5-2023

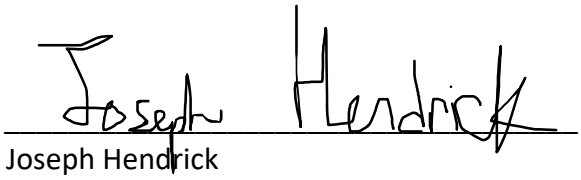
Comparing the use of American Sign Language and Speech Generating Devices for Children with Developmental Disabilities

Joseph Hendrick

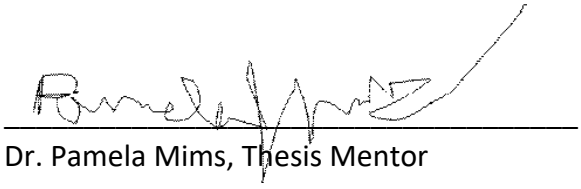
Comparing the use of American Sign Language and Speech Generating Devices for Children with Developmental Disabilities

by
Joseph Hendrick

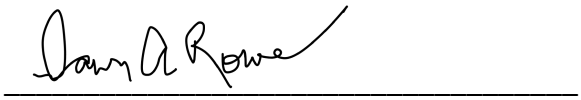
An Undergraduate Thesis Submitted in Partial Fulfillment of
the Requirements for the University Honors Program
East Tennessee State University



Joseph Hendrick



Dr. Pamela Mims, Thesis Mentor



Dr. Dawn Rowe, Reader

Abstract

This study compared the acquisition and maintenance of an Augmentative and Alternative device (iPad application, LAMP), and American Sign Language when teaching a 6th-grade student with an intellectual and developmental disability (IDD) and limited functional vocal verbal speech to make a request. A single-case alternating treatment design was applied to compare the acquisition rate between the two strategies. The system of least prompts was used to teach the student how to perform the request using the AAC device and ASL (American Sign Language). Results showed the student required fewer sessions to reach mastery when making a request using the AAC device. This study showed the system of least prompts paired with AAC was an effective and efficient strategy for the acquisition of a targeted communication request. This study provides additional evidence of an effective strategy that could be used when identifying a priority communication system for learners with limited functional speech and IDD.

Introduction

Previous studies show about one in six children between the ages of 3-17 have at least one or more developmental disabilities (Zablotsky et al., 2019). It is estimated between three and eight percent of individuals with developmental disabilities have some form of expressive or receptive communication deficit (Marrus & Hall, 2018). To help meet the communication needs of students who have developmental disabilities and communication deficits, augmentative and alternative communication (AAC) systems provide students with an effective mode of communication to supplement natural speech (Weitz et al., 1997).

Commonly used forms of AAC are unaided communication such as American Sign Language and aided communication systems such as iPads and tablets which produce speech output. When using unaided AAC such as sign language to do a daily task such as making a request, to increase the likelihood the communication partner can interpret the message, the communicator may need to use facial expressions and body language (American-SpeechLanguage-Hearing Association 2023). There are different forms of aided AAC devices (also known as speech generating devices; SGDs) such as switch devices and computer-based devices where AAC applications that use picture supports and words are installed for use. Aided AAC results in the communicator selecting a picture or symbol on the screen they are using, which produces an articulated message to serve a specific communicative function for the student.

Helping younger children with developmental disabilities who do not have an effective mode of communication learn to use diverse types of AAC systems can help them improve overall communication (Light & McNaughton, 2014). To date, few studies conducted have focused on older children. Van der Meer et al. (2012) compared the acquisition, maintenance, and preferences of three modes of communication in four individuals with an intellectual

disability. In this study, SGD, picture-exchange, and manual sign were compared. Discrete trial training was used to teach acquisition of the AAC. Results indicated discrete trail training was effective in teaching at least two of the three forms of communication to each of the four participants (i.e., 2 participants did not meet criteria for mastery with manual sign). While participants reached criterion for each of the modes of communication, three participants showed preference for SGD and one showed preference for picture exchange. Findings indicate students can learn to use several modes of communication but show preference for one which is consistent with previous research in this area. The results of this study also suggested preference influences acquisition and maintenance; however, researchers recommend future research to confirm these effects.

Determining an effective and efficient AAC system for a student is essential to increase their ability to communicate their wants and needs; therefore, the purpose of this study was to replicate findings of Van der Meer et al. (2012) using a system of least prompts (versus discrete trial training) to instruct students on use of the AAC. Research questions were as follows:

- Research Question 1: What was the effect of system of least prompts on a student's ability to use an SGD and ASL to communicate a need?
- Research Question 2: Which mode of communication did the participant acquire faster?

