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Phonological awareness in deaf/hard of hearing children

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Introduction

Children who are deaf or hard of hearing (DHH) in America may learn American Sign Language (ASL) or English as their first language and may early-on or eventually be bilingual in ASL and English. ASL is a manual communication system, meaning that the hands and body are moved in a certain way to convey a message. Deaf or hard of hearing children who learn ASL and use this as their mode of communication are learning a language with its own complex rules and grammar system. ASL, however, does not have a written system. Because of this, these children will need to learn how to read and write in English for school (Goldin-Meadow & Mayberry, 2001). An aspect of reading that can be particularly difficult for children who are DHH is phonological awareness (PA). Webb and Lederberg (2013) describe PA as a sensitivity and ability to manipulate sounds units into words; PA includes understanding rhyming, syllables, blends, and individual phonemes. PA and reading literacy are positively correlated, as reading is more efficient and effective when there is a foundational knowledge of how letters and sounds fit together to make up words, sentences, and stories (Berke, 2013).

There are many differences between the ASL and English phonological systems that can impact children's reading development. Though ASL is the sign system used most often in America, this does not mean that it is similar to spoken English. In fact, ASL structure is closer to that of the Navajo language than it is to English (Goldin-Meadow & Mayberry, 2001). For example, rather than rhyming or being made up of certain sounds, ASL signs can share parameters such as handshape, movement, or location of the sign. Spoken words rhyme when the endings of the words are made up of the same sounds. Signs in ASL 'rhyme' when the signs share a distinct parameter. Another difference between ASL and English is the word order that

is used. An English sentence may read 'I am going to school today' while the ASL version of this sentence would use time + topic + comment order to sign 'TODAY SCHOOL I GO.' Differences like these can make learning English PA very difficult for DHH children, putting these children at risk for reading deficits.

Knowledge of the spoken English language system is correlated with English reading skills, and Goldwin-Meadows and Mayberry (2001) reported that school-aged children's ASL knowledge is also positively correlated with reading comprehension. The results of a research study done by Berke (2013) indicated that mapping ASL to English is not direct, so bilingual DHH children must have an understanding of the relation between the visual language of ASL and the written words in English. Children who learned English as their first language follow patterns more similar to their hearing peers regarding reading comprehension skills than children who learned ASL as their first language (Berke, 2013). These findings highlight the need to further investigate sign PA, spoken language PA, and reading literacy of bilingual, DHH children. The purpose of this study is to examine the relationships between bilingual DHH children's ASL PA, English PA, and English reading comprehension.

Signed PA Spoken PA, and Reading Skills

There is very little research examining the relationships between DHH children's ASL PA, English PA, and English reading skills. Each of the studies discussed in this section have examined different combinations of signed and spoken PA. Table 1 presents the aspects examined in each of the studies, as well as those of the present research.

Table 1. Aspects of phonological awareness and general reading skills assessed in the current literature.

Research Study	Sign Phonological Awareness	Spoken Phonological Awareness	General Reading	Language(s)
Web & Lederberg (2013)		X	X	English
McQuarrie & Abbott (2016)	X	X	X	Swedish SL, Swedish
Holmer, Heimann, & Rudner (2016)	X		X	ASL, English
Present Study	X	X	X	ASL, English

Webb and Lederberg (2013) assessed DHH children's English PA and their reading abilities. The children's performances on the English PA measures correlated with their reading abilities at the time of the testing and approximately 4 months later (Webb & Lederberg, 2013). The PA assessments used in this research study were developed for hearing children, but Webb and Lederberg (2013) found that these assessments were appropriate measures of DHH children's English PA skills. Given these findings, the school aged DHH population that would be used for the present study would be able to use these measures, the *Test of Preschool Early Literacy – Phonological Awareness* subtest, the *Phonological Awareness Test – 2*, and the letter-word identification subtest of the *Woodcock-Johnson Test of Achievement-III,* to assess English PA.

McQuarrie and Abbott (2013) assessed bilingual, DHH children's PA in ASL and English reading skills. Their participants were school aged bilingual deaf children who were

fluent in ASL and English (McQuarrie & Abbott, 2013). In order to assess ASL PA, McQuarrie and Abbot (2013) developed a receptive language task. For this task, participants had to identify signs that shared one to three parameters (handshape, movement, and location). They were presented with one cue picture and three picture response choices and were instructed to choose the picture whose sign is most similar to the cue. ASL PA and reading comprehension were significantly correlated (r = .48). Measure of ASL PA were also significantly correlated with word recognition tasks, a predictor of reading comprehension (r=.47). The results identified a relation between bilingual deaf children's ASL PA and reading skills in English, but this article did not use any measures to assess the children's English PA (McQuarrie & Abbott, 2013).

