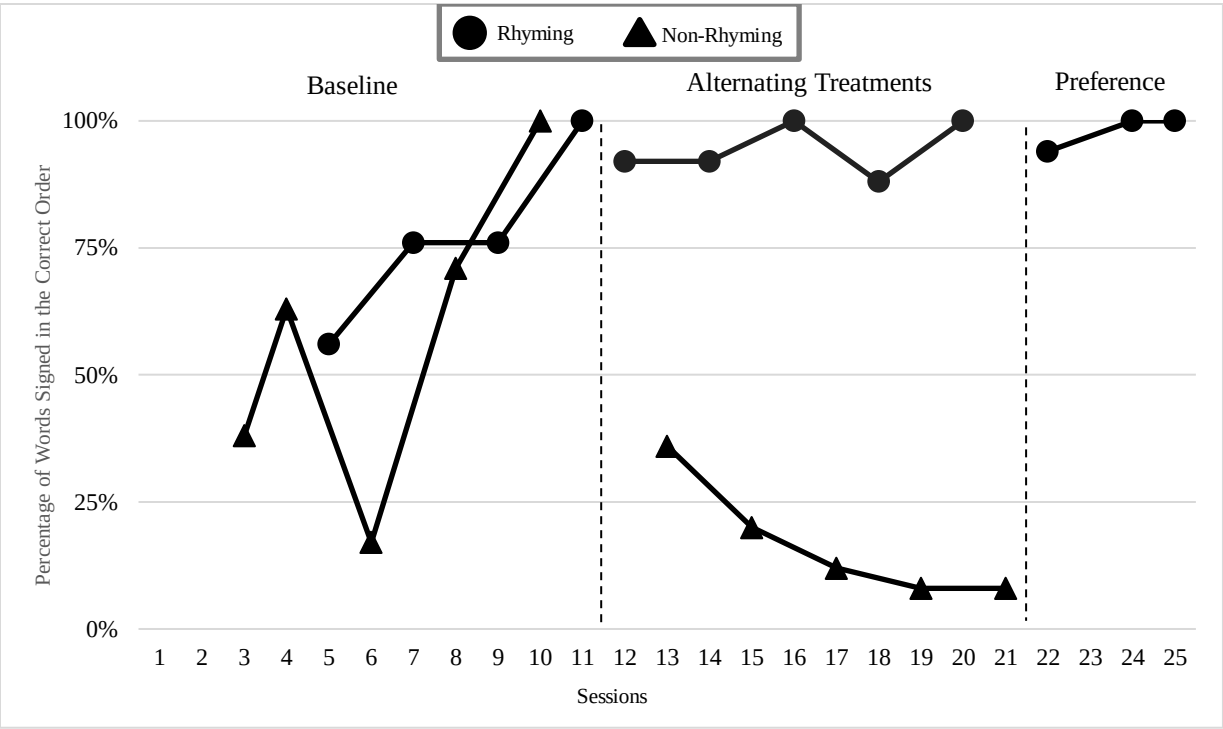


Figure 26. Giada's Percentage of Words Signed in the Correct Order in Recitation

Within the non-rhyming condition in baseline phase. Giada recited the non-rhyming condition of ASL Story 1 on five different days. Giada started the baseline at a moderately low level with 38% of words signed in the correct order. Then, Giada displayed a variable pattern with an increasing trend that reached to the ceiling at 100% in the last session. The range of percentages for Giada's words signed in the correct order was between 17% and 100%. Overall, Giada's mean percentage of words signed in the correct order was 58%.

Between rhyming and non-rhyming conditions in baseline phase. Giada's level, trend, and variability of data paths in both conditions had some differences. In the rhyming condition, Giada started at a moderate level and demonstrated a stable pattern (increasing trend) in improving in the percentage of words signed in the correct order. In the non-rhyming condition, Giada started at a moderately low level and had a variable pattern in signing the words in the

correct order. By the end of the baseline, Giada received 100% in signing the words in the correct order in both conditions. The range of percentages for Giada's words signed in the correct order in the rhyming condition was at a higher level (between 68% and 100%) compared to the non-rhyming condition (between 17% and 100%).

Alternating treatments.

Within the rhyming condition in alternating treatments phase. When handshape rhyme awareness intervention concluded, Giada recited the rhyming condition of ASL Story 2 on five different days. In the first session, Giada produced a high level of percentage of words signed in the correct order at 92%. Across the sessions, Giada demonstrated a relatively stable pattern with an increasing trend that reached to the ceiling at 100%. The range of percentages for Giada's words signed in the correct order was between 88% and 100%. Overall, Giada's mean percentage of words signed in the correct order in the alternating treatments phase was 94%.

Within the non-rhyming condition in alternating treatments phase. Giada recited the non-rhyming condition of ASL Story 2 on five different days. At first attempt, Giada demonstrated a moderately low level of percentage of words signed in the correct order at 36%. Across the sessions, Giada had a stable pattern of a decreasing trend that went down to 8% in the last session. The range of percentages for Giada's words signed in the correct order was between 8% and 36%. Overall, Giada's mean percentage of words signed in the correct order in the alternating treatments phase was 17%.

Between rhyming and non-rhyming conditions in alternating treatments phase.

Giada's level, trend, and variability in the data paths between both conditions were different but consistent and stable. There was a great magnitude of separation of data paths, demonstrating superiority of the rhyming condition. In the rhyming condition, Giada started at a

high level (92%) and demonstrated a stable pattern (increasing trend) in improving in the percentage of words signed in the correct order. In the non-rhyming condition, Giada started at a moderately low level (36%) in signing the words in the correct order with a decreasing trend. The range of percentages for Giada's words signed in the correct order in the rhyming condition was at a higher level (between 92% and 100%) compared to the non-rhyming condition (between 8% and 36%).

Preference.

Within the rhyming condition in preference phase. Giada recited the rhyming condition of ASL Story 3 on three different days. In the beginning, Giada produced a high level of percentage of words signed in the correct order at 94%. Then, Giada displayed a stable pattern at 100% for two consecutive sessions. The range of percentages for Giada's words signed in the correct order was between 92% and 100%. Overall, Giada's mean of words signed in the correct order in the preference phase was 98%.

Strength of evidence. A functional relation could be found in the effects of rhyming and non-rhyming conditions on Giada's words signed in the correct order in the recitation task. The rhyming condition was identified as the superior treatment in increasing Giada's words signed in the correct order. The overall mean levels between baseline and alternating treatments phases as well as the magnitude of separation of data paths between conditions presented visual evidence of the effects of receiving handshape rhyme awareness intervention and viewing ASL stories on increasing words signed in the correct order during recitation. Data presented meet What Works Clearinghouse's standard for strong evidence.

Jaslene

Engagement behavior. See Figure 27 for the visual graph on Jaslene's engagement behavior.

Baseline.

Within the rhyming condition in baseline phase. Jaslene viewed the rhyming condition of ASL Story 1 on six different days. Jaslene maintained high levels of engagement occurrence intervals with low variability that reached the ceiling in the middle of the phase and remained there for three consecutive sessions before decreasing by 4% in the last session. The range of percentages for Jaslene's engagement occurrence intervals was between 85% and 100%. The mean percentage of Jaslene's engagement occurrence intervals demonstrated that Jaslene viewed 35% of the time, imitated 62% of the time, and was disengaged 3% of the time.

Within the non-rhyming condition in baseline phase. Jaslene viewed the non-rhyming condition of ASL Story 1 on five different days. The level of Jaslene's engagement occurrence intervals remained at the ceiling across all sessions with a zero trend. The range of percentages for Jaslene's engagement occurrence intervals was between 100% and 100%. The mean percentage of Jaslene's engagement occurrence intervals displayed that Jaslene viewed 37% of the time, imitated 63% of the time, and was disengaged 0% of the time.

Between rhyming and non-rhyming conditions in baseline phase. Overall, Jaslene was comparably engaged in the rhyming condition (97%) and the non-rhyming condition (100%) in the baseline. Jaslene exhibited similar patterns in level, trend, and variability in data paths of both conditions. Jaslene's range of percentages of engagement occurrence intervals was lower in the rhyming condition (85%-100%) compared to the non-rhyming condition (100%-100%).

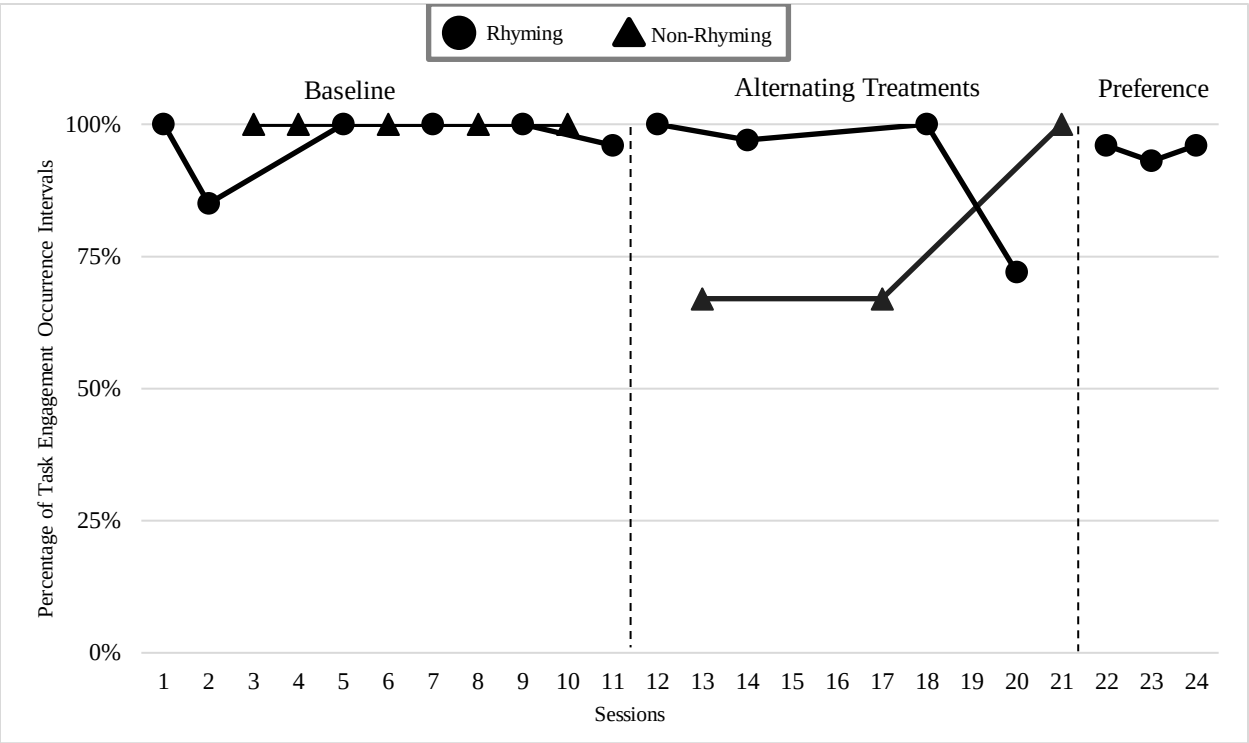


Figure 27. Jaslene's Percentage of Task Engagement Occurrence Intervals

Jaslene spent exactly the same amount of engagement occurrence intervals imitating in both conditions.

Alternating treatments.

Within the rhyming condition in alternating treatments phase. Upon the completion of handshape rhyme awareness intervention, Jaslene viewed the rhyming condition of ASL Story 2 on five different days. Jaslene exhibited high and mostly stable levels of engagement occurrence intervals that demonstrated ceiling effects three out of five sessions before decreasing to 72% in the last session. The range of percentages for Jaslene's engagement occurrence intervals was between 72% and 100%. The mean percentage of Jaslene's engagement occurrence intervals indicated that Jaslene viewed 14% of the time, imitated 80% of the time, and was disengaged 6% of the time.

Within the non-rhyming condition in alternating treatments phase. Jaslene viewed the non-rhyming condition of ASL Story 2 on three different days. Jaslene had moderately high and stable levels of engagement occurrence intervals with an increasing trend. The range of percentages for Jaslene's engagement occurrence intervals was between 67% and 100%. The mean percentage of Jaslene's engagement occurrence intervals demonstrated that Jaslene viewed 39% of the time, imitated 39% of the time, and was disengaged 22% of the time.

Between rhyming and non-rhyming conditions in alternating treatments phase. After receiving handshape rhyme awareness intervention and, upon introduction of the alternating treatments phase, Jaslene continued to maintain high and relatively stable levels of engagement occurrence intervals in the rhyming condition. In the non-rhyming condition, however, Jaslene's level of engagement occurrence intervals dropped to the moderate level with an increasing trend. The overall mean demonstrates that Jaslene was more engaged in the rhyming condition (94%) over the non-rhyming condition (78%). Jaslene also imitated more in the rhyming condition (80%) compared to the non-rhyming condition (39%).

Preference.

Within the rhyming condition in preference phase. Jaslene viewed the rhyming condition of ASL Story 3 on three different days. Jaslene displayed high levels of engagement occurrence intervals with a stable and increasing trend across three consecutive sessions. The range of percentages for Jaslene's engagement occurrence intervals was between 92% and 100%. The mean percentage of Jaslene's engagement occurrence intervals behaviors demonstrated that Jaslene viewed 38% of the time, imitated 58% of the time, and was disengaged 4% of the time.

Strength of evidence. Functional relation could be found in the effects of rhyming and non-rhyming conditions on Jaslene's engagement behavior. The pattern indicated that both

conditions were comparable in increasing Jaslene's levels of engagement occurrence intervals. The evidence demonstrated the effects of receiving handshape rhyme awareness intervention and viewing rhyming ASL stories on increasing Jaslene's imitating behavior. Data presented do meet What Works Clearinghouse's standard for moderate evidence.

Recitation: Words signed correctly. See Figure 28 for the visual graph on Jaslene's performance in reciting the words correctly.

Baseline.

Within the rhyming condition in baseline phase. Jaslene recited the rhyming condition of ASL Story 1 on six different days. At first attempt, Jaslene demonstrated a moderately low level of percentage of words signed correctly at 28%. Across the sessions, Jaslene displayed an increasing trend with low variability. The ceiling was attained in the last session. The range of percentages for Jaslene signing the words correctly was between 28% and 100%. Overall, Jaslene's mean percentage of words signed correctly in the baseline phase was 59%.

Within the non-rhyming condition in baseline phase. Jaslene recited the non-rhyming condition of ASL Story 1 on five different days. Jaslene started with a moderately low level of percentage of words signed correctly at 29%. Across the sessions, Jaslene exhibited an increasing trend with some variability. The range of percentages for Jaslene signing the words correctly was between 29% and 96%. Overall, Jaslene's mean percentage of words signed correctly in the baseline phase was 58%.

Between rhyming and non-rhyming conditions in baseline phase. Jaslene's level, trend, and variability of the data paths between both conditions were comparable. In both conditions, Jaslene started at moderately low levels and demonstrated increasing trends with some variability. The mean percentages of signing words correctly in both conditions were similar. By

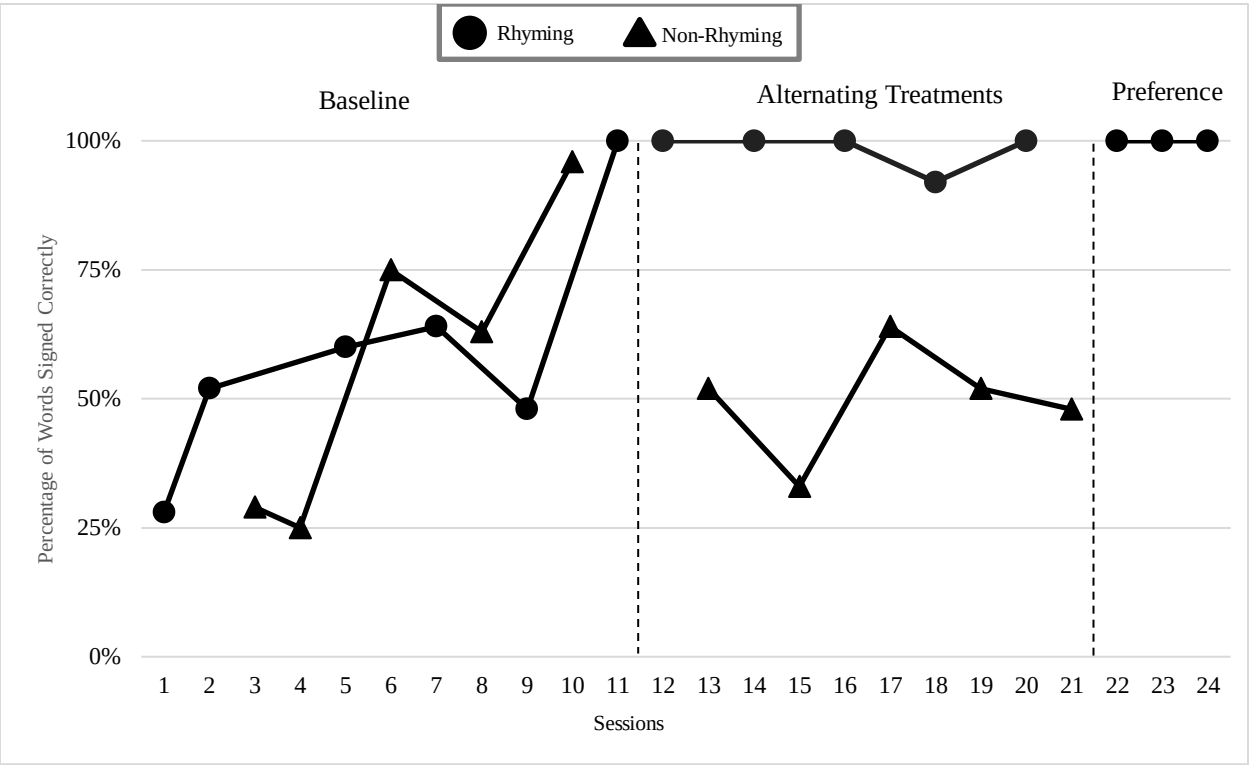


Figure 28. Jaslene's Words Signed Correctly in Recitation

the end of the baseline, Jaslene signed 100% of the words correctly in the rhyming condition and 96% of the words correctly in the non-rhyming condition. The range of percentages for Jaslene's words signed correctly in the rhyming condition (between 28% and 100%) compared to the non-rhyming condition (between 25% and 96%) was also comparable.

Alternating treatments.

Within the rhyming condition in alternating treatments phase. When handshape rhyme awareness intervention concluded, Jaslene recited the rhyming condition of ASL Story 2 on five different days. At first attempt, Jaslene greatly increased his level in signing all of the words correctly and performed at the ceiling. Across sessions, Jaslene had a stable pattern with low variability with a zero trend. The range of percentages for Jaslene signing the words correctly

was between 92% and 100%. Overall, Jaslene's mean percentage of words signed correctly in the alternating treatments phase was 98%.

Within the non-rhyming condition in alternating treatments phase. Jaslene recited the non-rhyming condition of ASL Story 2 on five different days. Jaslene started with a moderate level of percentage of words signed correctly at 52%. Across the sessions, Jaslene had a variable pattern that ended at 48% in the last session. The range of percentages for Jaslene signing the words correctly was between 33% and 64%. Overall, Jaslene's mean percentage of words signed correctly in the alternating treatments phase was 50%.

Between rhyming and non-rhyming conditions in alternating treatments phase. Jaslene's level, trend, and variability in the data paths between both conditions yielded significant differences. In the rhyming condition, Jaslene started at the high level (100%) and demonstrated a stable pattern (zero trend) in signing the words correctly. In the non-rhyming condition, Jaslene started at the moderate level (52%) and did not go higher than 64% in signing the words correctly. The range of percentages for Jaslene's words signed correctly in the rhyming condition was at a higher level (between 92% and 100%) compared to the non-rhyming condition (between 33% and 64%).

Preference.

Within the rhyming condition in preference phase. Jaslene recited the rhyming condition of ASL Story 3 on three different days. In the first session, Jaslene hit the ceiling level and signed all of the words signed correctly. The zero trend continued at the ceiling level with Jaslene signing all of the words correctly for the rest of the sessions. Overall, Jaslene's mean percentage of words signed correctly in the preference phase was 100%.

Strength of evidence. A functional relation could be found in the effects of rhyming and non-rhyming conditions on Jaslene's words signed correctly in the recitation task. The rhyming condition was identified as the superior treatment in increasing Jaslene's words signed correctly. The overall mean levels between baseline and alternating treatments phases as well as the great magnitude of separation of data paths demonstrate a difference in visual effect, providing evidence that handshape rhyme awareness intervention also had an effect on increasing Giada's words signed correctly in the rhyming condition. Data presented meet What Works Clearinghouse's standard for strong evidence.

Recitation: Words signed in the correct order. See Figure 29 for the visual graph of Jaslene's performance in reciting the words in the correct order.

Baseline.

Within the rhyming condition in baseline phase. Jaslene recited the rhyming condition of ASL Story 1 on six different days. Jaslene started at the low level with 8% of words signed in the correct order. Across the sessions, Jaslene displayed a stable pattern with an increasing trend that reached to the high level at 88%. The range of percentages for Jaslene signing the words in the correct order was between 8% and 88%. Overall, Jaslene's mean percentage of words signed in the correct order in the baseline phase was 42%.

Within the non-rhyming condition in baseline phase. Jaslene recited the non-rhyming condition of ASL Story 1 on five different days. In the beginning, Jaslene recited at the base level with 0% of words signed in the correct order for two consecutive sessions. Then, Jaslene displayed a variable pattern with an increasing trend that reached to the high level at 96%. The range of percentages for Jaslene signing the words in the correct order was between 0% and

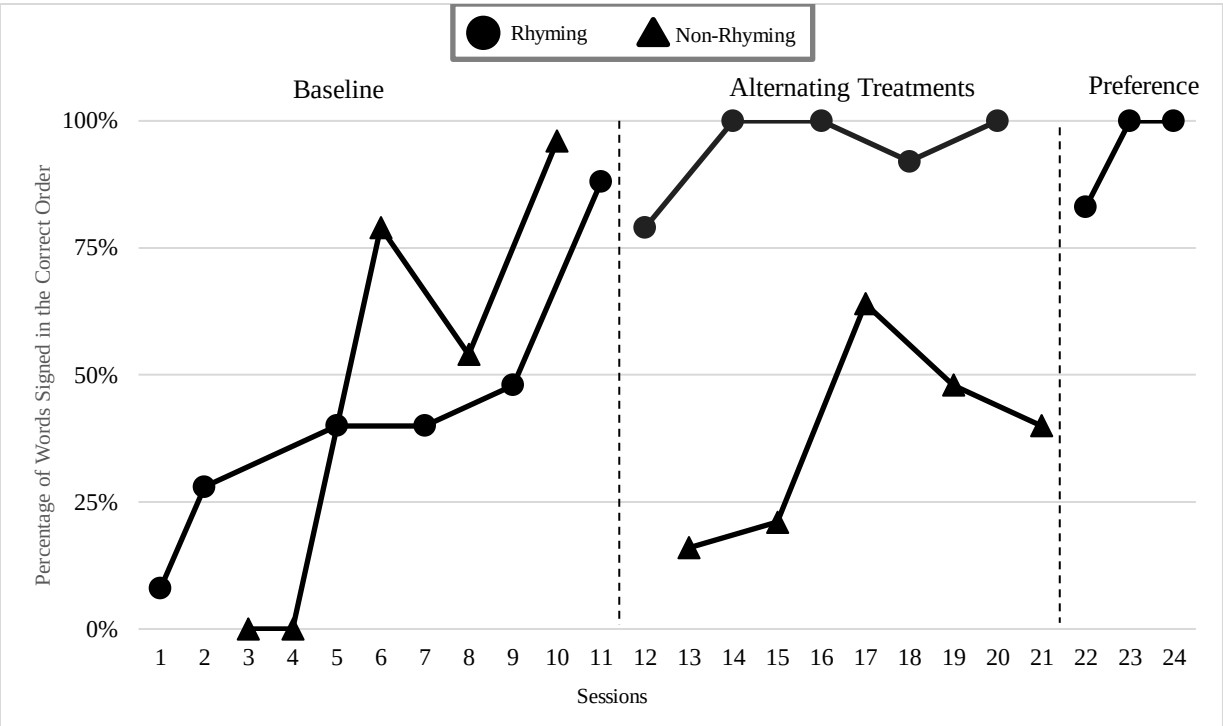


Figure 29. Jaslene's Percentage of Words Signed in the Correct Order in Recitation

96%. Overall, Jaslene's mean percentage of words signed in the correct order in the baseline phase was 46%.

Between rhyming and non-rhyming conditions in baseline phase. Jaslene's level, trend, and variability of the data paths between both conditions were similar. In the rhyming condition, Jaslene started at a low level and demonstrated a stable pattern (increasing trend) in improving in the percentage of words signed in the correct order. In the non-rhyming condition, Jaslene started at the base level and had an increasing trend with some variability in signing the words in the correct order. By the end of the baseline, Jaslene reached at moderately high levels in both conditions with a mean of 42% words signed in the correct order in the rhyming condition and a mean of 46% words signed in the correct order in the non-rhyming condition. The range of percentages for Jaslene's words signed in the correct order was slightly greater in the non-rhyming condition (between 0% and 96%) than the rhyming condition (between 8% and 88%).

Alternating treatments.

Within the rhyming condition in alternating treatments phase. When handshape rhyme awareness intervention ended, Jaslene recited the rhyming condition of ASL Story 2 on five different days. At first attempt, Jaslene produced a moderately high level of percentage of words signed in the correct order at 79%. Across the sessions, Jaslene had an increasing trend with low variability that reached the ceiling in the last session. The range of percentages for Jaslene signing the words in the correct order was between 79% and 100%. Overall, Jaslene's mean percentage of words signed in the correct order in the alternating treatments phase was 94%.

Within the non-rhyming condition in alternating treatments phase. Jaslene recited the non-rhyming condition of ASL Story 2 on five different days. Jaslene started with a low level of percentage of words signed in the correct order at 16%. Across the sessions, Jaslene displayed an increasing trend with some variability, ending with 40% of words signed in the correct order in the last session. The range of percentages for Jaslene signing the words in the correct order was between 16% and 64%. Overall, Jaslene's mean percentage of words signed in the correct order in the alternating treatments phase was 38%.

Between rhyming and non-rhyming conditions in alternating treatments phase. There were some differences in Jaslene's level, trend, and variability of data paths between both conditions. There was a great magnitude of separation of data paths with the rhyming condition being superior. In the rhyming condition, Jaslene started at a moderately high level (79%) and immediately went up to the ceiling with a stable pattern (zero trend) in the percentage of words signed in the correct order. In the non-rhyming condition, Jaslene started at a low level (16%) in signing the words in the correct order and had an increasing trend with variability across sessions. The range of percentages for Jaslene's words signed in the correct order in the rhyming

condition was at a higher level (between 79% and 100%) compared to the non-rhyming condition (between 16% and 64%).

Preference.

Within the rhyming condition in preference phase. Jaslene recited the rhyming condition of ASL Story 3 on three different days. In the first session, Jaslene produced a moderately high level of percentage of words signed in the correct order at 83%. Then, Jaslene increased the percentage of words signed in the correct order to 100% for two consecutive sessions. The range of percentages for Jaslene signing the words in the correct order was between 83% and 100%. Overall, Jaslene's mean of words signed in the correct order in the preference phase was 94%.