Methods

Participants

This study was conducted after gaining approval from the university's institutional review board. One 12-year-old child (EP) with a diagnosis of down syndrome participated in this study. Consent was obtained from the student's parents before the study began. The student attended an intermediate-level urban school in the southeastern US for grades four through seven. The

student spent part of their day in a self-contained classroom and the other part of their day in the general education classroom. The student for this study met the following criteria: (1) a diagnosis of a developmental disability (IDD), (2) ages between 10 years to 14 years 11 months, and (3) limited or no functional mode of communication. (4) familiarity with both ASL and SGD (i.e., iPad with LAMP system).

Interventionist

The interventionist was a student teacher securing his teaching license in special education from an accredited special education personnel preparation program. The interventionist was placed in the students' school for student teaching and was set to graduate at the end of the academic year with a bachelor's degree in special education.

Setting

Sessions were conducted in a one-to-one setting in the child's self-contained classroom due to the close vicinity of the bathroom (the communication request of focus was to ask to go to the bathroom). For the classroom sessions, EP was pulled away from his peers and asked to make the request on the iPad or in ASL. The setting was confined to performing the skill in the self-contained classroom because of his schedule and the specific times the student is prompted to go to the bathroom throughout the day. The classroom consists of ten students with varying disabilities, two head teachers, and four teaching assistants. The communication device was kept in the student's classroom in a locked cabinet so no one else was able to access the iPad. The time of day scheduled for each bathroom use was 9:00 A.M., 10:30 A.M., 12:30 P.M., and 2:00 P.M.

For all sessions, the student stood across from the interventionist during instruction, the head teacher of the student's classroom conducted all inter-observer agreement (IOA) and procedural fidelity sessions. While the classroom teacher had no prior research experience, she

was trained in the intervention procedures and collecting data on targeted student behavior. The teacher was seated away from the student to limit distractions while the student was engaged in intervention conditions. Data collection spanned across four weeks with four opportunities being collected each day.

Materials

The materials used during this study included an iPad with the AAC application, LAMP, and American Sign Language (which required no formal materials).

Research Design

A single-case alternating treatment design (Ledford & Gast, 2018) was used with two phases: alternating iPad and ASL instruction, and maintenance. To control the potential order effects of the two types of instruction, the instruction was chosen each day by a flip of a coin, but the same type of instruction could not be used more than two days in a row. The student received prior instruction on both types of communication prior to the first day of data collection for each AAC. During the study's instruction phase, a system of least prompts was used to teach the student how to use the communication system (iPad or ASL).

Independent Variable

The system of least prompts was used to teach the use of the LAMP AAC app and ASL sign for bathroom and included the following prompting hierarchy: natural cue, nonspecific verbal prompt (NSV), specific verbal prompt (SV) and a model (M).

LAMP™ AAC app

Language Acquisition through Motor Planning (LAMP) is an app downloaded to the iPad and used to support the student in making a request to go to the bathroom. The LAMP that was used was specifically designed for the classroom the student was in. The personal information

included was specific to the student. The request was made by tapping home and then bathroom to have the app say “bathroom” and then the student would touch please and then please again to have the app say “please.”

ASL

The ASL sign for bathroom was also used to make the request to go to the restroom. This sign is formed by making a fist and putting your thumb in between your index finger and middle finger to form a ‘t.’ Once a ‘t’ is formed then you shake hand from side to side a few times to indicate the need to go to the bathroom. The ASL sign for please was used too, and to make this you take an open palm place on your chest and move it circularly around it.

Dependent Variable

The dependent variable in this study was to make an independent request on the iPad using the LAMP AAC app or in ASL or the sign for bathroom in American Sign Language (ASL). The dependent variable included the number of independent, correct responses given by the student (i.e., non-prompted requests) via either the iPad or ASL across the instructional phase of the study. Independent requests included the student either stating “bathroom please” on their AAC device or signing “bathroom please” in ASL. The criteria for mastery was set at 4 out of 4 independent responses for 5 trials in a row.

Procedures

Each day the AAC system used was determined by the role of a dice where even numbers indicated the use of the iPad and odd numbers indicated the use of ASL. One intervention was not allowed for more than two consecutive days in a row. If the dice roll produced the same intervention for two consecutive days, the next day, the other intervention was automatically implemented and then the dice would be used again to randomly determine the intervention for the next day.