Holmer, Heimann, and Rudner (2016) looked at bilingual, school-aged, DHH Swedish children's PA in both Swedish Sign Language (SSL) and spoken Swedish, as well as their reading skills. As such, it was the only study found that examined both forms of PA and reading comprehension in the same children. Five categories were tested for each participant: signed and spoken PA, reading, numbers and letters, cognitive speed, and memory. In measuring PA, these authors created their own measure called the *Cross-modal Phonological Awareness Test*, with versions in both SSL and spoken Swedish (Holmer, et al., 2016). The results of this study revealed statistically significant relationships between the participants' sign language PA and the reading skills of lexical identification and wordchaining (r=.66 and .63, respectively). Non-significant correlations were found for their spoken PA and the two reading skills (r=.38 and .39, respectively).

When put together, these three studies provide insight on DHH children's PA and reading literacy. This includes information on reliable measures to assess reading literacy, how English PA and reading skills correlate, and the relations among SSL, Swedish PA, and reading literacy

in DHH children. One thing that seems to be missing from the literature is looking at the relation between all three of these PA and reading aspects in ASL and English. The findings between SSL and reading literacy seem to be consistent with ASL and reading literacy based on the results of McQuarrie and Abbott (2013) and Holmer et al. (2016). One important factor in these studies is that it cannot be assumed is that the relation between SSL and Swedish reading literacy will translate over to ASL and English reading literacy, especially given the differences between these languages. For example, SSL and Swedish have letters and numbers that rhyme, but ASL and English do not share this same quality. Thus, ASL and English do not overlap as SSL and Swedish seem to, which may be an important difference when considering the relation between sign PA and reading literacy. A second important factor is that while multiple studies investigated the PA skills of DHH children, there are no consistent measures for testing sign language PA. As a result, it is difficult to compare one study's findings to another.

Present Study

The present study uses measures comparable to those in past studies to make it possible to analyze the results alongside those found previously. As shown in Table 1, the present study also asses ASL PA, English PA, and reading literacy to see how the three correlate. This study uses ideas and methodologies from the communication sciences and disorders department as well as the school of intervention services.

Research questions:

1. What is the association between English PA and ASL PA in bilingual DHH children?

2. What is the association between English PA and reading literacy in bilingual DHH children?
3. What is the association between ASL PA and reading literacy in bilingual DHH children?

As the study progressed, unforeseen complications and setbacks occurred that delayed the project, eventually to the point where it could not be completed prior to graduation in Spring semester of 2020. The remainder of the paper will be written traditionally, but these complications and setbacks will be addressed in their own section, 'Complications,' appearing after the Methods section.

Methods

The population for this research project isbilingual ASL/English, DHH children in early childhood education kindergarten through third grade. At least four children who meet these criteria will be the desired participant group. These participants will be recruited from an urban public school district that provides services to children who are DHH. For this, any researchers interacting with the participants need background checks done, and parent consent as well as child assent would need to be obtained prior to any data collection. The researchers contacted a teacher for DHH children in kindergarten through fifth grade at the school above and a representative of the school district administration in September 2019 to discuss recruiting participants for the present study. Both were in favor of participants for the study being recruited from this school district.

The protocol for the proposed study includes several measures. To measure PA, the *PAT – 2*, *TOPEL*, and the *ASL – PA* task developed by McQuarrie and Abbott (2013) will be

administered. To measure receptive language skills, the *PPVT* and *ASL – VT* (Schick, De Villiers, J., De Villiers, P., & Hoffmeister, 2007) will be administered. For reading literacy, the *Woodcock Johnson Tests of Achievement – III* will be administered. Using the *ASL – PA* test as developed by McQuarrie and Abbott (2013) allows the results found in this study to be comparable to those found by McQuarrie and Abbott (2013). These protocol will be conducted in two 45-minute sessions, each within one to two weeks of the other. Having these sessions within one to two weeks of each other ensures that there will not be significant developmental changes in PA and reading literacy skills between the first and second session.

Complications

Concerning the school district participants were to be recruited from, the representatives from the district were originally supportive of us recruiting participants from the district for this study. Unfortunately, the school district's leadership decided in December 2019 that they would not be willing to participate in this study. This message was not relayed to us until early February 2020, unexpectedly leaving the study with no place to recruit participants.