Strength of evidence. A functional relation could be found in the effects of rhyming and non-rhyming conditions on Jaslene's words signed in the correct order in the recitation task. The rhyming condition was identified as the superior treatment in increasing Jaslene's words signed in the correct order. The overall mean levels between baseline and alternating treatments phases as well as the magnitude of separation of data paths between conditions presented visual evidence of the effects of receiving handshape rhyme awareness intervention and viewing ASL stories on increasing words signed in the correct order during recitation. Data presented meet What Works Clearinghouse's standard for strong evidence.

Lexie

Engagement behavior. See Figure 30 for the visual graph on Lexie's engagement behavior.

Baseline.

Within the rhyming condition in baseline phase. Lexie viewed the rhyming condition of ASL Story 1 on six different days. Lexie displayed high levels of engagement occurrence

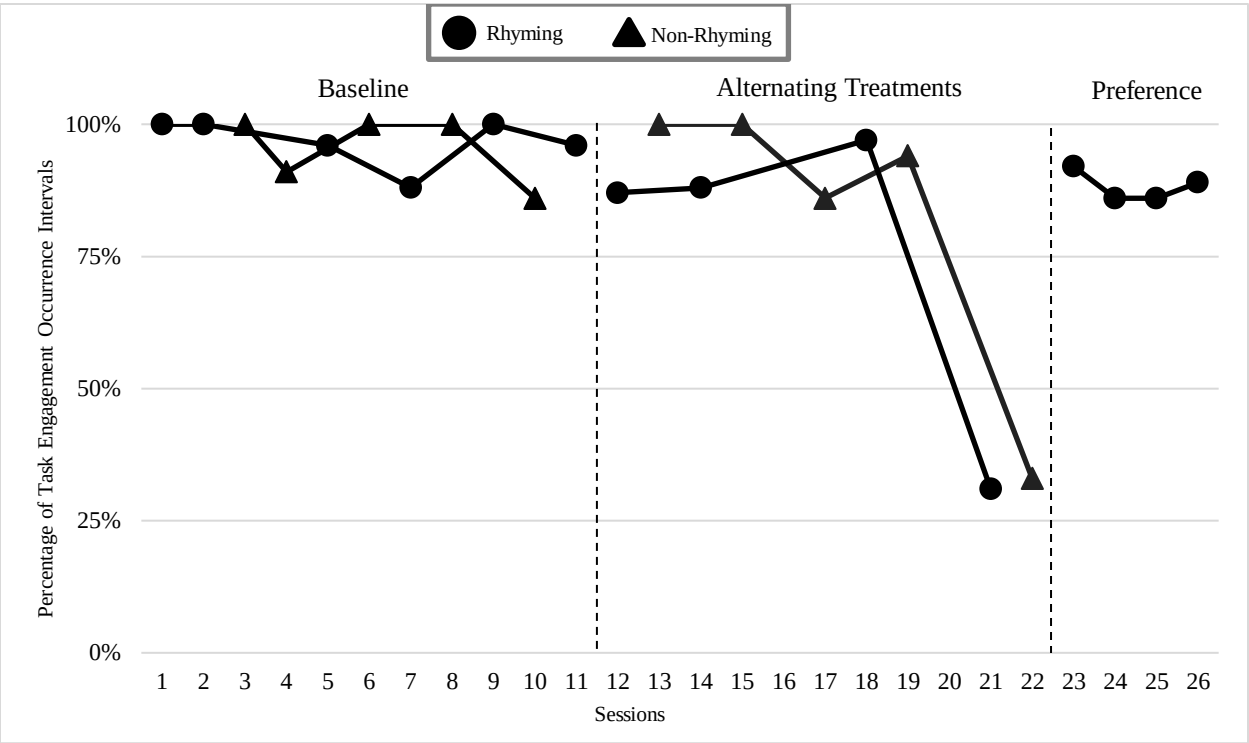


Figure 30. Lexie's Percentage of Task Engagement Occurrence Intervals

intervals with low variability. The range of percentages for Lexie's engagement occurrence intervals was between 88% and 100%. The mean percentage of Lexie's engagement occurrence intervals demonstrated that Lexie viewed 64% of the time, imitated 33% of the time, and was disengaged 3% of the time.

Within the non-rhyming condition in baseline phase. Lexie viewed the non-rhyming condition of ASL Story 1 on five different days. Lexie presented a high level of engagement occurrence intervals with low variability. The range of percentages for Lexie's engagement occurrence intervals was between 86% and 100%. The mean percentage of Lexie's engagement occurrence intervals showed that Lexie viewed 84% of the time, imitated 12% of the time, and was disengaged 4% of the time.

Between rhyming and non-rhyming conditions in baseline phase. Overall, Lexie was comparably engaged in the rhyming condition (88%) and the non-rhyming condition (89%) in

the baseline. Lexie exhibited similar patterns in level, trend, and variability in the data paths of both conditions. However, Lexie imitated more in the rhyming condition (33%) over the non-rhyming condition (12%). The range of percentages for Lexie's engagement occurrence intervals in the rhyming condition was at a similar level (between 88% and 100%) as the non-rhyming condition (between 86% and 100%).

Alternating treatments.

Within the rhyming condition in alternating treatments phase. After handshape rhyme awareness intervention concluded, Lexie viewed the rhyming condition of ASL Story 2 on four different days. Lexie demonstrated high and stable levels of engagement occurrence intervals with low variability except for the last data point, which had decreased to 27%. The range of percentages for Lexie's engagement occurrence intervals was between 31% and 97%. The mean percentage of engagement occurrence intervals indicated that Lexie viewed 46% of the time, imitated 34% of the time, and was disengaged 20% of the time.

Within the non-rhyming condition in alternating treatments phase. Lexie viewed the non-rhyming condition of ASL Story 2 on five different days. Lexie demonstrated high and stable levels of engagement occurrence intervals except for the last session, which ended at 27%. The range of percentages for Lexie's engagement occurrence intervals was between 33% and 100%. The mean percentage of engagement occurrence intervals demonstrated that Lexie viewed 83% of the time, imitated 0% of the time, and was disengaged 17% of the time.

Between rhyming and non-rhyming conditions in alternating treatments phase. After receiving handshape rhyme awareness intervention and, upon introduction of the alternating treatments phase, Lexie maintained high level of engagement occurrence intervals with moderate variability in both conditions. Overall, Lexie was similarly engaged in the rhyming condition

(80%) and the non-rhyming condition (83%) with the non-rhyming condition being slightly superior. Lexie imitated more in the rhyming condition (34%) compared to the non-rhyming condition (0%). There was no clear separation of trends in both conditions making to conclude a more efficacious condition.

Preference.

Within the rhyming condition in preference phase. Lexie viewed the rhyming condition of ASL Story 3 on four different days. Lexie displayed moderately high and stable levels of engagement occurrence intervals. The range of percentages for Lexie's engagement occurrence intervals was between 86% and 92%. The mean percentage of engagement occurrence intervals demonstrated that Lexie viewed 68% of the time, imitated 21% of the time, and was disengaged 11% of the time.

Strength of evidence. Functional relation could be found in the effects of rhyming and non-rhyming conditions on Lexie's engagement behavior. The rhyming condition was superior in increasing the imitating behavior. After repeatedly viewing the ASL videos, there was a decrease in engagement. Data presented do meet What Works Clearinghouse's standard for moderate evidence.

Recitation: Words signed correctly. See Figure 31 for the visual graph on Lexie's performance in reciting the words correctly.

Baseline.

Within the rhyming condition in baseline phase. Lexie recited the rhyming condition of ASL Story 1 on six different days. In the first session, Lexie demonstrated a low level of percentage of words signed correctly at 36%. Across the sessions, Lexie displayed a variable pattern in improving in the percentage of words signed correctly. The range of percentages for

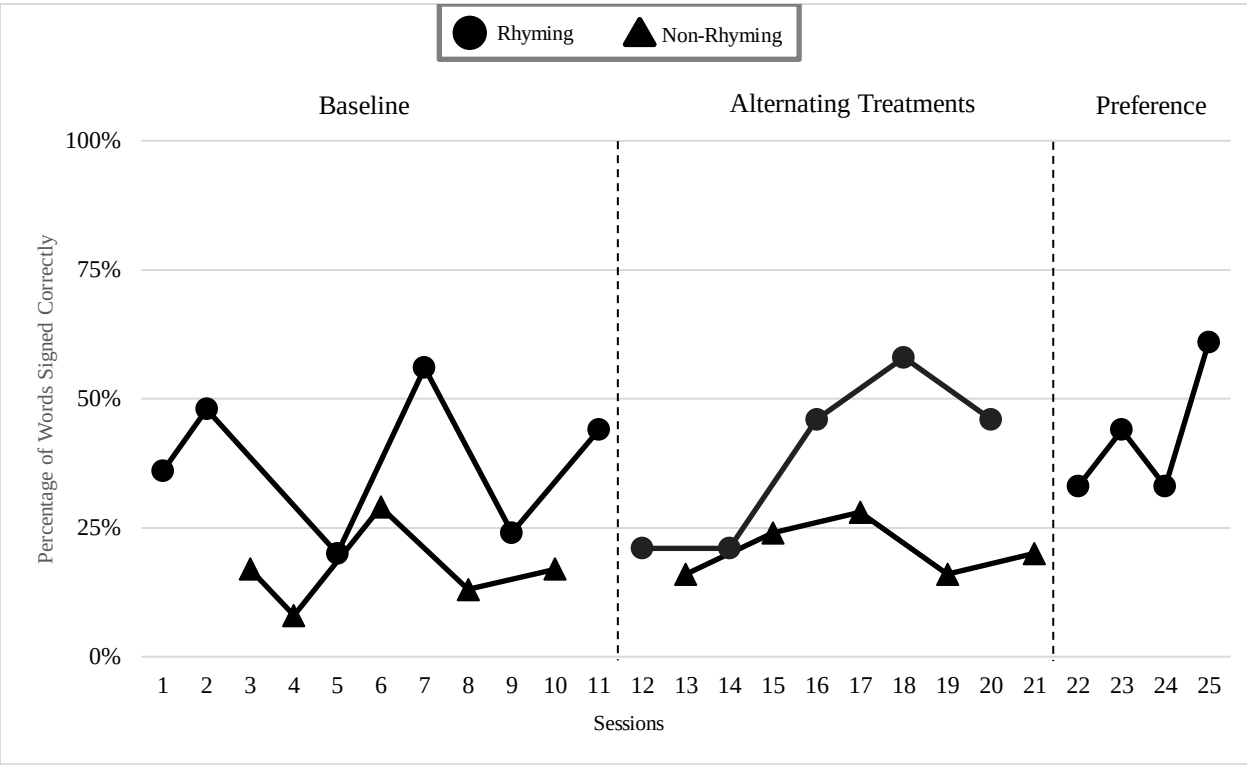


Figure 31. Lexie's Percentage of Words Signed Correctly in Recitation

Lexie signing the words correctly was between 20% and 56%. Overall, Lexie's mean percentage of words signed correctly in the baseline phase was 38%.

Within the non-rhyming condition in baseline phase. Lexie recited the non-rhyming condition of ASL Story 1 on five different days. Lexie started at a low level of percentage of words signed correctly at 17%. Across the sessions, Lexie had a variable pattern in words signed correctly and remained at the low level. The range of percentages for Lexie signing the words correctly was between 8% and 29%. Overall, Lexie's mean percentage of words signed correctly in the baseline phase was 17%.

Between rhyming and non-rhyming conditions in baseline phase. Lexie's trend and variability between both conditions in the baseline were similar, but the level was higher in the rhyming condition. In the rhyming condition, Lexie started at a moderately low level and

demonstrated a variable pattern with a total mean of 38% words signed correctly. In the non-rhyming condition, Lexie started at a low level and had a variable pattern with a total mean of 17% words signed correctly. In the last session, Lexie signed 44% of the words correctly in the rhyming condition and 17% of the words correctly in the non-rhyming condition. The range of percentages for Lexie's words signed correctly in the rhyming condition was at a higher level (between 20% and 56%) compared to the non-rhyming condition (between 8% and 29%). There was a consistent separation in the data paths of a small magnitude in both conditions.

Alternating treatments.

Within the rhyming condition in alternating treatments phase. Upon the completion of handshape rhyme awareness intervention, Lexie recited the rhyming condition of ASL Story 2 on five different days. At first attempt, Lexie produced a moderately low level of percentage of words signed correctly at 21%. Across the sessions, Lexie demonstrated a stable pattern with an increasing trend. The range of percentages for Lexie's words signed correctly was between 21% and 58%. Overall, Lexie's mean percentage of words signed correctly in the alternating treatments phase was 38%.

Within the non-rhyming condition in alternating treatments phase. Lexie recited the non-rhyming condition of ASL Story 2 on five different days. In the beginning, Lexie demonstrated a low level of percentage of words signed correctly at 16%. Across the sessions, Lexie had a stable pattern with low variability that remained in the low level. The range of percentages for Lexie's words signed correctly was between 16% and 28%. Overall, Lexie's mean percentage of words signed correctly in the alternating treatments phase was 21%.

Between rhyming and non-rhyming conditions in alternating treatments phase. Lexie's trend and variability between both conditions in the alternating treatments were comparable, but

the level was higher in the rhyming condition. In the rhyming condition, Lexie started at a moderately low level (21%) and demonstrated an increasing trend with small variability in improving in the percentage of words signed correctly. In the non-rhyming condition, Lexie started at a low level (16%) and also displayed an increasing trend with low variability. The total mean of Lexie's words signed correctly was 38% in the rhyming condition and 21% in the non-rhyming condition. The range of percentages for Lexie's words signed correctly in the rhyming condition was at a higher level (between 21% and 58%) compared to the non-rhyming condition (between 16% and 28%).

Preference.

Within the rhyming condition in preference phase. Lexie recited the rhyming condition of ASL Story 3 on four different days. Lexie started a moderately low level of percentage of words signed correctly at 33%. The pattern was variable with an increasing trend. The range of percentages for Lexie's words signed correctly was between 33% and 61%. Overall, Lexie's mean percentage of words signed correctly in the preference phase was 43%.

Strength of evidence.

A functional relation could be found in the effects of rhyming and non-rhyming conditions on Lexie's words signed correctly in the recitation task. The rhyming condition was identified as the favorable treatment in increasing Lexie's words signed correctly. However, the effects of rhyme awareness intervention on increasing Lexie's words signed correctly were not demonstrated in the overall mean levels between baseline and alternating treatments phases. Data presented meet What Works Clearinghouse's standard for strong evidence on the superiority of the rhyming condition in increasing Lexie's words signed correctly. Data, however, do not

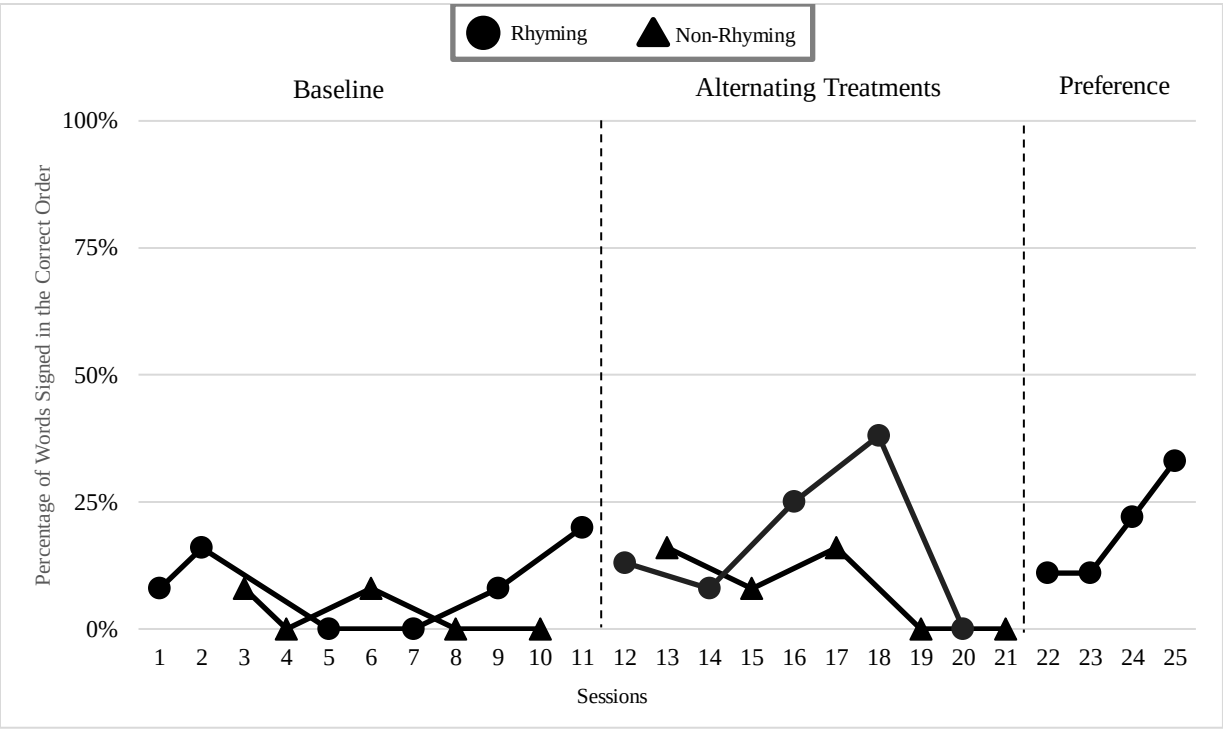


Figure 32. Lexie's Percentage of Words Signed in the Correct Order

demonstrate evidence of the effects of handshape rhyme awareness interventions, failing to meet the WWC standards.

Recitation: Words signed in the correct order. See Figure 32 for the visual graph of Lexie's performance in reciting the words in the correct order.

Baseline.

Within the rhyming condition in baseline phase. Lexie recited the rhyming condition of ASL Story 1 on six different days. Lexie started at a low level with 8% of words signed in the correct order. Across the sessions, Lexie displayed a variable pattern with an increasing trend in the last three consecutive sessions. The range of percentages for Lexie's words signed in the correct order was between 0% and 20%. Overall, Lexie's mean percentage of words signed in the correct order in the baseline phase was 9%.

Within the non-rhyming condition in baseline phase. Lexie recited the non-rhyming condition of ASL Story 1 on five different days. In the beginning, Lexie demonstrated a low level with 8% of words signed in the correct order. Then, Lexie yielded a variable pattern that remained in the base level. The range of percentages for Lexie's words signed in the correct order was between 0% and 8%. Overall, Lexie's mean percentage of words signed in the correct order in the baseline phase was 3%.

Between rhyming and non-rhyming conditions in baseline phase. Lexie's trend and variability in both conditions in were similar with the rhyming condition being in the higher level. In the rhyming condition, Lexie started at the low level and demonstrated a variable pattern in signing words in the correct order with an increasing trend in the last three consecutive sessions. In the non-rhyming condition, Lexie had a variable pattern in signing words in the correct order with a mostly zero trend. I the last session, Lexie signed 20% of the words in the correct order in the rhyming condition and 0% of the words in the correct order in the non-rhyming condition. The range of percentages for Lexie's words signed in the correct order in the rhyming condition was at a higher level (between 0% and 20%) compared to the non-rhyming condition (between 0% and 8%).

Alternating treatments.

Within the rhyming condition in alternating treatments phase. After handshape rhyme awareness intervention concluded, Lexie recited the rhyming condition of ASL Story 2 on five different days. At first attempt, Lexie produced a low level of percentage of words signed in the correct order at 13%. Across the sessions, Lexie exhibited a stable pattern with an increasing trend that suddenly plummeted to the base level in the last session. The range of percentages for

Lexie's words signed in the correct order was between 0% and 38%. Overall, Lexie's mean percentage of words signed in the correct order in the alternating treatments phase was 17%.

Within the non-rhyming condition in alternating treatments phase. Lexie recited the non-rhyming condition of ASL Story 2 on five different days. Lexie started with a low level of percentage of words signed in the correct order at 16%. Across the sessions, Lexie had a variable pattern with a decreasing trend that remained at the base level in the last two sessions. The range of percentages for Lexie's words signed in the correct order was between 0% and 16%. Overall, Lexie's mean percentage of words signed in the correct order in the alternating treatments phase was 8%.

Between rhyming and non-rhyming conditions in alternating treatments phase. Lexie's trend and variability in both conditions in were similar with the rhyming condition being in the higher level. In the rhyming condition, Lexie started at a low level (13%) and demonstrated a stable pattern (increasing trend) in improving in the percentage of words signed in the correct order with an exception of the last session. In the non-rhyming condition, Lexie had a variable pattern in words signed in the correct order with a decreasing trend that remained in the base level in the last two sessions. The range of percentages for Lexie's words signed in the correct order in the rhyming condition was at a higher level (between 0% and 38%) compared to the non-rhyming condition (between 0% and 16%).

Preference.

Within the rhyming condition in preference phase. Lexie recited the rhyming condition of ASL Story 3 on four different days. In the first session, Lexie produced a low level of percentage of words signed in the correct order at 1%. Then, Lexie displayed a stable pattern with an increasing trend in the subsequent sessions. The range of percentages for Lexie's words signed in

the correct order was between 11% and 33%. Overall, Lexie's mean of words signed in the correct order in the preference phase was 19%.

Strength of evidence. A functional relation could be found in the effects of rhyming and non-rhyming conditions on Lexie's words signed in the correct order in the recitation task. The overall mean levels show a small difference between both condition with the rhyming condition being superior in increasing Lexie's percentage of words signed in the correct order during recitation. The overall mean levels between baseline and alternating treatments phases demonstrate a difference in visual effect, providing evidence that handshape rhyme awareness intervention also had an effect on increasing Lexie's words signed in the correct order in the rhyming condition. The rhyming condition was identified as the superior treatment in increasing Lexie's words signed in the correct order. Due to the presence of non-effects, data presented do not meet What Works Clearinghouse's standard for moderate evidence.

Group Results

The performance in engagement and recitation tasks of the five participants, henceforth referred as the Visual Analysis (VA) participants, who met this study's criteria for inclusion of visual analysis are looked at as a whole group through the total mean percentage and mean difference. Then, the performance of subgroups based on variables such as age, language abilities, and vocabulary knowledge are reported. To compare with the results of the VA participants, the same whole group and subgroup analysis is extended to include the rest of the participants in this study who did not have sufficient data to meet the requirement for visual analysis, totaling up to 10 participants.

Engagement

Rhyming and non-rhyming conditions in each phase.

Visual analysis participants. See Figure 33. For the group of VA participants, the mean of total percentage of engagement occurrence intervals in the baseline was 92% in the rhyming condition (39% imitating, 53% viewing) and 90% in the non-rhyming condition (30% imitating, 60% viewing). The mean of total percentage of engagement occurrence intervals in the alternating treatments phase was 77% in the rhyming condition (45% imitating, 32% viewing) and 82% in the non-rhyming condition (23% imitating, 59% viewing). The mean of total percentage of engagement occurrence intervals in the preference phase was 78% in the rhyming condition (43% imitating, 35% viewing). Although participants were similarly engaged in both conditions, they imitated more while viewing rhyming ASL stories in baseline and alternating treatments phases. After receiving handshape rhyme awareness intervention, participants were slightly less engaged in both conditions in the alternating treatments phase, but their imitating behavior in the rhyming condition increased.

All participants. See Figure 34**.** For the whole group of 10 participants, the mean of total percentage of engagement occurrence intervals in the baseline was 83% in the rhyming condition (31% imitating, 52% viewing) and 89% in the non-rhyming condition (24% imitating, 65% viewing). The mean of total percentage of engagement occurrence intervals in the alternating treatments phase was 71% in the rhyming condition (35% imitating, 36% viewing) and 74% in the non-rhyming condition (15% imitating, 59% viewing). The mean of total percentage of engagement occurrence intervals in the preference phase was 72% in the rhyming condition (28% imitating, 44% viewing). Similar to the results in the VA participants group, even though all 10 participants were comparably engaged in both conditions, there were more instances of

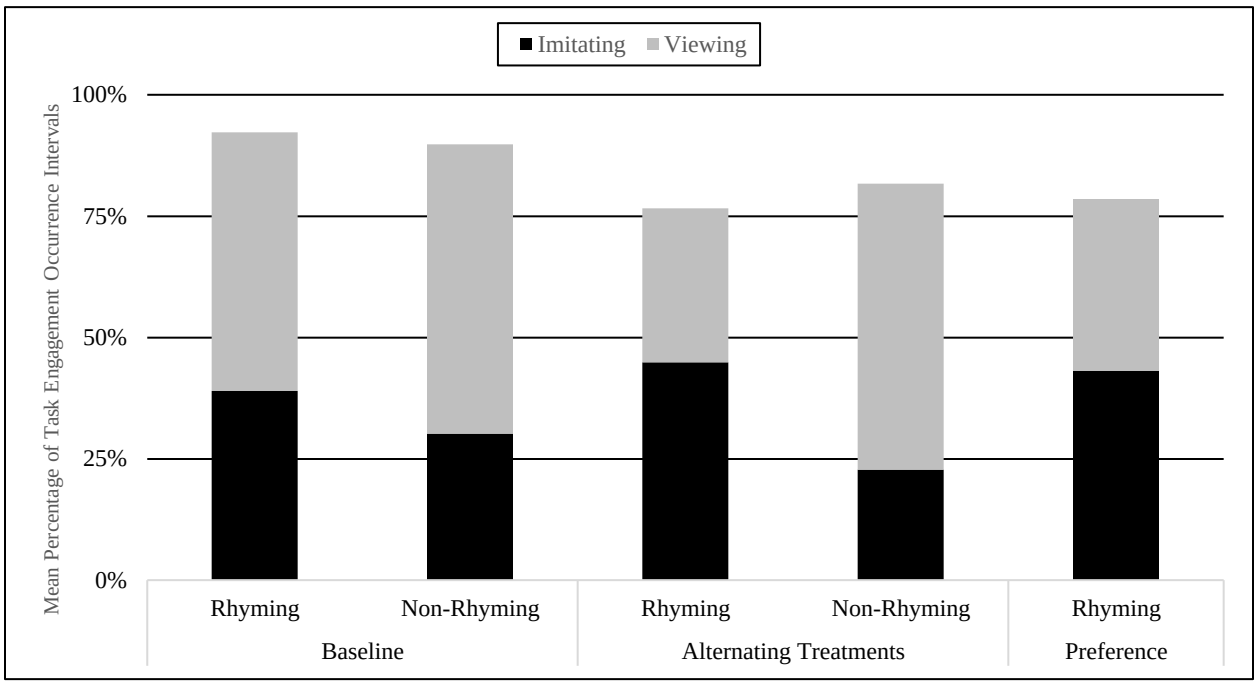


Figure 33. Task Engagement by Phase and Condition, Visual Analysis Participants

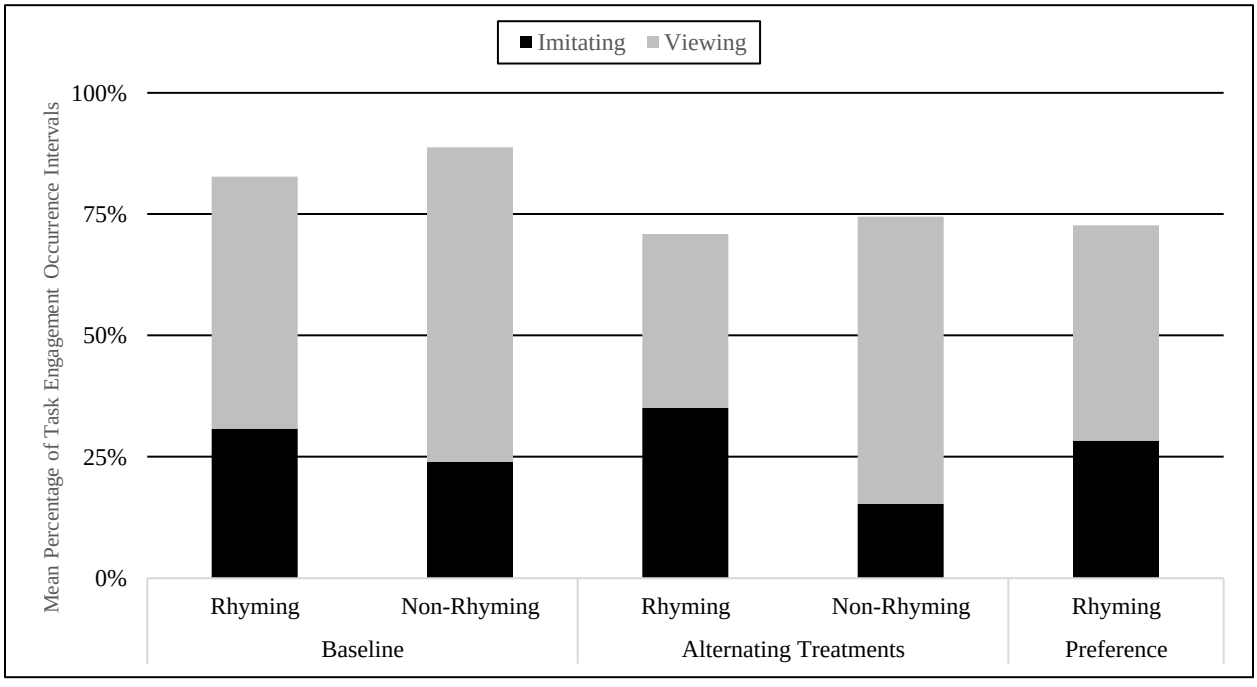


Figure 34. Task Engagement by Phase and Condition, All Participants

imitating behavior while viewing rhyming ASL stories in baseline and alternating treatments phases. When handshape rhyme awareness intervention concluded, participants were a little less engaged in both conditions in the alternating treatments phase, but their imitating behavior in the rhyming condition increased.