Each session across the instructional phase of the study followed a specific format and consisted of four attempts given to the student to elicit the correct response. This meant the student had a maximum of four attempts with different levels of prompting given before each attempt to exhibit the communication skill. Moreover, the student was given four opportunities throughout the day at naturally occurring times for a bathroom break to communicate the targeted phrase using the targeted intervention determined for that day.

A general format was used for each of the four trials conducted each day. The student stood across from the researcher. The researcher gave the student the same attentional cue each time of collecting data which was “time to go the bathroom.” Then the researcher waited five seconds to see if the student gave an independent response. If an independent response was not given the researcher would give the student a nonspecific verbal prompt of “tell me.” The researcher then gave the student five seconds to elicit the correct response. If no response was given, the researcher would then move on to the specific verbal prompt which was “touch bathroom or sign bathroom). The researcher then waited five seconds and if the correct response was not given, the researcher would provide a model prompt (i.e., signing ‘bathroom please' or model making the request on the iPad). The researcher waited five seconds and if the correct response was not given, or the wrong answer was given, an error correction of block and redirect was used for the student to give the correct response.

The number of independent requests given was recorded each day and graphed to facilitate a comparison of acquisitions of each of the two modes of communication. A plus was recorded for independent correct responses. NSV was recorded for a correct response after the delivery of a nonspecific verbal prompt. An SV was recorded for a response after a correct response upon the delivery of a specific verbal prompt and an M was recorded after a correct response upon the delivery of a model prompt.

As shown in Figure 1, the study was comprised of ten iPad sessions and eight ASL sessions. Decisions to move from the instruction phase to maintenance were made based on when a clear separation in the data paths of the two interventions was demonstrated indicating mastery of one method of communication. When a clear and consistent demonstration of effectiveness was shown in the data paths, the decision was made to drop the use of the AAC not mastered and continue with a best fit phase. Once a clear demonstration of mastery was identified with the best fit intervention, instruction stopped, and the student moved into the maintenance phase. The form of communication the student had more independent responses for was used later to record maintenance data.

Phase 1: Instruction

Instruction for iPad. During this condition, the iPad was placed in front of the student at the beginning of each instructional trial. The procedures mentioned above were implemented for each instructional trial (a five-second wait period in between each prompt in the list of the system of least prompts given). The student was first given five seconds to respond. If they responded correctly, the student was given a specific praise statement (e.g., great job using the iPad to communicate the need to go to the bathroom) and the trial ended. If no response or an incorrect response, a nonspecific verbal prompt (NSV) was delivered (e.g., How do you tell me you need to use the bathroom) and a 5 second wait time was implemented. If the student responded, praise was provided and NSV was recorded on the data collection sheet and the trial ended. If no response or an incorrect response was given, a specific verbal prompt was then delivered (e.g., show me bathroom on your iPad) and a 5 second wait time was implemented. If a correct response was provided, then the student was praised, SVP was recorded, and the trial ended. If the student still did not respond or responded incorrectly, a model prompt for the student was provided (e.g., interventionist would model the use of the iPad app). If the student

responded correctly then M was recorded, and the trial ended. If the student did not elicit the correct response in five seconds or tried to give an incorrect response, then a more intrusive prompt was provided (full-physical) to elicit the correct response (e.g., hand blocking and handover-hand redirection). Specific verbal praise was provided to the student when they elicited the correct response.

Instruction for ASL. During this condition, the student stood in front of the interventionist while the interventionist told the student "Time to go to the bathroom" to indicate they need to make the request and made a hand motion to indicate they were doing ASL. The same prompting procedures involving the system of least prompts hierarchy conducted in the iPad instruction phase were also implemented in this phase. However, when this intervention was conducted, the sign for bathroom in ASL was used versus choosing the picture symbol on the iPad to generate speech. Specific verbal praise was still given to the student when he independently gave the correct request to the researcher.

Phase 2: Maintenance

Once the mode of communication determined as the best fit was identified, data collection was continued to determine after an extended time if the student would still be able to perform the skill of making the request with that mode of communication. During maintenance, the same procedures were used to elicit the response as in the instruction phase, but only for the mode of communication in which the student reached mastery (i.e., iPad). When the student was asked to make the request on the iPad, data were recorded to assess independent response.

Verbal praise was provided when the student gave a correct response independently.

