

Teaching American Sign Language to Children with Autism Spectrum Disorder

Submitted by
Abby L. Hein

Linguistics

To
The Honors College
Oakland University

In partial fulfillment of the
requirement to graduate from
The Honors College

Mentor: Kuniko Nielsen, Associate Professor
Linguistics Department
Oakland University

Mentor: Teri Jacobsen
Speech Language Pathologist
Lake Orion Community Schools

(April 3rd, 2019)

Abstract

This project analyzed how learning American Sign Language (ASL) impacts the verbal and nonverbal communication skills of children with Autism Spectrum Disorder (ASD) and explored the effectiveness of using a book as a visual aid to teach ASL to children with ASD. Three fourth grade participants with ASD were taught ASL in an elementary school setting during twelve sessions over the course of nine weeks. The book used in this project contained twenty-one basic signs that the participants most likely use on a daily basis. Results showed improved verbal communication for two of the three participants, increased retention of ASL for one of the participants, and the book proved to be an effective teaching tool for one of the participants. Further research applications of using a book to teach ASL to children with ASD were identified throughout the research process of this project. Teaching ASL to this population has the potential to benefit the individual in their social endeavors with their families, teachers, and peers. Learning ASL creates a new form of communication for children with ASD, and this new means of expression could be life changing for those who are non-verbal or lack effective communication skills in a variety of situations.

Keywords: autism spectrum disorder, communication skills, teaching tool, book, verbal and nonverbal communication

Teaching American Sign Language to Children on the Autism Spectrum

Introduction

Imagine being unable to effectively communicate your wants, needs, and concerns, and how that would impact your daily life and responsibilities. This is a common situation that individuals with Autism Spectrum Disorder (ASD) encounter. ASD is characterized by “challenges with social skills, repetitive behaviors, speech, and nonverbal communication” (Autism Speaks, 2008). Those with ASD may also be affected negatively by sensory stimulation. Individuals with ASD may be overly sensitive to a combination of all of the sensory information that exists in the world around them, for example: bright lights, an itchy shirt, or a strong smell. ASD is a spectrum disorder, which means not all individuals with ASD present the same symptoms or are affected by the same difficulties or sensory stimulations. Individuals on the Autism Spectrum have a range of functioning and ability, and these individuals have their own set of strengths and challenges.

Since ASD can affect verbal and nonverbal communication skills, these individuals may not be able to effectively communicate their wants, needs, and ideas with others. Currently, there are various forms of Augmentative and Alternative Communication (AAC) available to help assist the communication skills of individuals with ASD. AAC is a fairly new program that began to gain popularity and a more widespread use in the late 1970s (Glennen, S. L., & DeCoste, D. C. 1997). There are two categories of AAC: unaided and aided. Unaided methods of AAC “rely completely on the user’s body to convey messages” (Glennen, S. L., & DeCoste, D. C., 1997). Examples of unaided AAC include: vocal sounds, sign language, and gestures. Aided methods of AAC “require the use of tools or equipment in addition to the user’s body” (Glennen,

S. L., & DeCoste, D. C., 1997). Examples of aided AAC include, but are not limited to: a whiteboard, pencil and paper, a picture board, or a computer with a speech synthesizer program. There are many different ways that AAC can be used depending on the functioning and ability of the user. For example, an individual can directly select words to communicate from a picture board, or they may scan through a program to search for words to help them communicate. In the text, *Instruments for Augmentative and Alternative Communication for Children with Autism Spectrum Disorder: a Systematic Review*, results showed that specific AAC programs “produce improvements in the communication skills, socialization and self-care skills of children with Autism Spectrum Disorder” (Antão, 2018). Various research articles have shown that AAC is effective in increasing the communication skills of individuals with a range of disabilities. Currently, there is little research on whether American Sign Language (ASL) is a successful form of AAC.

This thesis project aims to explore how learning ASL can be used as a form of AAC for those on the Autism Spectrum. All signs in ASL are composed of five parameters: handshape, location, movement, orientation, and facial expression. All five of these parameters contribute meaning to the sign. Handshape refers to the configuration of the signer’s hand when producing the sign. Location refers to where the sign is produced in relation to the body. Movement refers to the actions of the sign when it is produced. Examples of palm orientation include palm facing out, facing down, facing up, etc. Facial expressions provide meaning for a majority of signs in ASL, and this parameter plays an important role in the correct production and meaning of the sign. This research project examined the production of four of these parameters as linguistic units of ASL: handshape, location, movement, and orientation. Facial expressions were not

analyzed or taught to the participants. Facial expressions do not play a similar role in English as they do in ASL. Therefore, they are a difficult parameter to teach, especially among the population of this project's participants.