Language abilities as a variable in both conditions across all phases.

***Visual analysis participants*.** See Figure 35. VA participants' scores in Visual Communication Sign Language assessment were looked at as a variable in increasing engagement. Two participants had typical language abilities (one year or less delay in language development) and three participants were delayed in their language abilities. VA participants with typical language abilities were more engaged in both conditions over VA participants with delayed language abilities. While both subgroups imitated more in the rhyming condition, the mean percentage of the imitating behavior in the typical language subgroup (74% in the rhyming condition, 57% in the non-rhyming condition) greatly surpassed the delayed language subgroup (21% in the rhyming condition, 3% in the non-rhyming condition). Across all phases, the rhyming condition elicited more imitating behavior in VA participants with typical and delayed language abilities. VA participants with typical language abilities were the most engaged and demonstrated the highest imitating behavior in both conditions.

***All participants*.** See Figure 36**.** The whole 10 participants' scores in Visual Communication Sign Language assessment were analyzed as a variable in increasing engagement. Five participants had typical language abilities, and five participants had delayed language abilities. Similar to the results in the VA participants group, the typical language subgroup was more engaged in rhyming and non-rhyming conditions over the delayed language subgroup. Although both subgroups imitated more in the rhyming condition, the mean

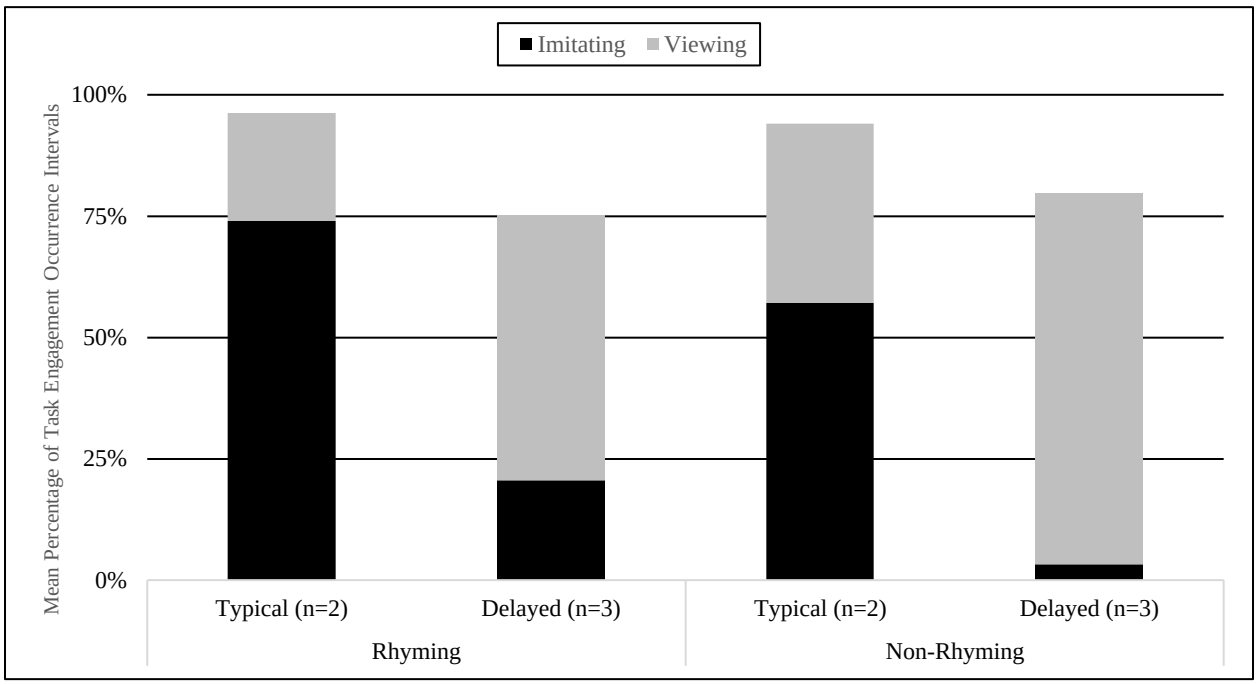


Figure 35. Task Engagement by Language Assessment and Condition, Visual Analysis Participants

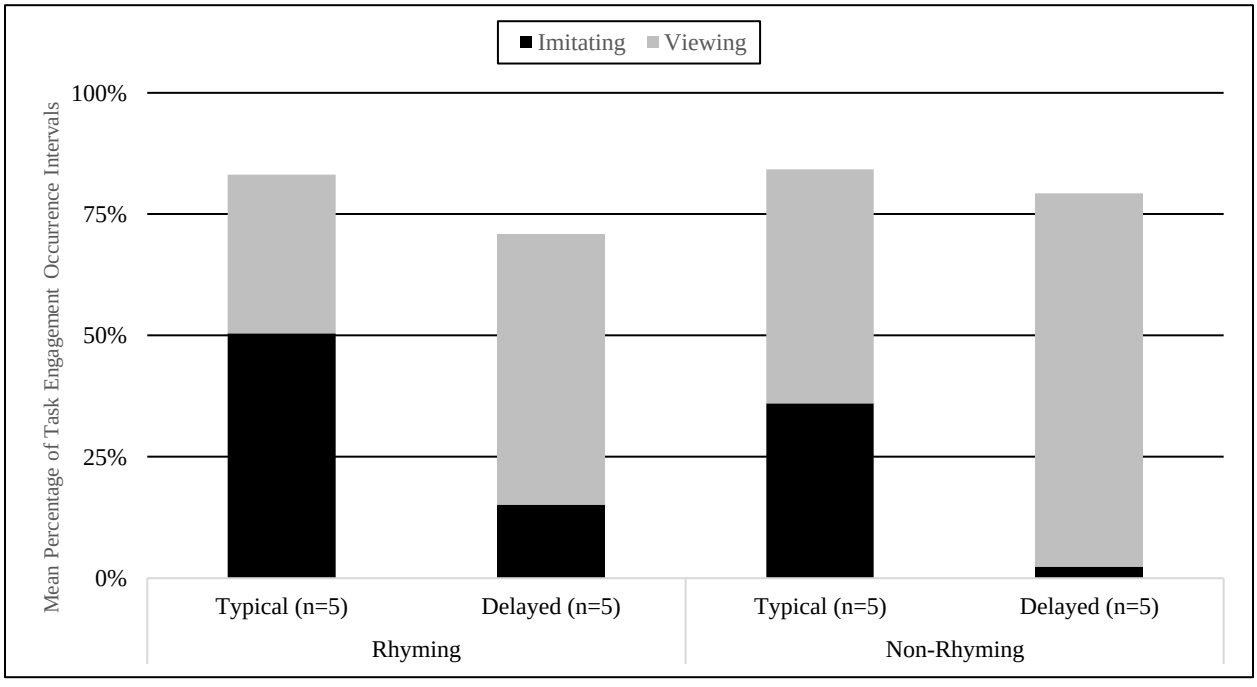


Figure 36. Task Engagement by Language Assessment and Condition, All Participants

percentage of the imitating behavior in the typical language subgroup (50% in the rhyming condition, 36% in the non-rhyming condition) was much higher than the delayed subgroup (15% in the rhyming condition, 2% in the non-rhyming condition). Across all phases, all participants imitated more in the rhyming condition. Participants with typical language abilities displayed the highest engagement and imitating behavior in both conditions.

Vocabulary knowledge as a variable in both conditions across all phases.

Visual analysis participants. See Figure 37. VA participants' scores in the picture vocabulary assessment were examined as a variable in increasing engagement. There were three subgroups of participants' knowledge of the target words in the ASL stories: little (0-8 signed words), some (9-18 signed words), and most (19-23 signed words). Three participants knew some target signed words, and two participants knew most target signed words in the stories. VA participants who had the highest vocabulary knowledge were a little more engaged (96% in the rhyming condition, 94% in the non-rhyming condition) and imitated a lot more (74% in the rhyming condition, 57% in the non-rhyming condition) compared to those who had some vocabulary knowledge (76% engaged in the rhyming condition, 80% engaged in the non-rhyming condition and 21% imitation in the rhyming condition, 3% imitation in the non-rhyming condition). Across all phases, the rhyming condition had drawn more imitating behavior in participants who knew some and most of the target vocabulary in the ASL stories. The participants with the most vocabulary knowledge had the highest engagement and imitating behavior in both conditions.

All participants. See Figure 38. All 10 participants' scores in the picture vocabulary assessment were looked at as a variable in increasing engagement. One participant had little vocabulary knowledge, three participants had some vocabulary knowledge, and six participants

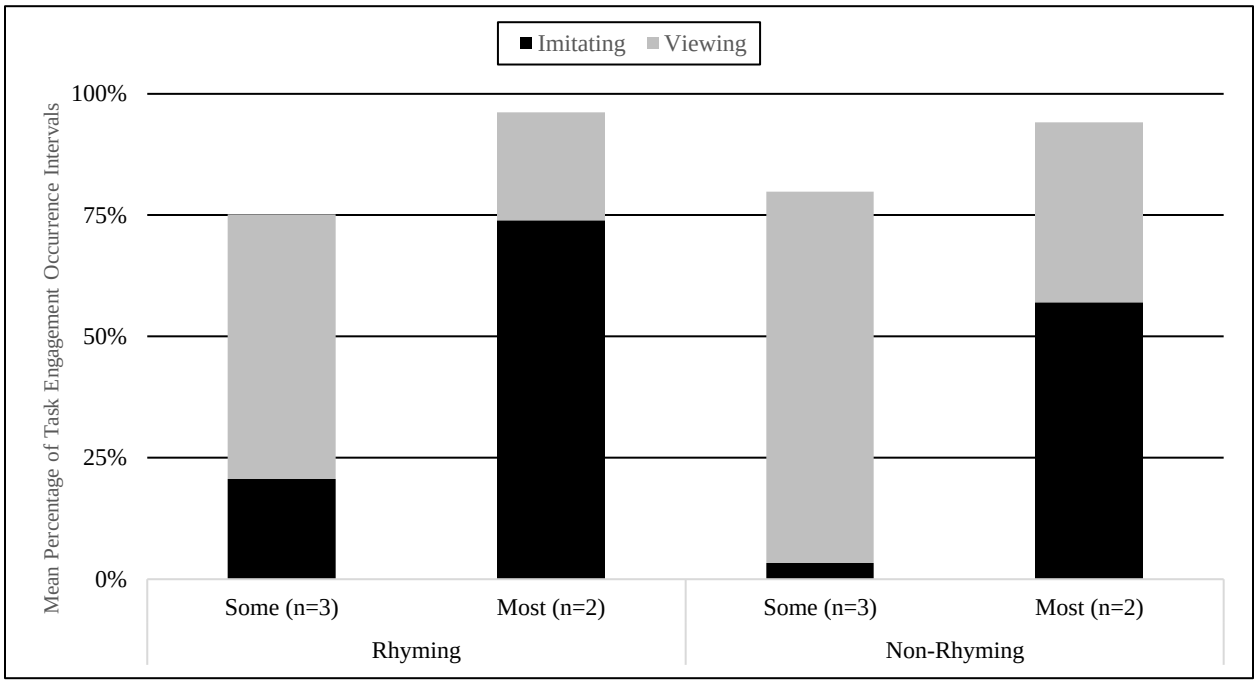


Figure 37. Task Engagement by Vocabulary Knowledge and Condition, Visual Analysis Participants

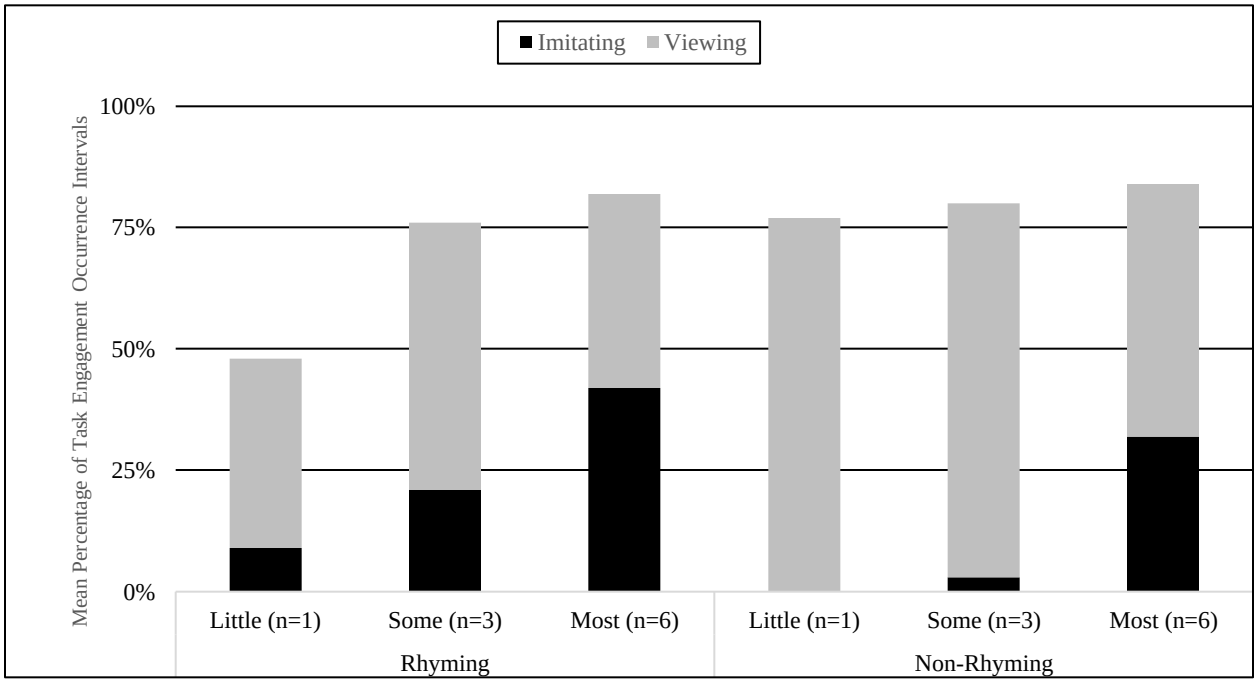


Figure 38. Task Engagement by Vocabulary Knowledge and Condition, All Participants

had most vocabulary knowledge. Similar to VA participants' results, participants who knew most of the signed words in the ASL stories were more engaged (82% in the rhyming condition, 84% in the non-rhyming condition) and imitated a lot more (42% in the rhyming condition, 32% in the non-rhyming condition) compared to those who knew some or little signed words. Participants with some vocabulary knowledge also were more engaged (76% in the rhyming condition, 80% in the non-rhyming condition) and imitated more (21% in the rhyming condition, 3% in the non-rhyming condition) over those with little vocabulary knowledge (48% engaged and 9% imitation in the rhyming condition, 77% engaged and 0% imitation in the non-rhyming condition). Across all phases, all participants imitated more in the rhyming condition. The more vocabulary the participants knew, the more they viewed and imitated ASL stories in both conditions.

Age as a variable in both conditions across all phases.

Visual analysis participants. See Figure 39. Age as a variable in increasing engagement with the rhyming and non-rhyming conditions in the VA participants group was examined. Two participants were four years old, two participants were five years old, and one participant was six years old. Differences in performance on the recitation task were found with five-year-old participants being more engaged (96% in the rhyming condition, 94% in the non-rhyming condition) and demonstrating more imitating behavior (74% in the rhyming condition, 57% in the non-rhyming condition) than four-year-old participants (67% engaged in the rhyming condition, 72% engaged in the non-rhyming condition and 15% imitation in the rhyming condition, 1% imitation in the non-rhyming condition). Across all phases, the rhyming condition elicited more imitating behaviors in four-, five-, and six-year-old participants. Five- and six-year -old participants were overall more engaged in both conditions than four-year-old participants.

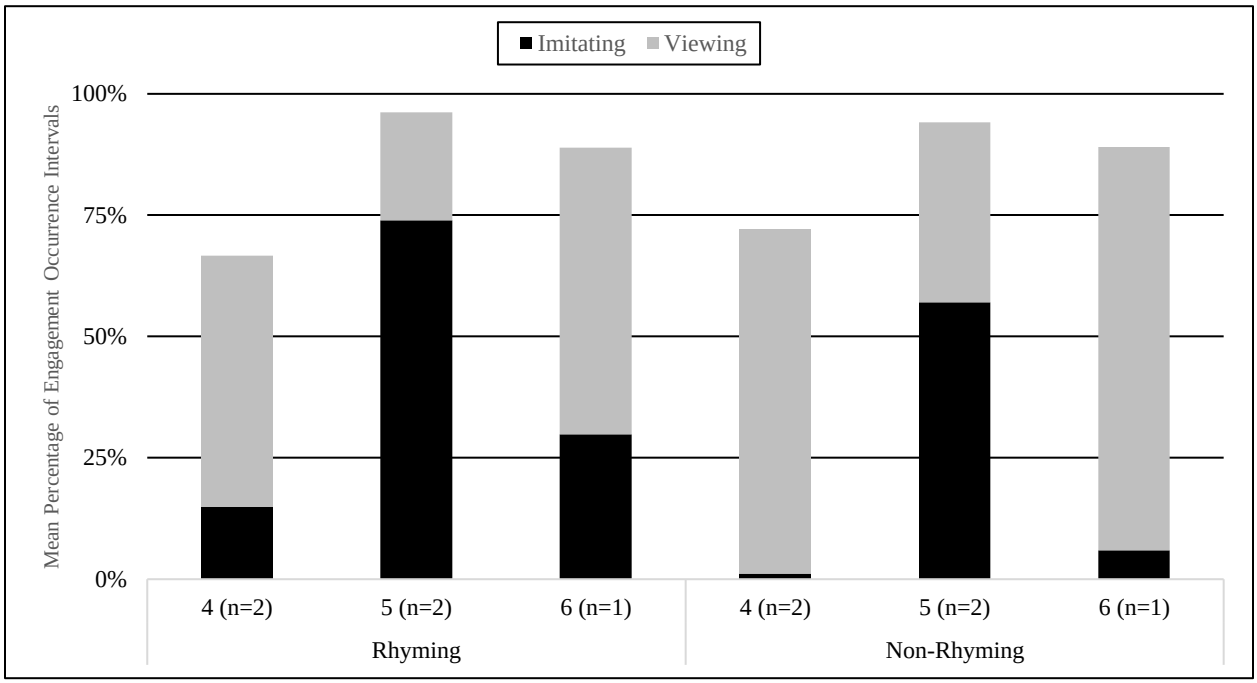


Figure 39. Task Engagement by Age and Condition, Visual Analysis Participants

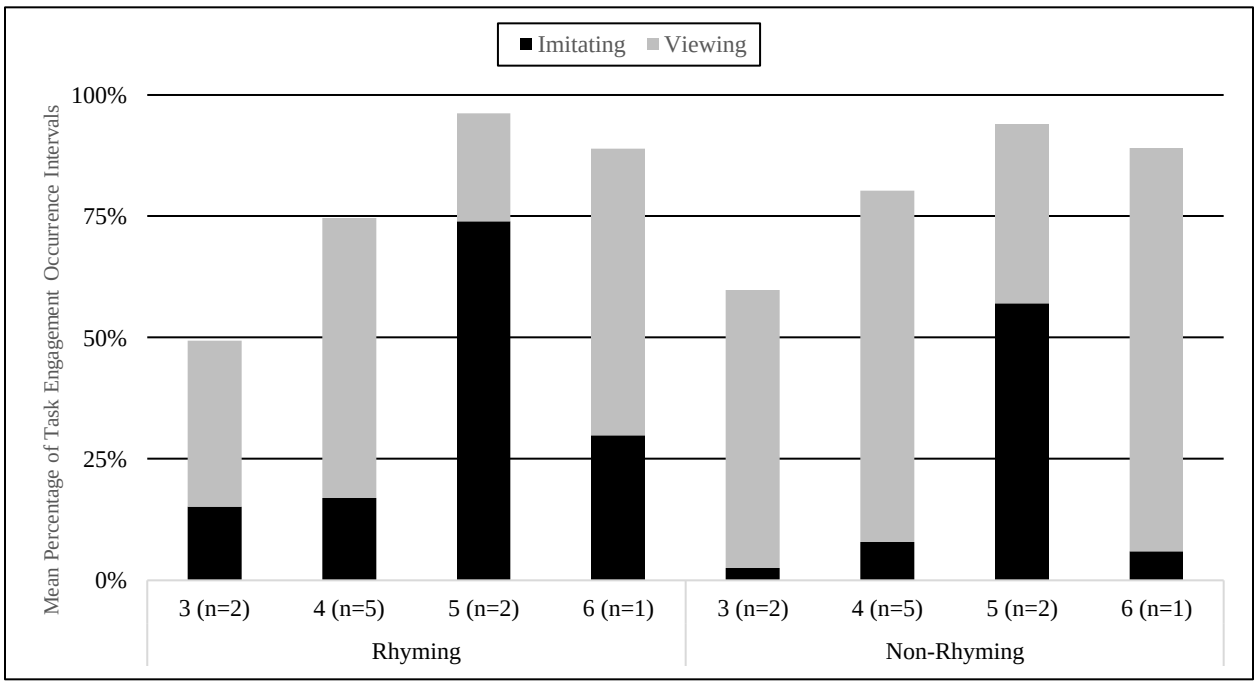


Figure 40. Task Engagement by Age and Condition, All Participants

All participants. See Figure 40. Age as a variable in increasing the whole group of 10 participants' engagement in the rhyming and non-rhyming conditions was explored. Two participants were three years old, five participants were four years old, two participants were five years old, and one participant was six years old. Like the previous results in the VA participants group, data continued to be consistent in showing participants of older ages having greater engagement and imitating behaviors over younger participants. The six-year-old adopted participant who only had two years of exposure to a language (ASL) demonstrated engagement levels that were under the performance of five-year-old participants and imitating behaviors that were above the performance of three- and four-year-old participants. All participants across ages imitated more in the rhyming condition.

Recitation: Words Signed Correctly

Rhyming and non-rhyming conditions in each and across phases.

