Language, Literacy and Classroom Participation of Students who are Deaf or Hard of Hearing in Nova Scotia and New Brunswick

by

Bonita Squires

Submitted in partial fulfillment of the requirements
for the degree of Master of Science

at

Dalhousie University
Halifax, Nova Scotia
June 2014

Table of Contents

List of Tables

List of Figures

Abstract

The language, reading and classroom participation of students who were deaf or hard-of-hearing (deaf/hoh), educated in inclusive settings, and served by APSEA were studied. Fifteen students in grades four to eight participated. All were the sole deaf/hoh student enrolled in their class. Standardized measures of spoken language and American Sign Language comprehension and reading fluency were administered along with a self-report classroom participation instrument. Consistent with previous research, the group scored below same-age hearing peers on spoken language comprehension and reading measures, with eight participants scoring greater than 1.5 standard deviations below the mean in at least one measure. Signing abilities were minimal. Regression analyses revealed classroom participation predicted spoken language comprehension and hearing age (number years since first aided) predicted reading fluency. Results from this study show that some students who are deaf/hoh continue to experience delays in their first and only language despite specialized intervention.

List of Abbreviations Used

ANOVA	Analysis of Variance
APSEA	Atlantic Provinces Special Education Authority
ASL	American Sign Language
ASL-RST	*American Sign Language Receptive Skills Test*
CI	cochlear implant
CPQ	*Classroom Participation Questionnaire*
dB	decibels
dB HL	decibels hearing level
deaf/hoh	deaf or hard-of-hearing
FM	frequency modulation
L1	first language
L2	second language
OWLS II	*Oral and Written Language Scales, Second Edition*
PTA	pure tone average
SD	standard deviation
SNHL	sensorineural hearing loss
TOSCRF	*Test of Silent Contextual Reading Fluency*
UNHS	Universal Newborn Hearing Screenings

Acknowledgements

I would like to first recognize that I was blessed with a highly engaged and supportive primary supervisor, Mandy Kay-Raining Bird. She helped me to shape and fine-tune this project into something I am proud to submit as my Masters thesis. The Atlantic Provinces Special Education Authority was an invaluable partner in this project and special thanks are extended to Lori Moore, Louise MacGillivary and Amy Parsons for their enthusiasm and collaboration. Thanks also go to Karisa Parkington, my fellow labmate, who was present to keep me motivated and thinking positively through much of the final steps in my thesis, including helping with editing portions of the final draft.

I benefitted from the knowledge and experience shared by researchers within Dalhousie University, including Dr. Aaron Newman, Dr. Sophie Jacques, Dr. Patricia Cleave, and Dr. Rachel Caissie. In addition, I am honoured to have had several researchers external to Dalhousie University take the time to share their perspectives, particularly regarding appropriate assessment of students who are deaf or hard-of-hearing, including Dr. Brenda Schick, Dr. Charlotte Enns and Dr. Michael Stinson.

A heart full of thanks goes to my parents, David and Wendy Squires, my sister, Sherie Squires, and my friends and fellow classmates who listened patiently and offered advice when I needed to talk things out.

Finally, I was fortunate to receive financial support through the Canadian Institutes of Health Research, the Nova Scotia Health Research Foundation and the Interprovincial School Development Association (research grant provided through APSEA).

Chapter 1: Introduction

Rationale for the Study

It would be difficult to explain the rationale behind this study without discussing my own personal background that led me to believe that this study was necessary. As an American Sign Language/English interpreter, I was offered a unique perspective working directly with individuals who are deaf or hard of hearing (deaf/hoh). I was able to discuss issues that surround the education of these individuals directly with them in the language of their choice. I observed interactions between children with varying levels of hearing and their hearing peers in inclusive classroom settings. I engaged in team meetings with other professionals working closely with students who were accessing the hearing environment through my services. I was frequently consulted as an expert on sign language acquisition and the language and literacy abilities of children and adults who are deaf/hoh, despite not having the professional or personal credentials to fulfill that role. What struck me the most was the lack of evidence available to support decisions made about the education of children who are deaf/hoh that I was witnessing; primarily anecdotal evidence was available to describe the overall language abilities and educational classroom participation of these children. No research studies had been conducted in the Atlantic provinces of Canada on the language and classroom participation of children who are deaf/hoh. In this region, the only educational option for a child who is deaf/hoh is to attend a school in an inclusive setting amongst hearing peers. Due to the region's small yet spread out population, students often grow up in rural communities where they rarely have the opportunity to meet and socialize with peers or adults who are also deaf/hoh. On the other hand, this area is unique in that one organization, the Atlantic Provinces Special Education Authority (APSEA), oversees the education of students who are deaf/hoh in English-speaking communities in New Brunswick and Nova Scotia and consultative services only to French-speaking communities in Nova Scotia. This is in contrast to the model adopted in many areas of North America, in which either the individual schools or school boards have the responsibility of deciding how to adapt educational services to suit the needs of students who are deaf/hoh. My own experiences and the unique circumstances surrounding these students motivated me to conduct research to help support decisions made regarding the education of children who are deaf/hoh in the Atlantic Provinces by providing novel data to the field regarding students who are deaf/hoh in inclusive settings.

Terminology

Statistics Canada reports that about five out of every 1,000 school-aged Canadian children are deaf/hoh (Statistics Canada, 2008, 2012a). There are varying hearing levels. Hearing levels can be described in terms of the threshold at which an individual can hear pure tones or speech stimuli and ranges in severity from mild (25 dB to 40 dB) to profound (over 95 dB). In this paper, individuals who have a mild to profound unaided hearing level will be referred to as 'deaf or hard-of-hearing' (deaf/hoh), although there are many different labels and identifiers that are used within the medical (e.g., hearing-impaired) and culturally Deaf (e.g., Deaf) communities. The medical community categorizes individuals based on hearing level or hearing technology used while the Deaf community tends to categorize people more by one's cultural identity and preferred language modality. This means that an individual may have any level of hearing but be considered to be culturally Deaf. In this paper, studies and discussions from both viewpoints will be included in the literature review and any mild to profound hearing level and preferred linguistic modality will be included under the deaf/hoh label.

Children who are deaf/hoh may be educated in a variety of settings. In this paper, the term ‘inclusion’ is used to mean that the child is attending a school in which the majority of students and staff are hearing and the child spends some or all of his or her time in the regular education classroom. This educational model has also been referred to as ‘integration’ or ‘mainstreaming’. All the participants of this study were educated within an inclusive setting but may have spent varying amounts of time outside of the regular classroom for specialized services, such as individual or small group instruction to address exceptional needs. Children who are deaf/hoh may also be educated in a school composed primarily of students who are deaf/hoh. In this paper, the phrase ‘special schools for students who are deaf/hoh’ or simply ‘special schools’ will be used to refer to these schools; these types of institutions are traditionally referred to as ‘schools for the deaf’ or ‘deaf schools’ despite the fact that these schools no longer contain only students who are culturally Deaf or medically diagnosed as deaf.

Need for Further Research

There is a need for research in the field of deaf/hoh studies to describe the language, literacy, and educational participation in the same individuals who are deaf/hoh. This population is heterogenous, but most studies have not reflected that heterogeneity. Most studies limit their sample by, for example, including only participants who are deaf/hoh and who have parents who are also deaf/hoh. Most studies also exclude children who are deaf/hoh and have additional special needs (Hauser &

Marschark, 2008). Mitchell and Karchmer (2004) report that 96% of students who are deaf/hoh have parents who are hearing and over 40% of students who are deaf in the United States have at least one disability in addition to being deaf/hoh. In addition, very few studies have focused upon children in an inclusive setting, although the proportion of children who are deaf/hoh being educated in this setting is rapidly growing and has long outnumbered that of students in primarily special school settings. In the United States, roughly 60-80% of children who are deaf/hoh are being educated alongside hearing peers in an inclusive setting (Mitchell & Karchmer, 2006; Slobodzian, 2010), although these numbers are likely conservative based on recent closures of state schools specifically for students who are deaf/hoh (National Association of the Deaf, 2011). In Canada, over 97% of students who are deaf/hoh are currently educated alongside hearing peers in an inclusive setting, based on data on student enrollment, deaf/hoh demographics (Statistics Canada, 2012a; Statistics Canada, 2012b) and special school enrollment for students who are deaf/hoh as calculated using enrollment numbers from school websites, or when these were unavailable, by directly calling schools over the months of May and June 2014. While having narrow inclusion criteria in a study increases its internal validity, it limits external validity as each subgroup represents only a minority of children who are deaf/hoh. Recent appeals have been made for research to be undertaken that includes a more heterogeneous sample of students who are deaf/hoh, even at the risk of reducing the internal validity of their samples (DeLana, Gentry & Andrews, 2007; Hauser and Marschark, 2008; Jamieson, Zaidman-Zait & Poon, 2011; Moores, 2008). Parents of children and youth who are deaf/hoh have also expressed a need for more practical research to provide them with information about expected developmental outcomes and the educational opportunities of children and youth who are deaf/hoh including those with additional disabilities, as was found in a series of surveys and focus groups conducted in British Columbia (Jamieson et al., 2011).

The current study took up this challenge by recruiting broadly and studying the language, literacy and self-perceptions of classroom participation of students in inclusive settings who are deaf/hoh. Participant characteristics were more homogeneous than expected. While some had additional special needs and the sample varied in terms of hearing level, number of years of hearing technology intervention and type(s) of assistive devices used, all had parents who were hearing and all participants used speech as their primary mode of communication. Nonetheless, the sample in this study was more heterogeneous than in many. This study also contributes to the extant literature as it included a unique combination of language, literacy and classroom participation measures which provided multiple sources of data on the same individuals. Since data were collected in Nova Scotia and New Brunswick, this information should be of interest to researchers as well as parents and organizations that oversee the education of students who are deaf/hoh in the Atlantic Provinces and anywhere where students who are deaf/hoh are educated in inclusive settings. Research of this type may assist in developing appropriate interventions and social opportunities for youth who are deaf/hoh as they develop towards becoming healthy and productive members of society.

Chapter 2: Background and Literature Review

Language and Literacy Development in Children who are Deaf/HoH

For hearing babies, full auditory access to the speech of native speakers around them gives them the opportunity to develop a complete linguistic system. Literacy is then based on this spoken language system. If a child is deaf/hoh, auditory access to spoken language input is significantly diminished and the ability to acquire the spoken language of the surroundings is therefore negatively impacted. Even a mild hearing level (26 to 40 decibels) may affect expressive and receptive language acquisition (Schönweiler, Ptok & Radü, 1998; Spencer, 2004). The less auditory information an individual can access, the more likely that development of spoken language will be affected, leading some parents to consider communicating with their deaf/hoh child in a visually accessible modality such as one of the sign language systems. Ideally, a mild to profound hearing level is diagnosed early allowing parents or guardians to make decisions about the language modality and facilitation of speech and language development in their children in a timely manner. This is reflected in the strong stance that Speech-Language & Audiology Canada are taking in publications such as their position paper on Universal Newborn Hearing Screening (UNHS) in Canada. UNHS is recommended in order to to prevent delays in "speech, language, cognitive, academic and social-emotional development" (Speech-Language & Audiology Canada, 2014). The language modality options include an auditory mode of communication, a visual mode of communication or a multimodal approach to communicating with the child (Stredler-Brown, 2010). Hintermair (2006) suggests that, "the deaf child's family plays a particularly important role as a central place for primary social, emotional, and cognitive experiences" (p. 497). Accordingly, regardless of the mode of communication, whether it be sign, oral or bi-modal, family and early intervention are critical (Antia, Jones, Reed & Kreimeyer, 2009; Meinzen-Derr, Wiley & Choo, 2011; Moeller, 2000; Sarant, Holt, Dowell, Rickards & Blamey, 2008; Spencer, 2004; Watkin et al., 2007). Because language development is affected as a result of being deaf/hoh, literacy skills are also affected. The literature on spoken language, signed language and literacy development for these children will be reviewed next.

Speech and Spoken Language Development

When a child is identified as having a mild to profound hearing level, many parents choose an exclusively auditory mode of communication with the goal being that the child will acquire a spoken language. To develop receptive skills and provide language exposure, the child is encouraged to depend purely on residual hearing, termed the auditory-verbal approach, or to include the use of visual cues to supplement the auditory signal (i.e., speech read), termed the auditory-oral approach (Stredler-Brown, 2010). In both cases, the child is taught to express him/herself through speech. The child may be fitted with a form of amplification, such as a hearing aid, or receive a cochlear implant to provide increased hearing ability. If the child still has hearing thresholds of 25 decibels (i.e., mild hearing level) or higher despite amplification, then spoken language training is typically very structured. Parents, teachers, speech-language pathologists and auditory-verbal therapists will often work regularly with the child to improve receptive and expressive spoken language abilities.

Despite these interventions, many children who are deaf/hoh are delayed in their spoken language (Sarant et al., 2008). For children and youth with greater than 25 decibel hearing thresholds (i.e., mild to profound hearing level), purely oral approaches have had varying degrees of success in the development of receptive and expressive spoken language. Successful use of the auditory-oral method for a child who is deaf/hoh depends on a complex set of variables, such as the child's hearing level, age of diagnosis, quality of early intervention services, home and school environments, intelligence, presence of additional disabilities and time spent reading (Blamey, 2003; Sarant et al., 2008; Szagun & Stumper, 2012; Vohr, Topol, Watson, St. Pierre & Tucker, 2014). Individual variability is particularly evident in adolescence when more sophisticated language is needed in academic and social environments (Archbold & Wheeler, 2010). Most children who have little functional hearing even with technological intervention and who are educated in an oral-only environment achieve limited success at acquiring oral spoken language skills in comparison to hearing children (Moeller, Tomblin, Yoshinaga-Itano, Connor & Jerger, 2007; Schönweiler, Ptok & Radü, 1998). The literature does not appear to specify which elements of language, in terms of form, content and use, are most delayed.

The majority of recent studies on the language abilities of children who are deaf/hoh focus on the success of cochlear implants to facilitate speech and oral language development. Children who receive cochlear implants are reported to achieve higher linguistic gains on average than children who use hearing aids (Geers, Nicholas & Sedey, 2003; Yoshinaga-Itano, Baca & Sedey, 2010). Many children who receive cochlear implants at a young age can make great gains in acquiring spoken language. A study by Geers and Nicholas (2013) longitudinally followed the receptive and expressive language development of 60 children who received a first cochlear implant between 12 to 36 months of age. At 4.5 years of age, the group's mean language scores fell below one standard deviation of the mean for same-age peers in the hearing normative sample while by 10.5 years of age, the group's mean had improved to fall within one standard deviation but still below the mean of the normative sample. For receptive language measures specifically, 52% of the children aged 10.5 years scored within one standard deviation of the mean of the normative sample. A significant advantage was found for children who received a cochlear implant before 24 months of age in all language measures at both 4.5 and 10.5 years of age. These outcomes replicate findings from less recent studies (Archbold & Wheeler, 2010; for a comprehensive review, see Bond et al., 2009). Similarly, a study by Geers et al. (2003) reported that out of 181 children who received a cochlear implant by the age of five, just over half acquired age-appropriate language skills after 4 to 7 years of multichannel cochlear implant use (as measured by verbal reasoning, narrative ability, utterance length and lexical diversity). Factors that had a significant positive influence on these results were greater nonverbal intelligence, smaller family size, higher socio-economic status and female gender. A study by Szagun and Stumper (2012) found that contrary to previous results, age of implantation was not a significant factor in the linguistic progress (assessed at 12, 18, 24 and 30 months post-implantation) of children with cochlear implants who were implanted between 6 and 42 months of age. Instead, home language environment contributed most to more successful and quicker language development. Yoshinaga-Itano et al. (2010) compared the English language abilities of 38 children with hearing aids and severe to profound hearing levels with 49 children who had cochlear implants; all children were aged four to seven. Most children in the study were receiving early intervention services in both auditory-verbal therapy and weekly sign language instruction by a native or fluent signer who was culturally Deaf. Eight out of the 33 children with cochlear implants were able to make gains that allowed them to achieve age-appropriate expressive language scores by 84 months of age as compared to 2 out of the 23 children with hearing aids. The children that achieved age-appropriate scores were primarily children who had severe hearing levels or progressive hearing loss pre-implantation.