The effect of learning ASL on the nonverbal and verbal communication of children with ASD was analyzed after a nine week long teaching period with elementary-aged children. The following were the goals of this thesis project:

1. Create a book to be used as a teaching tool to aid in the effective learning and retention of American Sign Language by individuals with Autism Spectrum Disorder
2. Explore the effectiveness of the book as a visual teaching tool
3. Analyze the effect of learning American Sign Language on the verbal and nonverbal communication skills of children with Autism Spectrum Disorder
4. Identify further research applications of using a book to teach American Sign Language to individuals with Autism Spectrum Disorder

Past research has shown learning ASL increases verbal communication in children with ASD.

Research findings presented in the text, *Spontaneous Verbal Language for Autistic children Through Signed Speech*, showed that verbal communication increased after participants (children with ASD) learned and used ASL while using signed speech (Schaeffer, B., Kollinzas, G., Musil, A., & McDowell, P., 1977). Signed speech can be defined as simultaneously verbalizing and signing. In the article, *Simultaneous Presentation of Speech and Sign Prompts to Increase MLU in Children With Intellectual Disability*, the effectiveness of three Augmentative and Alternative Communication interventions was analyzed to determine the impact of these interventions on the Mean Length of Utterance (MLU) of children with intellectual disabilities. MLU is the average

number of morphemes in an utterance, and it is a measure of language development in children. The three AAC interventions used in the study included “verbal imitation prompting, American Sign Language prompting, and simultaneous verbal imitation prompting and key word sign prompting” (Pattison, A. E., & Robertson, R. E., 2016). Results showed that simultaneous verbal imitation prompting and key word sign prompting led to the greatest MLU, but all forms of AAC intervention increased the MLU of the participants. These two studies show that combining verbal prompts with use of ASL can increase the verbal communication skills of children with ASD or intellectual disabilities. In relation to this research study, verbal prompts were offered while using the book in order to increase the exposure to these two forms of communication and attempt to increase the verbal and nonverbal communication of the participants.

Past research on using visual aids as an effective teaching tool strengthened the decision to use a book to teach the participants ASL in hopes that it would increase the effectiveness of the teaching period. Bryan & Gast (2000) analyzed the effect of using a “picture activity book” to increase on-task and scheduled behavior among children with ASD, and results showed that “student performance rose and was maintained when the book was available, and dropped when the book was not available.” Using a picture activity book promoted on-task behavior and retention of a behavior schedule. Pierce & Schreibman (1994) assessed the efficiency of using pictorial visual aids to teach self management and daily living skills to participants with low-functioning ASD, and results showed that “children with autism could successfully use pictures to manage their behavior in the absence of a treatment provider, generalize their behavior across settings and tasks, and maintain behaviors at follow-up.” These two research studies showed that using pictorial visual aids are successful when teaching individuals with

ASD. The book used in this research study was kept at the school with the participants, so that access and exposure to the book was maximized. It was hypothesized that the book would be an effective visual aid and teaching tool when teaching ASL to children with ASD, and that learning ASL would increase the verbal and nonverbal communication skills of the participants.

Methods

Creating the Book

The first step of this project consisted of creating a book that would be used to teach ASL to children with ASD. With the help of the participant's teachers, twenty-one signs were identified that elementary-aged children would most likely use and need to communicate on a daily basis. The following words were included in the book: want, food/eat, water, drink, home, time (to), car, go, school, stop, bathroom, again, more, thank you, yes, no, hungry, tired, happy, play, finish. The book layout consisted of one sign per page. The written word was stated at the top of each page, and a picture of the signed word was inserted below. If there was more than one location, orientation, handshape, or if the sign had movement, then multiple pictures were inserted on the page to demonstrate these changes in the parameters of the sign. If the movement was difficult to understand by only looking at the picture, "tip boxes" were included to better inform the reader of the intended and correct sign parameters. An example page of the book is presented in **Figure 1**.