Inter-observer Agreement (IOA)

To assess the reliability of data collected for the dependent variable (i.e., independent requests made by the student using either AAC system), a second trained data collector, a special education teacher at the student's school, independently scored the student's use of the AAC systems for 20% of the sessions for the totality of the study by observing while data was being collected. IOA was calculated by dividing the number of agreements of both data collectors by the total number of agreements and disagreements and multiplying the result by 100. The mean IOA was 86.67% across sessions.

Procedural fidelity

To ensure the procedures were implemented as they were designed across all sessions, a procedural fidelity checklist was created that listed the steps to implement the procedures and was scored by a second trained data collector who was a teacher in the student's classroom. These sessions were randomly selected for one-third of all sessions. Procedural fidelity was calculated by dividing the number of accurately performed steps by the total number of steps and multiplying the result by 100. The number of correct steps ranged from 77% to 100%. The mean procedural fidelity across sessions was 93% (i.e., 57 out of 61 steps correct).

Results

The results of the student's independent requests for both ASL and iPad during the instructional phase and maintenance for the iPad are presented in Figure 1. The x-axis denotes the session number for each AAC type, and the y-axis denotes the number of independent requests made in each session.

Figure 1

Graphed data

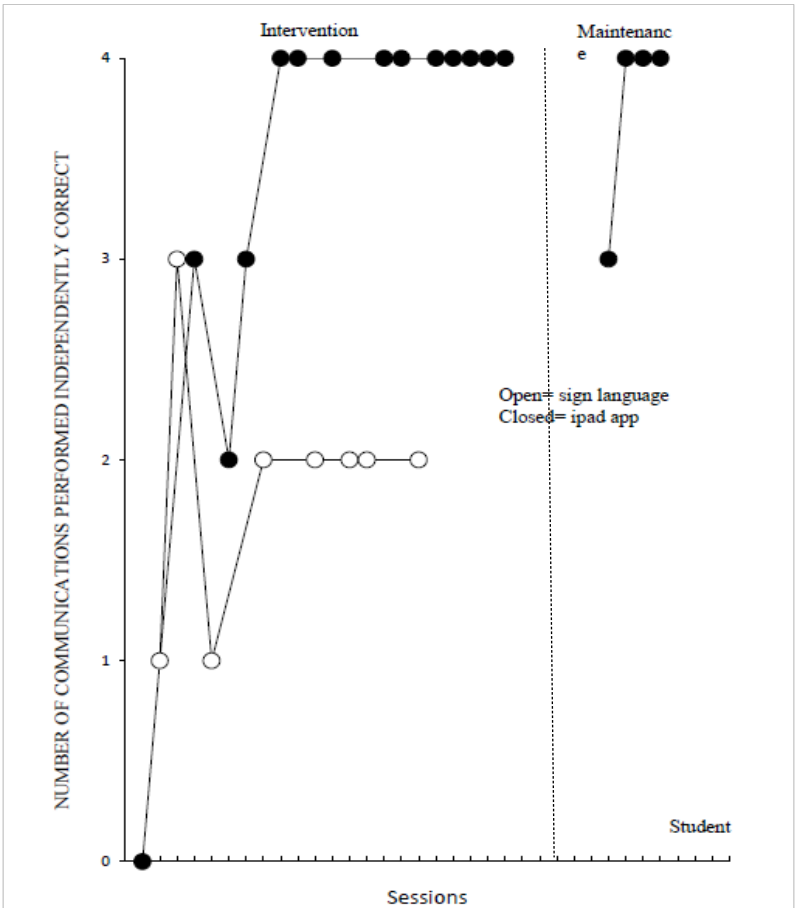


Figure 1. Number of independent correct responses to communicate the need to use the bathroom with either sign language or an ipad app.

During the instruction phases, the student needed to show a distinct difference in independent responses between the two modes of communication to move onto the maintenance stage two weeks later. The student demonstrated a significant distinction between the two modes of AAC around the 4th-5th rounds of data collection for each mode. During the instructional period, the student made independent requests with ASL 46.86% of the time (15 out of 32) and made independent requests with the iPad 80% of the time (32 out of 40). The data showed the iPad was more efficacious (4 out of 4 for 5 trials in a row) over the use of ASL for the student. It was anecdotally noted the student showed preference for the iPad by demonstrating excitement toward the use of the iPad and no interest in the use of ASL. It was decided after recurrence of

independence in the use of the iPad and decreased independence in the use of ASL to stop data collection after the 18th trial begin collecting maintenance data. After eight sign sessions and ten iPad sessions, it was determined the iPad was the best fit. Instructional data collection stopped, and maintenance data collection began for the use of the iPad to communicate. During the maintenance stage of study, the student was given the same steps to complete the independent requests with the iPad. The student consistently made the request independently across all four sessions of 16 testing trials.