Nonetheless, receiving a cochlear implant, even at a very young age, is not a guarantee of full and effortless access to spoken language development in part because children who receive cochlear implants acquire varying degrees of auditory benefit from implantation (Belzner & Seal, 2009; Geers & Nicholas, 2013), whether the children have additional disabilities or not (Beer, Harris, Kronenberger, Frush Holt & Pisoni, 2012). Belzner and Seal (2009) discuss this diversity of outcomes in their review of demographics and communication outcomes for children with cochlear implants. They report that of 57 longitudinal studies on cochlear implant outcomes conducted between 2000 and 2007 included in the review, the majority of studies found overall better performance of early-implanted over late-implanted children (also reported by Geers & Nicholas, 2013 as noted above) and better performance of implanted over non-implanted children. Most studies used outcome measures such as speech intelligibility and voice quality, while a smaller number looked at language measures such as vocabulary or narrative ability. All studies reported large individual variability. Belzner and Seal state that even in the larger longitudinal studies, such as one involving a sample of 76 children aged 54 months (± 2 months) conducted at the Central Institute for the Deaf (CID; Geers, Nicholas & Moog, 2007), the sample populations do not represent the larger pediatric deaf population, because they typically include only children who have no additional disabilities and are from white English-speaking middle- to upper-class families. Despite these privileged samples, Belzner and Seal conclude "…while many of the CID children have made substantial progress, others have not achieved the level of speech perception, speech intelligibility, and language and literacy development expected for their chronological ages" (p. 329).

Even when children who are deaf/hoh, with or without a cochlear implant, have achieved a high level of spoken language fluency, they may seek out opportunities to learn and use a signed language in adolescence or adulthood. In essence, although their ability to interact with others using spoken language may appear to be excellent, they may feel it is not equivalent to communicating using spoken language without being deaf/hoh (Kent & Smith, 2006; Wheeler, Archbold, Gregory & Skipp, 2007). In fact, using both modalities may facilitate language and social development, as studies have found that in well-supported bilingual environments, such as Sweden (where law dictates that children who are deaf/hoh must be given the opportunity to learn a signed language), children who are deaf/hoh with the strongest spoken language development also have strong sign language abilities and are able to switch comfortably back and forth between modalities as needed to adjust to their communication partners and environments (Hyde & Punch, 2011).

Signed Language Development

If introduced in infancy, a signed language can be acquired by children who are deaf/hoh with no additional disorders at a similar rate and with milestones reached at similar times as spoken language is acquired by hearing children (Mayberry & Squires, 2006). However, this will only occur if the child's caregivers are fluent signers and they expose the child to signs from birth as their first language. According to Mitchell and Karchmer (2005), “Having at least one deaf parent is strongly associated with regular signing experiences; having two deaf parents virtually guarantees them” (p. 243).

Studies have reported that between 15-25% of parents use signed language in the home to communicate with their child who is deaf/hoh (Mitchell & Karchmer, 2005; Hintermair, 2006; Hyde and Punch, 2011). Most of these are hearing parents. However, only about 4% of children who are deaf/hoh are raised in a family that has one or more caregivers who are deaf/hoh and fluent signers (Mitchell & Karchmer, 2004). Even when hearing caregivers are dedicated to learning and using signed language with their child, they are unlikely to have any past signing experience and rarely become fluent signers (Marschark, Lang, & Albertini, 2002; Spencer & Marschark, 2010). Studies have consistently found that a child’s signing abilities are positively correlated with the signing abilities of the child’s parents. Further, in predicting parental levels of ability, it does not seem to matter how long the adults have been learning signed language, but rather how much formal instruction they have received (Moeller & Schick, 2006). Since caregivers who are not fluent in signed language will not be able to provide models that support their child’s development of a fluent signed language, the child would benefit from access to other, fluent, signers. In the past, this was accomplished by placing children who were deaf/hoh in special schools where they had the opportunity to learn signed language from each other and fluent adult models, but that practice is rapidly declining and no longer exists in the Atlantic Provinces of Canada.

Children who are exposed to signed language in hearing homes are known to be delayed in their language development compared to native signers with parents who are deaf/hoh and use signed language. A study by Strong and Prinz (2000) looked at the correlation between English literacy and ASL skills in students at a residential school for the deaf in California. Their sample included a total of 149 children who were severely to profoundly deaf aged eight to fifteen. ASL ability was assessed using a test developed by the authors that tested comprehension of stories, classifiers, temporal concepts, visual-spatial ability (assessed by using a signed portrayal of objects in relation to each other and the student selected the representative picture out of four options), and production of classifiers and narratives. Of that sample, 109 children had hearing mothers and 38 had mothers who were deaf/hoh. Despite the rich signing environment within the school setting, children with hearing mothers had lower ASL skills than children with deaf/hoh mothers. Specifically,79% of participants with hearing mothers had low or medium ASL ability compared to 36% of participants with mothers who were deaf/hoh. Even if we look only at the older children aged 12-15, 23% of children with hearing mothers achieved a high score in ASL ability compared to 76% with mothers who were deaf/hoh. Given these findings, we would expect that the signing abilities of children who are also deaf/hoh with hearing parents but are being educated in inclusive English-speaking classrooms would typically be much lower than that reported in special school settings. Research on the signing abilities of children in inclusive settings does not yet appear to have been conducted.

Children who are deaf/hoh and who use a signed language but are also exposed to spoken language via speech and text in the majority population can be considered bilingual, as they are acquiring language in two modalities that are linguistically distinct. Andrews and Rusher (2010) refer to these children as emerging bimodal-bilinguals.

Bilingual individuals who are deaf/hoh tend to fit into one of three bilingual profiles: simultaneous bilinguals with early exposure to both modalities/languages, sequential bilinguals with early L1 (first language) exposure and later L2 (second language) exposure and acquisition, or late L1 and L2 acquisition where no language was developed to any substantial degree early in life. The L1 and the L2 may be spoken or signed.

Acquiring an L1 late means that the child, even with intact language-learning cognitive abilities, is prevented from learning much language due to accessibility problems. That is, spoken language accessibility may be severely limited because of the child's lesser degree of hearing and signed language accessibility may be severely limited by lack of or limited exposure to signed language models (Leigh, 2008; Mayberry, 2010; Moores, 2010). Mayberry (2010) states "the deaf child's growing maturity and inability to function at school or home without language is often the catalyst for the decision to educate the child in sign language" (p. 284). Children who are deaf/hoh and not very successful at acquiring spoken language often get exposed to signed language in late childhood, adolescence, or even adulthood. The later the accessibility to the L1, the more severe the language difficulties compared to typically hearing individuals (Boudreault & Mayberry, 2006).

In fact, the brain itself appears to undergo structural (Pénicaud et al., 2013) and functional (Mayberry, Chen, Witcher & Klein, 2011) differences in the organization of left hemisphere language regions as a result of not having acquired a first language early in life. These differences are not equivalent to those found in the brain activation of hearing participants who acquired a signed language as an L2 or hearing participants who acquired a signed language as a native language (Newman, Bavelier, Corina, Jezzard &

Neville, 2002). In addition, late L1 findings are in contrast to findings of several research teams that the brain of an adult who is a deaf native signer should be organized for linguistic information in both hemispheres similarly to that of a hearing adult who is a native speaker of a spoken language, with the exception of modality-specific differences (Capek et al., 2009; Kovelman et al., 2009; Newman, Supalla, Hauser, Newport & Bavelier, 2010; Penhune, Cismaru, Dorsaint-Pierre, Petitto & Zatorre, 2003).

Although none of the participants in the current study used primarily signed language, children who are deaf/hoh but receiving functional hearing via technology (i.e., hearing aids and/or cochlear implants) typically get limited exposure to signed language with the assumption that this will facilitate intensive auditory and spoken language exposure to ensure typical development of the auditory centers of the brain. However, many researchers argue that children who are deaf/hoh and using cochlear implants and/or hearing aids may benefit from early sign language exposure in order to acquire an early L1, especially if spoken language is not fully accessible to the child via the auditory modality and cannot be acquired early (Humphries et al., 2012; Mayberry, 2010; Petitto et al., 2000). Several studies have found that sign language exposure correlates with lower spoken language abilities (Geers, 2002; Geers et al., 2003; Kirk et al., 2002; Strube, 2003). This has led to the belief that sign language exposure hinders the development of spoken language abilities, a view that is reported to be communicated to families with children who are deaf/hoh by medical professionals (Humphries et al., 2012; Hyde & Punch, 2011). These studies included children who used sign and speech simultaneously but were not fluent users of a signed language such as ASL. These findings are being challenged by a recent study by Davidson et al. (2014) that looked at the spoken English expressive and receptive abilities of five children who had cochlear implants and 20 hearing children as controls. Both groups were being raised in fluent signing households. The children with cochlear implants were not found to perform significantly differently than the controls in English language abilities and exceeded the predicted English expressive and receptive abilities of children with cochlear implants who were not exposed to signed language (as reported in other research studies). The key component to successful development of spoken language then appears to be predicted more by early and complete L1, as opposed to degree or quality of auditory experience or even whether the L1 is spoken or signed.

In summary, individuals who are deaf/hoh have been documented to vary greatly in their success with spoken language acquisition even with more sophisticated technological advances such as cochlear implantation. Some individuals will excel in their spoken language abilities, some will acquire adequate skills to communicate at a functional level using spoken language while others may acquire very little spoken language ability. If access to fluent sign language models is provided, signed language will be acquired as a fluent first language by children who are deaf/hoh. Sign language exposure does not appear to directly impede the development of spoken language. In fact, it may facilitate it. The development of language may have a direct impact on the development of literacy abilities for people who are deaf/hoh. Factors found to impact English literacy development in individuals who are deaf/hoh will be discussed next.

Literacy Development

Literacy development in children who are deaf/hoh has also been found to lag significantly behind that of hearing same-age peers, not surprisingly perhaps, considering the language difficulties documented in this population. This is demonstrated by data collected by the Gallaudet Research Institute. They found that for every new edition of the Stanford Achievement Test since the 6th edition, the median scores of a US sample of several thousand deaf/hoh 17-year-old students consistently measured at a fourth grade reading level (Traxler, 2000; Qi & Mitchell, 2011). Another study provides evidence for higher reading levels, but has shown that a significant proportion of students who are deaf/hoh do not reach a Grade 10 literacy level by adulthood (Sarant et al., 2008). In a study by Geers and Hayes (2011), a group of students aged 15 to 18 who had cochlear implants were found to achieve mean standard scores in reading ability just greater than one standard deviation below the mean of the normative hearing sample, while 47% of the sample achieved scores that were within one standard deviation of the normative sample. Similarly, for a group of 86 participants aged 12 to 16 with severe to profound hearing levels aided by cochlear implants (n = 59) or hearing aids (n = 27), Harris and Terlektsi (2011) found mean reading abilities that were lower than the mean of the hearing group, with students who had hearing aids performing better than those with cochlear implants. However, these two groups of students were likely to be qualitatively different, as students with hearing aids tended to be educated in special schools for students who are deaf/hoh while students with cochlear implants were mostly in inclusive educational settings. Areas of literacy ability in which deaf/hoh students have the most difficulty seem to be reading comprehension, reading vocabulary, expository writing and spelling (Geers & Hayes, 2011; Traxler, 2000). Even with early intervention and advances in hearing technology, deaf/hoh students demonstrate lower literacy skills compared to their same-age hearing peers (Geers & Hayes, 2011; Spencer & Tomblin, 2008). According to Nussbaum, Waddy-Smith and Doyle (2012), students who are deaf/hoh appear to struggle with reading in the same areas as hearing students who are poor readers.

As with spoken language development, literacy development in children who are deaf/hoh is associated with a complex combination of factors. For example, higher literacy abilities are positively related to high parental support, higher levels of functional hearing, use of a spoken language modality, higher reading frequency, a younger age of acquisition of the child's first language, and a solid language base, whether it be spoken or signed (Antia et al., 2009; Aram, Most & Simon, 2008; Chamberlain & Mayberry, 2008; DeLana, Gentry & Andrews, 2007; Lederberg, Schick & Spencer, 2013; Mayberry, del Guidice & Lieberman, 2011). It is important to emphasize this last factor: a solid language base in any modality. Many health professionals and parents have long assumed that exposing a child who is deaf/hoh to signed language will have a detrimental effect on the child's literacy development due to the fact that signed languages do not include an auditory signal that can be sounded out to produce the written word. On the contrary, in a review of factors affecting literacy development in children who are deaf/hoh, Lederberg et al. (2013) conclude "for [deaf and hard-of-hearing] children, regardless of the language model they experience, reading depends on the development of good, underlying language skills."

In a meta-analysis of 57 studies, Mayberry, del Guidice and Lieberman (2011) found that the various sensory means of encoding phonological information (such as residual hearing and visual information acquired through speechreading) and phonological awareness accounted for about 11% of the variation in literacy abilities in subjects who are severely to profoundly deaf. In contrast, language ability, as measured by spoken and signed language vocabulary production and comprehension measures (assessed in 8 of the 57 studies), was found to account for 35% of the variation in literacy abilities. Intensive speech and spoken language intervention at a young age also positively impacts literacy development, as children who are deaf/hoh in highly intensive programs that require full-time auditory-verbal intervention in the preschool years have been shown to achieve average to above average scores in reading ability in the school years (Wray, Flexer & Vaccaro, 1997). For high school students with cochlear implants, a study by Geers and Hayes (2011) found that phonological processing skills, measured using a battery of tests that measured letter-sound correspondence, phonetic spelling and manipulation of sound in words, and phonological memory and production, explained 39% of the variance in literacy skills after controlling for child, family and implant characteristics. Note that this is in contrast to the aforementioned meta-analysis by Mayberry, del Giudice and Lieberman (2011), which reported that only 11% of variance in literacy abilities could be attributed to phonological awareness. This difference of 11% compared to 35% as reported by Geers and Hayes (2011) may be attributed to the fact that the students in the Geers and Hayes study had cochlear implants and hence were likely to be hearing a broader spectrum of frequencies that they could encode phonologically for spoken language. Some studies have also found that gender is also a factor, with girls who are deaf/hoh achieving more success in acquiring literacy skills than boys (Easterbrooks, Lederberg & Connor, 2010; Easterbrooks & O'Rourke, 2001).

Reading fluency, in terms of reading speed, accuracy and expression, is noted to be one of the five essential components of reading yet is a sparse body of research with participants who are deaf/hoh (Luckner & Urbach, 2012). A review of studies that looked at reading fluency in individuals who are deaf/hoh was undertaken by Luckner and Urbach (2012), who found only six studies with this focus despite reading fluency being seen as “a bridge between word recognition and comprehension” (p. 230). This link could be viewed as critical, especially for individuals who are deaf/hoh. The authors state that none of the studies reviewed met criteria for evidence of effectiveness. A need for more research in this area with low-incidence groups such as students who are deaf/hoh was indicated. In this study, the measure of reading ability used was a measure of silent reading fluency.

In summary, literacy abilities of students who are deaf/hoh are known to be lower than the average for hearing students. Some students do develop strong literacy skills but the factors that facilitate this development are still being investigated. One suggestion has been made that school placement in inclusive settings may support development of stronger literacy skills. The context of inclusive settings for students who are deaf/hoh will be discussed next.

Inclusive Education for Students who are Deaf/HoH

As stated previously, all children who are deaf/hoh in Nova Scotia and New Brunswick are educated in inclusive settings. Inclusive settings are intended to provide “appropriate and quality educational programming and services in the company of their peers” for all students (Nova Scotia Department of Education, 2008). For a student who is deaf/hoh, inclusive settings may include supports such as FM systems, interpreters and/or itinerant teachers for students who are deaf/hoh. Critics of inclusive education argue that there are certain needs of the child that should be prioritized and that could be better met in a special school for students who are deaf/hoh or in a daily mix of both inclusive and segregated educational programming. Special schools for students who are deaf/hoh may use oral communication, communication using signed and spoken language simultaneously or primarily signed instruction.