The *ASL-PA* test developed by McQuarrie and Abbott (2013) was being revised at the time this study was being developed. Upon contacting McQuarrie in February 2019, permission was gained to use the revised version in our study. However, the revisions were taking longer than they had originally planned, so much so, that the *ASL-PA* test would not be done in time to use for the present research study. To meet the needs of the study, it was determined that the *ASL Receptive Skills Test* from Northern Signs would suffice to establish ASL skills needed for a child to participate in this study. This would address the difficulty within current comparing

results because of the lack of standard, typical tests to use with this population; before switching assessments, it would have been more appropriate to compare findings from the proposed study to those in the study done by McQuarrie and Abbott (2013). Another problem with using this test is that, because it is officially published, it would cost money to order.

To fulfill this new monetary need, a Winter grant was applied for through the Center for Undergraduate Research and Scholarship (CURS) at Bowling Green State University for the purchase of the *ASL-Receptive Skills Test*, as well as to assist in funding background checks for the researchers. An application was submitted in November 2019 with an expected result by the middle of December. On the 9th of January 2020 the CURS announced that the application had been lost in their system and requested the application be resubmitted. A week later, the funds were granted, but the month past was another unexpected delay. This had a ripple effect on the timeline of the study's approval by the Institutional Review Board, who required a submission of the *ASL-Receptive Skills Test* form in order to gain approval to do the study. Waiting to purchase the test further delayed submission of revisions to the board.

Despite the sum of these factors prohibiting this study from being completed in time for a May 2020 completion, the research remains interesting and important. The findings of this study would provide more insight regarding the relationship between English PA, ASL PA, and reading literacy of DHH children, as expressed by the aforementioned research questions. This study would also contribute to the current research on this topic area by using a measure that another study has used in order to make it comparable. It is difficult to see how the results of studies on this topic compare to each other because each is using a different measure for ASL PA, making it hard to say whether the differences in results lie in the participants or in the measures used to assess PA.

Reflection

Some students may join an existing research project to use as a capstone project. This could be in varying capacities: the research questions already established, methods and practice testing done, data collected, analysis begun. Joining a project at any of these points and completing it from there, a student is able to learn about the ending/finalizing stages of a project more so than the beginning stages. My experience was the opposite of this. I was still able to learn more about certain pieces of the research project, but I learned the most about the beginning stages: developing research questions, coming up with appropriate methods to measure what those questions address, establishing a population to work with, contacting other researchers in the field, doing research to find related studies that have been done previously to see where the holes are in available published research. I had the opportunity my freshman and sophomore year at BGSU to work as a research assistant on a doctoral student's dissertation and was able to experience and learn about the data collection, data analysis, and validity and reliability measures at that point in my undergraduate career. With this honors project, I experienced something that is very real and common in research—unexpected issues that result in a need to make alterations to the study.

Starting a new project in an area that is under-studied is a big mountain to climb, and it was frustrating and difficult and so interesting and exciting all at once. I learned a lot through this experience, both about research and about myself. I now know what it's like to start a project from the very beginning to about 2/3 of the way through. I learned so much about this process and how to submit to the Institutional Review Board, getting feedback on the project, revising my submission, and meeting with a representative. In this meeting, I was able to explain why I thought it was important to keep the original formatting of some of the documents

in order for them to be parent-friendly, and I was treated like a researcher, like a professional. I also know more about how to work on a research team now. I was not alone in any sense throughout this research process. My advisors, Dr. Brackenbury and Dr. Handyside, were there to support me, provide constructive criticism, and to help me grow as a person, student, and researcher. I learned that research meetings are the time to discuss what needs to be done, keep meeting notes to stay organized, assign tasks, bounce ideas, and to check in on how people are doing as people. Generally, I really like schedules, plans, and sticking to them. This is just not how research goes a lot of the time, and that was something difficult for me to be okay with. When I was starting to feel defeated, Dr. Brackenbury would walk through options with me of different directions the project could go or how it could be altered to still answer the research questions, just in a new way. This project planning overlapped with my graduated school application process, and it was so nice to know they both cared how applications were going, where I was interested in attending graduate school, and how I was feeling throughout the process. Even though the project did not come to fruition in the way we had hoped, I think I gained more knowledge and grew more because of all the complications along the way than I would have if the process had gone smooth and as expected.

Thank you, Honors College, for challenging me, putting me outside of my comfort zone throughout college, and supporting me every step of the way.

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