Visual analysis participants. See Figure 41. The overall performance of the VA participants' group in reciting the words correctly in each phase was analyzed. During the baseline, VA participants performed similarly in the recitation task in both treatments with the rhyming condition being slightly superior. The mean percentage of words signed correctly in the baseline phase was 50% in the rhyming condition and 41% in the non-rhyming condition. After handshape rhyme awareness intervention was given, a greater separation could be seen in data paths across both conditions in the recitation task. The mean percentage of words signed correctly in the alternating treatments phase increased to 70% in the rhyming condition and decreased to 35% in the non-rhyming condition. With the rhyming treatment selected as the preferred condition, the mean percentage of words signed correctly in the preference phase was 65%. All phases altogether, the mean percentage of words signed correctly was 61% in the

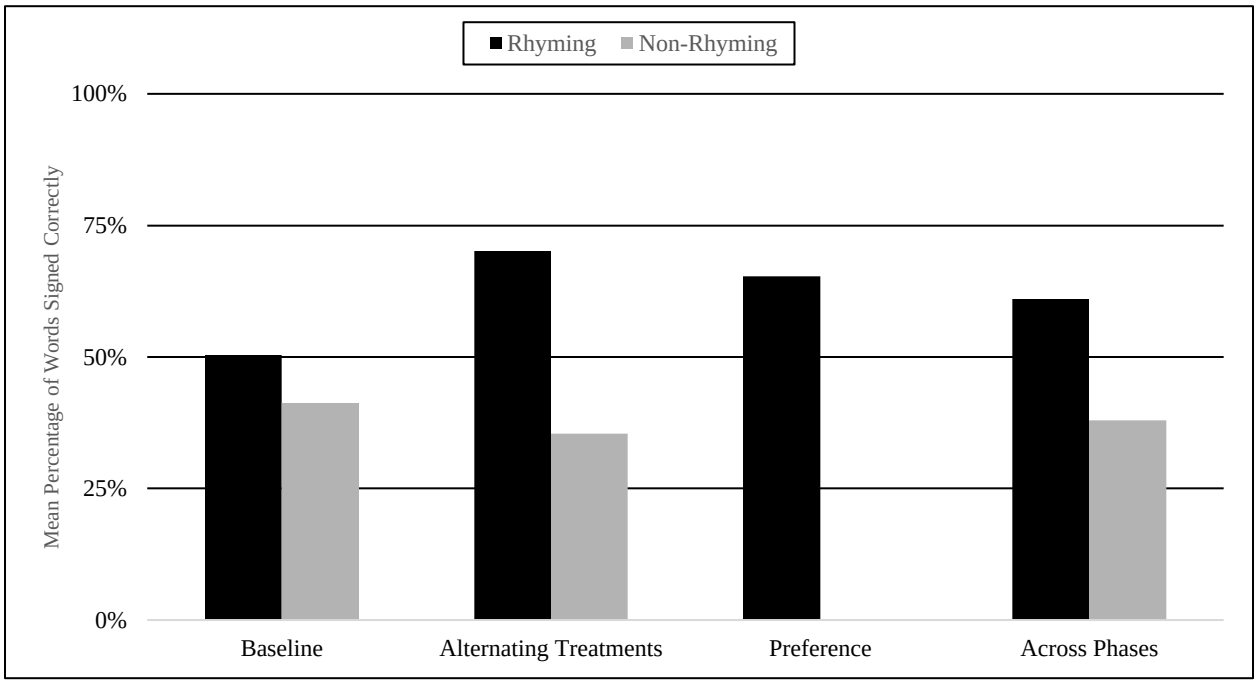


Figure 41. Words Signed Correctly by Phase and Condition, Visual Analysis Participants

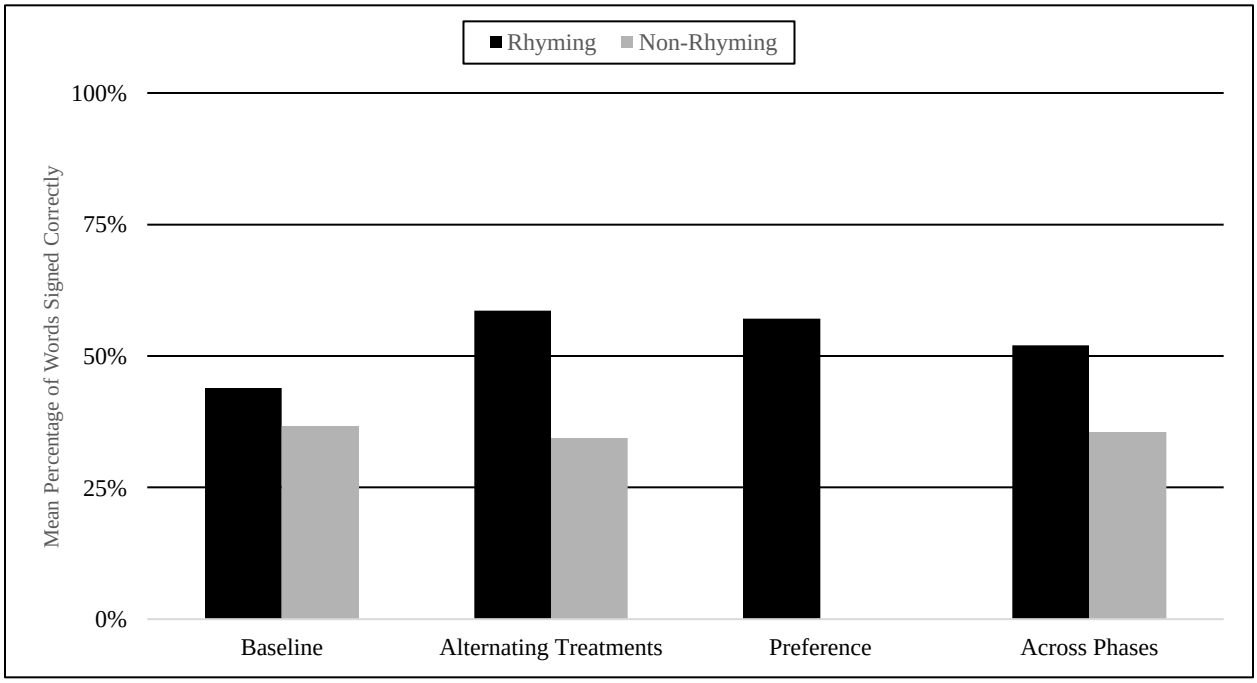


Figure 42. Words Signed Correctly by Phase and Condition, All Participants

rhyming condition and 38% in the non-rhyming condition. This means, overall within phases and all phases combined, VA participants signed more words correctly in the rhyming condition. After receiving handshape rhyme awareness intervention, VA participants' words signed correctly increased in alternating treatments and preference phases.

All participants. See Figure 43. The results of overall performance in the recitation task for the whole group of 10 participants in each phase were analyzed. During the baseline, participants performed similarly in the recitation task in both treatments with the rhyming condition being slightly superior. The mean percentage of words signed correctly in the baseline phase was 44% in the rhyming condition and 37% in the non-rhyming condition. After handshape rhyme awareness intervention was given, a clearer distinction could be distinguished in performance across both conditions in the recitation task. The mean percentage of words signed correctly in the alternating treatments phase increased to 59% in the rhyming condition and decreased to 34% in the non-rhyming condition. With the rhyming treatment selected as the preferred condition, the mean percentage of words signed correctly in this phase was 57%. All phases altogether, the mean of words signed correctly was 52% in the rhyming condition and 36% in the non-rhyming condition. This means, overall within phases and all phases combined, 10 participants as a whole group signed more words correctly in the rhyming condition. After receiving handshape rhyme awareness intervention, there was a higher percentage in VA participants' words signed correctly in alternating treatments and preference phases.

Language abilities as a variable in both conditions across all phases.

Visual analysis participants. See Figure 44. VA participants' scores in Visual Communication Sign Language assessment were examined as a variable in increasing words

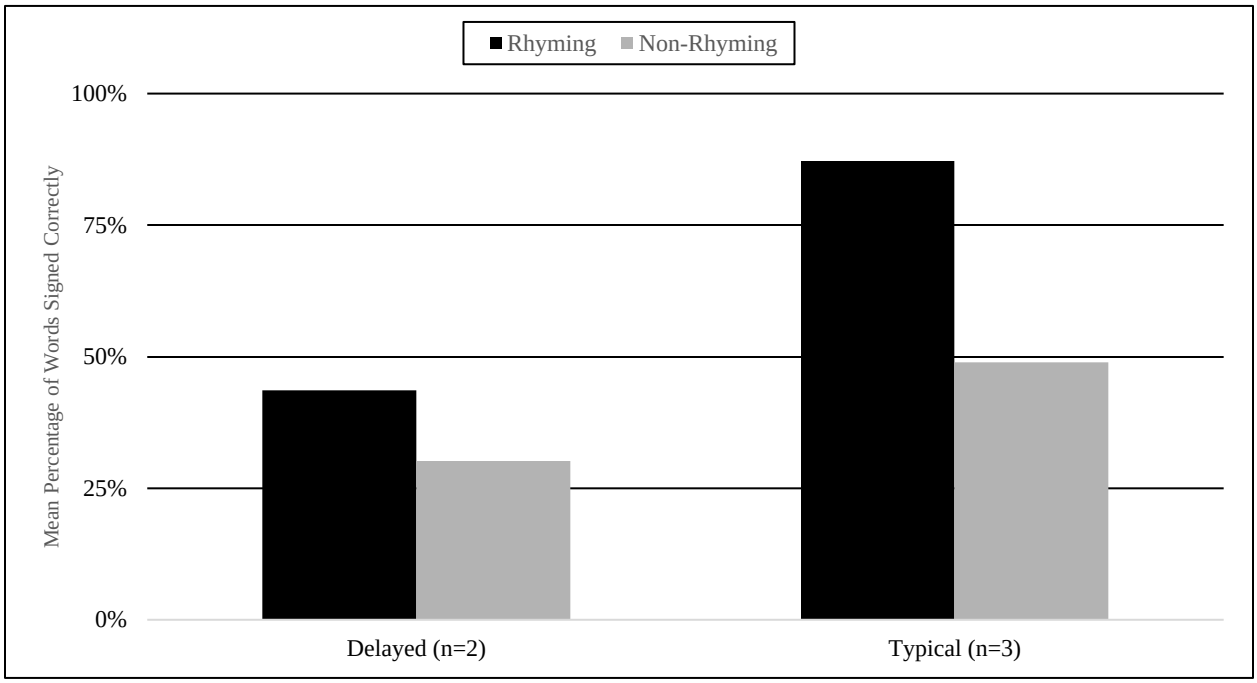


Figure 43. Words Signed Correctly by Language Assessment and Condition, Visual Analysis Participants

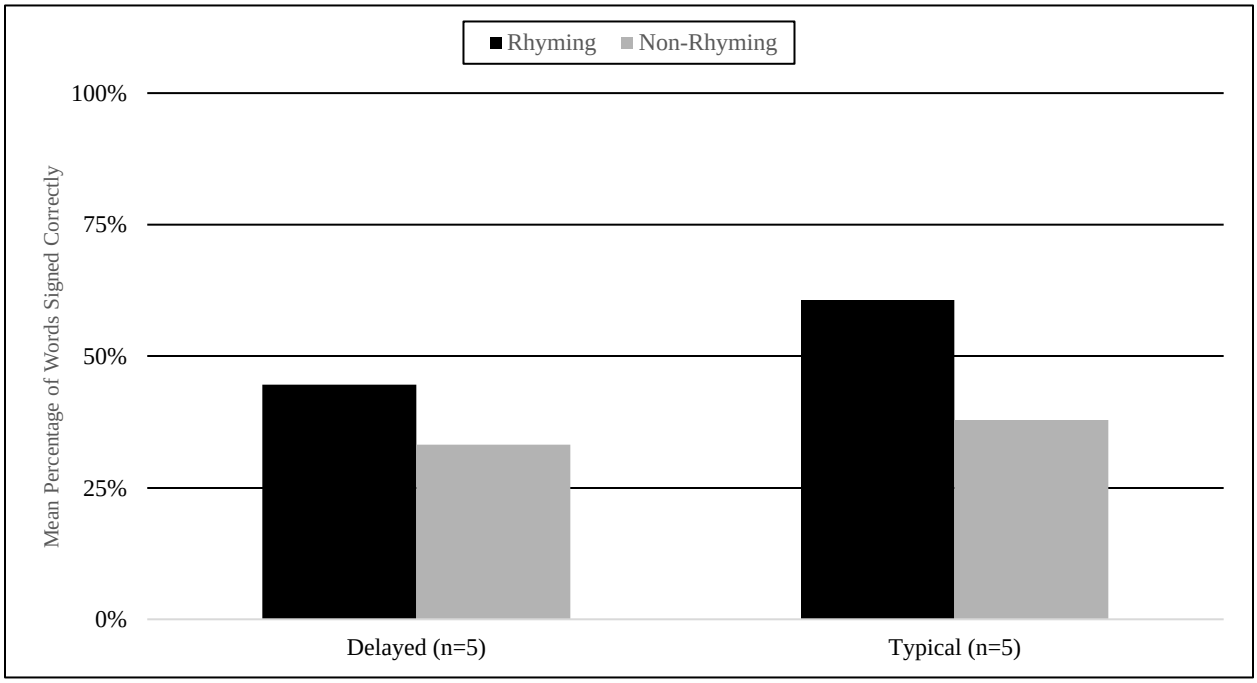


Figure 44. Words Signed Correctly by Language Assessment and Condition, All Participants

signed correctly in the recitation task. Two participants had typical language abilities (one year or less delay in language development) and three participants were delayed in their language abilities. Differences in performance on the recitation task were discerned between two subgroups. VA participants with typical language abilities provided more words signed correctly in both conditions than VA participants with delayed language abilities. In the typical language subgroup, the mean of words signed correctly was 87% in the rhyming condition and 49% in the non-rhyming condition. In the delayed language subgroup, the mean of words signed correctly was 44% in the rhyming condition and 30% in the non-rhyming condition. Although participants with higher language abilities had higher performance across conditions, both subgroups still signed more words correctly in the rhyming condition than the non-rhyming condition.

All participants. See Figure 43. All 10 participants' scores in Visual Communication Sign Language assessment were analyzed as a variable in increasing words signed correctly in the recitation task. Five participants had typical language abilities, and five participants had delayed language abilities. Like the results reported in the VA group, there was a difference between two subgroups of participants based on language abilities. Participants with typical language abilities provided more words signed correctly in both conditions over the participants with delayed language abilities. In the typical language subgroup, the mean of words signed correctly was 61% in the rhyming condition and 38% in the non-rhyming condition. In the delayed language subgroup, the mean of words signed correctly was 45% in the rhyming condition and 33% in the non-rhyming condition. Both subgroups, regardless of their language abilities, signed more words correctly in the rhyming condition over the non-rhyming condition.

Vocabulary knowledge as a variable in both conditions across all phases.

Visual analysis participants. See Figure 45. VA participants' vocabulary knowledge as a

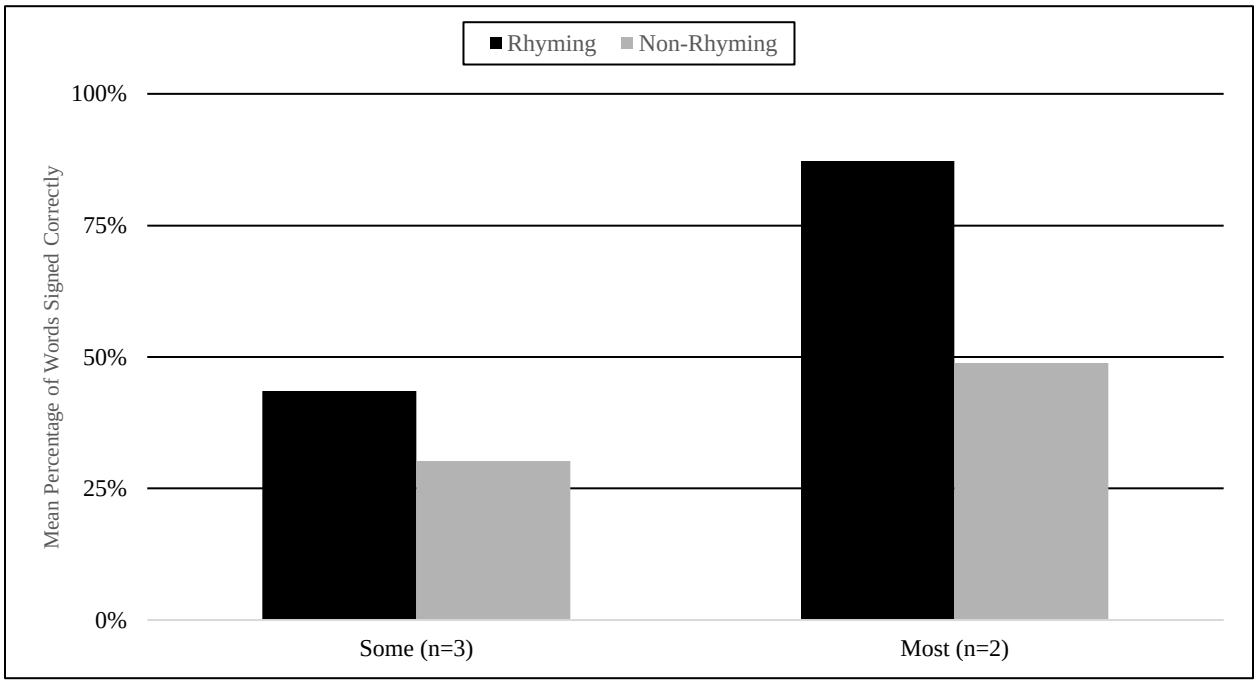


Figure 45. Words Signed Correctly by Vocabulary Knowledge and Condition, Visual Analysis Participants

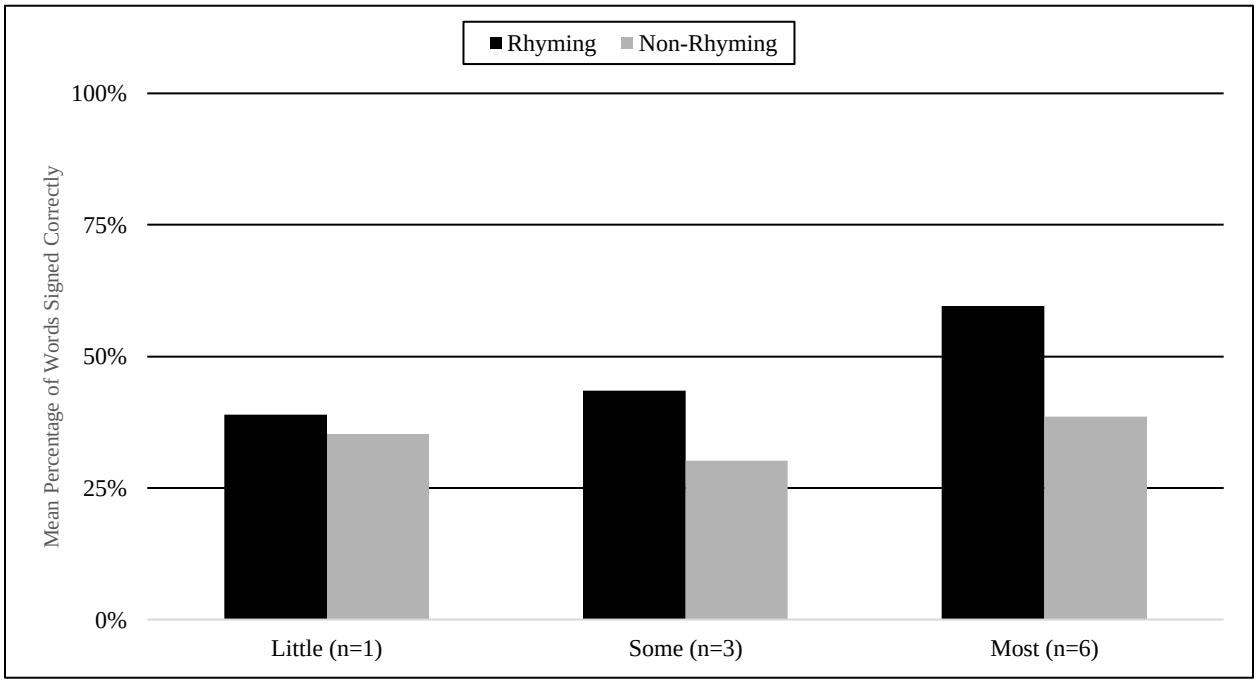


Figure 46. Words Signed Correctly by Vocabulary Knowledge and Condition, All Participants

variable in increasing words signed correctly were looked using scores in the vocabulary assessment. VA participants were split into three potential subgroups based on how much target words they knew in the ASL stories: little (0-8 signed words), some (9-18 signed words), and most (19-23 signed words). Three participants knew some target signed words, and two participants knew most target signed word. The VA participants who knew the most vocabulary signed more words correctly (87% in the rhyming condition, 49% in the non-rhyming condition) in the recitation task than those who knew some vocabulary (44% in the rhyming condition, 30% in the non-rhyming condition). Both subgroups signed more words correctly in the rhyming condition.

All participants. See Figure 46. All 10 participants' vocabulary knowledge as a variable in increasing words signed correctly were examined. One participant had little vocabulary knowledge, three participants had some vocabulary knowledge, and six participants had most vocabulary knowledge. Similar to the results in the VA participants group, participants who knew the most vocabulary signed more words correctly (60% in the rhyming condition, 39% in the non-rhyming condition) than those who knew some vocabulary (44% in the rhyming condition, 30% in the non-rhyming condition). Those who knew some vocabulary did better than those who knew little vocabulary (39% in the rhyming condition, 35% in the non-rhyming condition). All participants, regardless of their vocabulary knowledge, signed more words correctly in the rhyming condition.

Age as a variable in both conditions across all phases.

Visual analysis participants. See Figure 47. Age was looked at as a variable in increasing words signed correctly in the recitation task among VA participants. Two participants were four years old, two participants were five years old, and one participant was six years old. Differences

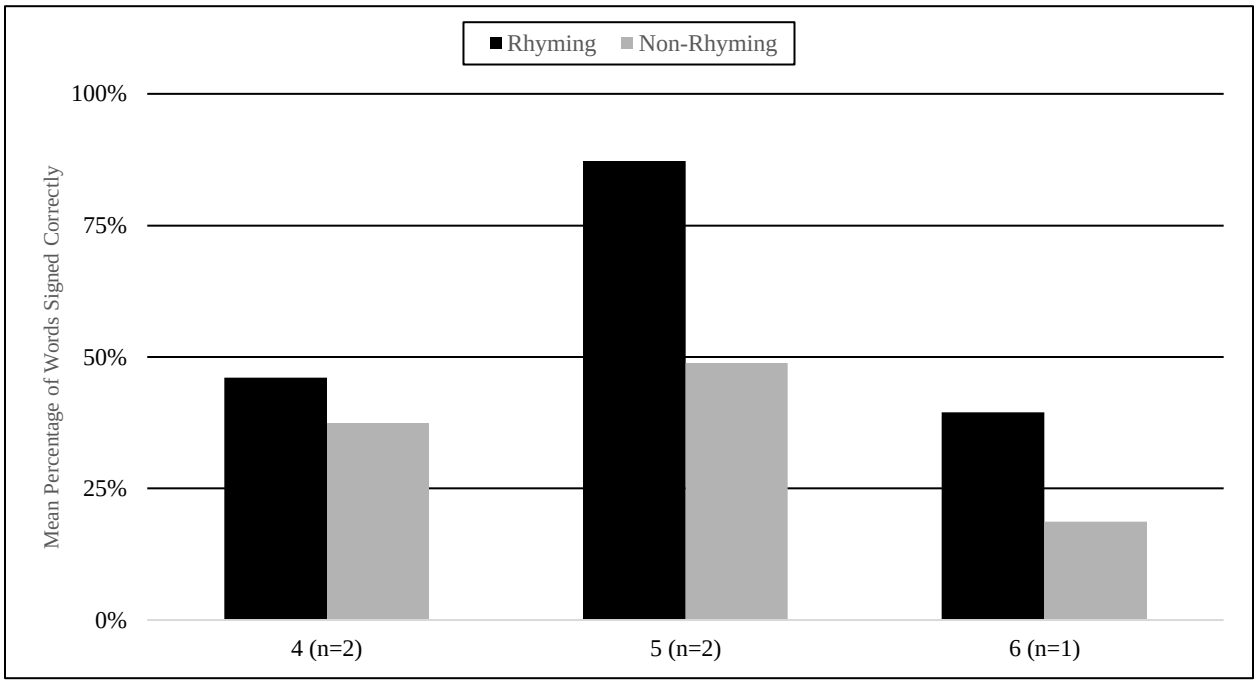


Figure 47. Words Signed Correctly by Age and Condition, Visual Analysis Participants

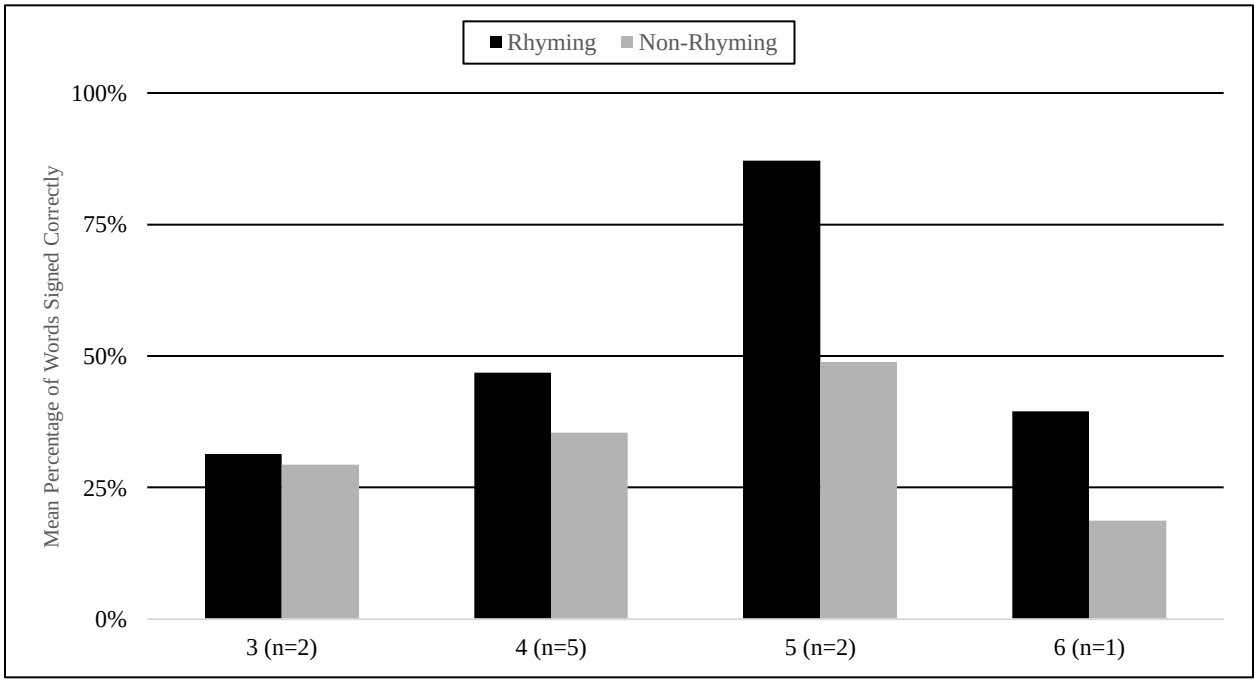


Figure 48. Words Signed Correctly by Age and Condition, All Participants

in performance on the recitation task were found with five-year-old participants reciting more words signed accurately than four-year-old participants. The mean percentage of five-year-old participants' words signed correctly was 87% in the rhyming condition and 49% in the non-rhyming condition. The mean percentage of four-year-old participants' words signed correctly was 47% in the rhyming condition and 35% in the non-rhyming condition. The six-year-old participant who had two years of language exposure was able to recite some words correctly with a mean percentage of 39% in the rhyming condition and 18% in the non-rhyming condition. All participants regardless of age had superior performance in the rhyming condition.

All participants. See Figure 48. When looking at age as a variable in increasing words signed correctly with reciting the rhyming and non-rhyming conditions among 10 participants, the results were not dissimilar from the VA participants group. Two participants were three years old, five participants were four years old, two participants were five years old, and one participant was six years old. The mean percentage of three-year-old participants' words signed correctly was 31% in the rhyming condition and 29% in the non-rhyming condition. The mean percentage of four-year-old participants' words signed correctly was 47% in the rhyming condition and 35% in the non-rhyming condition. The mean percentage of five-year-old participants' words signed correctly was 87% in the rhyming condition and 49% in the non-rhyming condition. The mean percentage of the six-year-old participant's words signed correctly was 39% in the rhyming condition and 18% in the non-rhyming condition. Older participants with an exception of the six-year-old participant performed better than younger participants in both conditions. The rhyming condition produced the highest percentage in words signed correctly across ages.

Recitation: Words Signed in the Correct Order

Rhyming and non-rhyming conditions in each and across phases.

Visual analysis participants. See Figure 49. The results of overall performance in the recitation task for the VA participants group in each phase were explored. During the baseline, VA participants performed identically in the recitation task in both conditions with a mean percentage of words signed in the correct order at 30%. After handshape rhyme awareness intervention was given, VA participants greatly improved their performance in the rhyming condition in the alternating treatments phase. The mean percentage of words signed in the correct order in the alternating treatments phase increased to 61% in the rhyming condition while there was a decrease in the non-rhyming condition to 25%. With the rhyming treatment selected as the preferred condition, the mean percentage of words signed in the correct order in this phase was 55%. All phases altogether, the mean percentage of words signed in the correct order was 47% in the rhyming condition and 27% in the non-rhyming condition. Participants greatly improved the mean percentage of words signed in the correct order in the rhyming condition after receiving handshape rhyme awareness intervention.