In inclusive settings, adults and hearing peers at school are language models for children who are deaf/hoh. These models may facilitate their spoken but not their signed language acquisition as few, if any, of the students and adults in their school will be proficient in signed language. Signing models may be available if the child is supported by staff who sign. Most hearing people assume that a signing staff member is providing a fluent language model for the child, however, this is the exception rather than the rule (Russell & McLeod, 2009; Schick, Williams & Kupermintz, 2006). More specifically, in the United States, Schick and colleagues (2006) found that out of a representative sample of 2,100 interpreters working in the education setting, 60% scored below the minimum score of 3.5 out of 5.0 on an interpreter proficiency assessment (as determined by state guidelines), while only 17% scored at least 4.0 out of 5.0, indicating advanced proficiency in interpreting skills. In Nova Scotia and New Brunswick, a variety of support staff are employed by APSEA to facilitate the inclusion of a student who is deaf/hoh (see the section titled "Education of Students who are Deaf/HoH in the Maritimes" for more details).

Academic Success in Inclusive Settings

Students who are deaf/hoh and attend special schools for students who are deaf/hoh in the United States tend to perform less well academically than students in inclusive settings (Kluwin, 1993). Decisions around the academic placement of deaf/hoh students are not done randomly however (Marschark, Spencer, Adams & Sapere, 2011; Stinson & Kluwin, 2011). For example, students who are achieving higher scores in academic subjects tend to be placed in inclusive settings amongst hearing peers (Marschark et al., 2011; Power & Leigh, 2003). To illustrate this, consider results from a study of signed reading fluency that was conducted by Easterbrooks and Huston (2009). Reading comprehension scores were collected for 29 middle-school students who used speech and/or sign language (on a continuum from English-like to ASL) in a special school for students who are deaf/hoh. Results showed student scores averaged about three standard deviations below the mean of same-age hearing peers, ranging from standard scores of 27 to 87. These sources of bias in educational placement are often not controlled in studies that compare academic success in inclusive and separate school settings.

Despite the apparent success of inclusive settings, many students who are deaf/hoh in inclusive settings still do not achieve on par with their hearing peers. In a longitudinal study spanning five years, Antia et al. (2009) reported that, of a sample of 197 students who were deaf/hoh with no additional severe cognitive disabilities enrolled in public schools and spending a minimum of two hours per day in general education classrooms, almost half were failing to achieve scores within the normal range on standardized academic tests. Even those scoring within one standard deviation of the mean on a test tended to fall below the normative sample mean, particularly the literacy scores.

According to Stinson and Kluwin (2011), one to five percent of the variance in student academic outcomes can be explained by academic placement. They argue that research through the 1980s and 1990s consistently showed that the best predictors of academic outcomes for students who were deaf/hoh were gender, hearing level, presence of additional handicaps, and age group. They proposed that academic difficulties stem from deficits in language and world knowledge caused by lower levels of hearing and modifications in social interaction patterns, which interact with the ability of teachers to adapt their teaching to the unique needs of students who are deaf/hoh.

Social Interaction and Participation of Children who are Deaf/HoH

As mentioned in the last section, social participation in the classroom is found to be an important factor in a child's academic success, especially for students who are deaf/hoh (Antia et al., 2009). For this reason, it would be important to examine the research that has looked at social interaction and participation in the classroom for students who are deaf/hoh. In this section, the social-emotional status of children who are deaf/hoh both as a group and specifically within the school setting will be discussed.

The study of children who are deaf/hoh has contributed to our understanding of the relationship between language and social skills development. As specified by Corina and Singleton (2009), "… the context of deafness presents highly unique developmental situations that offer great potential for providing critical insights into the biological, cultural, and linguistic factors that underlie the development of neural systems that impact social cognition" (p. 954). Communication abilities have been found to directly affect the social inclusion of children who are deaf/hoh who use spoken language to communicate with peers and teachers (Hadjikakou, Petridou & Stylianou, 2008).

Specific social delays have been documented in children who are deaf/hoh, including the development of emotional understanding (Dyck, Farrugia, Shochet &

Holmes-Brown, 2004) and predicting the motivation and feelings of others (Schick, de Villiers, de Villiers & Hoffmeister, 2007). This is to be expected, as children who either use a different language than the people in their daily environment or receive limited input in that language often have less complex and advanced interactions with others (Spencer & Marschark, 2010).

According to Peterson (2004), children who are deaf/hoh, even those with a cochlear implant, are similar to children with autism in their delayed ability to understand that people have differing ideas, feelings and intentions. She suggests this "highlights the likely significance of peer interaction and early fluent communication with peers and family, whether in sign or in speech, in order to optimally facilitate the growth of social cognition and language" (p. 1096). That is, better language abilities facilitate the ability to understand the thoughts and perspectives of others and this relationship holds across various populations.

Between 20% and 50% of children who are deaf/hoh experience psychosocial difficulties, such as low self-esteem, discomfort in social interactions and lack of emotional self-control (Dammeyer, 2010; Wake, Hughes, Poulakis, Collins & Rickards, 2004). In Dammeyer's (2010) study on psychosocial difficulties in a sample of 334 Danish children who were deaf/hoh with and without cochlear implants, it was found that delayed language abilities, whether spoken or signed, correlated with significantly more psychosocial difficulties (e.g., few friends, often loses temper or lies and cheats) than children with good language development, as measured by the Danish version of the Strengths and Difficulties Questionnaire (Goodman, 1997; Danish translation by Obel, Dalsgaard, Stax & Bilenberg, 2003) filled out by teachers and parents. Similarly, the children in the sample were 3.7 times more likely than hearing children to experience psychosocial difficulties. The psychosocial well-being of children with cochlear implants lay somewhere between that of hearing children and children who are deaf/hoh without a cochlear implant (Obel et al., 2003).

Placement in inclusive settings may have unintended negative consequences for children who are deaf/hoh, such as increased social isolation. Mitchell and Karchmer (2006) estimated that, in 2002 to 2003, one in every five deaf/hoh students in the United States was the sole student who was deaf/hoh in their entire school. This leads to concerns about the social-emotional well-being of students who are deaf/hoh and their ability to participate fully in classroom settings (Hintermair, 2011; Punch & Hyde, 2011; Schick et al., 2013). Academic achievement is strongly positively associated with social participation in all students (Merrell & Gueldner, 2010) including those who are deaf/hoh (Antia et al., 2009). Vogel-Walcutt, Schatschneider and Bowers (2011) studied the interrelatedness of various measures of social-emotional well-being in 20 students who were deaf/hoh in grades one to five. Loneliness was found to correlate significantly with *school interest* (negative correlation) and *significant school avoidance* (positive correlation).

Kreimeyer, Crooke, Drye, Egbert and Klein (2000) suggested that social and emotional difficulties are more pronounced in inclusive settings for children who are deaf/hoh. They argued that due to their communication difficulties, these children have much smaller social circles and hence fewer opportunities for direct and incidental learning of social skills. Slobodzian (2010) also argue that there are serious limitations to the inclusive model for students who are deaf/hoh, particularly in the dissonance between the overt messages of inclusion conflicting with systematic implicit messages of exclusion being experienced by these students. The experience of being deaf/hoh in a hearing school does not always result in negative social experiences, however. A study by Antia, Reed and Shaw (2011) found that a number of factors can minimize the risk of reduced social competence in children who are deaf/hoh. These include an outgoing personality, better ability to self-advocate, a stable, continuing teacher of the deaf, more extracurricular opportunities, increased communication between parents and school personnel and social coaching by parents.

Overall, receiving diminished auditory input in a predominantly hearing society can negatively affect the development of language, literacy and communication, which in turn leads to delays in social-emotional development. This becomes especially important in the school setting, where social communication can facilitate academic success.

Classroom Participation

During the school year, children spend at least 6 hours a day, 30 hours a week in the school setting. Research has found that a student's ability to communicate and participate effectively in the classroom with teachers and peers is a predictor of academic success for students who are deaf/hoh (Antia et al., 2009; Hadjikakou et al., 2008; Kluwin, Stinson & Colarossi, 2002). In fact, a study by Antia, Sabers and Stinson (2007) found that student self-rating of classroom participation by 136 students who were deaf/hoh predicted 43% of variance in academic achievement while hearing level was not found to be predictive at all.

One way that classroom participation has been studied is through the use of teacher questionnaires. Eriks-Brophy & Whittingham (2013) used a teacher questionnaire to measure the attitudes of 63 hearing classroom teachers in Ottawa, Ontario, towards the inclusion of students who are deaf/hoh in their classes. Results indicated that 84% of the teachers surveyed felt that the students who were deaf/hoh in their classrooms were accepted by their peers. They also overwhelmingly agreed that the inclusive setting has a positive effect on their students' language development, social development and self-esteem.

Another way used to measure the classroom participation of students who are deaf/hoh is to ask the students themselves, either as the sole measure or in addition to gathering perspectives from professionals or parents. A study by Punch and Hyde (2011) in which students with cochlear implants, parents and teachers were interviewed, suggested that students with cochlear implants who are being educated in inclusive settings experienced more issues in social participation at school than students who were not deaf/hoh. Parents and teachers generally reported positive social participation of students with a cochlear implant with both hearing and deaf/hoh peers, yet minor difficulties were reported in social communication related to students' awareness of "subtleties", "nuances…in the intonation", or the "social withitness" (p. 484). Parents and teachers also mentioned concerns about mental health, such as dealing with depression and students' acceptance of their difference in hearing ability, especially when the students entered adolescence. Some teachers felt that the same issues of belonging were found in students with hearing aids and cochlear implants. The students themselves reported that they preferred spending time with only one friend because it was too hard to understand their peers in groups and that it helped to have friends that had known them for a long time who could assist them when their lack of full accessibility to the auditory environment got in the way of school or social interactions.

Schick et al. (2013) used a self-report questionnaire focusing on issues of communication and participation at home and school with 221 students who were deaf/hoh. The participants were educated in hearing schools with or without a deaf/hoh program or in special schools for students who are deaf/hoh. Participants all had varying hearing levels that were categorized into four subgroups: 1) mild, 2) moderate to moderate-severe, 3) severe to profound, and 4) cochlear implant. Findings relevant to classroom participation were that the younger students aged 11 to 14 years reported better classroom participation scores than the older students aged 15 to 19 years. No significant differences in participation were found between students with different hearing levels and authors did not design the study in such a way as to compare participation with that of hearing students.

A study by Nunes, Pretzlik and Olsson (2001) examined the social participation of nine students who were deaf/hoh in two hearing schools through peer ratings, peer nomination and semi-structured interviews. They found that while students who were deaf/hoh were not more disliked by their peers, they were more likely to be neglected by them and less likely to have a friend in the classroom, creating a state of isolation. Hintermair (2011) studied the classroom participation and quality of life of a sample of 212 kindergarten to grade 12 students who were deaf/hoh being educated in hearing schools. By surveying students via a health-related quality of life questionnaire for children and youth and the *Classroom Participation Questionnaire* (CPQ; the same measure used in this study), they found that students who perceived classroom participation as satisfying had higher scores for quality of life in school, social contact with peers and mental health. This illustrates the important interactions between classroom participation and social-emotional well-being.

Only one study was found that measured language and literacy abilities and classroom participation in students who are deaf/hoh being educated in inclusive settings. Antia et al. (2009) used the CPQ to measure classroom participation and accessed standardized test results in English language (administered in written format), reading, writing, and math, along with teacher questionnaires to obtain a qualitative measure of communication ability. The authors of the study did not report the correlation between English language and reading, although they acknowledged that these two measures were related. They calculated how much classroom participation correlated with language (r = .40, $p < .0001$) and with reading ($r = .43$, $p < .0001$). Both pairs showed an almost identical moderate, positive and highly significant correlation, which implies that language and literacy scores were also positively correlated with each other.

Inclusive settings have been found to offer varying degrees of social and academic inclusion for students who are deaf/hoh. This educational placement can clearly be a positive and supportive educational environment for this population but it has also been revealed as a difficult environment for many students who are deaf/hoh in which to communicate, socialize and learn. Considering that inclusive settings are the only educational option for students who are deaf/hoh in the Maritimes and this group of students has never before been studied, the next section will describe the services provided to students in the Maritimes.

Education of Children Who Are Deaf/HoH in the Maritimes

In the Atlantic Provinces of Canada, several schools existed specifically for deaf/hoh students in the 1900s but are all closed today. These included the Halifax School for the Deaf (1856-1961), the Amherst School for the Deaf (1961-1995) and the Newfoundland School for the Deaf (1964-2010). Currently, all students who are deaf/hoh in the Atlantic Provinces are schooled in inclusive settings alongside hearing peers.

The Atlantic Provinces Special Education Authority (APSEA), established in 1975, provides supports and services to students with a sensory loss (blind/visually impaired and/or deaf/hoh) who are attending public schools in Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland and Labrador. APSEA is responsible for providing services and supports to meet the special needs of children from birth to age twenty-one. In the province of New Brunswick, APSEA provides services to students who are deaf/hoh in English-speaking school districts only. In Nova Scotia, APSEA provides services to students in English-speaking school districts and provides consultative services to school teams that work with students who are deaf/hoh in French-speaking school districts. APSEA provides short-term programs and assessments if the school team determines the service is required to support the school programming and makes a referral to APSEA. Short term programs, typically up to five days, are individualized programs offered at the APSEA Center to meet the needs related specifically to students who are deaf/hoh. APSEA also offers a five-day camp each summer to support self-advocacy skill development and social inclusion with peers who are deaf/hoh.

Several professionals are employed by APSEA to facilitate learning in children who are deaf/hoh in inclusive settings: oral interpreters, language acquisition support workers, itinerant teachers for students who are deaf/hoh, communication facilitators and educational interpreters (who interpret between spoken English and signed language, typically Signed English or ASL). The participants in this study only received services from itinerant teachers for students who are deaf/hoh, therefore only that professional will be described further.

Itinerant teachers are teachers who have obtained specialized credentials for working with students who are deaf/hoh, generally a Master's degree in Deaf Education. Their purpose is to support both the students' learning and the teachers in the classroom. The itinerant teacher may pull the student from the classroom for individual sessions for up to 5 hours a week to work on auditory-verbal communication and language development as well as more advanced cognitive skills required for academic success (i.e., critical thinking, social-emotional skills, self-advocacy) if the student is delayed relative to their peers (Atlantic Provinces Special Education Authority, 2011). An itinerant teacher may or may not have sign language abilities.

In the 2010-2011 school year, APSEA served 894 students who are deaf/hoh, with 244 students receiving direct services provided by itinerant teachers of students who are deaf/hoh (93 students in New Brunswick and 151 students in Nova Scotia) and 571 additional students only requiring consultative services, as determined by average to above-average scores on standardized language testing administered by APSEA. During the 2011-2012 school year, the total number of students who were deaf/hoh receiving services from APSEA constituted 0.40% of the total Anglophone school population in

New Brunswick and 0.40% of the total Anglophone and Francophone school population in Nova Scotia (Atlantic Provinces Special Education Authority, 2011; New Brunswick Department of Education and Early Childhood Development, n.d.; Province of Nova Scotia, 2014). In 2010-2011, APSEA employed 14 oral interpreters, 2 language acquisition support workers, 27 educational interpreters, and 1 communication facilitator. APSEA's Annual Report 2010-2011 did not provide data on the numbers of itinerant teachers of students who are deaf/hoh that were employed during that year nor the number of students on each itinerant teacher's caseload.

Purpose, Questions and Hypotheses

Much is known about the language, literacy and classroom participation of students who are deaf/hoh in inclusive settings, however several gaps still exist in the literature. The current study was unique on several accounts. First, it focused upon the Atlantic Region of Canada, which has a population of students who are deaf/hoh and all educated in the inclusive setting. No research to date has been conducted with this population. Second, this study analyzed a unique combination of measures to address language ability in the classroom: literacy, oral language comprehension, sign language comprehension and classroom participation. Only one other study by Antia et al. (2009) had included three of these measures, oral language comprehension, literacy and classroom participation, in one study and a highly significant correlation was found for classroom participation with both language and literacy. The data was collected from students' past academic records and not all measures were available for each student. Third, this study assessed both spoken and signed language. Although studies often include children who are reported to use signed language, the variable of interest that is assessed is typically spoken language development. Only one study was found in the last 20 years that assessed both signed and spoken language in children who are deaf/hoh. As mentioned previously, Davidson et al. (2014) recently published results of a study that assessed signed and spoken language abilities of five children with cochlear implants between the ages of four and six and being raised in fluent signing environments. ASL abilities were assessed only to verify that the children were truly fluent in ASL. The authors acknowledged that "very little is known about deaf children who are bimodal bilinguals using a sign language and a spoken language" (p. 239). The current study set out to contribute to this shortage of data. Lastly, the English comprehension measure in the current study was carefully chosen and uniquely adapted to avoid assessing in such a way that less residual hearing, lower speech-reading ability or poor reading ability could lead to an incomplete impression of the underlying spoken language knowledge of the participants.