Figure 1: Book page example for the sign “eat”

After completion of the book, a copy was printed with saddle-stitch binding. This copy demonstrated the “end result” of the book and was not used in the actual research. The participant’s teachers and speech language pathologist advised that the participants occasionally mistreat books, and this can lead to destruction of the text. The participant’s teachers and speech language pathologist suggested that alternate copies of the book be made for use in the teaching portion of this thesis project . Eight copies of the book were made, laminated, and spiral bound with large binding. These copies of the book were effective during the teaching period because the children could handle the books how they pleased, a book could be left in the participant's classroom at all times for continued exposure, and alternate copies were available if one of the books was mistreated.

Observation

Before use of the book to teach ASL, participant’s classroom behavior was observed for one week to explore the following questions:

1. What are the participant's current daily routines?
2. What is the current level of social interaction between the participants and their peers and teachers?
3. What are the participant's interests?
4. What are the participant's current levels of functioning?
5. How do the participants currently communicate verbally and nonverbally? Do the participants use Augmentative and Alternative forms of Communication?

There are two teachers in the ASD classroom at the elementary school where the research was completed. Even though the teachers share a classroom, they are assigned their own student caseload. All of the participants in this study were assigned the same teacher, but frequently interacted with the other ASD teacher as well. The sensory room is a separate room from the ASD classroom. The sensory room contains puzzles, books, play-doh, a bike, a swing, tables for activities, etc. The students in the ASD classrooms use the sensory room for calming purposes and free time. I worked with the participants in both the ASD classroom and the sensory room.

The participant's behaviors, likes, dislikes, difficulties, and strengths were observed throughout the observation period. The participant's teachers were also asked the previously listed questions to gain information about the participants. The daily routines of the participants consisted of academic lessons, working individually with a teacher, free time to explore and participate in activities they are interested in, and sensory time. It was observed that the participants had a considerable amount of social interaction with their teachers and para-pros, but they lacked social interaction with their peers. Throughout the day, there are usually five to ten students with ASD in the classroom at all times. The participants in this study did not socially interact with one another, and verbal and nonverbal communication between the participants and their peers was uncommon.

Participant Introduction

Participant one is a fourth-grade, nine-year old male with ASD. He is mostly verbal, but difficult to understand due to his hearing impairment. Participant one's cognitive functioning is higher than the other two participants. He communicates his wants and needs with his teachers mostly through writing on a whiteboard. His teachers are also able to communicate directions, desired tasks, and requests for improved behavior. This form of communication is effective, but not efficient for the participant and his teachers. Participant one does not have any former knowledge or use of ASL. He responds well to a strict schedule and enjoys his time in the sensory room and watching read-along books. In regard to his hearing impairment, participant one usually wears hearing aids in thirty minute intervals throughout the school day, and he is currently in the process of receiving a cochlear implant.

Participant two is a fourth-grade, nine-year old male with ASD. He is mostly non-verbal, but he is occasionally able to produce specific words in context. For example:

- At lunch, the participant said "ketchup"
- When a teacher asked him what he wanted, he said "bottle" (he has a bottle that he likes to chew on)
- When he fell and hurt his back, he said "back"
- When he was looking at a picture in one of his favorite books that shows a man drinking coffee, he said "coffee time"

Participant two often vocalizes, but the sounds do not have meaning. In terms of nonverbal communication, he has been exposed to the signs "more" and "bathroom" by his teachers. He occasionally produces an adapted sign for "more" but he does not produce any other signs, and he does not have substantial previous knowledge or use of ASL. After a few weeks of working with participant two, it was observed that he responds well to structured and consistent seating while working. Participant two also suffers from epilepsy, which causes him to have changes in

behavior before and after having seizures. He is able to express his feelings through facial expressions and sounds, and he has lower cognitive function and ability than the other two participants.

Participant three is a fourth-grade, ten-year old male with ASD. He is completely non-verbal, but he occasionally vocalizes sounds to express his emotions. He mostly non-verbally communicates by taking a teacher's hand and guiding them to somewhere in the classroom to express his wants and needs. He has some previous knowledge of ASL, and he produces alternate signs (not official ASL signs) for a few words he frequently uses to express his wants and needs. For example:

- He puts his palm to his cheek to express that he wants to lay down in the back of his classroom
- He moves his pointer finger from his mouth down his throat to produce an alternate sign for "drink"
(This is different from the official ASL sign for "drink")
- He understands and produces the correct ASL sign for "cookie"
- He produces an alternate sign for "more" by keeping his left hand upright (fingers pointing upwards, thumb facing himself) and taking his right hand and touching his fingers (minus his thumb) to his left palm
(This is different from the official ASL sign for "more")

Participant three responds well to rewards. Cookies are commonly used as a reward for working with a teacher, going to the bathroom, etc. He enjoys being pushed in his wheelchair and laying down in the back of his classroom for rest time or to calm himself down. He strongly dislikes loud noises or when his peers are upset. His cognitive functioning is higher than participant two, but slightly lower than participant one. It was observed that participant two is extremely assertive when nonverbally communicating his wants and needs.