All participants. See Figure 50. The results of overall performance in the recitation task for the whole group of 10 participants in each phase were looked at. During the baseline, participants performed similarly in the recitation task in both conditions with the rhyming condition being slightly superior (28% in the rhyming condition, 26% in the non-rhyming condition). After handshape rhyme awareness intervention was given, there was a jump in the rhyming condition in the alternating treatments phase with a mean percentage of 51% of words signed in the correct order. The non-rhyming condition in the alternating treatments showed no

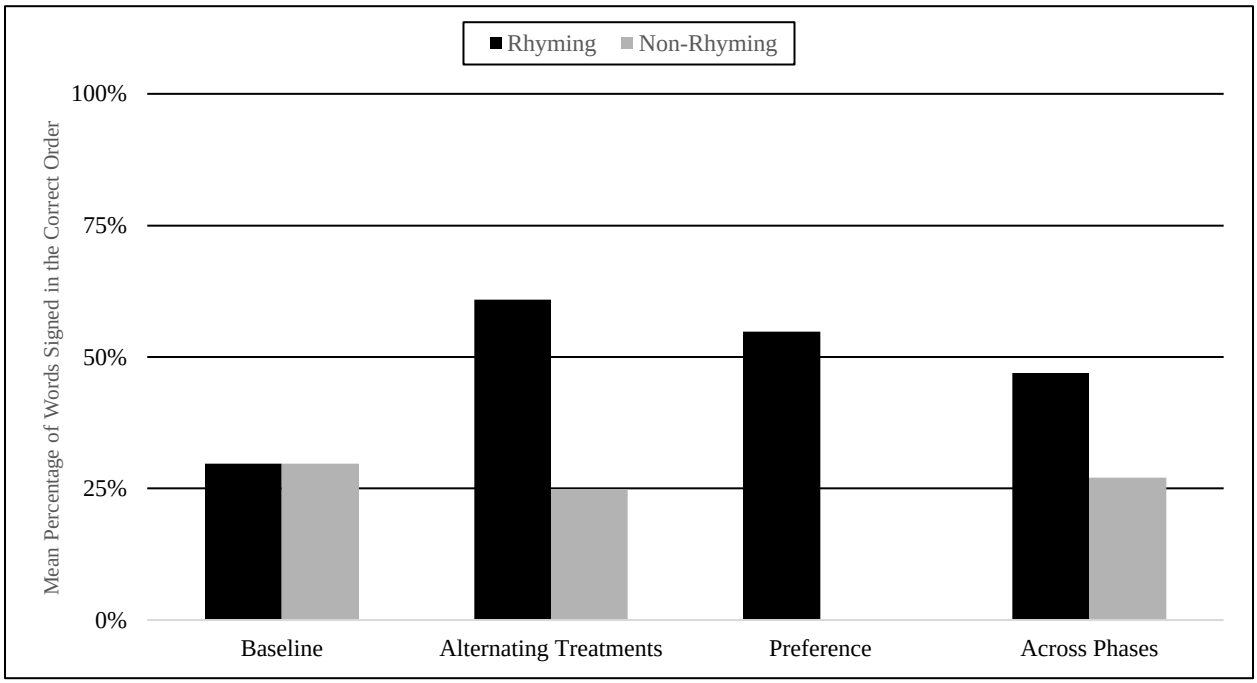


Figure 49. Words Signed in Correct Order by Phase and Condition, Visual Analysis Participants

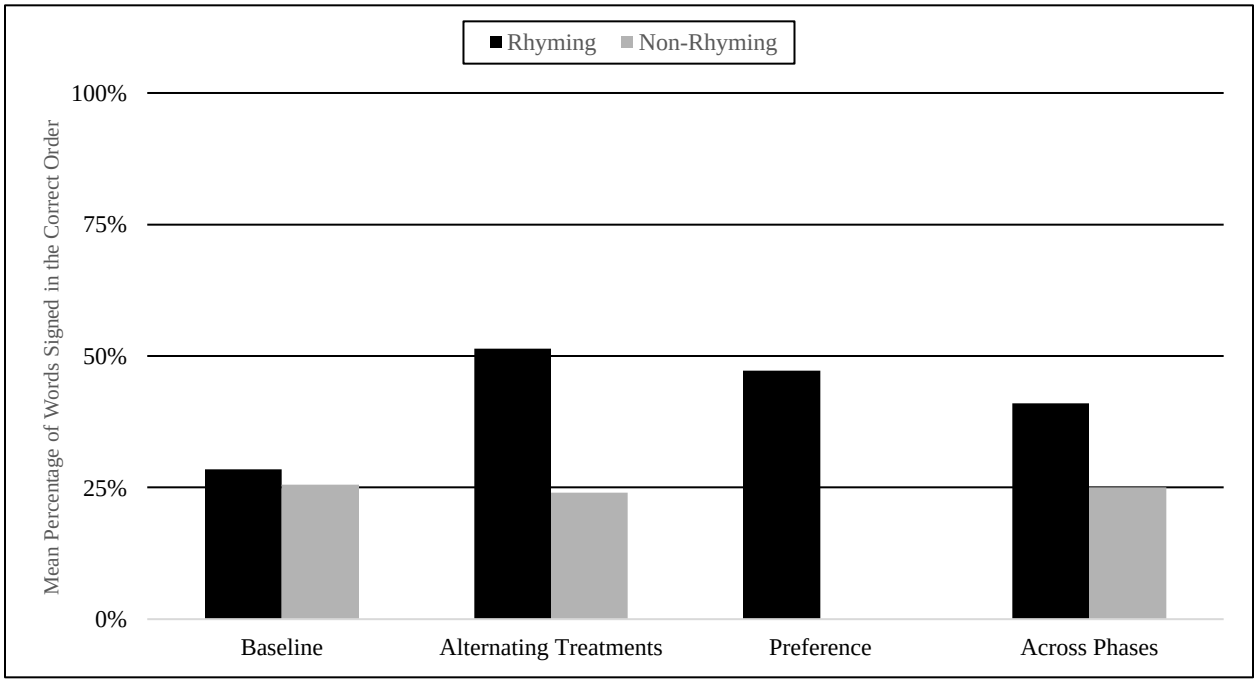


Figure 50. Words Signed in Correct Order by Phase and Condition, All Participants

improvement in signing words in the correct order. With the rhyming treatment selected as the preferred condition, the mean percentage of words signed in the correct order in this phase was 47%. All phases altogether, the mean of words signed correctly was 41% in the rhyming condition and 25% in the non-rhyming condition. After receiving handshape rhyme awareness intervention, there was a higher percentage in participants' words signed in the correct order in alternating treatments and preference phases.

Language abilities as a variable in both conditions across all phases.

Visual analysis participants. See Figure 51. VA participants' scores in Visual Communication Sign Language assessment were analyzed as a variable in increasing words signed in the correct order in the recitation task. Two participants had typical language abilities (one year or less delay in language development) and three participants were delayed in their language abilities. There was a great difference between these two subgroups. VA participants with typical language abilities had a higher ability to sign words in the correct order during recitation in both conditions, with superior performance in the rhyming condition. In the typical language subgroup, the mean of words signed in the correct order was 80% in the rhyming condition and 39% in the non-rhyming condition. In the delayed language subgroup, the mean of words signed in the correct order was 25% in the rhyming condition and 18% in the non-rhyming condition. Overall, the rhyming condition elicited more words signed in the correct order in participants with typical and delayed language abilities.

All participants. See Figure 52. The whole group of 10 participants' scores in Visual Communication Sign Language assessment were examined as a variable in increasing words signed in the correct order in the recitation task. Five participants had typical language abilities, and five participants had delayed language abilities. Like the results reported in the VA

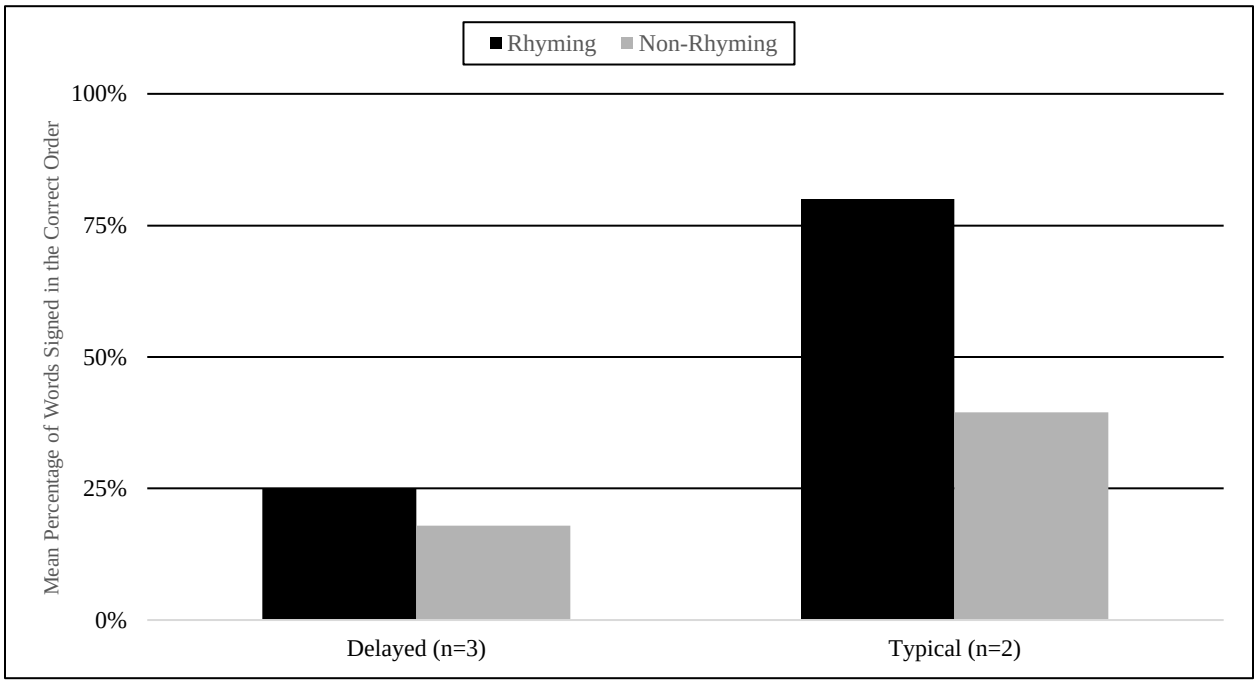


Figure 51. Words Signed in Correct Order by Language Assessment and Condition, Visual Analysis Participants

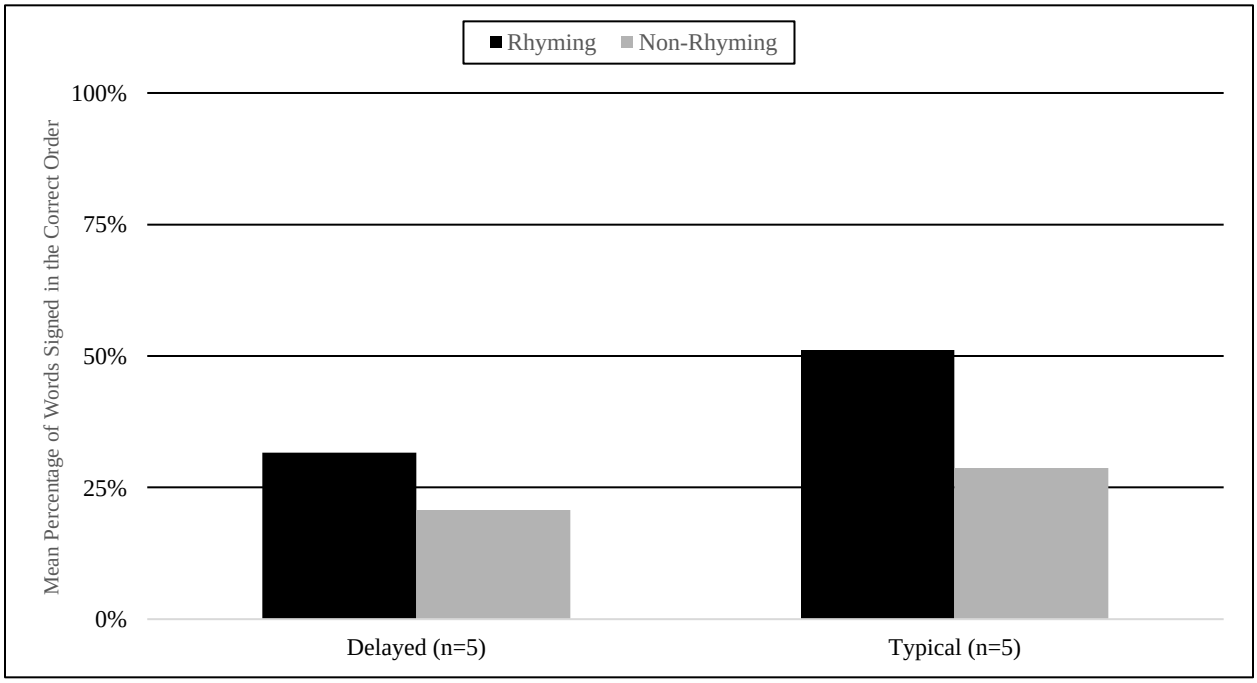


Figure 52. Words Signed in Correct Order by Language Assessment and Condition, All Participants

participants group, difference in performance was found between the two subgroups based on language abilities. Participants with typical language abilities provided more words signed in the correct order in both conditions over the participants with delayed language abilities. In the typical language subgroup, the mean of words signed in the correct order was 51% in the rhyming condition and 29% in the non-rhyming condition. In the delayed language subgroup, the mean of words signed in the correct order was 32% in the rhyming condition and 21% in the non-rhyming condition. Both subgroups had a higher mean percentage of words signed in the correct order in the rhyming condition than the non-rhyming condition.

Vocabulary knowledge as a variable in both conditions across all phases.

Visual analysis participants. See Figure 53. VA participants' knowledge of the target words in the ASL stories as a variable in increasing words signed in the correct order were analyzed. VA participants were split into three subgroups based on their vocabulary knowledge scores from the picture vocabulary assessment: little (0-8 signed words), some (9-18 signed words), and most (19-23 signed words). Three participants had some knowledge, and two participants had the most knowledge of target vocabulary in the ASL stories. VA participants who knew the most vocabulary signed more words in the correct order (80% in the rhyming condition, 39% in the non-rhyming condition) in the recitation task than those who knew some vocabulary (25% in the rhyming condition, 18% in the non-rhyming condition). The higher vocabulary knowledge participants had, the greater their ability to recite words in the correct order. The rhyming condition showed to be the superior treatment in increasing words signed in the correct order regardless of language abilities.

***All participants*.** See Figure 54. The whole group of 10 participants' knowledge of target vocabulary in the stories was looked at as a variable in increasing words signed in the correct

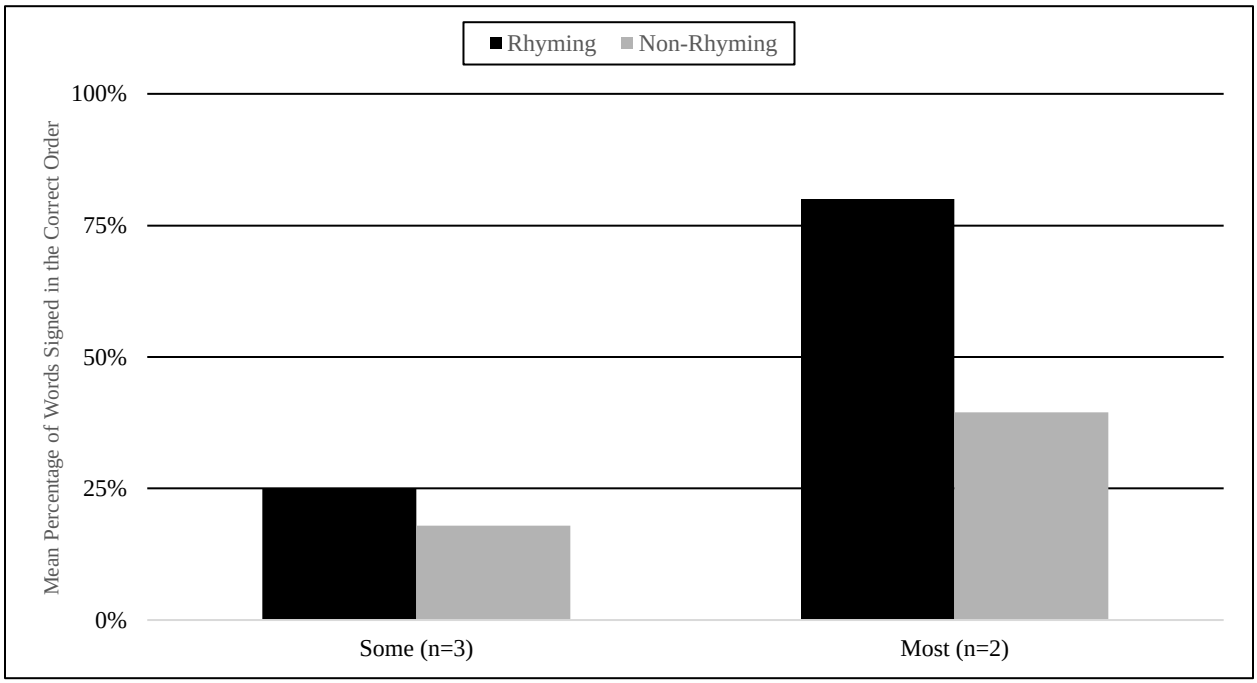


Figure 53. Words Signed in Correct Order by Vocabulary Knowledge and Condition, Visual Analysis Participants

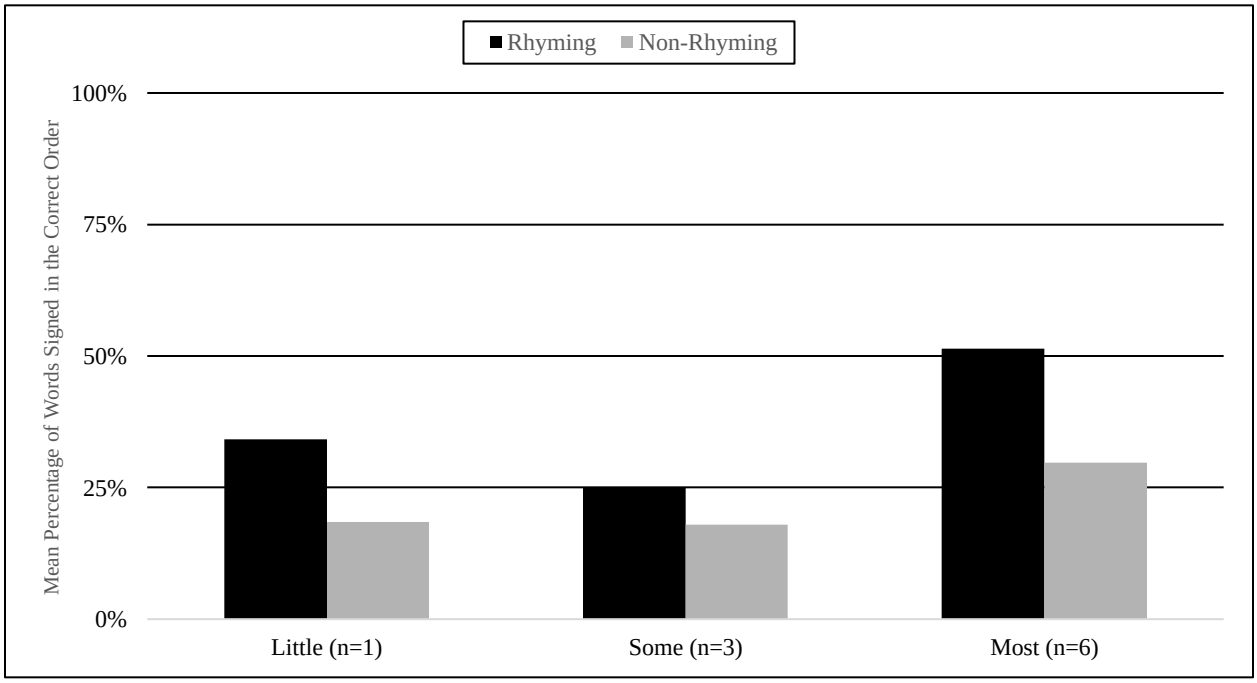


Figure 54. Words Signed in Correct Order by Vocabulary Knowledge and Condition, All Participants

order. One participant had little knowledge, three participants had some knowledge, and six participants had most knowledge of target vocabulary in the stories. Similar to the results in the VA participants group, participants who knew the most vocabulary signed more words in the correct order (51% in the rhyming condition, 30% in the non-rhyming condition) in the recitation task than those who knew some vocabulary (25% in the rhyming condition, 18% in the non-rhyming condition) or little vocabulary (34% in the rhyming condition, 18% in the non-rhyming condition). The higher vocabulary knowledge a participant had, the greater percentage of words signed in the correct order they were able to produce in the recitation task. All subgroups demonstrated higher performance in the rhyming condition over the non-rhyming condition.

Age as a variable in both conditions across all phases.

Visual analysis participants. See Figure 55. Age was analyzed as a variable in increasing words signed in the correct order in the recitation task among VA participants. Two participants were four years old, two participants were five years old, and one participant was six years old. A great difference in performance on the recitation task was found with five-year-old participants reciting more words signed in the correct order than four-year-old participants. The mean percentage of five-year-old participants' words signed in the correct order was 80% in the rhyming condition and 39% in the non-rhyming condition. The mean percentage of four-year-old participants' words signed in the correct order was 32% in the rhyming condition and 26% in the non-rhyming condition. The six-year-old participant who had one year of exposure to a language was able to recite a few words in the correct order with a mean percentage of 14% in the rhyming condition and 6% in the non-rhyming condition. All participants regardless of age had superior performance in the rhyming condition.

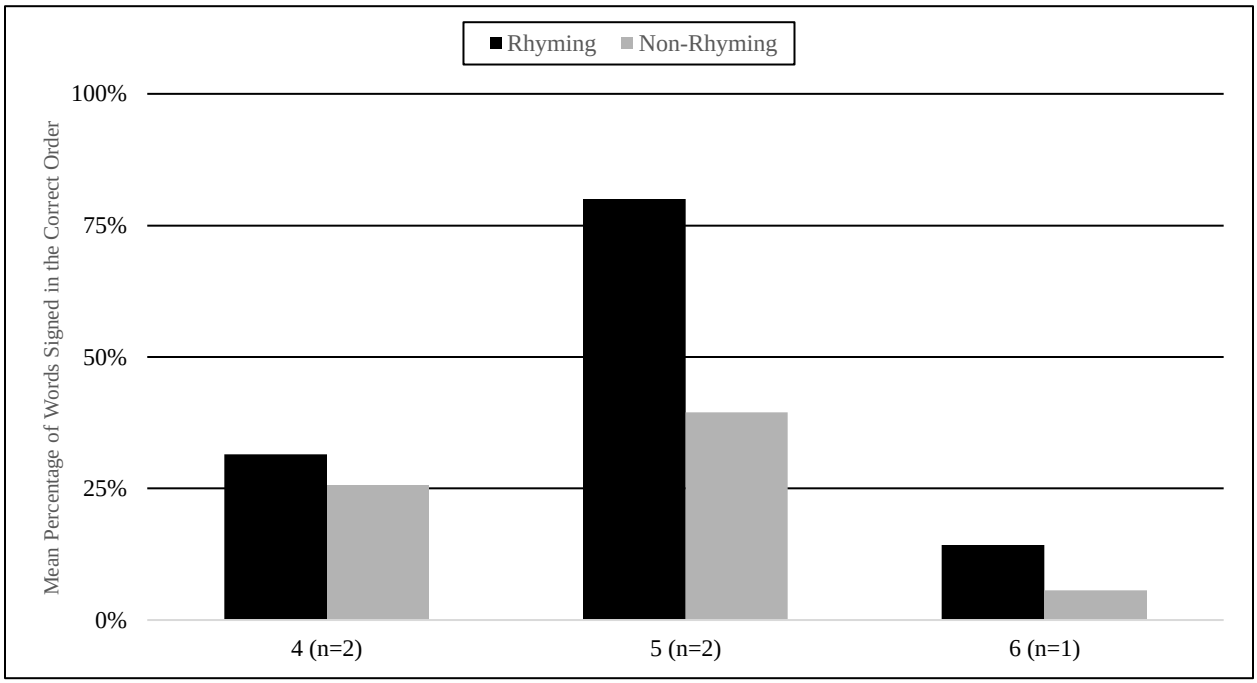


Figure 55. Words Signed in Correct Order Age and Condition, Visual Analysis Participants

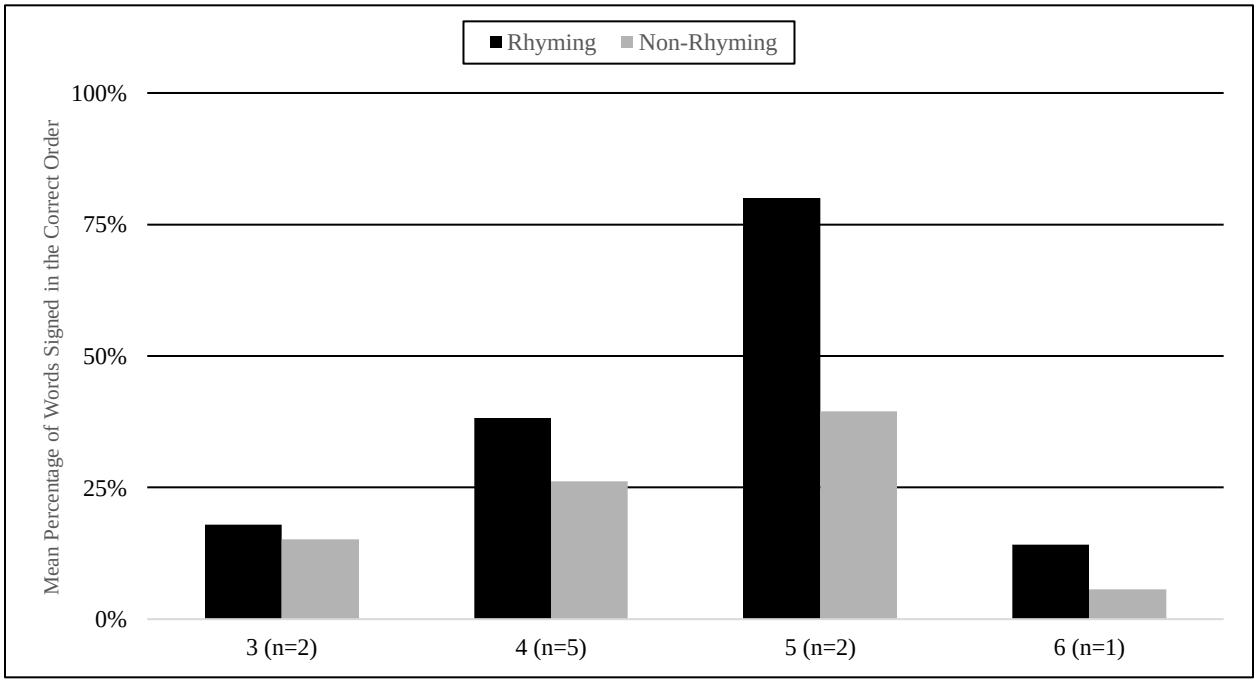


Figure 56. Words Signed in Correct Order Age and Condition, All Participants

All participants. See Figure 56. When looking at age as a variable in increasing words signed in the correct order among 10 participants, the results were not any different from the VA participants group with older participants demonstrating superior performance. Two participants were three years old, five participants were four years old, two participants were five years old, and one participant was six years old. The mean percentage of three-year-old participants' words signed in the correct order was 18% in the rhyming condition and 15% in the non-rhyming condition. The mean percentage of four-year-old participants' words signed in the correct order was 38% in the rhyming condition and 26% in the non-rhyming condition. The mean percentage of five-year-old participants' words signed in the correct order was 80% in the rhyming condition and 39% in the non-rhyming condition. The mean percentage of the six-year-old participant's words signed in the correct order was 14% in the rhyming condition and 6% in the non-rhyming condition. The older participants with an exception of the six-year-old participant performed better than the younger participants. The rhyming condition produced higher percentage in words signed in the correct order across ages.