Discussion

Results from this study are generally in line with past research, which suggests children with IDD and a non-effective mode of communication, acquire and maintain iPad forms of AAC faster than other forms of AAC. Findings of this study were consistent with the results from (Van der Meer et al. (2012). The student in this study was able to use the iPad AAC to communicate his need to go to the restroom independently faster than using ASL to request to go to the restroom. In general, these findings highlight that the efficiency and acquisition of different AAC systems may be quite distinctive based on the individual's preference emphasizing the importance of comparing AAC systems for individual learners (Ford et al., 2023).

Implications for practice

This study provides a systematic approach that classroom teachers could adopt to evaluate and select a priority AAC system for middle-school-aged students with IDD. Just like students without disabilities, students with disabilities could thrive on accessing different forms of communication and different AAC systems. Considering there is not a one size fits all form of communication or AAC system for all students with or without disabilities, it is important to determine for each student the mode of best fit. Time spent acquiring and establishing an effective mode of communication is essential for the student's success in school.

Limitations and future research directions

A few limitations of this study deserve attention. The small sample size of one student is not representative of all children or individuals with IDD who use AAC systems. To be able to further the validity of this research, more research would have to be done with a larger sample size. Future research may also help with determining what other modes of communication besides SGD or ASL can be acquired faster using the same research approach. Future research can also focus on examining the generalization of this skill with other communication partners and in other settings. Future research could explore the effects of system of least prompts to teach use of AAC for individuals with IDD of varying abilities. Finally, although not within the realm of this study, future research could examine the changes AAC use has on speech development and receptive language skills.

Conclusion

This study presents a systematic approach to comparing the acquisition of an iPad SGD and ADL in teaching making a request for one middle-school-aged student with a developmental disability and no functional mode of communication. Data on acquisition and maintenance were collected to inform a decision on a priority form of communication between the two different AAC systems. Moving forward, with the expansion of the availability of different AAC systems, and the increase of technology use in the classroom, additional research is needed on how to use data-based decisions to determine effective modes of communication for individuals with developmental disabilities.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publications of this article

References

American Speech-Language-Hearing Association. (n.d.). *Augmentative and alternative communication*. American Speech-Language-Hearing Association. Retrieved April 15, 2023, from https://www.asha.org/practice-portal/professional-issues/augmentative-andalternative-communication/

Centers for Disease Control and Prevention. (2022, May 16). *Increase in developmental disabilities among children in the United States*. Centers for Disease Control and Prevention. Retrieved April 13, 2023, from

https://www.cdc.gov/ncbddd/developmentaldisabilities/features/increase-indevelopmental-disabilities.html

Ford, J. W., Kern, A. M., Gorman, J. P., & Mooney, C. D. (2023). Time is of the essence: Individualizing academic intervention for students of transition age. *TEACHING Exceptional Children*, 004005992211446. https://journals.sagepub.com/doi/10.1177/00400599221144632

Gast, D. L., & Ledford, J. R. (2018). Research approaches in applied settings. *Single Case Research Methodology*, 1–26. https://doi.org/10.4324/9781315150666-1

Light, J., & Mcnaughton, D. (2015). Designing AAC research and intervention to improve outcomes for individuals with complex communication needs. *Augmentative and Alternative Communication*, *31*(2), 85–96. https://doi.org/10.3109/07434618.2015.1036458

Marrus, N., & Hall, L. (2017). Intellectual disability and language disorder. *Child and Adolescent Psychiatric Clinics of North America*, *26*(3), 539–554. https://doi.org/10.1016/j.chc.2017.03.001

Van der Meer, L., Didden, R., Sutherland, D., O'Reilly, M. F., Lancioni, G. E., & Sigafoos, J. (2012). Comparing three augmentative and alternative communication modes for children with developmental disabilities. *Journal of Developmental and Physical Disabilities*, *24*(5), 451–468. https://doi.org/10.1007/s10882-012-9283-3

Weitz, C., Dexter, M., & Moore, J. (1997). AAC and children with developmental disabilities. *Handbook of augmentative and alternative communication*, 395-431.

Yong, Y. H. L., Dutt, A. S., Chen, M., & Yeong, A. M. (2021). Evaluating acquisition, preference and discrimination in requesting skills between Picture Exchange and iPad®based speech generating device across preschoolers. *Child Language Teaching and Therapy*, *37*(2), 123–136. https://doi.org/10.1177/0265659021989391