Pre-test

Originally, an official pre-test was planned to be conducted in order to determine the participant's current knowledge of ASL and use of verbal and nonverbal communication. This test was going to consist of asking the participants to produce the sign and vocalize each of the twenty-one signs from the book. However, after learning from the observation period that two of the participants had no previous ASL knowledge, it was decided that a pre-test would not be an efficient way to test the participant's current verbal and nonverbal communication and use of ASL. Rather than conducting this formal pre-test, the observation period and insight from the teachers was used to gauge the participant's current knowledge and use of ASL. All of the signs the participants currently produced or were familiar with were noted. The participant's current verbal and nonverbal communication were identified from the observation period as well.

Table 1 summarizes the participant's knowledge and use of ASL prior to the current experiment.

	Participant 1	Participant 2	Participant 3
want			
food/eat	familiar	familiar	familiar
water			
drink			produced alternate sign
home			
time (to)			
car			
go			

school			
stop	familiar	familiar	familiar
bathroom	familiar	familiar	familiar
again			
more		produced	produced alternate sign
thank you			
yes	familiar		
no	familiar		
hungry			
tired			produced alternate sign
happy			
play			
finish			

Table 1: Participant's previous knowledge and use of ASL

Working with the Book

After the completion of the observation period, the three participants were taught ASL by using the book weekly on Mondays, Wednesdays, and Fridays. The sessions varied in length due to the participant's attention span, mood, and behavior. On average, the sessions consisted of approximately ten minutes of work with the book. The twenty-one signs in the book were

divided into three groups of seven target signs. For the first five days of working with the book, the sessions focused on teaching the first set of seven target signs to the participants. For the next four days, the sessions focused on teaching the second set of seven target signs. For the final three days of working with the book, the sessions focused on teaching the third set of target signs. Due to absences and unforeseen circumstances, participant one was only able to work with the book for ten out of twelve teaching sessions and participant two was only able to work with the book for eight out of twelve teaching sessions. Due to behavior issues, participant three was only able to work with the book for five out of twelve teaching sessions. The breakdown of the three sets of target signs are represented in **Table 2**.

Target Signs Group 1	Target Signs Group 2	Target Signs Group 3
want	go	yes
food/eat	school	no
water	stop	hungry
drink	bathroom	tired
home	again	happy
time (to)	more	play
car	Thank you	finish

Table 2: Organization of target signs

While working with the book, routines and methodology varied depending on the participant's level of functioning and ability. Participant one was able to flip through the book on his own and learn the signs by looking at the pictures that were presented. Verbal guidance was

offered if participant one struggled with specific sign parameters. It was not effective for physical guidance to be offered to participant one when he was attempting to learn and produce the signs because it caused him to become frustrated. Instead, if participant one needed help producing a specific sign, verbal reminders to look closely at the pictures in the book were offered and the signs were demonstrated.

Unlike participant one, participants two and three required hand-over-hand physical guidance when producing the signs. Due to their levels of functioning and ability, participants two and three were unable to flip through the book and learn the signs solely by looking at the pictures. The teaching sessions working with participants two and three consisted of a verbal demonstration of the word, physical demonstration of the sign, and then help producing the sign by using the hand-over-hand method. Phrases such as “your turn” or “show me ___” were used to encourage the participants to produce the signs or verbalize the words on their own.

As stated previously, participants worked in both the ASD classroom and the sensory room. Participant one worked best at a desk or a table. Occasionally, the location was adjusted to fit his needs and work with the book was completed while he was sitting on the bike in the sensory room. Participants two and three worked best at a desk or table because they were better able to stay on task. It was difficult to encourage participant two to work at a desk or table, so the location had to be adjusted and work with the book was completed in several places such as: the swing in the sensory room, the floor, or wherever the participant was currently sitting.