Social Validity

Social validity data from family and teacher questionnaires (see Appendix E and Appendix F) along with interviews supplied information that these stakeholders would use ASL rhymes and rhythms with Deaf children, further strengthening the social validity of this type of intervention. Eight out of ten parents, five hearing and three Deaf, returned the questionnaire. When asked if they knew how to make rhymes in ASL, four people "agreed," two people "disagreed," one person "strongly disagreed," and one person was "uncertain." When asked if they were familiar with ASL rhymes and rhythms prior to this research, five people "agreed," three people "disagreed" and one person "strongly disagreed." When asked if they had access to

ASL rhyme and rhythm videos at home, one person "strongly agreed," four people "agreed," one person "disagreed," and two people were "uncertain." When asked if signing along with ASL rhyme and rhythm videos was easy for them, six people "agreed," and two people were "uncertain." When asked if signing ASL rhymes and rhythms without videos was easy for them, three people "agreed," and five people "disagreed." When asked if they thought ASL rhymes and rhythms were a good way for families to learn sign language, two people "strongly agreed," four people "agreed," and two people were "uncertain." When asked if they thought ASL rhyme and rhythm videos were good resources for families, two people "strongly agreed," and six people "agreed." A parent left a comment on the questionnaire, "Anytime spent communicating with your child is very important for bonding. Using fun ASL rhymes and rhythms would only enhance this experience." Another parent also wrote a note on the questionnaire, "Rhyming in groups I think might be analogous to singing in chorus—a social activity." Their overall responses were mostly either positive or uncertain as some parents were familiar with ASL rhymes and rhythms while others had no exposure to this particular practice or did not know ASL.

To collect data on social validity from educators' perspective, I interviewed teachers involved in this study. I asked them questions about their knowledge of ASL rhymes and rhythms, their experience with and use of this practice, their access to resources, and their beliefs about its benefits. In the interviews, all teachers indicated that they found both interventions, rhyming ASL stories and non-rhyming ASL stories, appropriate for their students. All teachers felt their students benefited from exposure to a variety of ASL literature and would specifically recommend ASL rhyme and rhythm to other teachers and parents. All teachers shared similar hesitations about their skills. A teacher said in ASL:

> I have a lack of confidence or certainty that I understand the difference between rhymes and rhythms. I still get confused between rhymes and rhythms. But I notice that children develop the skills of predicting, analyzing, comparing, and more through this kind of activity.

Another teacher commented in ASL:

> If you asked me to do ASL rhymes and rhythms on the spot, it might not look very pretty! We use ASL rhymes and rhythms but inconsistently. It can be time-consuming looking for resources, coming up with ideas for our own class, and editing our own videos. It would be easy to sign ASL rhymes and rhythms if they were readily established but limited resources create a stumbling block. If done right, I believe it is extremely beneficial for my students. They increase my students' prediction, routine, and security, and help them make connections between nouns and classifiers/adjectives/verbs through sequencing.

CHAPTER FIVE :

DISCUSSION AND CONCLUSION

Summary of the Research

Over the past twenty to thirty years, there has been a growing interest among educators to better improve the quality of Deaf education by incorporating approaches that are linguistically and culturally responsive to Deaf students. While ASL rhyme and rhythm have long been used by members of the Deaf community at community gatherings—such as public performances and athletic events—these practices were not included in curricula used with Deaf children for the purpose of language acquisition. In the 1990s, the exploration of new pedagogical approaches began in some Deaf education programs. For example, some Deaf schools transformed themselves into bilingual environments, and ASL was legitimized as an effective method of instruction. In these bilingual programs, Deaf teachers in early childhood education began to innovate and introduce their Deaf students to ASL rhyme and rhythm as part of the curriculum. There is still a lot to learn about these practices as the inclusion of rhyme and rhythm in classroom instruction is still emerging.

Research on young hearing children shows that rhyme, rhythm, engagement, imitation, rhyme awareness, and recitation play an integral role in language development. This study aimed to investigate the role of ASL rhyme and rhythm in Deaf children's language development. More specifically, this study compared the effects of rhyming and non-rhyming conditions of ASL stories on Deaf children's engagement behavior and accuracy in recitation with the goal of identifying the most effective condition. Ten Deaf children between three and six years old in an ASL/English bilingual early childhood program participated in this study. The research questions were:

1) What are the effects of rhyming and non-rhyming conditions of ASL stories on Deaf children's engagement behavior?

2) What are the effects of rhyming and non-rhyming conditions of ASL stories on Deaf children's accuracy in recitation?

3) What are the effects of handshape rhyme awareness instruction on Deaf children's engagement behavior and accuracy in recitation?

The single subject design method was applied, making it the first experimental research of its kind on the phenomenon of using ASL rhyme and rhythm with Deaf children. There were four phases used to document and track Deaf children's engagement behavior as well as their performance in recitation. These phases included (1) baseline, (2) handshape rhyme awareness intervention, (3) alternating treatments, and (4) preference. Visual analysis procedures were utilized to examine the effects of the two conditions (rhyming and non-rhyming versions) on increasing Deaf children's engagement in viewing videos of ASL stories and their accuracy in recitation.

While the initial study began with six participants in the preschool class and four participants in the prekindergarten class, only five out of the ten participants met the inclusion criteria for visual analysis. The other five participants were excluded because they missed too many sessions due to unforeseen circumstances beyond the control of this study (such as illness, pullout for special services, or off-campus appointments). Even though individual visual analysis was not conducted for these five excluded participants, their data were still included in a separate set of group analysis (all 10 participants) with the total mean and mean difference in both conditions across phases, language skills, vocabulary knowledge, and ages. The results provided

evidence of the positive effects of the handshape rhyme awareness intervention on increasing imitating behaviors and accuracy in recitation in the rhyming condition.

The subsequent sections will provide a discussion and implications of the findings. Individual and group differences such as language abilities, vocabulary knowledge, and age that have impacted results will be explored and explained. The value of this practice based on the perspectives of teachers and families will be shared. The limitations of this study will also be discussed to provide guidance for future investigations. Findings from this study add to the foundation of the empirical base knowledge on the role of ASL rhyme and rhythm in supporting young children's language development.

Child Performance Across Phases

1. Baseline phase. After obtaining information on each Deaf child's age and background (family questionnaire), language abilities (VCSL assessment), and vocabulary knowledge (researcher-made picture vocabulary assessment), the baseline phase commenced. Alternating treatments of the rhyming and non-rhyming conditions were administered on a daily basis for two weeks to collect baseline data on engagement and recitation. Both versions of ASL Story 1 (rhyming and non-rhyming) were shown to the whole class to measure participants' engagement with the rhyming condition as compared to the non-rhyming condition. The baseline results revealed that although participants imitated more in the rhyming condition, the number of intervals they were engaged in both conditions was similar. For a separate set of data on recitation, each participant was individually called to a private and quiet area to view ASL Story 1 for the second time on a laptop. Immediately after, the participant was asked to recite the story verbatim. An area of concern arose from the baseline data, which is discussed below.

After showing ASL Story 1, it became apparent that most, if not all, participants were not aware of or familiar with the existence of handshape rhymes. During and after viewing the ASL video, they did not acknowledge the unique presentation of handshape rhymes in the rhyming condition of ASL Story 1. No comments were made about the existence of different signed words in sentences sharing the same handshape. When there was discussion among participants, they talked about the content of the story. Furthermore, participants showed no reliance on the rhyming handshapes to help them remember what signed words should come next in the ASL story and there was little patterning in their recitation of the rhyming condition. The observed lack of handshape rhyme awareness implied participants were oblivious to the differences between both conditions (rhyming and non-rhyming versions), and treated them as one and the same condition, which may have affected the way they used their working and sequential memory during the task of recitation.

Although imitating behavior was higher in the rhyming condition, baseline data demonstrated minimal difference between both conditions when it came to overall percentage of engagement occurrence intervals, words recited correctly, and words recited in the correct order. To examine why the results came in the way they did in the baseline, it is critical that we understand the context of participants' lack of handshape rhyme awareness. This lack of awareness corresponds with the current literature regarding daily barriers and limitations among many young Deaf children in accessing abundant and rich language experiences.

The literature indicates that two-year-old hearing children can recognize phonological differences between words that sound alike and identify words that rhyme. In fact, even hearing children as young as nine months old can distinguish subtle differences in words that share similar phonological features with training (Werker, Yeung, & Yoshida, 2012). The consistent

and abundant input of spoken language rhyme and rhythm on a daily basis through incidental exposures in the child's natural environment (e.g. restaurants, grocery stores, car rides, television) and explicit instruction (e.g. *parentese* or *motherese*, daycare centers, early childhood classrooms, interventions) make a significant addition to most hearing children's lives. Because hearing individuals perceive, recognize, interpret, and recite rhyme and rhythm consistently, they likely rely on their background knowledge and experience when participating in experimental studies that focus on these skills. Besides, rhyme awareness is also necessary to maximize the benefits of activities that incorporate rhyme and rhythm among hearing children (Patscheke et al., 2016).

There are general milestones in the development of rhyme awareness in hearing children. They include: hearing words that rhyme, recognizing words that rhyme, and producing words that rhyme (Adams, 1990). When frequently exposed to rhymes, many hearing children go through these stages and acquire the skills without much difficulty. It is not uncommon for hearing children to quickly recognize rhymes after listening to just a few examples. Others, however, may struggle with rhyme recognition and need more explicit instruction. Multiple programs exist for the purpose of helping develop this skill in hearing children. Playing musical instruments, participating in rhythmic activities, listening to songs, clapping to the syllables, singing nursery rhymes, and using rhyming pictures are typically included in these interventions (Moritz et al., 2013). Moreover, having hearing children focus on and respond to one phonological awareness task at a time is a common language interventions—similar to the method employed in Di Perri (2004)'s study on ASL phonological awareness with Deaf children.

Di Perri had Deaf children between four and eight years old do the singular task of identifying the handshape rhyme after viewing three signed words with the same handshape. Di

Perri found that all participants regardless of age were able to reach the ceiling level in identifying and categorizing different handshape rhymes. The findings in Di Perri's study differed from the findings in this study as age did factor in Deaf children's imitating behaviors while viewing and their ability to recite with higher accuracy, even after receiving handshape rhyme awareness intervention. It appears that the tasks in this study departed substantially from other studies that focused on one phonological awareness task at a time such as Di Perri's study. This study specifically shed light on Deaf children's processing abilities of viewing and repeating the whole ASL story with rhymes without informing the child's awareness of the existence of rhyme. There was presupposition that Deaf children, like most hearing children, would be able to integrate multiple skills all at once to capture and process phonological information. For example, it was assumed that the participants would be able to independently discern the handshapes in individual signed words and notice the existence of handshape rhymes in the rhyming ASL story and then recite them. However, findings from the baseline phase signified that these participants did not share the same level of exposure, experience, and training with rhyme and rhythm as hearing children, even in American Sign Language. What can be learned from the baseline is that when Deaf individuals have minimal, if any, exposure to ASL rhyme and rhythm and have no rhyme awareness. Thus, there is a higher likelihood of them being oblivious to the existence of rhymes in ASL songs or stories.

In fact, the researcher's experience as a professional trainer of Hands Land reinforces this phenomenon. Over the years, the researcher has given trainings on ASL rhyme and rhythm to more than 500 adults. During the training sessions, many adults could not detect the rhymes in ASL without the researcher pointing them out to them. The lack of handshape rhyme awareness seems to be the case with the participants in this study and would help explain why they did not

initially respond to rhymes in the baseline. Deaf children needed to first master the prerequisite skills of handshape identification, handshape categorization, and rhyme awareness in order to increase appreciation of ASL stories with rhymes during viewing and to successfully use handshape rhyme awareness as a tool to support the sequential memory ability that is required for the task of recitation. Multiple studies on young hearing children stressed supplementing song recitations with phonological awareness activities for better language outcomes (Bolduc & Lefebvre, 2012; Flett & Conderman, 2002; Patscheke et al., 2016; Williams & Rask, 2003).

During discussions with classroom teachers about the lack of rhyme awareness within the participants it was confirmed that these children had extremely limited exposure to ASL rhyme and rhythm and ASL phonological awareness prior to this study. Even though some of the teachers were Deaf, they were not trained in the emerging pedagogical practices designed to promote ASL phonological awareness including rhyme and rhythm. In order to have a greater benefit from participating in activities with ASL rhyme and rhythm, these children needed to obtain handshape rhyme awareness intervention. This approach supports overarching theoretical postulations related to the importance of having prior knowledge of rhymes and the ability to recognize them for enhanced ability in remembering vocabulary (Tillmann & Dowling, 2007), word pairs (Bower & Bolton, 1969), sequences (Sheingold & Foundas, 1978) and stories (Johnson & Hayes, 1987).

2. Handshape rhyme awareness intervention (phase 2). To address the lack of handshape rhyme awareness among participants in this study, a decision was made to add a new condition to the data collection procedure. Handshape rhyme awareness intervention was provided to all participants, allowing for additional data on the impact of explicit instruction on Deaf children's engagement behavior and accuracy in recitation, especially when exposed to the

rhyming condition of the ASL story. Accordingly, a third research question was added to this study: What are the effects of handshape rhyme awareness instruction on Deaf children's engagement behavior and accuracy in recitation?

Participants' responses to the handshape rhyme awareness intervention were mixed. While some participants seemed to have an "aha!" moment during the lessons and caught on quickly, others continued to struggle to recognize rhymes, let alone produce them. Their responses were not unlike from those reported in the literature on hearing children's varied ability to quickly acquire rhyme awareness after minimal exposure and practice (Adams, 1990). This also aligns with the researcher's experience as a Hands Land trainer where the researcher provided workshops on ASL rhyme and rhythm to adults. In the workshops, some adults were slow in picking up on the skill of recognizing rhymes in ASL while others caught on quickly.

3. Alternating treatments phase. After the handshape rhyme awareness intervention was provided to all participants, the alternating treatment phase commenced using the same format used during the baseline phase. More specifically, the rhyming and non-rhyming versions of ASL Story 2 were shown to the participants for two weeks. At each session, participants were prompted by their classroom teachers to sit in a large U-circle and view the ASL story on the Smartboard. Each time, almost all participants appeared excited about being called to view the ASL stories and ran to their seats for the experience. While viewing, some participants were always visibly engaged and captivated by the ASL stories and kept their eyes glued on the screen. Other participants, however, sometimes appeared not as engaged and fidgeted in their seats. For example, they looked at other children instead of the screen or became silly and acted out while the videos were shown. Similar to the baseline figures, the results showed that participants' levels of engagement were comparable at a moderately high level in both conditions

(rhyming and non-rhyming versions of the ASL story shown on the video). The mean of total percentage of engagement occurrence intervals was 71% in the rhyming condition (35% imitating) and 74% (15% imitating) in the non-rhyming condition.

The most interesting finding was the prominent difference in the number of intervals participants spent imitating the signer on the video as opposed to simply viewing the video during the rhyming condition. What is remarkable about this difference is that they did it on their own without any instruction or modeling from adults. This spontaneous and naturalistic behavior in participants shows how Deaf children are not any different from hearing children as hearing children can and often imitate rhyme and rhythm without any prompting when they hear them (Hanna & Meltzoff, 1993; Moog, 1976; Piaget, 1966). However, hearing children with language delays are more likely to demonstrate fewer imitating behaviors when listening to rhyme and rhythm (Georgiadou et al., 2015). In a fashion that corroborates existing literature, the participants with language delays in this study were found to be imitating substantially less compared to participants with age-appropriate language skills. There are existing theoretical questions about why children imitate and the role imitation plays in language development. The function of imitation in young children seems to be related to processing linguistic input from the environment, which helps with memory and furthers their understanding of language. It was argued that children imitate only the phonological information that they can perceive and understand well enough to repeat it (Bloom, Hood, & Lightbown, 1974). Interventions that incorporate imitation are one of the key features in strengthening overall language and communication skills in hearing children, especially those with significant language delays (Georgiadou et al., 2015; Ingersoll & Schreibman, 2006). The use of rhyme and rhythm is an

emerging evidence-based practice being used to increase hearing Autistic children's attention, motivation, and engagement (Gold et al., 2004; Vaiouli et al., 2015).

The rhyming condition in this study was the favorable treatment in increasing imitating behaviors. After the handshape rhyme awareness intervention was given, the rhyming condition also prompted an increased number of words signed correctly and words signed in the correct order during recitation. It was discovered that older participants with higher vocabulary knowledge and age-appropriate language skills imitated more during viewing and performed better in recitation than those who were younger or had relatively weaker language skills and lower vocabulary knowledge. The performance of each age group and certain participants is closely examined and reported as case studies next.

Performance of Five-Year-Old Deaf Children

Giada and Jaslene. Giada and Jaslene were five-year-old participants who had early access to ASL, age-appropriate language skills, and high vocabulary knowledge. They were able to successfully recite the rhyming condition of all ASL stories in the study verbatim. Giada acquired ASL at four months old and was five years old at the time of the study. Giada has hearing parents who are moderately fluent in ASL and use ASL and Spoken English at home. Giada took the researcher-made picture vocabulary assessment and knew 21 out of 23 target words. The Visual Communication Sign Language (VCSL) assessment indicated that Giada had age-appropriate language skills. Jaslene was also a five-year-old participant who had acquired ASL at birth from their Deaf parents. Jaslene took the researcher-made picture vocabulary assessment and recognized 21 out of 23 target word. Like Giada, Jaslene had age-appropriate language skills based on the VCSL assessment. Giada and Jaslene's commensurable age, language abilities, vocabulary knowledge, and the similarities in their performance during the

baseline, alternating treatments, and preference phases make a good case study that parallels the literature on typically developing hearing children. The variables that may have contributed to Giada and Jaslene's high levels of imitating behavior and accuracy in recitation are discussed in-depth next.

During the baseline phase, both Giada and Jaslene appeared to be oblivious to the existence of handshape rhymes and used the same approaches in their effort to memorize and recite the entire story in both conditions. For example, they would pause when they could not remember what words came next and would demonstrate a "thinking face" as they waited for words to come up in their minds. They did not rely on handshape rhymes as clues into what words should come next in the story. It took them approximately four to five sessions in both conditions before they could successfully recite the whole ASL Story 1, which had six lines and approximately 25 words in total. By the last session, they were able to recite both conditions of the story with 100% or near 100% accuracy. Their ability to successfully recite ASL stories whether they had rhymes or not is an age appropriate skill. However, their lack of handshape awareness was incongruent to the literature on age-appropriate rhyme awareness development in the population of young hearing children.

After receiving handshape rhyme awareness intervention, Giada and Jaslene were surprised to discover the existence of handshape rhymes in ASL Story 1 of which they had already recited in the baseline phase. For example, when showed the rhyming condition of ASL Story 1 during the lesson and had the handshape rhymes pointed out, both Giada and Jaslene's eyes widened, and their mouths opened. Giada put their hand on their face as if they were indicating "Why did I not see it before?!?" During the alternating treatments phase, Giada and Jaslene's behavior changed by instantly pointing out the handshape rhymes in the rhyming

condition during and after viewing and making comments about them. While viewing, they imitated much more than they did in the baseline with Giada imitating 100% of the time and Jaslene imitating 78% of the time. While reciting, Giada and Jaslene clearly relied on handshape rhymes as clues of what signed words should come next. When Giada and Jaslene could not remember what to sign next, they stopped reciting while holding up the correct rhyming handshape until they could remember the next signed word and then proceeded to recite. Sometimes Giada and Jaslene gave the wrong signed word and immediately caught their mistake because the signed word did not rhyme with the previous signed word. Giada and Jaslene specifically thought about the linguistic feature of handshape rhyme and reflected upon their own language production, judging the handshape in their signed word as an error to be corrected. This type of self-correction demonstrates metalinguistic awareness. The literature states hearing children as young as three years old can possess metalinguistic skills that include self-correcting behaviors in language output, and that children with language impairments often struggle in this area (Long, 2015). Since interrelationships exist between metalinguistic awareness, phonological awareness, language abilities, and literacy development (Chaney, 1992), Giada and Jaslene's successes in recitation could be attributed to these factors. After the handshape rhyme awareness intervention concluded, Giada and Jaslene made big improvements in their accuracy in recitation and recited the rhyming condition of the ASL Story 2 with 92% and 100% accuracy on their first try, respectively.

By contrast, both Giada and Jaslene performed far worse in their recitation of the non-rhyming condition in alternating treatments as compared to performance during the baseline phase. Giada and Jaslene's accuracy in recitation of the non-rhyming ASL story consistently declined across sessions. Initially, Giada received 36% accuracy in their recitation and then their

performance deteriorated to 11% accuracy by the end of the phase. Similarly, Jaslene recited the non-rhyming ASL story with 52% accuracy at the beginning of this phase and then went down to 48% accuracy by the end of the phase. It was expected that with improved handshape rhyme awareness, they would be able to recite the rhyming condition quicker with a greater accuracy over the non-rhyming condition. However, losing motivation in trying to memorize and recite the non-rhyming condition was unanticipated. It may be possible that once Giada and Jaslene had learned about the existence of rhymes in the rhyming condition of ASL Story 1 and ASL Story 2, they found this version much easier and more enjoyable to recite. Perhaps, one consequence of this is that they lost the ambition to recite the non-rhyming version. As it turns out, Jaslene was quick to become frustrated when they could not remember the correct order of the signed words in the non-rhyming condition. During the preference phase with ASL Story 3, both Giada and Jaslene enthusiastically recited the rhyming ASL story verbatim with 100% accuracy each time. The difference in the attitude towards reciting both conditions in the alternating treatments and preference phases was outstanding. The difference could be attributed to the difficulty of reciting stories without the support of rhymes and the pleasure of repeating stories with rhymes. Apparently, the augmented joy of reciting ASL stories was made possible with the awareness of handshape rhymes.

Giada and Jaslene's results fit the literature regarding imitation (Hanna & Meltzoff, 1993), engagement (Vaiouli, Grimmet, & Ruich, 2015), rhyme and rhythm (Gordon et al., 2015), rhyme awareness (Bolduc & Lefebvre, 2012), and overall language abilities (Gold, Voracek, & Wigram, 2004) in young children. Imitation as a type of engagement behavior is associated to the ability to process language. Rhyme awareness is linked to the heightened ability to recognize and appreciate rhymes in stories. In addition, other variables such as being familiar with the

target words, having age-appropriate language skills, and being older may play a part in being able to imitate while viewing and recite stories with accuracy. Giada and Jaslene had all these traits, which contributed to their higher levels of engagement and superior performance in recitation.

Performance of Three- and Four-Year-Old Deaf Children

There were greater and complex variations in the three-and four-year old group that may have affected results. The demographic information of these participants is disclosed and analyzed to identify potential factors that might have influenced their performance. Of the six participants, Zake, Yair, and Tri were the highest performers in this age group.

Zake, Yair, and Tri. Zake acquired ASL at birth and was four years old at the time of the study. Zake has Deaf parents who use ASL and Spoken English at home. Zake took the researcher-made picture vocabulary assessment and was able to identify 22 out of 23 target words. The VCSL assessment determined that Zake had age-appropriate language skills. Yair was also a four-year-old participant who had acquired ASL at birth from their Deaf parents. Yair took the researcher-made picture vocabulary assessment and recognized 16 out of 23 target word. Based on the VCSL assessment, Yair was delayed in their language abilities by approximately two years. Tri was four years old when Tri participated in the study. Tri's parents were hearing, used Spoken English at home and did not sign. Tri only had acquired ASL one year prior to the study. Tri took the researcher-made picture vocabulary assessment and was familiar with 19 out of 23 target words. According to the VCSL assessment, there was a year's delay in Tri's language development. Evidently, there are some variations in the demographics and abilities of this particular group.

Even though these three participants had superior performance compared to others in their age group in this study, their accuracy in recitation was still nowhere close to Giada and Jaslene's level. Zake (38%), Yair (6%), and Tri (20%) imitated the most of this age group while viewing the rhyming condition in alternating treatments phase. The rate of these three participants' imitating behavior was considerably low compared to the amount of intervals Giada (100%) and Jaslene (78%) spent imitating. The significant difference in the top performers between 5-year-old children and 4-year-old children may be explained by age, language experience, amount of imitating behavior during viewing, or other confounding variables beyond the scope of information retrieved from this study such as parent-child interaction, personality, socio-emotions, and pace of child development. The conjunction of higher imitating behavior during viewing, higher vocabulary knowledge, and higher handshape rhyme awareness may have enabled Zake, Yair, and Tri to also have higher accuracy in their recitation compared to other peers in their age group. In the recitation of the rhyming condition in alternating treatments phase, Zake, Yair, and Tri averaged 44%, 78%, and 46% accuracy in words signed in the correct order, respectively. Again, their performance was not comparable to Giada and Jaslene's average of 100% or near 100% accuracy in recitation.

Since both Zake and Yair came from a Deaf family and were exposed to ASL since birth, they make a good case study of what Deaf children with full access to language are capable of at this age. After Zake received handshape rhyme awareness intervention, 50% accuracy was Zake's highest performance level in the recitation of ASL Story 2, which was an improvement compared to the baseline figure of 21%. Still, Zake's performance was rather low considering that Zake had age-appropriate language skills and high vocabulary knowledge.

Although Yair was delayed in language by two years, Yair was the only four-year-old participant who was able to recite a story with 100% accuracy. Yair was able to accomplish this only once with the rhyming condition of ASL Story 2 at the end of the alternating treatments phase. It may be possible that participants in this age group, including those with age-appropriate language skills, still needed more repetition and practice before they are able to recite with near 100% accuracy. Yet another possibility is the general limited experience in viewing and reciting ASL stories or songs even within this unique population of Deaf children of Deaf families, which may have affected their overall ability to recite.

Although Tri was from a hearing non-signing family, they were surprisingly among the few participants who recognized the existence of handshape rhymes in the baseline phase. Tri also demonstrated reliance on handshape rhyme awareness to support the recitation of the rhyming condition across all phases. Interestingly, Tri appeared to have some listening and speaking skills as indicated by their use of a cochlear implant and occasional use of spoken language during the intervention. Perhaps the potential impact of language deprivation was remedied by some successful early access Tri had to a spoken language. Having a solid foundation in a language could have enhanced their ability to acquire and process ASL as their second language. Furthermore, speech therapy that comes with cochlear implants typically involves intensive training in various language-related areas in spoken language. It might be that Tri had access to nursery rhymes, music, rhyme and rhythm, and phonological awareness in spoken language prior to this study. If this was the case, this experience could have supported the cognitive load to allow them to recognize similar linguistic features in ASL.