The current study sought to describe the language and literacy abilities and self-reported classroom participation of students who are deaf/hoh in inclusive settings in Nova Scotia and New Brunswick. The study was also intended to investigate relationships between these measures and to see if there may be other factors that predict performance in these measures. It was predicted that considerable variability in language, literacy and classroom participation scores would be obtained, as is typically found with children who are deaf/hoh (Lederberg et al., 2013) even without the anticipated heterogeneity of the current sample. It was also expected that there would be a general tendency for standard scores in English language and literacy measures to fall below the average scores for hearing students overall and that several students may achieve scores over two standard deviations below the mean of the normative sample (Antia et al., 2009). Further, it was hypothesized that language and literacy scores in English and classroom participation scores would positively correlate (Antia et al., 2009; Eriks-Brophy et al., 2006; Hadjikakou et al., 2008) and that ASL scores would positively correlate with English language and literacy scores (Lederberg et al., 2013) but negatively correlate with scores in classroom participation as higher scores in ASL ability may indicate a preference for a visual mode of communication which would not facilitate social and academic classroom communication through spoken language in the inclusive educational setting. Additional factors that were expected to be related to language, literacy and participation measures were age, hearing level, cochlear implantation, and gender (Antia et al., 2009; Lederberg et al., 2013; Punch & Hyde, 2011, Schick et al., 2013). Finally, current literature suggested that greater hearing age, cochlear implantation, higher classroom participation scores and preferred oral mode of communication would significantly predict better performance on the English language and literacy scores (Antia et al., 2009; Yoshinaga-Itano et al., 2010).

Chapter 3: Methodology

Participants

Inclusion criteria for participation in the study were as follows. The student had to be 8 to 14 years of age and in grade 3 to 8 at the time of assessment. The student also had to have a moderate to profound hearing level[1] but could use any form of auditory sensory aids including hearing aids and cochlear implants that were introduced at any stage of their lives. The student had to be educated in the inclusive setting and receive direct (as opposed to consultative) services from an Itinerant Teacher for students who are deaf/hoh or an Interpreter who works for APSEA. In order for a child to be eligible for services from APSEA's deaf/hoh program, the child had to be diagnosed by an audiologist as having a mild to profound hearing level (Atlantic Provinces Special Education Authority, 2012). Students with additional disabilities were included as long as they were capable of completing the assessments as determined by the APSEA itinerant teachers. Participants could have corrected visual problems which did not affect their ability to participate. Students had to use primarily English and/or sign language to communicate on a daily basis and not live in families where a language other than English was spoken in the home.

A total of 48 students were identified by APSEA as matching the inclusion criteria and were invited to participate. Eighteen consent forms and language questionnaires were completed by a parent/guardian and returned by mail. Two students with informed consent did not complete the assessments, one due to relocation out of the

---

[1] It was not specified that the moderate to profound hearing level should be in the better ear, which resulted in one participant being included in the study whose audiogram revealed that he had a mild hearing level in the better ear with a moderate-severe hearing level in the other ear.

province and the other due to the inability to arrange a testing date. One student participated in testing, however, upon receipt of the student's audiogram it was revealed that the student had normal hearing in both ears with a possible diagnosis of Auditory Processing Disorder therefore was not eligible to participate in the study. She was seen by APSEA because she was tested as an infant and found to have a moderate to severe sensorineural hearing level that has apparently changed over time. Consequently, 15 of 48 (31.3%) of all eligible students in Nova Scotia and New Brunswick were tested and were included in the analyses for this study.

The participants in this study were enrolled in inclusive public school settings in Nova Scotia or New Brunswick. All students were receiving direct services from an itinerant teacher for students who are deaf/hoh but none of the students received services from an oral interpreter, sign language interpreter or language acquisition support worker. Four students attended a short term program (see page 29 for a description), participants S01, S05 and S11 in 2012 and participant S04 in 2013. Participant S12 had started receiving services from a transition worker to prepare for the student's transition to high school. Although the inclusion criteria stated that participants could use signed language or spoken English to communicate, all students who participated in the study used predominantly spoken English to communicate with parents, teachers and peers, as reported by the students and their parents.

The 15 students assessed in this study had a mean age of 12;3 (years;months; *SD* = 1;3) ranging from 10;0 to 14;4. Seven students were male and eight students were female. The mean age of diagnosis of mild to profound hearing levels was 2;3 (*SD* = 2;4, range = 0;0 to 8;0) and the cause of mild to profound hearing levels as reported by the parents was: unknown (*n* = 13), syndrome associated with sensorineural hearing loss (*n* = 1) or congenital malformation of the cochlea (*n* = 1). Table 1 provides individual and group statistics about participants' sex, chronological age, grade, other known disabilities, and known history of family members who were deaf/hoh. All participants used hearing aids and/or cochlear implants. Data was not gathered on FM use in the classroom, although all students who participated in the study had FMs that may be used in the classroom (Louise MacGillivary, personal communication, May 30, 2014). Six participants used their FM system with the investigator during testing. The mean hearing age[2] of the students in this study was 8.87 years of functional hearing (*SD* = 2.70 years), ranging from one to 13 years. Information was not available regarding levels of hearing prior to technological intervention. There was one outlier in this group who was fitted with hearing aids one year before the study. It is not known if that student had a progressive or sudden hearing loss. For all other students, hearing age ranged from 7 to 13 years of functional hearing. The hearing levels (without hearing technology) according to their most recent audiogram was: mild (20-40 dB HL; *n* = 1)[3], moderate (41–55 dB HL; n =2), moderate–severe to severe (56–90 dB HL; *n* = 5), or profound with a cochlear implant (*n* = 5). These designations are for unaided pure-tone averages (PTA) in the better ear. Unaided audiograms were collected for eight of the 10 students with hearing

---

[2] *Hearing age* is a term which refers to the age at which it is assumed that technological intervention first introduced the child to functional hearing. For children with hearing aids, this will be determined as the age at which the first hearing aid was fitted. For children with at least one cochlear implant, this will be determined as the age at which the first cochlear implant was activated regardless of the age at which the child received his or her first hearing aid. This is due to the fact that in order to receive a cochlear implant, the child must receive a three to six month trial of a hearing aid, which must then be determined as having provided minimal to no benefit. In other words, the hearing aid trial was not providing functional hearing and therefore will not be considered in the calculation of hearing age for children who have received a cochlear implant.

[3] One student had a mild hearing level in the better ear and a moderate to severe hearing level in the other ear.

aids, showing a mean pure-tone hearing level of 59.8 dB (*SD* = 15.9 dB) with a range of 28.8 dB to 83.3 dB. There were five students with at least one cochlear implant and their audiograms specified aided hearing levels. Their aided hearing levels for the better ear showed a mean pure-tone average threshold of 19.3 dB (*SD* = 8.6 dB) with a range of 8.3 dB to 26.7 dB. Functional audiograms of the aided thresholds for participants with two hearing aids were not available to provide information about how much the students may be hearing in the classroom while aided. Audiologists do not typically do functional aided audiograms for individuals with hearing aids anymore due to the increased accuracy of software that calculates real ear measurements. Aided audiograms are no longer useful as today's hearing aids have dynamic ranges that will automatically lower the gain (ie., reduce the loudness of sounds going through the hearing aids) if non-speech stimuli, such as the pure tones or warble tones used in the sound booth for hearing tests, are detected (Rachel Caissie, personal communication, May 29, 2014). Table 2 shows individual and group statistics for chronological age, age of diagnosis of mild to profound hearing levels, hearing age, unaided pure-tone average thresholds for the better ear for participants who used hearing aids, aided pure tone average thresholds for the better ear for students with at least one cochlear implant, and hearing technology used.

Ten background questions were asked at the beginning of the CPQ. Many of these were redundant either with the questionnaire completed by the parent or with other background questions on the CPQ. Responses to four background questions are considered of unique interest and are presented in Table 9. These four questions were: #1 - *How often does your family use sign language?*, #4 - *How do you like best for hearing students to communicate with you?*, #6 - *How do you like best for hearing teachers to* *communicate with you?*, and #10 - *How many other deaf/hoh students are in your class?*. Although all parents reported in the parent questionnaire that they used only spoken English with their child, in background question #1 participants S04, S12 and S15 reported that their parent(s) sometimes used signed language. For background questions about preferred communication mode, eight participants (just over half the sample) expressed a preference for using exclusively speech to communicate with hearing students and teachers. The remaining seven students did express a preference for using speech but also indicated at least once a preference for 'speech and sign' or 'writing notes' when communicating with other students or teachers. In background question #10, all students reported being the only student who was deaf/hoh in their classes.

Data regarding each student's past sign language exposure was not collected. However, the parent questionnaire included questions about the parent's sign language comprehension and production. Out of 15 participants, on a scale of 1 to 7 (1 meaning *not at all* to 7 meaning *fluently*), 11 parents selected '1' for both comprehension and production of sign language, indicating that they do not know any sign language. Ratings for the other four parents are shown in Table 3 and suggest that these parents knew and used some sign language with their children at some point in the child's life even if they report no longer using it currently. Three out of four of these parents had a child with a cochlear implant. The other parent is the parent who reported the highest ratings in sign language ability and this is the parent of the child who had only been diagnosed with a moderate to profound hearing level one year prior to testing.

Another question in the questionnaire asked parents how their child communicated prior to getting a cochlear implant, if applicable. For the five parents whose child had a cochlear implant, three selected *speech with some signs added*, one selected *speech with hand cues* (Cued Speech) and one selected *speech only*.

Testing Materials and Procedures

A variety of measures were used to gather information about the participants in the study. In order to gain background information about the participants, a parent questionnaire, a parent consent form and audiograms were collected. There were four dependent measures used in testing: an English comprehension test, an English reading fluency test, an ASL comprehension test and a classroom participation questionnaire.

Parent Questionnaire and Consent Forms

A parent questionnaire was modified from several used in other studies conducted by Dr. Elizabeth Kay-Raining Bird and Dr. Aaron Newman (see Appendix A). The questionnaire included 26 questions under six topics: family in the home (three questions), hearing status (four questions), hearing assistance (ie., hearing technology used; eight questions), current language and communication (five questions), parent/guardian language abilities (four questions), and social communication (ie., the child's interaction with other children who are deaf/hoh; two questions). The question regarding the frequency of interactions that the child has with other children who are deaf/hoh was: *How often would you say that your child interacts with other deaf or hard-of-hearing children?* The response options were ordered from most to least frequent with the following options: 1) *two or more times a week*, 2) *about once a week* 3) *about one or two times a month*, 4) *once every couple of months*, 5) *two or three times a year*, 6) *once a year*, and 7) *less than once a year or never*. Space was provided at the end of each section for additional comments, if needed. Informed consent was obtained from parents;

ethics approval was obtained through Dalhousie University Health Sciences Research Ethics Board (see Appendix B for the consent form).

English Comprehension Measure

Receptive English language proficiency was assessed using the Listening Comprehension subtest of the *Oral and Written Language Scales*, 2^{nd} edition (OWLS II; Carrow-Woolfolk, 2011). The Listening Comprehension subtest is designed to be administered orally; the participant responds by looking at four pictures and pointing to the one that matches the stimulus. A basal and ceiling are used to reduce the number of items administered. The basal is defined as seven consecutive correct responses and the ceiling as six consecutive errors. Raw scores, age-equivalent scores and standard scores were computed for each participant using procedures in the manual.

The OWLS II was normed on 2,123 hearing subjects in the US aged 3;0 to 21;11 years. The OWLS II has strong reliability and validity and is used extensively in research with hearing subjects. This assessment has not been normed on subjects who are deaf/hoh and no studies to date have assessed its validity with this population. However, it is highly recommended as an appropriate assessment tool to use with students who are deaf/hoh (Gallaudet University, n.d.; National Association of State Directors of Special Education, Incorporated, n.d.; Rhoades, 2001) and has been used in research that assesses the language development of children who are deaf/hoh (e.g., Lieu, Tye-Murray, Karzon & Piccirillo, 2010; McConkey Robbins, Green & Waltzman, 2004).

In spoken language comprehension assessments, there are concerns about the validity of the assessment if the auditory deficits of the participants prevent them from comprehending orally-presented stimuli that they may otherwise recognize with visual supports, such as signs, hand cues or text. This issue of validity in language assessment with participants who are deaf/hoh has been recognized by several researchers in their work yet there appears to be no standard adaptation to address this challenge. Some researchers have chosen to present stimuli both orally and using Signed Exact English, if the child signs (Beer et al., 2012; Geers et al., 2003). Another adaptation, chosen by Spencer and Tomblin (2008), is to present the stimuli first orally then, once the subtest was completed, if the child had answered incorrectly for at least one of the items then the item was re-administered with auditory-visual cues in a live format. This provided two separate scores for the tests.

In the current study, each item in the OWLS II was first administered orally, using both residual hearing and speech reading cues to comprehend the stimuli. The student gave his or her response after the oral-only presentation then was given the opportunity to change his or her response after viewing the text. The student responded to test items in the standardized fashion—by pointing to a picture that matched the stimulus sentence. These decisions regarding administration of the stimuli were made to allow the best possible opportunity for the students to demonstrate their underlying knowledge of English language components by utilizing a combination of hearing, speech-reading and reading abilities.

ASL Comprehension Measure

In order to assess the signed language abilities of the participants, the *American Sign Language Receptive Skills Test* (ASL-RST; Enns, 2014) was administered. This test is intended to assess ASL morphosyntactic skills in number/distribution, negation, noun/verb distinction, spatial verbs, size/shape specifiers, handling classifiers, role shift and conditionals. These grammatical elements of ASL reflect primarily semantic and morphosyntactic knowledge. A vocabulary test of 20 words is first administered at the start of the test to verify that the vocabulary used in the test is familiar to the participant. According to the manual, if the student is unable to label or recognize at least 15 out of the 20 vocabulary items, the test is discontinued. The test includes a total of 42 test items. The test begins with 3 practice items and is discontinued if the testee responds incorrectly to all 3 practice items. Test administration begins at item 1 and has a ceiling of 4 incorrect responses in a row. If the testee passes the vocabulary test then the ASL-RST produces a raw score to compare with age-equivalent scores and standard scores (Enns & Herman, 2011). The ASL-RST is administered using a video recording of a native ASL signer presenting signed noun or verb phrases as stimuli and requires that the examinee point to one of four pictures as the response that best represents the stimuli presented. The ASL-RST has a normative sample of 180 children who are deaf/hoh and fluent signers; there are 20 children for each age level. No studies have yet looked at psychometric properties of the test.

English Literacy Measure

Reading ability was assessed using the *Test of Silent Contextual Reading Fluency* (TOSCRF; Hammill, Wiederholt & Allen, 2006). The TOSCRF measures the extent to which a student can segment words within a three minute period. Printed passages are presented in all capitals with no spaces or punctuation. The student must draw lines to mark the boundary between words in the passages as quickly as they can. The passages increase in complexity (content, vocabulary and grammar) as the student works through the items. For example, the student is presented with a passage such as the following: “I

T W A S T H E D A Y F O R T H E S C H O O L P I C N I C A L L T H E F O O D W A S O N A T A B L E U N D E R A T R E E”. Passages were selected from the *Gray Oral Reading Tests, Fourth Edition* (Wiederholt & Briant, 2001) and the *Gray Silent Reading Tests* (Wiederholt & Blalok, 2000) in order to take advantage of stories that have already been nationally-normed on a large number of students throughout the United States. The passages were designed to use age- and grade-appropriate vocabulary. There do exist two reading series created specifically to meet the needs of students who are deaf/hoh, the *Reading Milestones* and *Reading Bridges* series. These were used to create the *Silent Reading Fluency Test* (unpublished) that was modeled after the TOSCRF and was designed to assess students who are deaf/hoh. However, this test was assessed for validity, reliability and sensitivity to change in elementary, middle school and high school students and did not show good correlations between teacher ratings of student reading ability in the middle school and high school levels (Rose, McAnally, Barkmeier, Virnig & Long, 2008). For this reason, it was not chosen to be used in this study.