Participant three frequently worked in the back room of the ASD classroom where he enjoyed laying down. Overall, the sessions took place in various locations throughout the ASD classroom and sensory room.

Benchmark Tests

Throughout the teaching period of this thesis project, three benchmark tests were conducted after the completion of working with each of the three sets of target signs. The benchmark tests analyzed the participant's sign parameter production and verbal and nonverbal communication. During the benchmark tests, the participants were prompted with different questions depending on their level of functioning and ability. Participant one was prompted with the phrase “can you show me how to say ___ with your hands?” and the following sign production and verbal communication of the word were observed. When testing participants two and three, the phrase “show me _____” was used to prompt the participants. If participants two and three did not produce the sign on their own, the hand-over-hand method was used to help the participants produce the sign. Benchmark test one analyzed the verbal and sign parameter production of the first set of target signs: want, food, water, drink, home, time (to), and car. The benchmark tests were cumulative, so benchmark test two analyzed the first set of target signs and the second set of target signs: go, school, stop, bathroom, again, more, and thank you. Benchmark test three analyzed the first two sets of target signs and the third set of target signs: yes, no, hungry, tired, happy, play and finish.

Results

Results from the three benchmark tests showed retention of ASL for participant one, and improved verbal communication skills for participants one and two. The results from the three benchmark tests are shown in **Figure 2**. Research with participant three ended before benchmark test two was conducted. Therefore, this data is not present. Additionally, results also showed that

the book only proved to be an effective teaching tool for participant one due the three participant's varying degrees of functioning and ability.

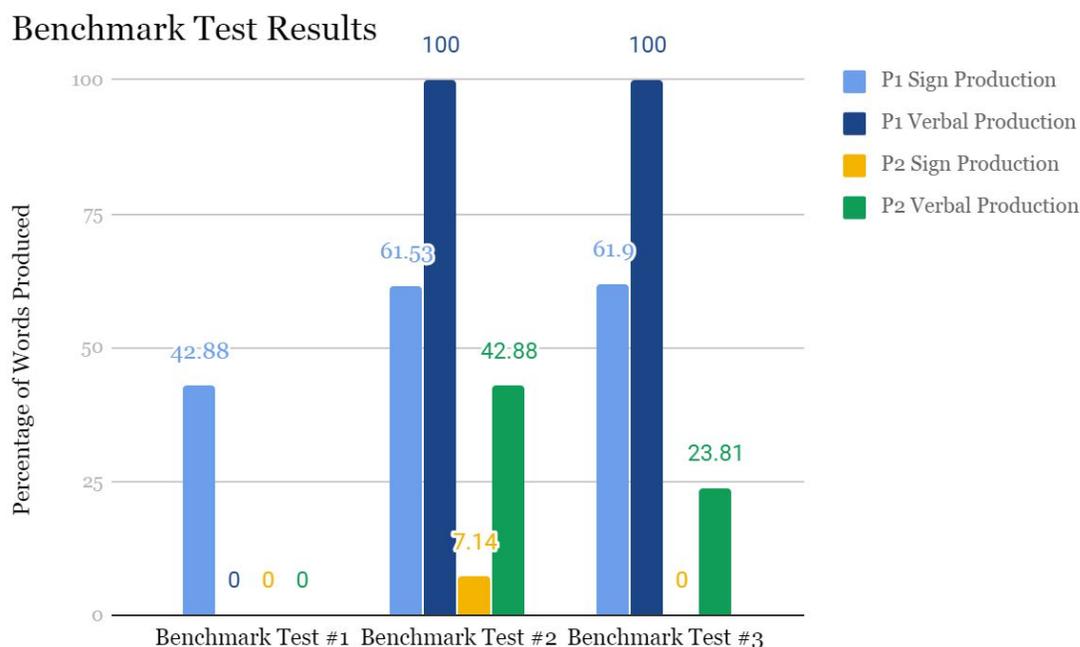


Figure 2: Participant sign production and verbal production

This project also aimed to analyze how learning ASL impacted the verbal and nonverbal communication skills of the participants. As shown in Figure 2, the verbal communication skills of participants one and three increased over the course of the research period. Participant one began to verbalize the words during the benchmark tests while he was producing the sign. Participant two had limited sign production, but his verbal communication skills increased at each benchmark test. Participant three is nonverbal, and even though the research period with this participant was shortened due to behavior issues, it was observed that his verbal communication skills were not affected by learning ASL. At the end of the research period with participant two, he remained nonverbal.