In sum, Zake, Yair, and Tri demonstrated superior performance in the recitation of the rhyming condition in their age group. They also imitated the most while viewing the rhyming

condition. By contrast, the other three participants in this age group, Cole, Daya, and Haiden did not show any clear and consistent preferred condition. Cole, Daya, and Haiden shared similar variables that might have contributed to their weaker performance in engagement behavior and accuracy in recitation. A profile on these three participants are given next.

Cole, Daya, and Haiden. Cole, Daya, and Haiden had limited vocabulary knowledge based on the researcher-made picture vocabulary assessment and weak ASL fluency according to the VCSL assessment. They rarely imitated any signed words while viewing ASL stories in both versions. Their accuracy in recitation was generally low, irregular, and inconsistent. These three participants did not have successful access to spoken language and were raised in families where a signed language was not used. Because of this, their challenges could be attributed to multiple overlapping factors related to language deprivation impacting language and cognitive development as described above and in the literature review.

Multiple studies have looked into Deaf adults who experienced language deprivation during their early years and their ability to imitate and recall. It was discovered that these Deaf adults had difficulty signing along simultaneously to what was signed to them and struggled to recall sentences verbatim (Mayberry, 1993; Mayberry & Eichen, 1991; Mayberry & Fischer, 1989). Knowing that the challenges with language processing tasks remains with Deaf individuals into adulthood, questions are raised about the type of specialized interventions that should be given to Deaf children like Cole, Daya, and Haiden. Even though they are in an ASL-rich environment in school and have been since an early age, they still have extremely limited communication at home with their families. This seemed to have greatly impacted their ability to process language as evidenced in their low level of engagement while viewing ASL stories and low accuracy in recitation.

Outliers

Lacey. Out of the 10 participants, Lacey struggled the most to recite any portion of any of the ASL stories. Although in some instances Lacey was able to sign some words correctly, Lacey was not able to sign words in the correct sequential order in most sessions across all phases. Because Lacey comes from a Deaf family, has had access to ASL since birth, and had high vocabulary knowledge and age-appropriate language skills, the results seemed to be an anomaly for someone with this particular background. In a follow-up interview with Lacey's teachers, they shared that they had noticed some weakness in Lacey's academic performance in the classroom. However, they attributed the weakness to Lacey's "free spirit" personality and relatively slow social-emotional development. They explained that Lacey would often become silly while reciting ASL rhyme and rhythm that were frequently sung in the classroom; Lacey would change the structure of the song or sign words that were not part of the song. Also, in lessons where children were expected to recall an ASL story, Lacey had the tendency of not following the correct sequence. Teachers commented that they found themselves frequently using the phrase "OFF-THE-POINT" to encourage Lacey to stay on track or stick with the story they were supposed to recall. Teachers also observed that Lacey struggled with remembering numbers and math in general. They said the research findings corroborate with their observations, and that it seemed like Lacey may have difficulty with language processing tasks as they relate to working and sequential memory.

Lexie. Lexie was six years old—the oldest participant in this study—who the tasks given at a range comparable to three- and four-year-old participants. Lexie was four years old when Lexie was adopted from another country and came to the United States without any language or lexical vocabulary. After two years of intensive attention and support provided by their adoptive

Deaf parents and teachers at the Deaf school, Lexie's language abilities were approximately equal to two- or three-year-old children according to the Visual Communication Sign Language assessment. Lexie also knew some target words in the researcher-made picture vocabulary assessment (14 out of 23 signed words). As the oldest participant in this study, Lexie's extreme case of language deprivation clearly had an impact on their results. Notwithstanding the fact that Lexie having gone from a person with no language to a person who could perform as well as three- and four-year-old participants within a two-year period was encouraging. Lexie's imitating behaviors and words signed correctly were comparable to the highest performing group in the four-year-old group (Zake, Yair, and Tri). However, Lexie's ability to sign the words in the correct sequential order was more similar to but slighter better than the younger language deprived group (Cole, Daya, and Haiden). Although Lexie's case of language deprivation was the most extreme, the fact that Lexie's parents were able to communicate with Lexie fully at home in addition to being placed in an ASL-rich environment for two years made a difference in their ability to perform in language processing tasks such as imitation and recitation.

Unexpected Outcomes and Future Directions

It was not the purpose of this study to identify Deaf children of signing parents with potential signs of dyslexia, signed language impairment, or ADHD. The subpar performance of Lacey, a native signing Deaf student in this study raised some questions regarding the understudied phenomenon of dyslexia, signed language impairment, or ADHD in the population of Deaf children from Deaf or signing families. Since there are widely recorded challenges in hearing children with language impairments or ADHD with phonological processing tasks—including phonological awareness, memory, and sequencing—it is not surprising that similar challenges would also show up in the Deaf population with ASL. When young hearing children

struggle with phonological awareness tasks, such as not recognizing or responding to rhyme or having difficulty with learning common nursery rhymes, professionals often perceive this as a red flag for dyslexia or language impairments. Only a few studies were conducted on native signing Deaf students suspected of dyslexia or signed language impairment. In these studies, it was discovered that Deaf students with signed language impairments performed poorly on short-term sequential memory tests such as fingerspelling words, recalling sequences of items, and repeating ASL sentences (Quinto-Pozos, Singleton, & Hauser, 2017). Yet, little is known about using ASL phonological awareness, ASL rhyme and rhythm, and recitation as a means to capture dyslexia or signed language impairments in young Deaf children.

By documenting the attending, imitating, and reciting behaviors, it was made possible to recognize more clearly the gaps in Deaf children's language foundation and pre-literacy skills in this study. This attention to detail is especially important not only for Deaf children of hearing families but also for Deaf children coming from Deaf families as evidenced by the situation with Lacey—a student who needed more specialized support in ASL. It is noteworthy to point out that Lacey's area of weakness in language processing as described by the classroom teachers was not raised as a red flag for sign language impairment or ADHD as it may have been if Lacey was a hearing child. Teachers were not overly concerned about Lacey because Lacey was the highest performing student in class and had a strong language and communication skill base. Lacey was able to produce eloquent and creative ASL sentences independently and engage in meaningful turn-taking conversations. In contrast, the language abilities of their peers in the class were much more delayed than Lacey, necessitating more attention and support from teachers. Thus, the weakness in language usage by Lacey was overshadowed by their classmates' even weaker skills. This seemingly low expectation for Deaf children who have "good enough" language

skills seems to be another major issue in Deaf education, which can be attributed to the heightened attention required to deal with the complex, prevalent, and overwhelming issues of language deprivation in other Deaf children.

The need for high levels of attention to individual Deaf children, regardless if they experience language deprivation or not, and their progress with language development is critical to ensure that each Deaf child is properly supported. This study allowed for consistent monitoring and documenting on each Deaf child's language processing tasks, which does not usually occur during regular daily classroom activities. For example, Deaf children at this age (three or four-year-old) were expected to engage in different types of play such as drama, art, read-a-louds, and manipulatives as part of the curriculum without any precise data collection. With the empirical evidence from this study, the stark difference between Lacey's performance and the rest of the class was illuminated—which the teachers found extremely beneficial and helpful. The significant difference in Lacey's performance could have gone overlooked if not for the type of intervention and data collection that were done as part of this study. Future studies can explore the effectiveness of tracking young Deaf children's ability to imitate ASL rhyme and rhythm while viewing and then subsequently recite relying on their handshape rhyme awareness to support sequential memory. Further, whether this approach is appropriate in identifying potential red flags for signed language impairments in Deaf children from Deaf or signing families needs to be explored.

Another known delimiter that arose in this study was the exceptional performance of Tri—a Deaf student of hearing non-signing parents who wore cochlear implants and had some listening and spoken language skills. It is possible that Tri had prior exposure, experience, or training in rhyme and rhythm. Tri may have also developed phonological awareness in spoken

language during speech therapy. If it was the fact that Tri had successfully learned about the structures of language as a whole and in parts, Tri might have developed some metalinguistic awareness of English. Essential access to language and the ability to analyze language could have aided Tri in while learning ASL—leading Tri to recognize the presence of rhymes in ASL. The Common Underlying Proficiency model (CUP) model (Cummins, 1979) outlines that all languages share the same base in which skills and knowledge can be transferred across languages. This process is what Cummins calls the linguistic interdependence hypothesis. In Cummins (1979)'s own words, linguistic interdependence hypothesis is defined as follows:

> "To the extent that instruction in Lx is effective in promoting proficiency in Lx, transfer of this proficiency to Ly will occur provided there is adequate exposure to Ly (either in school or environment) and adequate motivation to learn Ly" (p. 29).

With this proposed model, there is an existing argument regarding the importance of building a strong foundation in the first language in order to enable the successful acquisition of second or subsequent languages. Usually, in the case of Deaf children, ASL is the most readily accessible language and thus arguably should be their first language. A strong foundation in their first language is then used to acquire English as a second language. However, the opposite seems to be the case with Tri who appears to have had some productive access to spoken language through cochlear implants, enabling them to successfully acquire ASL as a second language.

Future studies may be interested in looking at the effects of both spoken and signed rhyme and rhythm on language development in bilingual and bimodal young hearing children (e.g. Children of Deaf Parents—CODA) and young Deaf children (e.g. cochlear implant users or those with residual hearing). More specifically, it may be interesting to explore the process of

linguistic transfer of knowledge and levels of metalinguistic awareness of both languages—ASL and English—in this particular population.

Social Validity

Social validity is the value society places on the interventions used in research (Wolf, 1978). In the context of this study, social validity of exposing Deaf children to rhyming ASL stories was explored through family and teacher questionnaires and interviews. The results from family and teacher questionnaires affirm that there is a paucity of knowledge and resources among families and teachers related to the practice of ASL rhyme and rhythm. While Deaf parents were enthusiastic and asked for more resources, most hearing parents had no knowledge of and were uncertain about this practice. A Deaf parent commented that ASL rhyme and rhythm are fun to create at home. Their Deaf child(ren) were motivated to imitate which usually ended with everyone bursting in laughter. This comment paints a picture of the high social importance of this practice for Deaf families. In addition, all parents, hearing and Deaf, agreed that ASL rhyme and rhythm videos were good resources for families. Most parents said it would be hard to expose their Deaf children to ASL rhyme and rhythm if there were no videos available.

Teachers, like the Deaf parents, spoke highly of the role of ASL rhyme and rhythm in boosting language development and lamented over the lack of resources. They did not feel knowledgeable and confident enough to sign ASL rhyme and rhythm on their own in their instruction. It seems like there are issues with accessibility and application in real life with limited access families and teachers have to resources that incorporate ASL rhyme and rhythm. More funds possibly from grants are needed to generate more innovative, culturally and linguistically responsive resources and make them available to stakeholders.

Six months after the study took place, the principal requested an all-day professional development to be given to the Early Childhood Education staff on the principles of ASL rhyme and rhythm. Teachers expressed high desire to increase the use of this practice in their educational program. Teachers remarked that they felt ASL rhyme and rhythm promoted repetitions and patterns, memorization, creativity and play, metalinguistic awareness, prediction, humor, family-child bond, and turn-taking skills, and pleaded for more research in these areas. Clearly, there is a high social validity in exploring pedagogies that incorporate specific techniques to teaching and improving language skills in Deaf children such as the use of ASL rhyme and rhythm.

Conclusion of Discussion on Findings

The overall benefits of the rhyming condition of ASL stories in increasing imitating behavior and accuracy in recitation were present among many participants. However, the benefits were not consistent among all participants. Initially, almost all participants demonstrated no awareness of handshape rhymes. Upon receiving intervention with the handshape rhyme awareness training, some participants were able to quickly understand and apply newly acquired handshape rhyme awareness to the task of recitation. These participants subsequently imitated more with the rhyming condition and demonstrated greater ability to accurately recite the rhyming condition of ASL stories over the non-rhyming condition. Other participants, especially younger ones with weaker language skills, did not. They struggled to accurately recite both conditions of the ASL stories and demonstrated only slightly greater gains in the rhyming condition. They may need more than just two lessons to build the skill of recognizing handshape rhyme.

Deaf children generally need more exposure, experience, and training in handshape rhyme awareness before these skills can truly become helpful in the recitation of ASL stories with rhymes. Furthermore, increased accuracy in recitation seems to be linked to increased imitation during viewing. Most of the imitating behaviors across participants occurred when the rhyming condition of ASL stories were shown. The results of this study reinforce the relative importance of imitation and handshape rhyme awareness as they pertain to phonological and language processing.

Building a strong language foundation in Deaf children is a socially important outcome. Both teachers and Deaf families remarked on the difference between using rhyming and rhythmic signing as opposed to regular signing in eliciting engagement and language in Deaf children. Teachers and Deaf families find interventions that provide Deaf children access to ASL rhyme and rhythm, prompt imitating behaviors, and elevate Deaf children's rhyme awareness in ASL desirable and beneficial.

Future Studies

Information extrapolated from this study reveals that most Deaf children do not have abundant exposure and experience in ASL, and this impacts their language processing abilities. For Deaf children who experience language deprivation and/or have limited experience with ASL, what type of specialized interventions in ASL are appropriate and effective? Is training in language processing tasks such as imitation and recitation relevant and important for Deaf children as young as three and four years old? What is the role of ASL rhyme and rhythm in these interventions? More specifically, do they need to learn how to successfully imitate, recognize handshape rhymes, and recite ASL stories and songs as part of building blocks towards stronger language foundation and pre-literacy skills? Then, there is the next question of

the amount of intervention needed to successfully build these skills. Younger and language deprived participants in this study needed more than just two handshape rhyme awareness lessons to build the skill of recognizing handshape rhymes. Future studies need to identify evidence-based interventions that are effective in remedying the potential lasting impact of language deprivation on the brain by closing the gaps in language development early on. A comprehensive evaluation of extended features such as ASL phonological awareness conducted over a period of time may be necessary in order to more thoroughly investigate the effectiveness of interventions that address ASL rhyme and rhythm, engagement, imitation, recitation, phonological and language processing tasks.

Limitations

There is no known previous experimental research to have taken the approach of utilizing single subject design to study the effects of ASL rhyme and rhythm on Deaf children's language development in general, and on engagement and recitation skills specifically. There were some potential methodological issues in this study. The issues include the lack of proper ASL assessments, how the research was designed, and threats to internal and external validity. These factors may have impacted the findings of this study.

ASL assessments. Norm-referenced assessments to measure ASL skills did not exist until recently, making it a challenge for researchers and educators to properly assess Deaf children and develop data-driven interventions (Henner, Novogrodsky, Reis, & Hoffmeister, 2018). In fact, the norming process is made complicated by the fact that most of the Deaf population experience language deprivation. Nonetheless, several signed language assessments are currently available with norms based on a small sample size of typically developing native signers for ages three to six. These assessments evaluate children's ASL receptive skills,

vocabulary, and linguistic milestones. The Visual Communication Sign Language (VCSL) Checklist was specifically selected for this study to measure participants' language abilities according to age-appropriate development. This assessment was the first standardized instrument to measure developmental milestones with language items normed based on the ages of 83 children who were native users of ASL (Simms, Baker, & Clark, 2013). The VCSL Checklist was conducted by classroom teachers observing each participant's use of language in their daily environment. While the information was helpful in understanding how language abilities impacted participants' engagement behavior and accuracy in recitation, the limitations of the VCSL Checklist need to be acknowledged. Although its creation and development was pivotal, the VCSL Checklist was normed on a very small sample of children. Therefore, the years of language delay identified in participants may not be entirely accurate.

Given that the baseline data collection captured the lack of handshape rhyme awareness in participants, it would have been beneficial to assess ASL phonological awareness in general, and handshape rhyme awareness specifically, prior to the start of this study. Since there is no standardized assessment available to the public yet, a researcher-made assessment would have reaped useful information in supplying evidence of participants' ability (or lack thereof) in this specific language area. These additional data specifically on their ASL phonological awareness and handshape rhyme awareness would have better explained their performance in the baseline and alternating treatments phases.

Research design. There are some elements in the research design that could be changed to significantly improve the quality of the results. Discussion of the problems with the research design as well as suggestions are provided next so that replication of this type of study can be

done in the future. This is done in hopes of providing a structure for superior research design and clearer results in replications or other studies focusing on this research agenda.

Data collection on engagement. Having three-year and four-year-old participants sit in a U-circle while viewing ASL videos made it difficult to appropriately collect data on engagement. The structured school setting where participants were specifically asked to view the ASL videos likely promoted routine behaviors of paying attention (e.g. eyes on the screen) rather than reflecting children's authentic engagement in the ASL stories. This factor contributed to a ceiling effect with participants being 100% engaged across sessions, preventing a greater understanding of the amount of time participants were engaged with the ASL stories. A more accurate collection of engagement data could occur if researchers found a way to remove the influence of school expectations during structured activity.

At the same time, some participants had a difficult time fully attending to the ASL stories when staff members were walking around the room, arranging materials, cleaning up, or talking with each other. Moreover, sometimes there was a classmate in their view who was visibly cranky, fidgeting, rolling on the floor, or even excitedly jumping around. It was difficult for participants to fully attend to the ASL stories when that happened and for teachers to remain completely removed as requested. At times, teachers had to intervene when a child behaved in ways that were overly disruptive to the whole class. Therefore, participants moving their eyes away from the screen did not necessarily mean they were disengaged from the ASL stories. To specifically address the issue of conspicuous staff or child distraction, "d-i" was used in the coding system to indicate that there was external interruption during the five-second interval that caused other participants to move their eyes away from the screen. However, it was hard to determine whether minor distractions such as other children talking (not imitating) causing a

participant to look away from the screen should be marked as "d-i". Even though the coding system accounted for external distractions and eliminated those intervals from the final calculation, a different and more precise approach to collect data on engagement is recommended for future research. If this study was to be redesigned, the recommendation is to leave a recurring loop of the rhyming and non-rhyming ASL stories on two separate screens during free play time to capture engagement that is more spontaneous, natural, and authentic, and to use a more elaborate measurement to document differing types of engagement behavior. The research design in this study was not the best way to capture and compare young Deaf children's natural engagement towards the use of regular signing compared to rhythmic and rhyming signing.

Data collection on recitation. Since several participants struggled in the task of recitation possibly due to age, language, and limited experience and training, more sessions should be added to baseline and alternating treatments phases for additional opportunities to view, practice, and recite the ASL stories. Moreover, two twenty-minute lessons on handshape rhyme awareness were insufficient for several participants. Providing more opportunities to practice recognizing and producing rhymes in ASL would have benefitted participants. While the alternating treatments design supplied useful information in understanding child behavior and performance when exposed to rhyming and non-rhyming ASL stories, other designs such as multiple baselines that incorporate more training in handshape rhyme awareness along with other rhyme awareness skills might bring more data and insights into participant performance in language processing tasks such as recitation or phonological awareness. Further discussion on internal validity and external validity of this study is presented below.

Inter-Rater Reliability. The videos were randomly selected to be reviewed by two raters. It happened that the rhyming condition was picked more often. Further, no videos from the preference phase were selected. Although the percentages of inter-rater reliability met the 20% criteria with 90% or above agreements, there still could be a small room of error in the videos not observed by two reviewers.

Internal validity. There are advantages to employing an alternating treatment design when it comes to minimizing threats to internal validity. Since both treatments were alternated on a daily basis, there is a decreased chance of background variables such as school schedule, weather, and staffing changes becoming a factor in child performance. However, one of the biggest threats to internal validity in this study was short-term (temporary) and long-term (permanent) maturation. There were a number of short-term maturation effects that could have affected a child's behavior. Children's behaviors can change within days or even a few hours from being in a good mood to a bad one or from feeling good to feeling sick. For example, several participants were tired, cranky, restless, or unmotivated on some days. These short-term factors might have been caused by circumstances external to the experiment, but they could also have been caused by the experiment itself having an effect on participants' behaviors due to their age and growth. The task of recitation was challenging for some participants, possibly resulting in their loss of motivation to put in their best effort. This might have affected their performance on some days and caused data points to appear inconsistent on the visual graphs. Long-term factors might include participants getting a little older, having more exposure and experience to rhyming and non-rhyming ASL stories, and becoming increasingly comfortable with the tasks. Another threat of testing effect arises with the practice of repeatedly measuring the participants. For example, when participants went through the baseline phase, this experience and exposure

might have assisted them in improving their recitation in the alternating treatments phase. Even if such threats occurred, they did not affect the reliability of the outcomes as the objective was to determine which condition was more effective in increasing engagement and accuracy in recitation.

There were a few more potential threats to the internal validity of this study. There was an issue of participants being absent on some days due to illnesses, appointments, or personal circumstances. Reduced exposure to a particular treatment could have had affected their performance on the recitation task. This threat was beyond the control of this experiment as alternating treatments had to take place on a daily basis with the whole class. The time available to collect data and measure change over time was also constrained by the fast approaching summer break. Some participants, especially the younger ones, clearly needed more time to practice and improve their recitation of the ASL stories but did not have sufficient opportunities to participate in more sessions due to absences. Lastly, there was the issue of how participants may react or change their behavior because they are being observed by someone they did not know very well. This potential threat remained even though the researcher attended the classroom, interacted with the participants on a daily basis, and filmed them reciting random ASL stories selected by their classroom teachers one week prior to the start of the study.

External validity. Limitations of single subject design itself may have affected the external validity of outcomes, such as the limited number of participants. It is true that the goal of single subject research is to find the functional relationship between independent and dependent variables in an individual; still, it is difficult to know whether the outcomes of the 10 participants in this study could be generalized to other Deaf children, locations, or behaviors. Since this experimental study is the first of its kind with Deaf children, this study needs to be

replicated with more participants. Having said that, external validity of this study was increased through replication of visual analysis across five participants out of the overall 10 participants (Horner et al., 2005).

Implications

A thoughtful and careful review of the literature provides clarity into the large gaps in our empirical knowledge of the role of ASL rhyme and rhythm and ASL phonological awareness in facilitating language and literacy development in young Deaf children. A body of research has been built to affirm the significance of providing hearing children exposure to rhyme and rhythm supplemented with training in phonological awareness for successful literacy development. Yet, any interventions that incorporate Deaf cultural approaches using ASL are novel to most classrooms that serve Deaf children. The results of this study have implications for potential positive change on the individual, cultural, educational, and societal levels. On the individual level, the results of this study inform the field that certain interventions such as imitation training, handshape rhyme awareness, recitation of rhyming and non-rhyming ASL stories may have a favorable impact on Deaf children's language processing abilities as these skills are directly linked to critical pre-literacy skills in the population of young hearing children (Ozernov-Palchik et al., 2017). On the cultural level, Deaf community members have long offered culturally-rich linguistic models through ASL storytelling, poetry, rhyme and rhythm, and games. When the Deaf community sees their linguistic and cultural capitals (Bourdieu, 1986) become an important part of Deaf students' experience in schools, this may lead to a greater understanding, appreciation, and sense of validation of ASL literature, including the genre of ASL rhyme and rhythm. Should this occur, there may be a shift in Deaf children's relationship with language and music, making their experiences more Deaf-centric and

empowering. On the educational level, this study cast light on the insight that teachers are often untrained in ASL rhyme and rhythm and ASL phonological awareness, and that Deaf children often lack exposure to such practice at home and in schools. Without proper systemic and cultural support, Deaf children are being deprived from accessing essential language exposure and experience that hearing children have. The lack of proper interventions has an impact on Deaf children's language skills to an extent, stalling their ability to maximize their linguistic potential. Educators can use this data to advocate for additional professional development to incorporate culturally and linguistically responsive approaches to enhance Deaf children's access to rich and abundant language experiences at home and in schools. The findings provide a foundation for future research to explore interventions that are not only "new and better," but also specifically geared for bilingual learners such as Deaf children who are primed for the benefits of metalinguistic awareness and linguistic transfers. Considering that this study sought to address the gaps in pedagogy from long-standing systemic barriers towards the acceptance of Deaf cultural practices, outcomes might also have implications at the societal level. The new knowledge about the role of ASL rhyme and rhythm in early childhood development may propel society to take steps towards generating a paradigm shift in valuing ASL and Deaf-centric learning for the sake of Deaf children and humankind.

Conclusion

The key aspects of the literature as it relates to Deaf education in the context of the history, power, culture, language, signed and spoken rhyme and rhythm, engagement, recitation, and memory have been discussed in depth. The case of Deaf children not sharing the same language as their hearing non-signing parents complicates their ability to access and acquire language naturally and effortlessly. Further complicating the barrier to rich and accessible

language input, many methods used in Deaf education are geared towards hearing-centric models with the primary goal of teaching Deaf children without the use of signed language (Humphries, 2013). Deaf epistemologies, or ways of knowing, have not been embraced by most people who make decisions related to Deaf education (Holcomb, 2010). Bourdieu's (1986) framework of social fields provide a theoretical foundation in understanding how hearing doxa (status quo) manifests in the course of Deaf education. While the Deaf community intimately know the widespread and devastating impact of language deprivation, the academic community is beginning to recognize this problem as a social issue that could be prevented with proper systemic support (Hall, Hall, & Caselli, 2019).

The critical social and critical Deaf pedagogy theories provide Deaf researchers opportunities to re-visit and scrutinize history, detecting how oppression has hindered Deaf children from accessing certain cultural practices in signed language. Since Deaf adults vicariously understand the struggle, they often strive to ameliorate the sufferings of the next generation by setting up educational projects to remove barriers and stigmas of Deaf culture and American Sign Language. For example, the emergence of ASL-English bilingualism in Deaf education enabled Deaf teachers and leaders to enter the field and devise methods that are culturally and linguistically responsive to Deaf children's language, identity, and culture. When Deaf people have autonomy over pedagogy, it is worthwhile to investigate what materializes in the classroom. ASL rhyme and rhythm are an example of the cultural artifacts that emerged in the early childhood classroom.

There is a plethora of research connecting spoken language rhyme and rhythm to multiple developmental areas in hearing children such as elevated skills in engagement, attention, memory, vocabulary, language, and literacy. These findings raise questions about the impact of

ASL rhyme and rhythm on Deaf children's development. When Deaf adults are liberated to explore music through their lens, what kind of "Deaf-centric music" would ensue? And in what ways would Deaf-centric music such as ASL rhyme and rhythm benefit Deaf children's language acquisition and learning? More specifically, would these language experiences help Deaf children build specific language and cognition skills typically found in hearing children? Indeed, there is still a lot to learn about the effects of ASL rhyme and rhythm on Deaf children's language development. This study is but the first step at answering some of the questions related to the effects of ASL rhyme and rhythm and handshape rhyme awareness on Deaf children's engagement and recitation. The results produced evidence that Deaf children with higher ASL rhyme awareness have higher ability to accurately recite rhyming ASL stories. There is also evidence that some Deaf children are able to develop rhyme awareness rather quickly after just a few examples.

Even though previous research has given reasons why ASL interventions are important for language development, this is only the tip of the iceberg, as there are still myriad questions to be answered regarding the effects of specific language approaches on Deaf children. Whatever the answers may be, this line of investigation is needed to offer challenges to the paradigm regarding the abilities of Deaf children and to generate a cultural, linguistic, and educational shift from looking at deafness alone as the cause of gaps in language and cognition abilities to optimizing and embracing Deaf ways of learning.