The TOSCRF has been normed on a representative sample of 1,898 hearing students aged 7;0 to 18;11 in the United States. The TOSCRF provides normative data on a number of subgroups, including five “exceptionality” subgroups consisting of deaf/hoh students (n=49), students who are identified as gifted or talented (n=70), students having attention-deficit/hyperactivity disorder (n=134), students with learning disabilities (n=154) and poor readers (n=316) (Allen & Rogers, 2008). It has undergone successful psychometric testing and has demonstrated high validity and reliability with good and poor readers (Allen & Hammill, 2011; Bell, McCallum, Kirk, Fuller & McCane-Bowling, 2007). This test is of particular interest for this study as it has been found to show a very large positive correlation (r = 0.86; p < .0001, for Grades 6, 7, and 8) with reading comprehension using the 'Passage Comprehension' subtest of the *Woodcock-Johnson Psychoeducational Battery, Third Edition* (Allen & Hammill, 2011).

Classroom Participation Measure

To measure language-related participation in the classroom, the *Classroom Participation Questionnaire-Revised* (CPQ; Stinson et al., 2006) was completed by the student. This questionnaire was based on the *Classroom Communication Ease Scale* created at the National Technical Institute of the Deaf that contained 28 statements with both cognitive and affective components for college student who are deaf/hoh (Garrison et al., 1994). The longer form was modified by Stinson et al. (2006) to create a shorter, simpler form appropriate for younger students in Grades 4 and up (Antia et al., 2007). In the CPQ, the student first answers 10 questions about the mode(s) of communication used at home and school after which he/she rates 16 statements on a 4-point scale (1, *Almost Never*; 2, *Seldom*; 3, *Often*; 4, *Almost Always*). These statements fit into four subscales: 1) self-perception of information received and expressed with teachers in the classroom, 2) self-perception of information received and expressed with other students in the classroom, 3) positive affective responses to the communicative situation, and 4) negative affective responses to the communicative situation. See Appendix C for a copy of the CPQ. This measure has been used in several studies with students who are deaf/hoh to date (Antia et al., 2009; Hintermair, 2011; Richardson, Marschark, Sarchet & Sapere, 2010) but is not yet a well-established measure therefore its psychometric properties will be described in further detail.

The CPQ was developed for use with deaf/hoh students from Grades 3 to 12 and has undergone psychometric testing for validity and reliability in a sample of 136 deaf/hoh students (Antia et al., 2007). Internal validity, which was assessed by calculating the correlations (corrected for attenuation) between scores in each of the four subscales, was positive (.32 to .89, $p < .001$), suggesting that the subtests are assessing one common construct, yet not so high as to suggest redundancy within the subscales. It was noted, however, that the correlations between the Understanding Teachers (UT), Understanding Students (US) and Positive Affect (PA) subscales were "substantially higher" than those for the Negative Affect (NA) subscale. In addition, the correlations between items within each subtest were high (.78 to .82), indicating that items within each subtest were accurately reflecting the same construct. However, when subscales correlations were not corrected for attenuation, a highly significant correlation ($p < .001$) was found between only three of the subscales, UT, US and PA, while the subscale NA was not found to correlate significantly ($p < .05$) with any of the other three subscales. For this reason, the authors recommended that a composite score of the UT, US and PA subscales be analyzed separately from the score for the NA subscale in order to maintain validity of the measure, leading to a total score out of 12 instead of 16.

External validity was assessed by comparing CPQ scores to teacher ratings from the Academic Competence subscale of the *Social Skills Rating System* (Gresham & Elliott, 1990) and to *Stanford Achievement* (9th edition) test scores (reading, mathematics and language; Harcourt Brace Educational Measurement, 1997). A positive correlation with CPQ scores was found for all measures ($p < .01$) with the exception of a non-significant positive correlation with the Stanford mathematics test scores ($p < .05$).

Assessment of the CPQ's test-retest reliability was attempted by administering the test once a year for three consecutive years, however the length of time between testing was too great for any significant correlation to be found. This is to be expected considering that classroom context can change dramatically from year to year. This is a criterion-referenced measure in which a score of 12 suggests that the student feels that he/she experiences full participation in classroom activities.

Recruitment

Recruitment was done in collaboration with APSEA after receipt of approval by both the Dalhousie University Research Ethics Board and the APSEA ethics committee. With APSEA's collaboration and following their recommended practice on soliciting participation, packages were mailed to families of students who were eligible for inclusion in the study. Included in the package were: a letter of support from APSEA, the consent form, the Parent Questionnaire and a self-addressed stamped envelope. Parents who were interested in having their child participate in the study returned the completed questionnaire and consent form back to Dalhousie University by mail.

Testing

Upon receiving the completed forms from parents, the investigator then contacted APSEA in order to be put in touch with the itinerant teacher of each student. The itinerant teacher and the investigator arranged a satisfactory time for the investigator to go to the school for testing. Two parents indicated in the consent form that he/she would prefer to have the student complete the testing in the home instead of taking time out of the student's learning at school. In this case, the investigator contacted the parent by phone or emailed to arrange a satisfactory time for testing.

All testing was completed by the primary investigator, who is fluent in English and American Sign Language. A quiet space that was free of distractions was identified at the student's school (typically the room in which the student and the itinerant teacher would meet for one-on-one teaching time) or home for testing and the investigator provided a laptop computer and a DVD player for the ASL assessment. Prior to testing, the investigator briefly introduced herself, explained the purpose of the study, obtained assent, checked with the student about whether or not the hearing technology was working well that day and provided a visual schedule of the testing.

The four measures were administered in a counterbalanced order across participants. A 4x4 Latin Balanced Square method was used to counterbalance the measures. This method offers four different orders for four measures in such a way that each measure was assessed in each position only once and preceded and followed each other measure only once (see Table 4). This method was determined to be a good match for the small number of participants in this study. The four orders were matched in a repeating order with each subject ID before it was assigned to participants. The order of administration was therefore predetermined before testing dates were arranged. Instructions for all tests were provided in spoken English and clarified as required.

Audiograms

Finally, it was necessary to obtain information about the hearing levels of the students who participated in the study. This was initially determined by itinerant teacher referral and later verified in the spring following the completion of testing by obtaining the youth's most recent audiogram. APSEA was unable to share the audiograms of children under their care. Therefore, copies of the most recent audiograms of the students who participated in the study were obtained from the centres where their hearing was tested. One parent/guardian did not give consent to having the investigator obtain a copy of the audiogram; all others gave consent. The investigator obtained 10 out of 15 audiograms using the consent directly; one more was obtained via verbal consent from the parent to the audiology clinic; two parents provided a copy of their child's audiogram themselves. In sum, thirteen out of fifteen audiograms were collected.

Chapter 4: Results

Description of Children who are Deaf/HoH in Nova Scotia or New Brunswick

This study's first goal was to describe the language and literacy abilities and self-reported classroom participation of children who are deaf/hoh in Nova Scotia or New Brunswick. This was accomplished by generating descriptive statistics for the group as a whole for all dependent variables: English language comprehension (OWLS II), reading fluency (TOSCRF), ASL comprehension (ASL-RST), and classroom participation (CPQ). Individual scores were also examined for patterns of performance. Language and reading standard scores were then compared using a paired t-test to determine the relative degree of deficiency the group exhibited on these two tests. Finally, the possibility that subgroups (sex, cochlear implantation, additional disabilities and preferred modes of communication other than speech) differed in performance on the dependent measures was analyzed using independent means t-tests.

English Language Comprehension Performance

All 15 participants completed the OWLS II Language Comprehension subtest. Raw and standard scores for individual participants and descriptive statistics for the group are presented in Table 5. A preliminary analysis was done to determine whether providing text plus spoken input as opposed to spoken input alone led to an increase in performance on the OWLS II. All students changed at least one response after receiving the text presentations of the items (raw number of changed: 1 - 11; % items changed: 1.6% - 26.9%). Not all of the changed responses were to correct responses. All but one participant (S11) attained a score that was either equal to or higher than their score without the text presentation. A two-tailed paired samples t-test found that standard scores in the oral plus text condition were significantly higher than in the oral condition only ($t(14) = 3.520$, $p = .003$, $d = .145$) with a small effect size. This means that the text presentation of each item consistently allowed participants to increase their correct responses but only by a few points in the standard scores. Considering that a consistent increase in scores may indicate better ability to demonstrate underlying knowledge, only oral plus text responses will be considered in future analyses.

The distribution of standard scores on the OWLS II roughly reflected a bell curve mean of 82.1 (*SD* = 16.9), which was more than one standard deviation below the mean of the normative sample (see Figure 1). Scores ranged from 42 to 103. The scores were found to be distributed with skewness of -1.215 (SE = .580) and kurtosis of 1.119 (SE = 1.121). This shows that scores were distributed slightly more to the left of the mean and peaked compared to a typical bell curve distribution. All but one participant had a standard score on the OWLS II below the normative mean of 100, six scored more than one standard deviation below the mean with three scoring more than two standards deviations below the mean.

The OWLS II Language Comprehension subtest assesses content in four language domains: lexical, syntactic, suprasegmental, and pragmatic. Items in each category are not distributed evenly throughout the test, with more items in the suprasegmental and pragmatic components especially found later in the assessment. There is no normative data corresponding to the subcategories. *Z*-scores were calculated in order to examine relative strengths and weaknesses across subcategories for each student in comparison to the study sample (see Table 6). These scores showed that most students scored consistently relative to the group across lexical, syntactic and suprasegmental categories. That is, if they scored high in the lexical category, they also scored high in the other two categories relative to the other participants. The pragmatic component was not included in this analysis because there were only three items in this subcategory.

American Sign Language Comprehension Performance

A summary of scores for individual participants and group statistics for the vocabulary pretest components of the ASL-RST are given in Table 9. All 15 participants completed the expressive portion of the vocabulary check. The number of signs that the participants correctly produced ranged from 0 to 8 out of 20, with a mean of 2.1 (*SD* = 2.6). The scores were not normally distributed, with skewness of 1.120 (SE = .580) and kurtosis of .284 (SE = 1.121). This shows that the majority of the scores were distributed to the left of the mean of the bell curve but the distribution was not flat or peaked compared to a typical bell curve distribution. The receptive component of the vocabulary check followed the expressive component and was administered to 14 of the 15 participants. The investigator did not administer the receptive vocabulary component to participant S13 because the student repeatedly stated they did not know any sign language. For the other 14 participants, the mean receptive and expressive vocabulary score combined was 9.4 (*SD* = 3.9) ranging from 4 to 19 (out of 20 vocabulary items).

Only one participant (S04) reached criterion for continuing with the full ASL-RCT, with 19 correct on the vocabulary check. This student achieved a raw score of 26 out of 42 on the full test. However, at 14 years and 4 months of age at the time of testing, the student was four months older than the upper age limit for the ASL-RST norms. Her standard score of 89 was therefore based on the norms for children 13 years of age. This is a student with a cochlear implant whose mother indicated that they used speech with some signs to communicate before the student received her implant.

English Reading Fluency Performance

Raw and standard scores for the TOSCRF were calculated for all 15 eligible participants. Individual scores are presented in Table 5 along with descriptive statistics for the group. The mean standard score was 86.3 (SD = 10.0), which is nearly one standard deviation below the normative mean of 100 for same-age hearing peers and is slightly lower than the mean standard score of 90 (SD = 11) for the sample of students who were deaf/hoh (n = 49) that was reported in the TOSCRF manual. The standard scores for the present sample ranged from a low of 71 to a high of 102. Scores did not follow a typical distribution, with skewness of .121 (SE = .580) and kurtosis of -1.281 (SE = 1.121). This shows that the bell curve of the scores was not skewed left or right of the mean but was slightly flat compared to a typical bell curve distribution (see Figure 2). All but two participants scored below the normative mean of 100, with 6 scoring more than one standard deviation below the mean but none scoring more than two standard deviations below the mean of the normative sample.

Classroom Participation Scores

Individual and group descriptive statistics for all four subscales and the total score on the CPQ are provided in Table 8. All 15 students completed the CPQ. The mean total composite score was 9.45 (*SD* = 1.88) ranging from 6.00 to 12.00. The distribution of scores was not a standard distribution. The skewness was -.163 (SE = .580) and kurtosis was -1.191 (SE = 1.121), which suggests that the scores were not skewed in either direction but that they were flatter than the peak of the normal bell curve distribution of the scores. However, in the histogram it is clear that there are two peaks on either side of the mean, creating a bimodal distribution (see Figure 3). Indeed, five students reported a composite score greater than 11.00 out of 12.00 which indicates that the students felt that they participated fully in classroom communications (Antia et al., 2007). Eight students obtained a composite score of nine or less out of 12, which suggests that these students did not feel that they participated fully in classroom communication. This measure does not have any normative data to compare results to other students who are deaf/hoh or hearing students.

According to the Antia et al. (2007), the authors of the CPQ, the Negative Affect subscale provided different results in their validity study than the other three subscales. Analyses were therefore conducted in the current study to determine if ratings on the four subscale scores differed significantly with each other. A one-way within subjects analysis of variance was conducted. In the analysis, Mauchly's Test of Sphericity was not passed ($\chi^2(5) = .391$, $p < .05$), indicating that there was a difference between the variance of the four subscales. Therefore, the degrees of freedom were corrected using Greenhouse-Geisser. Results showed a significant difference between at least two of the subscales ($F(1.824, 25.530) = 4.243$; $p = .029$; $\eta_p^2 = .233$). Post-hoc pairwise comparisons revealed that the CPQ subscale Negative Affect approached a statistically significant difference with Understanding Students ($p = .071$) (see Table 10). This finding is consistent with that of Antia et al. (2007) who, as a consequence, recommended that a composite score comprised of the first three subscales only be used (Understanding Teachers, Understanding Students and Positive Affect). Therefore, this composite score was adopted in the current study.

Comparison of Means for English Comprehension and Reading Scores

A two-tailed paired samples t-test was conducted to see if the means of the standard scores for the two English measures, the OWLS II and the TOSCRF, differed significantly from each other. Results did not find a significant difference between the two means ($t(14) = -.985$, $p = .341$, $d = .352$) and the effect size was small to medium.

Subgroup Analyses

Exploratory analyses were conducted to examine whether various subgroups of participants differed on the OWLS II standard scores, TOSCRF standard scores, number of signs produced in the ASL vocabulary check, or CPQ total score. Independent means t-tests compared each of the following subgroups: sex (male, female), cochlear implantation (present, absent), reported preference for a mode of communication in addition to speech (speech +, speech only), or additional disabilities (present, absent) and are presented in Table 11.

<u>Sex</u>. Seven participants were male, eight female. T-tests indicated no significant differences between male and female scores on any dependent measure.

<u>Presence of cochlear implant</u>. Participants had at least one cochlear implant (n = 5) or two hearing aids (n = 10). T-tests revealed no significant differences in the means of the two groups on any dependent measure.

<u>Use of a communication mode other than speech</u>. Preference for an alternative communication mode along with speech was indicated by students in the background questions of the CPQ. T-tests revealed a difference approaching significance for the ASL expressive vocabulary measure only. The group that preferred an additional

communication mode along with speech scored higher on the ASL vocabulary production pre-test compared to the group that did not have that preference (Figure 4).

Additional disabilities. T-tests compared performance of participants with and without additional disabilities on each dependent variable. No significant differences were obtained for analyses involving language or literacy measures. However, the total participation ratings analysis approached significance with the group with additional disabilities rating their participation marginally lower than the group without additional disabilities (Figure 5). This suggests that students with additional disabilities may feel like they participate less effectively in the classroom.

Correlational Analyses: Language, Literacy and Classroom Participation Scores

The relationship between language, literacy and classroom participation standard scores were analyzed using Pearson product-moment correlation coefficients. There was a moderate but non-significant correlation between standard scores on the OWLS II and the TOSCRF ($r = .338$, $p = .218$) and standard scores on the TOSCRF and CPQ total scores ($r = .290$, $p = .294$). In contrast, OWLS II standard scores were highly and significantly correlated with CPQ total scores ($r = .645$, $p = .009$) (see Figure 6).