In addition to the three participants, one of their peers developed an interest in learning ASL from the book after watching his peers and looking at the book himself. This student is in kindergarten, and he is verbal - except during times of frustration and meltdowns, he is unable to communicate his wants and needs. This student had no previous knowledge of ASL and he showed a high level of interest in the book. He was able to learn all of the signs by solely looking at the pictures in the book. He produced eight of the thirteen signs he learned after being tested with the verbal prompt “how do you say ____ with your hands?” He also verbally produced all of the words for the signs he learned.

Discussion

In this project, the book was an effective teaching tool for participant one because he was able to look at the pictures in the book and produce the sign without any additional resources. While some of the sign parameters may have been incorrect or modified, the participant was still able to learn to produce a majority of the signs correctly by looking at the pictures in the book. Participants two and three were unable to successfully use the book without additional resources to learn ASL. The difference in the participant’s ability to use the book as a successful teaching tool was dependent on their cognitive ability and interest, among other unknown factors.

As previously mentioned, participant one learned the twenty one ASL signs presented solely by looking at the pictures in the book. While some of his parameter production errors seemed random or only occurred once, some parameter production errors occurred repeatedly throughout the research period. It was observed that specific signs were commonly harder to learn and produce among all three participants. For example, “want” was a difficult sign to gain the participant’s interest, the movement and location parameters of the sign for “eat” were easier

for the participants to produce, the handshape parameter of the signs for “home” “play” and “tired” were difficult to produce, and the orientation parameter of the sign for “yes” was difficult to produce. Additional trends are represented in **Table 3**. Terms with no comments signify that the sign was neither especially difficult nor especially easy to produce, and the interest level of the sign was average for the participants.

P1 = Participant One

P2 = Participant Two

P3 = Participant Three

want	<ul style="list-style-type: none"> ● Difficult sign to gain interest by all participants ● P2 and P3 – difficult to produce this sign with hand-over-hand method
food/eat	<ul style="list-style-type: none"> ● P2 and P3 – commonly touch mouth to “produce” this sign (incorrect handshape, correct location and movement) ● P3 – high interest
water	<ul style="list-style-type: none"> ● P1 – difficult handshape, but can produce
drink	<ul style="list-style-type: none"> ● P1 – tilts head all the way back, correct handshape, location and movement ● P3 – alternate sign (previous knowledge)
home	<ul style="list-style-type: none"> ● P1 – difficult to produce handshape, altered handshape (flat hand)
time (to)	<ul style="list-style-type: none"> ● P1 – difficult concept to grasp with phrasing “time (to)” participant would ask “time for what?”
car	<ul style="list-style-type: none"> ● P1 – high interest, enjoys signing ● P2 – high interest, movement is the easiest parameter for him to produce
go	
school	<ul style="list-style-type: none"> ● P2 – high interest
stop	

bathroom	<ul style="list-style-type: none"> ● P1 – difficult handshape
again	<ul style="list-style-type: none"> ● P3 – signed “more”
more	<ul style="list-style-type: none"> ● P1 – sometimes produces incorrect handshape (signs handshape with his pinkies out)
thank you	
yes	<ul style="list-style-type: none"> ● P1 and P4 – difficult orientation, has fist facing himself instead of out
no	<ul style="list-style-type: none"> ● P4 – difficult handshape
hungry	<ul style="list-style-type: none"> ● P1 – difficult handshape and orientation ● P2 – correctly produced movement
tired	<ul style="list-style-type: none"> ● P1 – difficult handshape, orientation, movement
happy	<ul style="list-style-type: none"> ● P1 – difficult orientation, movement
play	<ul style="list-style-type: none"> ● P1 – difficult handshape ● P4 – difficult handshape
finish	

Table 3: Trends of level of difficulty and interest of specific signs among participants

During the teaching period, the participant’s conversations and interactions were observed to survey if the participants were using ASL in the classroom with their peers or teachers. It was observed that the three participants had little to no verbal or nonverbal interaction with their peers before and after learning ASL. However, the participants had frequent verbal and nonverbal interactions with their teachers before and after learning ASL. It was observed that participant two’s use of the ASL sign for “more” became more accurate and was used more frequently with his teacher during the teaching period.