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APPENDIX

APPENDIX A

Letter of Approval from the Institutional Review Board



Exp211 Rev Approval (No Provisos)
April 20, 2018

Leala Kay Holcomb,
UTK - Coll of Education, Hlth, & Human - Theory & Practice In Teacher Education

Re: UTK IRB-18-04313-XP
Study Title: Effects of ASL Rhymes and Rhythms on Deaf Children' s Engagement and Recitation Skills

Dear Dr. Holcomb:

The UTK Institutional Review Board (IRB) reviewed your application for **revision** of your previously approved project, referenced above

The IRB determined that your application is eligible for **expedited** review under 45 CFR 46.110(b)(2). The following revisions were approved as complying with proper consideration of the rights and welfare of human subjects and the regulatory requirements for the protection of human subjects:

- Adding Dr. Thomas Holcomb as study personnel
- UTK Knoxville Main Campus IRB Application - Version 1.3

Approval does not alter the expiration date of this project, which is 03/26/2019.

In the event that subjects are to be recruited using solicitation materials, such as brochures, posters, web-based advertisements, etc., these materials must receive prior approval of the IRB. Any revisions in the approved application must also be submitted to and approved by the IRB prior to implementation. In addition, you are responsible for reporting any unanticipated serious adverse events or other problems involving risks to subjects or others in the manner required by the local IRB policy.

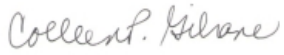
Finally, **re-approval** of your project is required by the IRB in accord with the conditions specified

Institutional Review Board | Office of Research & Engagement
1534 White Avenue Knoxville, TN 37996-1529
865-974-7697 865-974-7400 fax irb.utk.edu

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above. You may not continue the research study beyond the time or other limits specified unless you obtain prior written approval of the IRB.

Sincerely,



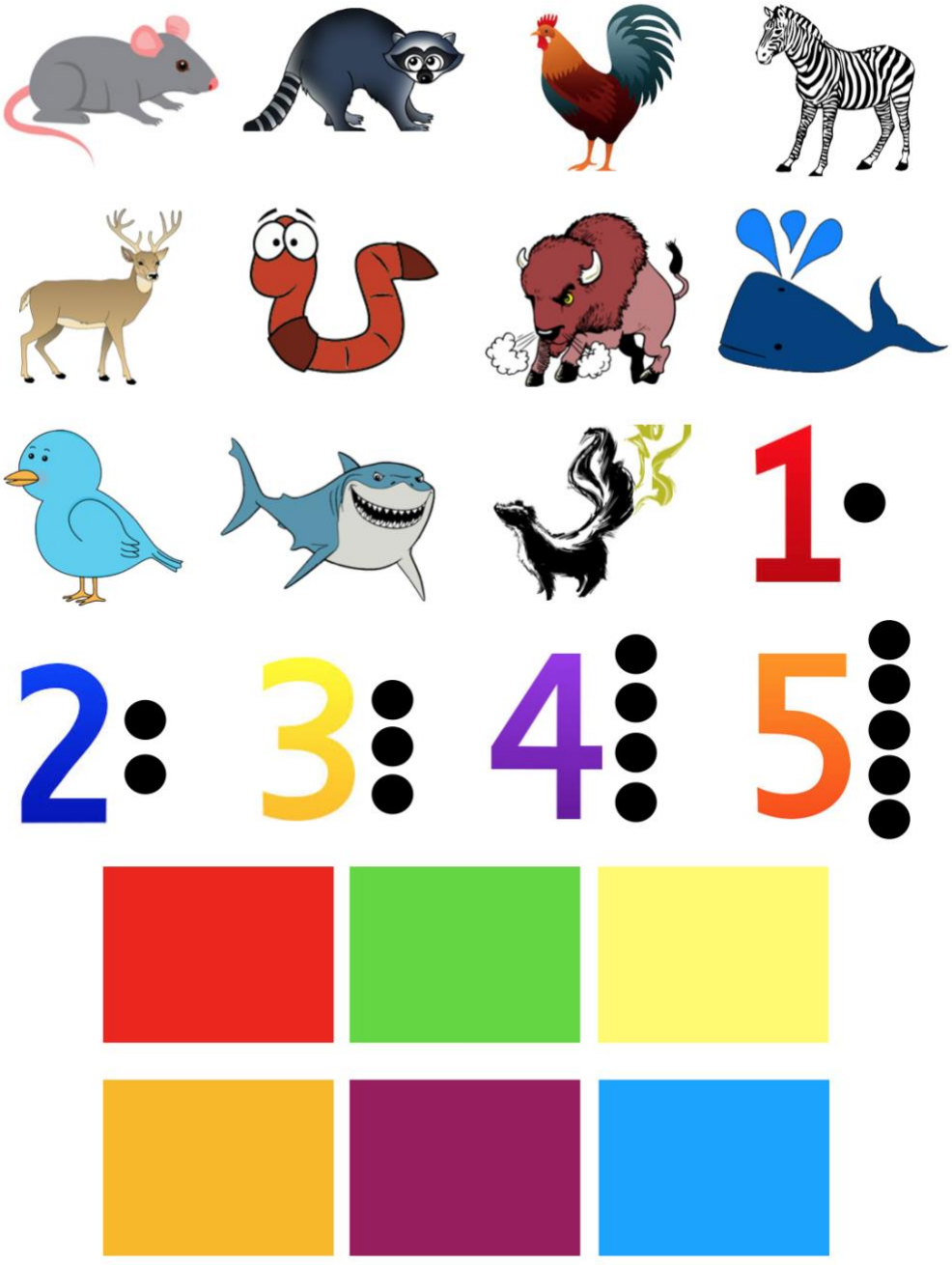
Colleen P. Gilrane, Ph.D.
Chair

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APPENDIX B

Picture Vocabulary Assessment



APPENDIX C

Family Background Questionnaire

Child Name:_____

Family Member/Guardian's Email Address:_____

Family Background

Family Member/Guardian #1

1. My relationship to the Deaf child (e.g. parent/guardian/grandma/uncle, etc.):

_____

2. My name is:

_____

3. My gender identity is (e.g. woman/man/transgender/non-binary/etc.):

_____

4. My pronoun is (e.g. she/he/they/ze/xe/etc.):

_____

5. My racial identity is (e.g. Asian-American/Latino/Black/African-American/White, etc.):

_____

6. My hearing status is (e.g. Deaf/Hard of Hearing/Hearing/etc.):

_____

7. My other identities are (e.g. any other identities not mentioned above you would like to add):

_____

8. Language(s) I use at home to communicate (e.g. spoken Spanish/written English/ASL/Mexican Sign Language/etc.):

_____

9. My American Sign Language skill is (e.g. none/basic/moderate/fluent/native/etc.):

_____

10. My highest degree (e.g. high school/B.A./M.A., etc.):

_____

11. My job title is (e.g. kindergarten teacher, stay-home dad, secretary, etc.):

_____

Family Member/Guardian #2

1. My relationship to the Deaf child (e.g. parent/guardian/grandma/uncle, etc.):

_____

2. My name is:

_____

3. My gender identity is (e.g. woman/man/transgender/non-binary/etc.):

_____

4. My pronoun is (e.g. she/he/they/ze/xe/etc.):

_____

5. My racial identity is (e.g. Asian-American/Latino/Black/African-American/White, etc.):

_____

6. My hearing status is (e.g. Deaf/Hard of Hearing/Hearing/etc.):

_____

7. My other identities are (e.g. any other identities not mentioned above you would like to add):

_____

8. The main language(s) I use at home to communicate (e.g. spoken Spanish/written English/ASL/Mexican Sign Language/etc.):

_____

9. My American Sign Language skill is (e.g. none/basic/moderate/fluent/native/etc.)

_____

10. My highest degree (e.g. high school/B.A./M.A., etc.)

_____

11. My job title is (e.g. kindergarten teacher, stay-home dad, secretary, etc.):

_____

My Child

1. My child's name is:

_____

2. My child's gender identity is (e.g. girl/boy/transgender/non-binary/etc.):

_____

3. My child's pronoun is (e.g. she/he/they/ze/xe/etc.):

_____

4. My child's racial identity is (e.g. Asian-American/Latino/Black/African-American/White, etc.):

_____

5. My child's other identities are (e.g. any other identities not mentioned above you would like to add):

_____

6. The main language(s) my child uses at home to communicate (e.g. spoken Spanish/written English/ASL/Mexican Sign Language/etc.):

_____

7. My child began learning American Sign Language at (e.g. birth/6 months/3 years old):

_____

APPENDIX D

Teacher Background Questionnaire

Teacher Name:_____

Teacher's Email Address:_____

1. My gender identity (e.g. woman/man/transgender/non-binary/etc.):

_____

2. My pronouns are (e.g. she/he/they/ze/etc.):

_____

3. My racial identity is (e.g. Asian-American/Latino/Black/African-American/White, etc.):

_____

4. My hearing status is (e.g. Deaf/Hard of Hearing/Hearing/etc.):

_____

5. My racial identity is (e.g. Asian-American/Latino/Black/African-American/White, etc.):

_____

6. My other identities are (e.g. any other identities not mentioned above you would like to add):

_____

7. My American Sign Language skill is (e.g. baic/moderate/fluent/native/etc.):

_____

8. My job title is (e.g. kindergarten teacher/family educator/etc.)

_____

9. I have been teaching for (e.g. 1 year/5 years/10 years/20 years/etc.):

_____

APPENDIX E

Social Validity Questionnaire for Teachers

Knowledge

1. I know how to make rhymes in ASL.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

2. I know how to make rhythms in ASL.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

Comments:_____

_____

_____

Experience and Uses

3. I had been using ASL rhymes and rhythms prior to this research.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

4. I used ASL rhymes and rhythms outside the research sessions during the research period.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

5. I will use ASL rhymes and rhythms with my students after this research is done.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

Comments:_____

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Implementation

6. ASL rhyme and rhythm videos are easy to implement in the classroom.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

7. Signing along with the ASL rhyme and rhythm videos is easy for me.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

8. Signing ASL rhymes and rhythms without videos is easy for me.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

Comments:_____

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Language Development

9. The uses of ASL rhymes and rhythms are a Deaf-centric approach.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

10. ASL rhymes and rhythms are effective for language acquisition.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

11. ASL rhymes and rhythms prompt young children into language play.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

12. ASL rhymes and rhythms promote ASL phonological awareness.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

13. ASL rhymes and rhythms are beneficial for children experiencing language deprivation.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

14. ASL rhymes and rhythms are beneficial for children with disabilities.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

15. ASL rhymes and rhythms are beneficial for children with age-appropriate language skills.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

Comments:_____

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Preference and Skills

16. Young children prefer videos with ASL rhymes and rhythms over videos without ASL rhymes and rhythms.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

17. Young children are more engaged in ASL stories if there are rhymes and rhythms.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

18. Young students' ability to memorize and re-tell ASL stories increase if there are rhymes and rhythms.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

Comments:_____

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ASL Rhyme and Rhythm Videos

19. The duration of ASL rhyme and rhythm videos is appropriate for young children.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

20. The second loop feature with the signer faded encouraged us to memorize the song and sign more independently.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

21. The features of rhymes used in the videos can be improved.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

22. The features of rhythms used in the videos can be improved.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

Comments:_____

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Recommendations

23. ASL rhyme and rhythm videos are good resources for teachers.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

24. ASL rhyme and rhythm videos are good resources for families.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

25. I would recommend ASL rhyme and rhythm videos to other teachers and parents of Deaf children.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

26.

27. ASL rhymes and rhythms have other benefits not listed in this questionnaire.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

Comments:_____

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APPENDIX F

Social Validity Questionnaire for Families

Knowledge

1. ***I know how to make rhymes in ASL.***

Strongly Disagree Disagree Uncertain Agree Strongly Agree

2. ***I know how to make rhythms in ASL.***

Strongly Disagree Disagree Uncertain Agree Strongly Agree

Comments:_____

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Experience and Uses

3. ***I was familiar with ASL rhymes and rhythms prior to this research.***

Strongly Disagree Disagree Uncertain Agree Strongly Agree

4. ***I used ASL rhymes and rhythms with my child at home prior to this research.***

Strongly Disagree Disagree Uncertain Agree Strongly Agree

5. ***My child liked reciting ASL rhymes and rhythms at home prior to this research.***

Strongly Disagree Disagree Uncertain Agree Strongly Agree

6. ***During the research period, my child recited ASL rhymes and rhythms they learned from school at home.***

Strongly Disagree Disagree Uncertain Agree Strongly Agree

7. ***I will use ASL rhymes and rhythms with my child at home after this research is done.***

Strongly Disagree Disagree Uncertain Agree Strongly Agree

8. Using ASL rhymes and rhythms increase family-child bonding.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

Comments:_____

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Implementation

9. I have access to ASL rhyme and rhythm videos at home.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

10. Signing along with ASL rhyme and rhythm videos is easy for me.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

11. Signing ASL rhymes and rhythms without videos is easy for me.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

Comments:_____

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Language Development

12. ASL rhymes and rhythms are a good way for families to learn signed language.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

13. The uses of ASL rhymes and rhythms are a Deaf-centric approach to language acquisition.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

14. ASL rhymes and rhythms are effective for language acquisition.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

15. ASL rhymes and rhythms prompt young children into language play.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

Preference and Skills

16. Young children prefer videos with ASL rhymes and rhythms over videos without ASL rhymes and rhythms.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

17. My child is more engaged in ASL stories if there are rhymes and rhythms.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

18. My child's ability to memorize and re-tell ASL stories increase if there are rhymes and rhythms.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

Comments:_____

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ASL Rhyme and Rhythm Videos

19. The duration of ASL rhyme and rhythm videos is appropriate for young children.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

20. The second loop feature with the signer faded encouraged us to memorize the song and sign more independently.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

21. The features of rhymes used in the videos can be improved.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

22. The features of rhythms used in the videos can be improved.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

Comments:_____

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Recommendations

23. ASL rhyme and rhythm videos are good resources for teachers.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

24. ASL rhyme and rhythm videos are good resources for families.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

25. ASL rhymes and rhythms have other benefits not listed in this questionnaire.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

Comments:_____

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APPENDIX G

Procedural Integrity for Engagement Behavior

STEPS	GUIDE	IMPLEMENTED (0 or 1)	COMMENTS
1	Set up the video on the Smartboard screen		
2	Sign, “READY - VIEW - ASL - STORY”		
3	Click “Play”		
4	Walk away from the Smartboard, stay behind the students, and refrain from intervening.		

APPENDIX H

Procedural Integrity for Accuracy in Recitation

STEPS	GUIDE	IMPLEMENTED (0 or 1)	COMMENTS
1	Prompt a participant to come to the conference room		
2	Sign “READY - WATCH - VIDEO – AGAIN”		
3	Click “Play” to show the video on the laptop		
4	View the video quietly until the end		
5	Sign “READY - SIGN – ALL - FROM BEGINNING TO END”		
6	Film using iPhone with a pleasant face on		
7	When the participant finishes, sign “yay.”		

APPENDIX I

Procedural Integrity for Handshape Rhyme Awareness Intervention #1

STEPS	GUIDE	IMPLEMENTED	COMMENTS
1	Set up the "Handshape" Keynote presentation on the Smartboard		
2	Transition students to the ASL center by waving and signing "ASL!"		
3	Show Slide #1: Handshape Chart		
4	Raised hand to create "1" handshape		
5	Look for the "1" handshape on the handshape chart		
6	Point at the "1" handshape on the handshape chart		
7	Think out aloud three different signed words that use the "1" handshape		
8	Ask students to provide more examples		
9	Show Slide #2: Animals Crossing, Handshape "1"		
10	Ask students what handshape was used for all of the signed words?		
11	Repeat the line "SPOT – ONE – MOUSE – CROSSING"		
12	Say that all signed words use the same "1" handshape		
13	Show Slide #3: Handshape Chart		
14	Raised hand to create "2" handshape		
15	Look for the "2" handshape on the handshape chart		
16	Point at the "2" handshape on the handshape chart		
17	Think out aloud three different signed words that use the "2" handshape		

18	Ask students to provide more examples		
19	Show Slide #4: Animals Crossing, Handshape “2”		
20	Ask students what handshape was used for all of the signed words?		
21	Repeat the line “SEE – TWO – RACCOONS – CROSSING”		
22	Say that all signed words use the same “2” handshape		
23	Show Slide #5: Handshape Chart		
24	Raised hand to create “3” handshape		
25	Look for the “3” handshape on the handshape chart		
26	Point at the “3” handshape on the handshape chart		
27	Think out aloud three different signed words that use the “3” handshape		
28	Ask students to provide more examples		
29	Show Slide #6: Animals Crossing, Handshape “3”		
30	Ask students what handshape was used for all of the signed words?		
31	Repeat the line “JAW DROPS – THREE – ROOSTERS – CROSSING”		
32	Say that all signed words use the same “3” handshape		
33	Show Slide #7: Handshape Chart		
34	Raised hand to create “4” handshape		
35	Look for the “4” handshape on the handshape chart		
36	Point at the “4” handshape on the handshape chart		
37	Think out aloud three different signed words that use the “4” handshape		

38	Ask students to provide more examples		
39	Show Slide #8: Animals Crossing, Handshape “4”		
40	Ask students what handshape was used for all of the signed words?		
41	Repeat the line “HAIR STANDS – FOUR – ZEBRAS – CROSSING”		
42	Say that all signed words use the same “4” handshape		
43	Show Slide #9: Handshape Chart		
44	Raised hand to create “5” handshape		
45	Look for the “5” handshape on the handshape chart		
46	Point at the “5” handshape on the handshape chart		
47	Think out aloud three different signed words that use the “5” handshape		
48	Ask students to provide more examples		
49	Show Slide #10: Animals Crossing, Handshape “5”		
50	Ask students what handshape was used for all of the signed words?		
51	Repeat the line “EYES POP – FIVE – DEERS – CROSSING”		
52	Say that all signed words use the same “5” handshape		
53	Show Slide #11: View the Animals Crossing story		
54	While viewing, raise hand to form handshape that matches the signed words in the ASL story		
55	Show Slide #12: Handshapes 1-5		
56	Tell students to watch me recite the whole story from memory		

57	Line #1: Sabotage the situation by inserting a signed word not following the correct handshape sequence (e.g. EYES POP - ONE – MOUSE)		
58	Pause and wait for students to correct you		
59	Say that EYES POP is wrong because it uses the wrong handshape “5”.		
60	Ask which signed word uses the correct “1” handshape		
61	Pause and wait for students to provide the correct answer		
62	Repeat line #1 with the correct signed words		
63	Line #2: Sabotage the situation by inserting a signed word not following the correct handshape sequence (e.g. SPOT - TWO – RACCOON)		
64	Pause and wait for students to correct you		
65	Say that SPOT is wrong because it uses the wrong handshape “1”.		
66	Ask which signed word uses the correct “2” handshape		
67	Pause and wait for students to provide the correct answer		
68	Repeat line #2 with the correct signed words		
69	Line #3: Sabotage the situation by inserting a signed word not following the correct handshape sequence (e.g. HAIR STANDS - THREE – RACCOONS)		
70	Pause and wait for students to correct you		
71	Say that HAIR STANDS is wrong because it uses the wrong handshape “4”.		
72	Ask which signed word uses the correct “3” handshape		

73	Pause and wait for students to provide the correct answer		
74	Repeat line #3 with the correct signed words		
75	Line #4: Sabotage the situation by inserting a signed word not following the correct handshape sequence (e.g. SEE - FOUR – ZEBRAS)		
76	Pause and wait for students to correct you		
77	Say that SEE is wrong because it uses the wrong handshape “2”.		
78	Ask which signed word uses the correct “4” handshape		
79	Pause and wait for students to provide the correct answer		
80	Repeat line #4 with the correct signed words		
81	Line #5: Sabotage the situation by inserting a signed word not following the correct handshape sequence (e.g. JAW DROP - FIVE – DEERS)		
82	Pause and wait for students to correct you		
83	Say that JAW DROP is wrong because it uses the wrong handshape “3”.		
84	Ask which signed word uses the correct “5” handshape		
85	Pause and wait for students to provide the correct answer		
86	Repeat line #5 with the correct signed words		

APPENDIX J

Procedural Integrity for Handshape Rhyme Awareness Intervention #2

STEPS	GUIDE	IMPLEMENTED	COMMENTS
1	Set up the "Handshape" Keynote presentation on the Smartboard		
2	Transition students to the ASL center by waving and signing "ASL!"		
3	Show Slide #1: Handshape Chart		
4	Raised hand to create "1X" handshape		
5	Look for the "1X" handshape on the handshape chart		
6	Point at the "1X" handshape on the handshape chart		
7	Think out aloud three different signed words that use the "1X" handshape		
8	Ask students to provide more examples		
9	Show Slide #2: Colorful Animals, Line 1, Handshape "1X"		
10	Ask students what handshape was used for all of the signed words?		
11	Repeat the line "RED – WORM – WIGGLE - ASK"		
12	Say that all signed words use the same "1X" handshape		
13	Show Slide #3: Handshape Chart		
14	Raised hand to create "CS" handshape		
15	Look for the "CS" handshape on the handshape chart		
16	Point at the "CS" handshape on the handshape chart		

17	Think out aloud three different signed words that use the “CS” handshape		
18	Ask students to provide more examples		
19	Show Slide #4: Colorful Animals, Line 2, Handshape “CS”		
20	Ask students what handshape was used for all of the signed words?		
21	Repeat the line “ORANGE – BISON – STOMP - GULP”		
22	Say that all signed words use the same “CS” handshape		
23	Show Slide #5: Handshape Chart		
24	Raised hand to create “Y” handshape		
25	Look for the “Y” handshape on the handshape chart		
26	Point at the “Y” handshape on the handshape chart		
27	Think out aloud three different signed words that use the “Y” handshape		
28	Ask students to provide more examples		
29	Show Slide #6: Colorful Animals, Line 3, Handshape “Y”		
30	Ask students what handshape was used for all of the signed words?		
31	Repeat the line “YELLOW – COW – CHEW – SILLY”		
32	Say that all signed words use the same “Y” handshape		
33	Show Slide #7: Handshape Chart		
34	Raised hand to create “G” handshape		
35	Look for the “G” handshape on the handshape chart		
36	Point at the “G” handshape on the handshape chart		

37	Think out aloud three different signed words that use the “G” handshape		
38	Ask students to provide more examples		
39	Show Slide #8: Colorful Animals, Line 4, Handshape “G”		
40	Ask students what handshape was used for all of the signed words?		
41	Repeat the line “GREEN – BIRD – SING - ZOOM”		
42	Say that all signed words use the same “G” handshape		
43	Show Slide #9: Handshape Chart		
44	Raised hand to create “B” handshape		
45	Look for the “B” handshape on the handshape chart		
46	Point at the “B” handshape on the handshape chart		
47	Think out aloud three different signed words that use the “B” handshape		
48	Ask students to provide more examples		
49	Show Slide #10: Colorful Animals, Line 5, Handshape “B”		
50	Ask students what handshape was used for all of the signed words?		
51	Repeat the line “BLUE – SHARK – SWIM - TROUBLE”		
52	Say that all signed words use the same “B” handshape		
53	Show Slide #11: Handshape Chart		
54	Raised hand to create “P” handshape		
55	Look for the “P” handshape on the handshape chart		

56	Point at the “P” handshape on the handshape chart		
57	Think out aloud three different signed words that use the “P” handshape		
58	Ask students to provide more examples		
59	Show Slide #12: Colorful Animals, Line 6, Handshape “P”		
60	Ask students what handshape was used for all of the signed words?		
61	Repeat the line “PURPLE – SKUNK – WALK – TAKE CARE		
62	Say that all signed words use the same “P” handshape		
63	Show Slide #13: View the Colorful Animals story		
64	While viewing, raise hand to form handshape that matches the signed words in the ASL story		
65	Show Slide #12: Handshapes 1X, CS, Y, G, B, P		
66	Tell students to watch me recite the whole story from memory		
67	Line #1: Sabotage the situation by inserting a signed word not following the correct handshape sequence (e.g. RED – COW – WIGGLE - ASK)		
68	Pause and wait for students to correct you		
69	Say that COW is wrong because it uses the wrong handshape “Y”.		
70	Ask which signed word uses the correct “1X” handshape		
71	Pause and wait for students to provide the correct answer		
72	Repeat line #1 with the correct signed words		

73	Line #2: Sabotage the situation by inserting a signed word not following the correct handshape sequence (e.g. ORANGE – WORM – STOMP - GULP)		
74	Pause and wait for students to correct you		
75	Say that WORM is wrong because it uses the wrong handshape “1X”.		
76	Ask which signed word uses the correct “CS” handshape		
77	Pause and wait for students to provide the correct answer		
78	Repeat line #2 with the correct signed words		
79	Line #3: Sabotage the situation by inserting a signed word not following the correct handshape sequence (e.g. YELLOW – SHARK – CHEW - SILLY)		
80	Pause and wait for students to correct you		
81	Say that SHARK is wrong because it uses the wrong handshape “B”.		
82	Ask which signed word uses the correct “Y” handshape		
83	Pause and wait for students to provide the correct answer		
84	Repeat line #3 with the correct signed words		
85	Line #4: Sabotage the situation by inserting a signed word not following the correct handshape sequence (e.g. GREEN – SKUNK – SING - ZOOM)		
86	Pause and wait for students to correct you		
87	Say that SKUNK is wrong because it uses the wrong handshape “K”.		

88	Ask which signed word uses the correct “G” handshape		
89	Pause and wait for students to provide the correct answer		
90	Repeat line #4 with the correct signed words		
91	Line #5: Sabotage the situation by inserting a signed word not following the correct handshape sequence (e.g. BLUE – BISON – SWIM – TROUBLE)		
92	Pause and wait for students to correct you		
93	Say that BISON is wrong because it uses the wrong handshape “CS”.		
94	Ask which signed word uses the correct “B” handshape		
95	Pause and wait for students to provide the correct answer		
96	Repeat line #5 with the correct signed words		
97	Line #6: Sabotage the situation by inserting a signed word not following the correct handshape sequence (e.g. PURPLE – BIRD – WALK – TAKE CARE)		
98	Pause and wait for students to correct you		
99	Say that BIRD is wrong because it uses the wrong handshape “G”.		
100	Ask which signed word uses the correct “K” handshape		
101	Pause and wait for students to provide the correct answer		
102	Repeat line #6 with the correct signed words		

VITA

Leala Holcomb comes from a multigenerational Deaf family with zir parents and grandparents passionately involved in improving the quality of education for Deaf children. After graduating from the California School for the Deaf, Fremont (CSDF) in 2005, Leala continued zir education at Gallaudet University and earned a B.A. in International Education and Development. Leala also obtained a M.A. in Special Education with specialization in Deaf Education from National University. Leala returned to CSDF to teach in the Early Childhood Education department where ze was instrumental in developing American Sign Language (ASL) national standards, bilingual resources, and ASL rhyme and rhythm videos. Leala is committed to the anti-oppression work and aims to eradicate systemic inequalities within the education system. Since then, Leala has taught college level courses at Kapiolani Community College, Chinese University of Hong Kong, and University of Tennessee, Knoxville on topics pertaining to Deaf education. Leala also has been giving presentations at national and international conferences in addition to providing consultations to schools nationally and internationally. On the side, Leala is devoting zir energy on a new enterprise called Hands Land to develop educational resources for young children through ASL rhyme and rhythm.