The total number of signs produced in the vocabulary pre-test was moderately and negatively correlated with standard scores on the TOSCRF ($r = -.367$, $p = .179$), the OWLS II ($r = -.457$, $p = .087$), and the CPQ total score ($r = -.452$, $p = .091$). The latter two correlations approached significance.

Linear Regression Analyses

Linear regression analyses were conducted to determine the degree to which potential predictor variables might explain the variance in English language and literacy scores. Neter et al. (1996; cited in Quinn & Keough, 2002) suggests that a linear regression analysis should only include one predictor variable for every six to 10 participants in the study. This would mean that in the current study with 15 participants only two predictor variables should be selected. However, given that this study could be considered an exploratory study, it was decided that a maximum of three predictor variables could be used for each analysis, understanding that this will limit the interpretations made based on the results.

It was of interest to determine whether self-ratings of classroom participation predicted language or literacy skills. Therefore, the CPQ total score was chosen for analyses of both English language and literacy. Previous studies would suggest that a measure of hearing ability should be included as a predictor variable (Lederberg et al., 2013). Unfortunately audiograms were not available for all participants. In addition, audiograms for participants with hearing aids provided different information (primarily unaided) from audiograms for participants with cochlear implants (primarily aided), so a single measure that would apply to all participants was not available. Instead, age of diagnosis, presence of a cochlear implant and hearing age were considered. A general measure of development such as age or grade was also considered as a candidate predictor variable, given previous findings in the literature (Geers & Nicholas, 2013; Lederberg et al., 2013).

Pearson product-moment correlation (*r*) analyses were conducted on the six possible predictor variables (chronological age, grade, age at diagnosis of mild to profound hearing level, cochlear implantation, hearing age, and CPQ total scores) to determine the degree of shared variance between them. As would be expected, significant correlations were found between chronological age and grade (r = .887, p < .001), chronological age and hearing age (r = .568, p = .027), grade and hearing age (r = .629, p = .012), age of diagnosis of mild to profound hearing level and cochlear implantation (r = -.567, p = .028), and age of diagnosis of mild to profound hearing level and hearing age (r = -.720, p = .002). Classroom participation scores did not correlate significantly with any of the other variables. The correlation matrix for all six variables is shown in Table 12.

Three predictor variables were chosen following two conditions: 1) the variables must have been shown to be of interest to researchers in the field by a previously demonstrated relationship in the literature with English comprehension and/or literacy measures (as discussed in the Predictions section) and 2) the variables could not significantly correlate with each other as that would result in them essentially explaining the same variance in the measures. Based on those conditions, the following three predictor variables were chosen: hearing age, cochlear implantation and CPQ total scores.

The first linear regression looked at the effect of predictors for OWLS II raw scores using the Enter method, which enters variables in the order specified. Variables were entered as follows: hearing age was chosen first to account for developmental age and a measure of hearing, cochlear implantation was chosen second to account for a second measure of hearing ability, and classroom participation was entered last after effect of age and audiological measures were accounted for. Overall model fit when predictors were entered using the enter method was R^2 = .545, meaning that the variables predicted 54.5% of the variability in English comprehension scores. This result was significant (F (3,11) = 4.389, p = .029). Only classroom participation scores made a significant contribution to the variance (β = .743, p = .012) after the other two predictor variables had accounted for non-significant contributions to the variance. Looking at the *B*-value, this model predicted that for every one point increase in the classroom participation score, a student's English comprehension raw score would increase by 5.785 (SE = 1.921). There were no major differences in the results when the same dependent variable and predictor variables were entered using the stepwise method, however the model showed a slightly lower shared variance (R^2 = .498, F (3,11) = 12.878, p = .003), as would be expected given that the non-significant variables were removed from the analyses. Classroom participation was the only predictor variable that entered into the model showing a significant contribution (β = .705, p = .003). See Table 13 for a full comparison of the enter method and stepwise method results for the OWLS II linear regressions.

The second linear regression examined predictors for literacy raw scores. First using the enter method, predictors were entered in the same order as the previous model: hearing age, cochlear implantation, then classroom participation. For this model, the ANOVA showed a significant result (R^2 = .506, F(3, 11) = 3.067, p = .044). This estimated that the variables predicted 50.6% of the variability in reading fluency scores. However, none of the three predictor variables made a significant independent contribution, although hearing age (β = .450, p = .080) and cochlear implantation (β = .439, p = .099) approached significance. A stepwise linear regression was conducted to determine whether predictors would enter differently under these conditions. The stepwise method yielded a significant result for this model (R^2 = .353, F(1) = 7.096, p = .019). In this case, only hearing age entered and significantly contributed to the variance in literacy raw scores (β = .594, p = .019). The B-value in this model predicted that for every additional year of hearing experience, a student's literacy score on the TOSCRF would increase by 6.649 (SE = 2.496). See Table 14 for a full comparison of the enter method and stepwise method results for the TOSCRF linear regressions.

Chapter 5: Discussion

This study aimed to describe the spoken and signed language and literacy abilities and self-reported classroom participation of students who are deaf/hoh in inclusive settings in Nova Scotia and New Brunswick. The goal was also to look for relationships between these three measures and investigate factors that predict performance on the English comprehension and literacy measures. Overall findings were that participants scored lower as a group on English comprehension and reading measures than hearing same age normative data, with a few participants scoring quite low. All children in the study sample used spoken language as their primary mode of communication and therefore the group was not an ideal one for use of the ASL test of grammatical structures. Despite this, perhaps not surprisingly, the ASL vocabulary scores did correlate near-significantly with preference for an additional communication mode to spoken English. Classroom participation was significantly correlated with English comprehension and predicted it strongly. In contrast, reading ability was predicted only by hearing age, which, although intuitive due to the high correlation between hearing age and chronological age, is of note as the range of hearing ages in this study was quite narrow. Reading fluency was not found to be correlated with classroom participation or English comprehension, results that were unexpected.

English Comprehension, Reading Fluency and Classroom Participation

It was predicted that participants in this study would achieve mean scores that fell below that of normative samples and that a few participants would score more than two standard deviations below the mean for the normative sample. As predicted, the mean of the English comprehension scores (*M* = 82.1, *SD* = 16.9) was lower than the mean of the normative samples (*M* = 100, *SD* = 15). Other studies also found lower means on English language measures for children with hearing aids (Calderon, 2000; Vohr, Topol, Watson, St. Pierre & Tucker, 2014; Watkin et al., 2007) and cochlear implants (Geers et al., 2003). Studies that used comparable measures of language comprehension also found that scores were between one to one-and-a-half standard deviations below the mean of the normative sample (Vohr et al., 2014; Watkin et al., 2007) while Geers et al. reported scores to be greater than two standard deviations below the mean with greater variation than in this study (scores were reported as amount of lag in months compared to same-age hearing peers so are not directly comparable to this study). However, the Geers et al. (2003) study included only participants with cochlear implants and the language comprehension measure was administered using speech plus signed English simultaneously to all participants, regardless of preferred communication mode. Both the sample composition and test administration procedures were therefore quite different than in this study, which may have led to the differences in findings. In general, it appears that the students in this sample achieved scores in English comprehension that would be expected given their hearing status.

In terms of reading scores, the mean score for the students who were deaf/hoh in the current study (*M* = 85.7, *SD* = 10) was also lower than that of the normative hearing sample (*M* = 100, *SD* = 15), consistent with previous literature (Geers & Hayes, 2011; Harris & Terlektsi, 2011; Lederberg et al., 2013). However the difference was greater than expected. In a study by Antia et al. (2009), literacy scores of children who were deaf/hoh were found to be, on average, half a standard deviation below the normative mean whereas it was closer to one standard deviation from the mean in the current study. Similarly, the TOSCRF manual reported that a sample of students who were deaf/hoh (n = 49) obtained a mean of 90 and a standard deviation of 11, also higher than the students in this study. This could be due to differences in participant samples in the present study compared to previous studies. This will be discussed below. It may be a consideration for future studies looking at literacy abilities to include a measure of reading fluency for participants who are deaf/hoh.

Looking at individual data, nine of fifteen students in the present study (60%) obtained English comprehension and/or reading scores that were within one standard deviation of the norms for their hearing peers. This is consistent with other studies of students who are deaf/hoh in the same age range, in which around 50% to 60% of students achieved scores within one standard deviation of the mean or higher in English comprehension (Antia et al., 2009; Geers & Nicholas, 2013) and around 46% to 66% of students achieved scores within one standard deviation or higher of the mean in English reading scores (Antia et al., 2009; Geers & Hayes, 2011; Geers & Nicholas, 2013). However, individual scores barely surpassed the mean for both English comprehension and reading fluency, which is due to the fact that below-average language scores on standardized English assessments administered by APSEA are criteria for receiving direct services from an itinerant teacher. Only one student scored just above the mean in English comprehension (standard score = 103) and a different participant scored just above the mean in reading (standard score = 102). In this sample, there were no higher achievers as were present in previous studies (Antia et al. 2009; Harris & Terlektsi, 2011) as high-achieving students would not be receiving direct intervention from an APSEA itinerant teacher. Higher scores would be expected if students who were only receiving consultative, not direct, services from itinerant teachers had been included in the study. There were however several children who obtained very low scores: five scored more than one and a half standard deviations below the mean in language comprehension for example and four scored more than one and a half standard deviations below the mean for reading fluency (see Table 5). Two of these students obtained an average score in the other English assessment (i.e., low score in TOSCRF but an average score in OWLS II or vice versa). The other five students scored low in both assessments, composing one third of the sample. Looking closely at the characteristics of the children who obtained the lowest scores, they did not appear to differ by sex, chronological age, hearing age (although the single student with only one year of functional hearing was in this group), cochlear implantation or preferred communication mode. Four out of the five students with identified additional disabilities were in this low-achieving group and the fifth student whose parent identified an additional disability reported that the student had "learning problems", which may not be a diagnosed disability. Otherwise, it is not clear from the data what may have contributed to these lower individual scores, which suggests that they were largely caused by idiosyncratic differences. More detailed participant characteristics would need to be collected in future studies in order to investigate language and literacy scores further.

Group mean standard scores in English comprehension ($M = 82.07$, $SD = 16.939$) and reading fluency ($M = 86.27$, $SD = 10.046$) were not significantly different from each other ($t(14) = -.985$, $p = .341$, $d = 0.352$). Both means were found to be low, around one standard deviation below the mean of same-age hearing peers, with four to five individual students achieving standard scores greater than one standard deviation below the mean of same-age hearing peers. The overall lower scores in both English comprehension and reading for this group can likely be attributed to sample characteristics, as described above. This is a group that has not been studied previously. In addition, in regions where research is conducted with children who are deaf/hoh, both special schools for students who are deaf/hoh and inclusive educational settings are available. In comparison, this region is unique in that only inclusive educational settings are an option for students who are deaf/hoh. Research that has attempted to compare performance between students in these two settings has found that the two groups of students have different characteristics that reflect biasing in decisions on educational placement. In essence, students who have not been or are expected not to be as successful academically in inclusive settings are more likely to be placed in special schools for students who are deaf/hoh (Marschark et al., 2011). A review of state schools for students who are deaf/hoh by Cawthon (2004) found that of the 27 schools that reported the percentage of students who were deaf/hoh meeting state-determined passing grades in English language and literacy measures, percentages ranged from 0 to 29% for middle school grades. Only one study by Easterbrooks and Huston (2009) was found that measured reading ability with students who were deaf/hoh and being educated in a middle school for students who are deaf/hoh in a major American city. The mean reading comprehension score for this group was greater than three standard deviations below the mean, ranging from standard scores of 27 to 87 (*SD* = 16). These studies illustrate the fact that students in special schools achieve lower scores in reading than students in inclusive settings. The reading fluency scores for nine of the students in the current study fell within the range of scores in the

Easterbrooks and Huston study. It is likely that some students in this study would have been placed in special schools due to lower English language and/or literacy abilities but were by default in inclusive settings. Future studies should clearly state which educational placement options were available to students who are deaf/hoh in the region studied.

Scores on English comprehension were not found to be significantly better for students with cochlear implants, despite this being predicted by the literature (Geers & Nicholas, 2013). This is likely due to low statistical power resulting from a small number of participants ($n = 5$) with cochlear implants in this study and the large variability in age of implantation (ranging from 18 to over 60 months), where studies have shown that children with earlier implantations have better outcomes in language acquisition (Geers & Nicholas, 2013).

It is interesting that the English comprehension and the English reading measures were not significantly correlated in this sample ($r = .338$, $p = .218$). The literature on reading development shows that there should be a positive relationship between English language abilities and reading abilities for all populations, including children who are deaf/hoh with functional hearing (Lederberg et al., 2013). This is the first study that has used reading fluency as a measure of reading ability with students who are deaf/hoh. It is therefore possible that use of a reading fluency measure explains the lack of a correlation with the English oral comprehension measure. However, the TOSCRF manual reports high correlations between reading fluency and reading comprehension which would argue against this interpretation. Nonetheless, using a different measure of reading ability may have led to finding a significant correlation in the present group. When the participants' individual scores were reviewed, it was apparent that the majority of participants scored similarly for the English comprehension and reading measures, however two participants had a standard score greater than 95 in one measure and lower than 80 in the other. One participant had a high score in comprehension and a low score in reading while the other participant scored low in comprehension and high in reading. The scores from these two participants may have contributed to the lack of correlation found for the group. The sample size for this study was small and a larger sample size may have led to a significant positive correlation.

In linear regression analyses, the only predictor variable found to contribute to the variance in raw reading scores was hearing age, accounting for 51.3% of the variance using the enter method with hearing age as the first predictor. Cochlear implantation and classroom participation scores did not add any significant contribution to reading scores. A contribution of hearing age was expected, as reading would be expected to improve with age, and chronological age and hearing age were significantly correlated in this sample (see Figure 9). This is also consistent with findings in the literature as several studies have found significant differences in English literacy scores of groups categorized by hearing age (Beer et al., 2012; Geers & Hayes, 2011; Geers & Nicholas, 2013; Harris & Terlektsi, 2011).

Classroom participation total scores were also found to correlate significantly and positively with English comprehension scores, consistent with findings by Antia et al. (2009) who found a positive and significant correlation between the total CPQ score and the Stanford Language test in students who are deaf/hoh in inclusive settings. The positive correlations in both studies suggest that students who had higher oral comprehension abilities felt that they were better able to participate in classroom communication, a factor that would be critical in an inclusive setting. Linear regression analyses showed that classroom participation scores predicted 67.8% of variance in raw scores for English comprehension after hearing age and cochlear implantation were accounted for. This is a high percentage, compared to Antia et al.'s findings that classroom participation scores using the same measure predicted 18% of the variance in standardized English language assessments after hearing levels and interpreter use were accounted for. While both studies found the CPQ total score significantly predicted language comprehension, the higher predictive value of the CPQ in the present context may be explained by the fact that the language measure used in this study was administered orally and individually, while the language measure in the Antia et al. study was a written assessment administered in a group in the classroom. Using a written measure of language comprehension likely confounded reading and oral comprehension abilities in the Antia et al. study thus reducing the relationship between language comprehension and classroom participation. This view is supported by the fact that there was no relationship between the CPQ and reading fluency found in the present study. These findings support recommendations by researchers who have used the CPQ (Antia et al., 2009; Hintermair, 2011; Schick et al., 2013) that future studies should include self-reported classroom participation scores when assessing language abilities as they may provide highly useful information about student inclusion in purportedly inclusive educational settings.

The classroom participation scores measured using the CPQ were expected to correlate significantly with literacy scores (Antia et al., 2009) but in this study they did not, as stated previously. This is surprising considering that the classroom is an environment where oral and written language are both used to communicate and literacy is increasingly used as the medium for learning. However, the classroom participation measure does not directly address the student's ability to use text effectively in the classroom. Consequently it would be expected that oral language rather than reading abilities would be more associated with this measure. Also, given a larger sample, a significant correlation might have been obtained.

In this study, classroom participation scores showed a bimodal distribution indicating that some students felt that they were participating well while others felt that they were not participating fully in the oral classroom communications. T-tests revealed no group differences on the classroom participation measure as a function of sex, cochlear implantation, communication mode and additional disabilities. Even so, four of the five students who were listed as having additional disabilities scored lower on the CPQ, suggesting that additional disability could inflate negative feelings of classroom participation. Of the five students with cochlear implants, three of them reported scores in the lower group, which implied that cochlear implantation did not protect children who were deaf/hoh from low classroom participation scores. Notably, six out of the seven students who achieved average scores in both the English comprehension and reading assessments were in the group of students with higher classroom participation scores. It appears that the combination of good abilities in both English comprehension and reading is related to increased feelings of participation in the inclusive classroom environment. Future studies need to further explore factors that influence classroom participation.