Future Research

For the purposes of this research project, only one book was created that contained twenty one signs. In future research, it would be advantageous to continue creating books with new signs for the participants to learn. Participant one lost interest in the book and producing the signs after he successfully learned the twenty one signs contained in the first book. In the future, participants who learn well from using the book as a teaching tool should be presented with new books containing more material in order to avoid losing interest. It would also be helpful in future research to increase the participant's exposure to the books and ASL signs by working more frequently and for less time throughout the week.

This thesis project aimed to analyze the impact learning ASL has on the verbal communication skills of, specifically, male individuals with autism that may be nonverbal or have poor verbal communication. ASD is more prevalent in the male population than in the female population. The ASD classroom at the elementary school where the teaching period was conducted consisted entirely of male students. Therefore, there weren't any female students available to participate in the study. Further research in teaching ASL to female children with ASD has the potential to provide new results and outcomes. It would also be beneficial to teach ASL to those on the Autism Spectrum who are verbal, but have difficulty expressing themselves when they are upset, frustrated, or are having an outburst. Since the outcomes of this research project are individual-dependent, the population of this research project is versatile. Meaning, further research can be conducted with the opposite gender and with individuals who have a range of functioning and ability.

Outside the realm of research, teaching ASL to children with ASD also has potential beneficial applications for parents and teachers. Creating personalized books to teach signs pertinent to the child's life would be an effective way to increase communication between the child and their parents or teachers. For example, if a child has epilepsy, the word "sick" could be included in the book. Once the child learns how to sign "sick" they would be able to effectively communicate with their parents or teachers that they are not feeling well, which is usually a precursor to having a seizure.

Conclusion

The purpose of this project was to analyze how teaching American Sign Language to children with Autism Spectrum Disorder impacts their verbal and nonverbal communication skills. The effectiveness of using a book as a visual aid to teach the material was analyzed as well. After the research period, the benchmark tests showed increased verbal communication for two of the three participants and increased sign production for one of the three participants. The book proved to be an effective teaching tool for the participant with increased sign production. In future research, creating new books would be beneficial for keeping participant's interest and providing them with a wider range of ASL sign vocabulary. Future research with teaching ASL to children with ASD has the potential to benefit individuals with a wide range of verbal and nonverbal communication ability.

References

- Bryan, L. C., & Ghaat, D. L. (2000). Teaching On-Task and On-Schedule Behaviors to High-Functioning Children with Autism Via Picture Activity Schedules. *Journal of Autism and Developmental Disorders*, 30(6), 553-567.
doi:<https://doi.org/10.1023/A:1005687310346>
- Edelson, S. M. (2017). Signed speech or simultaneous communication. In *Autism Research Institute*. Retrieved September 26, 2017.
- Glennen, S. L., & DeCoste, D. C. (1997). *Handbook of Augmentative and Alternative Communication* (pp. 59-96). N.p.: Singular Publishing Group. Retrieved from <https://books.google.com/books?hl=en&lr=&id=yIHxZMRseFgC&oi=fnd&pg=PR9&dq=augmentative+and+alternative+communication+devices+and+programs&ots=Wt7WrpYNhF&sig=eMEgnitBavacs9iCAR-ezhQhArs#v=onepage&q&f=f>
- Lima Antão, J., Oliveira, A., Almeida Barbosa, R. T., Crocetta, T. B., Guarnieri, R., Arab, C., ... Abreu, L. C. (2018). Instruments for augmentative and alternative communication for children with autism spectrum disorder: a systematic review. *Clinics (Sao Paulo, Brazil)*, 73, e497. doi:10.6061/clinics/2017/e497
- Pattison, A. E., & Robertson, R. E. (2016). Simultaneous presentation of speech and sign prompts to increase MLU in children with intellectual disability. *Communication Disorders Quarterly*, 37(3), 141-147. doi:<https://doi.org/10.1177%2F1525740115583633>
- Pierce, K. ., & Schreibman, L. (1994). Teaching Daily Living Skills To Children With Autism In Unsupervised Settings Through Pictorial Self-management. *Journal of Applied Behavior Analysis*, 27(3), 471-481.

Schaeffer, B., Kollinzas, G., Musil, A., & McDowell, P. (1977). *Spontaneous Verbal Language for Autistic Children Through Signed Speech* (Vol. 17, p. 287-328). N.p.: Gallaudet University Press.

doi: <https://doi.org/10.1353/sls.1977.0009>

What is Autism? (2019). In *Autism Speaks*. Retrieved from

<https://www.autismspeaks.org/what-autism>