American Sign Language Ability

The original intention of this study was to include participants who used signed or spoken language as their primary language and to assess both signed and spoken language comprehension with all participants. It was expected that students who were deaf/hoh and used primarily spoken language could still have some signing exposure, therefore a signed language assessment could provide insight into their overall language knowledge beyond only spoken language. As it turned out, none of the participants in this study were primary signers. This is most likely due to the fact that there are a small number of children who use primarily sign language in this region. Only seven students were identified in Nova Scotia and New Brunswick who fit the grade criteria for this study and who used either an educational ASL/English interpreter or a language acquisition support worker in the classroom in the 2011/2012 year (Lori Moore, personal communication, November 14, 2011). There may have been more students who use signed language but are communicating orally in the classroom however the numbers would still be small. In addition, there may have been a bias for parents of children who use signed language to resist participating in research that would assess the child's oral English comprehension.

The only measure of ASL knowledge that was gathered for all participants in this study was the raw score out of 20 for the ASL-RST expressive vocabulary check. Results from this measure highlighted the poor ASL knowledge of the sample with seven of the participants (n = 15) unable to produce a single correct sign and only one participant reaching criterion for continuing testing on the full assessment. The absence of a significant correlation between ASL and the English comprehension and reading measures further attests to the lack of importance of this ASL measure for these participants.

Despite the low number of signs expressed by this sample, a near-significant difference was found in the number of signs expressed by students as a function of preferred communication modes. The students who indicated that they preferred to communicate using exclusively speech with teachers and students at school knew less signs than those who indicated a preference for another mode of communication in addition to speech (see Figure 4). This may have been because students who struggled to communicate effectively using speech would be likely to indicate other preferred modes such as using signs or simple gestures and writing notes. These students would also be more likely to have been exposed to and retained some signs at some point in their lives. It is possible that the students who knew more signs and who expressed other communication modes than just speech could benefit from ASL exposure or the option of being educated in a special school for students who are deaf/hoh.

Limitations of the Study

The intention was to recruit a heterogeneous sample of students who are deaf/hoh in inclusive educational settings in Nova Scotia and New Brunswick. This was not accomplished. The sample was small, comprised of four participants from New Brunswick and 11 from Nova Scotia. Despite the intention to use broader inclusion criteria than other similar research studies conducted with children who are deaf/hoh, the sample of participants in this study were a much more homogeneous group than expected, especially because all students communicated almost exclusively through spoken English. This may have reflected the more homogeneous nature of students in

APSEA that matched the inclusion criteria, which was only 48 students out of 300 students (16%) who were deaf/hoh within the grades specified in Nova Scotia and New Brunswick. These students had already been identified as requiring direct services from an itinerant teacher as their level of hearing was already noted to have an impact on their academic achievement. This study could have broadened the inclusion criteria to include students within the same range of grade and hearing levels but who were receiving only consultative services from APSEA. Regardless, this study managed to assess 31.3% of students who were invited to participate, almost one third of all students that were invited to participate in the study. This was a markedly better response rate than has been achieved in past attempts to survey parents of APSEA students (Atlantic Provinces Special Education Authority, 2012). Parents may have been motivated to respond to this study's call for participants due to the fact that their child's scores would be shared with APSEA, which may aid in their child's education.

A second limitation of the study was that several useful background characteristics, such as parental involvement, past ASL exposure, more detailed information about prior and current amplification usage and number of hours spent in the regular classroom, could have been collected. In this study, hearing age was calculated based on parental report whereas medical records would have been a more accurate means of calculating hearing age. As well, given the lack of a common hearing measure across participants and difficulties in acquiring and interpreting audiograms created by independent sources, it would have been preferable to test participants' hearing within the testing procedures of the study to ensure full up-to-date data for all participants and consistent measurement of hearing levels. Hearing level is a controversial variable that has been shown to be related to language and literacy abilities in some studies (Bond et al., 2009; Geers & Hayes, 2011; Geers & Nicholas, 2013; Leigh, Dettman, Dowell & Sarant, 2014) and not in others (Antia et al., 2009; Davidson et al., 2014; Harris & Terlektsi, 2011; Watkin et al., 2007). As has been seen in other studies (Anderson, 2001; Schick et al., 2013), it may be most useful in future studies with heterogeneous groups of individuals who are deaf/hoh to group participants with cochlear implants separately from those with hearing aids when collecting data on hearing levels due to the qualitatively different information gathered from audiograms.

Finally, the administration of the ASL assessment was not as consistent as it should have been. The investigator did not administer the receptive component of this test to all participants. Further, the importance of the vocabulary check scores was not recognized until the end of testing when it became apparent that only the vocabulary portion would be available for all participants. It was also possible for a sign to be produced correctly by participants through guessing. It would be important to distinguish if a sign was known or guessed. It could have been requested that the student identify if he or she was guessing, which would have allowed that distinction to have been noted on the response sheet. Data should be collected in a more consistent manner by determining in advance the mandatory components of the test and the range of acceptable responses.

Clinical Implications

There are no standard adaptations recommended for assessment of English language abilities in students who are deaf/hoh. Educators and researchers have chosen to either not provide any adaptations to an orally administered assessment or create adaptations that make the stimuli more visual, such as allowing speech-reading during presentation of the stimuli or adding signs that follow English word order. In this study, it was decided that the stimuli would be provided first orally then via text to allow the students to use as many tools as possible to demonstrate their underlying English knowledge. In the results, scores for the oral plus text presentations were consistently and significantly higher compared to scores from the oral only condition ($t(14) = 3.520$, $p = .003$, $d = .145$). These results suggest that the adaptation used in this study of adding a text version of each test item to an English comprehension assessment helped the students to show their English comprehension skills more completely. Adding a text version of stimuli therefore seems to be a useful means of providing better accessibility to an English comprehension assessment for students who are deaf/hoh, if the goal is to tap into the student's underlying knowledge of a spoken language. Note that the investigator did not specifically request that students look at the investigator's face during oral presentation of stimuli. Although some students used the visual support, other students chose not to. It is possible that the students who chose not to look may not have realized that visual cues would help or they may have been accustomed to doing 'listening tests' in which they were not permitted to use visual cues. Future studies could include consistent instructions for participants to use visual cues to ensure that all participants are offered the same opportunity to demonstrate underlying knowledge.

Regardless of the limited usefulness of the ASL-RST assessment in measuring ASL knowledge of the participants in this study, the ASL-RST remains the best option available for assessing if a child who is deaf/hoh has some ASL knowledge. According to the developers, the primary purpose of the vocabulary check is to verify which signs may be less familiar to the child in order to cross check incorrect responses in the assessment to see if they may have been explained by lack of vocabulary knowledge instead of lack of grammatical knowledge. In the case of children who are deaf/hoh and have limited exposure to ASL, the vocabulary check could instead be a crucial component of the assessment to rule out ASL knowledge. This would allow parents, teachers and researchers to determine for certain whether or not a child has other language knowledge besides the spoken language. ASL assessment measures with evidence of validity and reliability are needed, especially for use with children who are deaf/hoh and with limited exposure to signed language.

Lastly, one goal of this study was to describe students who have moderate to profound hearing levels in the Maritimes and who do not have access to educational programming in special schools for students who are deaf/hoh. Since the children in this study, according to inclusion criteria, were not being exposed to any other language besides English or a signed language, and were clearly not fluent signers of a signed language, then by definition they should be native speakers of English. However, even given reasonable conditions to demonstrate their knowledge of the English language, several students achieved alarmingly low scores in the English comprehension measure and no students achieved above average scores. This means that there are students who are deaf/hoh being educated in inclusive settings without a good command of their only language, English. As English is the language of instruction for these students, their academic achievement likely suffers as a result. This should raise red flags for the need for intensive language intervention with such students. In an article entitled "Language acquisition for deaf children: Reducing the harms of zero tolerance to the use of alternative approaches" in the *Harm Reduction Journal*, Humphries and colleagues

(2012) express deep concern that there is resistance in the field of education with students who are deaf/hoh to entertain the idea of incorporating signed languages in addition to spoken language intervention rather than exclusively following an auditory-oral approach. One suggestion could be made that a fully accessible and complete visual language system, such as cued speech or a signed language, may be beneficial to these students in order to acquire a full language that can facilitate successful academic participation and achievement.

Conclusions

In conclusion, for this group of oral students who are deaf/hoh in Nova Scotia and New Brunswick, this study provided evidence that as a group English comprehension and reading abilities were below the expected levels for same-age hearing students. That being said, approximately half of the students tested scored within one standard deviation of the mean on either the language comprehension or reading fluency tests. The only factors that were identified that appeared to be positively related to their abilities in these areas included self-reported classroom participation scores for English comprehension and hearing age for English reading fluency. Children without any additional disabilities were also more likely to achieve better scores. These results were consistent with previous research. In contrast, group means for English comprehension and reading scores were lower than what has been reported in the literature but are understandable given the inclusion criteria of the group and the lack of alternative educational placements besides inclusive settings. Also unexpected were results that classroom participation scores were not predictive of reading fluency, which was possibly due to the highly specific reading measure chosen that targeted silent reading fluency and the lack of a focus on written language communication in the classroom participation measure. All measures administered were determined to be useful and effective to assess the communicative abilities of this sample and are recommended as measures to be used both in educational and research settings with youth who are deaf/hoh. Despite the limitations of this study, it is recommended that health professionals, educators and parents of children who are deaf/hoh be willing to consider alternative methods of language intervention for students who are deaf/hoh as they may not be as successful as anticipated using auditory-oral communication alone. Further research is warranted that examines a more complete communication profile beyond speech and spoken language ability for students who are deaf/hoh in inclusive settings, with measures such as sign language ability, reading fluency and self-reported classroom participation, as were included in this study.

Appendix A: Parent Questionnaire

Parent/Guardian Questionnaire

INFORMATION

____ Identification Number: _____________
Child's name (Last Name, First Name)

____ Grade: ________ Gender: ☐ M ☐ F ☐ Other
Birth date (Year/Month/Day)

____ ___________________________________
Name of person filling out questionnaire Relation to child

____
Today's Date (Year/Month/Day)

Family

Who else lives in the family home?

- ☐ mother
- ☐ father
- ☐ siblings, how many? _______________
- ☐ grandparent
- ☐ other: __________________________________

Does anyone else in your immediate family have any form of hearing loss? If yes, what is their relationship to the child? (*please use terms above*)

- ☐ yes, _________________________________ am/is/are profoundly deaf
- ☐ yes, _________________________________ am/is/are hard of hearing
- ☐ no

What location would best describe where you live?

- ☐ city
- ☐ suburb
- ☐ rural
- ☐ other: __________________________________

Current Language & Communication

What is the primary way that **your child communicates** currently?

- ☐ sign language with very little mouth movements
- ☐ sign language and speech at the same time
- ☐ speech with some important signs added
- ☐ speech with hand cues (Cued Speech)
- ☐ speech only

What is the primary way that **you communicate with your child** currently?

- ☐ sign language with very little mouth movements
- ☐ sign language and speech at the same time
- ☐ speech with some important signs added
- ☐ speech with hand cues (Cued Speech)
- ☐ speech only

If your child has a cochlear implant, what was the primary way that you communicated with your child ***before*** the implant?

- ☐ sign language with very little mouth movements
- ☐ sign language and speech at the same time
- ☐ speech with some important signs added
- ☐ speech with hand cues (Cued Speech)
- ☐ speech only
- ☐ not applicable (my child doesn't have a cochlear implant)

Who (e.g., parents, siblings, friends, teachers) speaks **English** to your child? (list all but note that *names are not necessary*)

- In the home:
- At school:
- Elsewhere (specify):

Hearing Status

At what age was your child's hearing loss diagnosed? ________

If your child is profoundly deaf, at what age did he/she become profoundly deaf? ________

Do you know what is the cause of your child's hearing loss? If yes, please specify:

Does your child have any additional disabilities?

Hearing Assistance

Has your child ever worn a **hearing aid**? ☐ Yes ☐ No

If YES, in what year did they Start wearing it/them? Right ear ________________ Left ear ________________

Does your child still wear a hearing aid? ☐ Yes ☐ *one* ☐ *two* ☐ No ☐ Sometimes

If your child wore a hearing aid, but has stopped, state the main reasons:

Has your child ever had a **cochlear implant** fitted? ☐ Yes ☐ No

If YES, list when and for how long: Right ear ________________ Left ear ________________

Does your child still wear a cochlear implant? ☐ Yes : ☐ *one* ☐ *two* ☐ No ☐ Sometimes

If your child wore a cochlear implant, but has stopped, state the main reasons:

Who (e.g., parents, siblings, friends, teachers) uses **sign language** with your child? (list all but note that *names are not necessary*)

- In the home:
- At school:
- Elsewhere (specify):

Parent/Guardian Language Abilities

On a scale of 1 to 7 (with 1 meaning not at all and 7 meaning fluently), how well do you feel **you** can:

Understand English	1	2	3	4	5	6	7
Speak English	1	2	3	4	5	6	7
Read English	1	2	3	4	5	6	7
Write English	1	2	3	4	5	6	7

On a scale of 1 to 7 (with 1 meaning not at all and 7 meaning fluently), how well do you feel **you** can:

Understand Sign Language	1	2	3	4	5	6	7
Use Sign Language	1	2	3	4	5	6	7

On a scale of 1 to 7 (with 1 meaning not at all and 7 meaning fluently), how well do you feel **your child's other parent/guardian** can:

☐ Not applicable

Understand English	1	2	3	4	5	6	7
Speak English	1	2	3	4	5	6	7
Read English	1	2	3	4	5	6	7
Write English	1	2	3	4	5	6	7

On a scale of 1 to 7 (with 1 meaning not at all and 7 meaning fluently), how well do you feel **your child's other parent/guardian** can:

☐ Not applicable

Understand Sign Language	1	2	3	4	5	6	7
Use Sign Language	1	2	3	4	5	6	7

Comments:

Social Communication

How often would you say your child interacts with other deaf or hard-of-hearing children?

- ☐ two or more times a week
- ☐ about once a week
- ☐ about one or two times a month
- ☐ once every couple of months
- ☐ two or three times a year
- ☐ once a year
- ☐ less than once a year or never

If your child interacts with other deaf and hard of hearing children, how do they connect? Check all answers below that apply.

- ☐ in person
- ☐ in video over the internet (ex: Skype or ooVoo)
- ☐ in video using a videophone
- ☐ in text over the internet (ex: email, Facebook or instant messaging chat)
- ☐ in text using a cellphone (i.e., texting)
- ☐ by writing and receiving letters sent by mail

Comments:

Appendix B: Parent Consent Form

Consent Form

Title: Language, Literacy and Social Participation of Children Who are Deaf or Hard of Hearing in Nova Scotia and New Brunswick

Principal Investigator:
Bonita Squires
School of Human Communication Disorders, Dalhousie University
1256 Barrington Street, Halifax, NS B3H 4R2
Email: bonita.squires@dal.ca

Faculty Supervisor:
Dr. Elizabeth Kay-Raining Bird
School of Human Communication Disorders, Dalhousie University
1256 Barrington Street, Halifax, NS B3H 4R2
Email: rainingbird@dal.ca

Thesis Committee Members:
Dr. Sophie Jacques
Department of Psychology, Dalhousie University
Life Sciences Centre
P.O. Box 15000, Halifax, NS B3H 4R2
Email: sophie.jacques@dal.ca

Dr. Aaron Newman
Department of Psychology, Dalhousie University
Life Sciences Centre
P.O. Box 15000, Halifax, NS B3H 4R2
Email: aaron.newman@dal.ca

Lori Moore, M.Sc.
Director of Programs for Students who are Deaf or Hard of Hearing
Atlantic Provinces Special Education Authority
5940 South Street, Halifax, NS B3H 1S6
Email: lori_moore@apsea.ca

Invitation to Participate:

We invite your child to take part in a research study being conducted through Dalhousie University in Halifax. The researchers on this study are Bonita Squires, a graduate student in the Speech-Language Pathology program, School of Human Communication Disorders at Dalhousie University. Bonita is a native English speaker who is also fluent in ASL and Signed English. She is being supervised in her research by Dr. Elizabeth Kay-Raining Bird.

Participation in this study is voluntary and your child may withdraw from the study at any time without penalty. The quality of your child's educational and health services will not be affected by whether or not he/she participates. The research is being conducted in order to learn more about the language abilities and classroom participation of children who are deaf or hard-of-hearing (deaf/hoh) in Nova Scotia and New Brunswick. The study is described below. This description tells you about the risks, inconvenience, or discomfort that your child might experience.

We invite you to read the consent statement below to learn more about the study. The statement describes the study and tells you about the risks, inconveniences or discomforts that your child might experience. Participating in the study might not benefit your child directly but we might learn things that will benefit others. If you have any questions about the study please contact Bonita Squires by email (bonita.squires@dal.ca) or Dr. Elizabeth Kay-Raining Bird by email (rainbird@dal.ca) or phone (902) 494-7052 (call collect).

Purpose of the Study

The purpose of this research is to study the language, reading and social participation of children who are deaf or hard-of-hearing (deaf/hoh) in schools in Nova Scotia and New Brunswick. This is the first study of its kind in the Atlantic Provinces.

Study Design

This research will describe and look at the relationships between spoken English understanding, American Sign Language (ASL) understanding, reading ability, and children's self-reports of the ability to understand and be understood at school in children who are deaf/hoh. It would be helpful for the analysis of results if we could obtain certain information from APSEA about the educational services that your child has received from APSEA. We would like to know if your child has worked with a Language Acquisition Support Worker (LASW), an Interpreter (oral or sign), an Educational Assistant/Interpreter, an Auditory/Verbal Therapist and/or an Itinerant Teacher of the Deaf. We would also like to know for how long your child may have worked with any of the above staff supports. You will have the opportunity in the consent form below to give permission or refuse permission for the researchers to get the above information from APSEA.

Who can participate in the study

We are looking for 30 children in Grades 3 to 8 who are being seen by an Itinerant Teacher of the Deaf that works for the Atlantic Provinces Special Education Authority (APSEA). Children in this study must have a moderate to profound hearing loss. They may use English and/or sign language to communicate but should not be regularly exposed to another language in the home.

What your child will be asked to do

If you choose to have your child participate, your child will be seen for one session lasting about one hour. In the session, your child will complete a test of English language understanding and a test of ASL understanding. Your child will be asked to complete both the English and the ASL tests. This is because your child may have learned something about each language even if he or she does not use both languages to communicate. For the English test, your child will be asked to point to pictures that match a phrase or sentence said by the examiner (10-15 minutes). For the ASL test, your child will watch a native ASL signer on a computer sign a phrase or sentence, then your child will point to one of four pictures that matches what was signed (20 minutes). Your child will do a short reading test (5 minutes). In this test, your child will draw lines to separate words in a sentence (for example, the/dog/and/cat/sat/down). Your child will also complete a questionnaire that will ask your child how well they feel they understand and are understood by teachers and other students in school and how your child feels about their ability to communicate (10-15 minutes). The examiner will go through the questions with your child. Throughout, the examiner will communicate with your child in his or her preferred language.

Possible Risks and Discomforts

Participation in this study is unlikely to cause discomfort for your child. However, some of the tasks may prove boring. Breaks will be given as needed. If your child asks to stop, the session will end.

If your child is tested in the school setting, then he or she will miss one hour instruction time with their Itinerant Teacher of the Deaf. If you would prefer that your child be tested in your home so he or she will not miss class time, this can be arranged.

Possible Benefits

The results of the study will advance our understanding of the development of English, English literacy and ASL in children who are deaf/hoh and attending school in inclusive settings. It will also help us to understand the how some children who are deaf/hoh feel about their ability to communicate in school. APSEA supports this research and has reviewed and approved the testing procedures. With your permission, all the data gathered from your child will be shared with APSEA and included in your child's academic file, which may benefit your child's educational programming. As well, conclusions from the data gathered may help APSEA develop appropriate assessments and interventions for students who are deaf/hoh and receiving direct services from APSEA's Itinerant Teachers of the Deaf.

Confidentiality

Analyses and thesis requirements are expected to be completed by June 2014. At that time, all test sheets and identifying information at Dalhousie University will be destroyed. The results of this research may be published or presented at scientific or professional meetings. In all cases, personal information will not be revealed. Individual identifying information will be kept strictly confidential. All written records and data will be identified using numbers, and will be stored in a locked room. Only researchers associated with the project will have access to this information. Consistent with the Child and Family Services Act, if abuse or neglect of a child is suspected, child protection services will be notified.

Researcher responsibility

The researcher will remain professional and abide by ethical standards at all times in the child's school and home environments. The researcher will do her best to put the child at ease in the testing environment and will disrupt the child's classroom experience as little as possible. The researcher will respectfully treat all information about the child as highly confidential.

Voluntary Participation

Participation in this study is strictly voluntary. You and your child have the right to withdraw at any time without negative consequences. If you withdraw, you can choose to have us destroy the data that we have collected or you can choose for us to keep it.

In order to ensure that you are fully informed regarding your decision to participate, you will be provided with any new information that could affect your participation in this study.

Questions

If you have any questions about the study, please feel free to contact Bonita Squires at bonita.squires@dal.ca or (902) 494-5126 (please leave message) or Dr. Elizabeth Kay-Raining Bird at rainbird@dal.ca or (902) 494-7052 (call collect).

Problems or Concerns

If you have any difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Catherine Connors, Director, Research Ethics, Dalhousie University for assistance at (902) 494-1462, ethics@dal.ca .

Project: **Language, Literacy and Social Participation of Children Who are Deaf or Hard of Hearing in Nova Scotia and New Brunswick**

"I have read the explanation about this study. I have been given the opportunity to discuss it and my questions have been answered to my satisfaction. I hereby consent to have my child take part in this study. However I realize that my child's participation is voluntary and that I am free to withdraw my child from the study at any time."

______________________________	____________	____________
Name of Child (Last name, First name)	**Date of Birth**	**Age**

Today's Date: ______________________________

Participation in the Study
For my child to participate in this study

- ☐ I give permission
- ☐ I do not give permission

Verbal Assent of the Child

- ☐ The child is old enough to understand the nature of his participation, and his or her assent has been secured

Child Signature (if able to write): ______________________________

- ☐ The child is not old enough to understand the nature of participating, therefore assent will be monitored through the child's behavior during the activities

Preferred Testing Location
I would prefer that my child do the assessments

- ☐ In my home
- ☐ At school

Release of Information about Child's Past and Current Educational Services
For APSEA to share information about the educational services provided by APSEA to your child (i.e., titles and duration of past and current support staff):

- ☐ I give permission
- ☐ I do not give permission

Release of Audiogram from Nova Scotia Hearing and Speech Centres (NSHSC)
The child's most recent audiogram will be needed so that we know how much the child is hearing in the frequencies, or pitches, needed to understand speech.

For NSHSC or your local New Brunswick audiologist to be contacted and to share your child's audiogram with the researcher:

- ☐ I give permission
  Please indicate where we may make a request for a copy of your child's audiogram (ex: NSHSC, hospital name) ______________________________
- ☐ I do not give permission

Results of the Study
APSEA would like to receive a copy of these current, formal measures of some of the child's language abilities to add to the child's academic file.

For APSEA to receive a summary of my child's language, reading and social participation scores

- ☐ I give permission
- ☐ I do not give permission

- ☐ When the study is completed, I wish to receive a summary of the results.

Name of Parent/Caregiver: ______________________________

Parent/Caregiver Signature: ______________________________

Phone: ________________ **E-mail:** ______________________

Address: ______________________________

____

6

Permission to Re-contact Participant for Participation in Future Research

I agree to be re-contacted about future research projects if they become available and my child or I are eligible to participate.

- ☐ I give permission
- ☐ I do not give permission

Name of Parent/Caregiver: ____

Parent Signature: ____

Phone: _______________________**E-mail:** ________________________________

Address: ____

____

Appendix C: Classroom Participation Questionnaire

Classroom Participation Questionnaire-Revised
Deaf/ Hard-of-Hearing Students

Subject ID____ **Grade** ________

Investigator ____ Date _______________________

AT HOME

1. How often does your family use sign language? Never Sometimes Often All the time

2. a. Are there any other family members who have a hearing loss? No Yes
   b. IF YES, circle who: Father Mother Brother Sister Other_____________________

IN SCHOOL- Please circle one answer for each question. If there are no other deaf/hard-of-hearing students in your class(es), ignore questions 7 and 8.

	Interpreter	Sign	Speech	Speech & Sign	Writing Notes
3. How do you like best to communicate with hearing students?	1	2	3	4	5
4. How do you like best for hearing students to communicate with you?	1	2	3	4	5
5. How do you like best to communicate with teachers?	1	2	3	4	5
6. How do you like best for teachers to communicate with you?	1	2	3	4	5
7. How do you like best to communicate with other deaf/ hard-of-hearing students?	1	2	3	4	5
8. How do you like best for other deaf/ hard-of-hearing students to communicate with you?	1	2	3	4	5

9. Do you typically use an interpreter in class? No Yes

10. How many other deaf/hard-of-hearing students are in your class(es)? 0 1-2 3-4 5 or more

Stinson, M., Long, G., Reed, S., Kreimeyer, K., Sabers, D. & Antia, S.D. (2006). 1

Classroom Participation Questionnaire-Revised

DIRECTIONS:

- Read each sentence.
- Decide how often it happens for you.
- Circle the answer that is best for you.
- Be sure to circle an answer for each sentence.
- The word **"understand"** is used frequently in this questionnaire. **"Understand"** is defined as knowing the meaning of what is said or asked.

HERE IS AN EXAMPLE:

How often do you make your bed?

1 2 3 4

Almost Never Seldom Often Almost Always

- Notice the circle pictures above each number. They are to help you think about how OFTEN you do something.
- Do you make your bed almost always? If so, you should circle number 4.
- If you almost never make your bed, you should circle number 1.
- If you seldom (not very often) make your bed, you should circle number 2.
- If you often make your bed, circle number 3.

NOW SELECT THE RESPONSE THAT IS BEST FOR YOU.

IF YOU HAVE ANY QUESTIONS PLEASE ASK THE TEACHER NOW!

If you use an interpreter, you understand what your teacher or classmates say through your interpreter. They understand what you say by listening to the interpreter.

If you do not use an interpreter, you understand what your teacher or classmates say by listening to them. They understand what you say by listening to you.

RESPOND TO EACH STATEMENT BASED ON THE WAY YOU USUALLY COMMUNICATE IN YOUR CLASS.

This questionnaire is not part of your schoolwork. It will not be graded. If the questions upset you, you can stop answering them at any time. We need your honest answers. Please read each question carefully. Thanks for your help.

1	2	3	4
Almost Never	**Seldom**	**Often**	**Almost Always**

1.	I understand my teacher.	1	2	3	4
2.	I understand the other students in class.	1	2	3	4
3.	I join in class discussions.	1	2	3	4
4.	I feel good about how I communicate in class.	1	2	3	4
5.	I feel frustrated because it is difficult for me to communicate with other students.	1	2	3	4
6.	I get upset because other students cannot understand me.	1	2	3	4
7.	I get upset because my teacher cannot understand me.	1	2	3	4
8.	I feel relaxed when I talk to my teacher.	1	2	3	4
9.	I understand my teacher when she gives me homework assignments.	1	2	3	4

1	2	3	4
Almost Never	**Seldom**	**Often**	**Almost Always**

10. I understand my teacher when she answers other students' questions.	1	2	3	4
11. I understand my teacher when she tells me what to study for a test.	1	2	3	4
12. I understand other students during group discussions.	1	2	3	4
13. I understand other students when they answer my teacher's questions.	1	2	3	4
14. I feel happy in group discussions in class.	1	2	3	4
15. I feel good in group discussions in class.	1	2	3	4
16. I feel unhappy in group discussions in class.	1	2	3	4

Classroom Participation Questionnaire-Revised
Summary Sheet

Student Name: Date: Grade:

	Questions	Never	Sometimes	Often	All the Time	
1	How often does your family use sign language?					
2	Are there any other family members who have a hearing loss?	**No**	**Yes**	**List who:**		
		Inter-preter	**Sign**	**Speech**	**Speech & Sign**	**Writing notes**
3	How do you like best to communicate with hearing students?					
4	How do you like best for hearing students to communicate with you?					
5	How do you like best to communicate with teachers?					
6	How do you like best for teachers to communicate with you?					
7	How do you like best to communicate with other deaf/hard-of-hearing students?					
8	How do you like best for other deaf/hard-of-hearing students to communicate with you?					
9	Do you typically use an interpreter in class?	**No**		**Yes**		
10	How many other deaf/hard of hearing students are in your class(es)	**0**	**1-2**	**3-4**	**5 or more**	

Desirable ratings are in the 3-4 range.

1 - Almost Never **2 - Seldom** **3 – Often** **4 - Almost Always**

Subscale	Question Number	Questions	Ratings 1	2	3	4
Understanding Teacher (4)	**1**	I understand my teacher.				
	9	I understand my teacher when she gives me homework assignments.				
	10	I understand my teacher when she answers other students' questions.				
	11	I understand my teacher when she tells me what to study for a test.				
		Mean of the Subtotal	**____ / 4 = ____**			
Understanding Student (4)	**2**	I understand the other students in class.				
	3	I join in class discussions.				
	12	I understand other students during group discussions.				
	13	I understand other students when they answer my teacher's questions.				
		Mean of the Subtotal	**____ / 4= ____**			
Positive Affect (4)	**4**	I feel good about how I communicate in class.				
	8	I feel relaxed when I talk to my teacher.				
	14	I feel happy in group discussions in class.				
	15	I feel good in group discussions in class.				
		Mean of the Subtotal	**____ / 4 = ____**			

Desirable ratings are in the 1-2 range.

Negative Affect (4)	**5**	I feel frustrated because it is difficult for me to communicate with other students.				
	6	I get upset because other students cannot understand me.				
	7	I get upset because my teacher cannot understand me.				
	16	I feel unhappy in group discussions in class.				

Appendix D: Tables

Table 1 *Individual and group (if applicable) mean (M), standard deviation (SD), minimum (min) and maximum (max) participant characteristics for sex, chronological age (years and months), grade, other disabilities, and history of family members who are deaf/hoh*

Subject	Sex	Age (yr;mth)	Grade	Other Disabilities	Family History of Deaf/HoH
S01	F	11;5	5		no
S02	M	11;11	6	ADHD, Tourette Syndrome	yes
S03	F	11;6	6	Learning difficulties	yes
S04	F	14;4	8	Craniosynostosis Oral Motor Disorder	yes
S05	F	11;6	5	Anxiety, Glaucoma, OCD, Sensory Processing Disorder	no
S06	F	13;2	8		yes
S07	M	14;0	8		no
S08	M	11;10	5		no
S09	M	13;4	6		no
S10	F	10;0	4		no
S11	F	12;2	6	Leopard's Syndrome, Hypertrophic Cardiomyopathy	no
S12	M	14;2	8		yes
S13	F	11;5	6		no
S14	M	12;3	7		no
S15	M	12;0	7		yes
M		12;3	6.3		
SD		(1;3)	(1.3)		
Min		10;0	4		
Max		14;4	8		

Notes: yr;mth = age in terms of number of years and months. M = Male. F = Female. ADHD = Attention Deficit and Hyperactivity Disorder.

Table 2 *Individual and group (if applicable) mean (M), standard deviation (SD), minimum (min) and maximum (max) participant characteristics for chronological age (Age), age of hearing level diagnosis (Age Dx), age of hearing intervention as determined by first cochlear implant or, if no cochlear implant then first hearing aid (Age Tx), hearing age, unaided pure tone average for better ear (dB) for students with hearing aids, aided pure tone average for better ear for students with at least one cochlear implant, and hearing technology used*

Subj	Age (yr;mth)	Age Dx (yr;mth)	Age Tx (years)	Hearing age (years)	Unaided PTA for better ear using HA (dB)	Aided PTA for better ear using CI (dB)	Hearing technology used
S01	11;5	1;3	2	9	-	25	1 CI, 1 HA
S02	11;11	3;0	4	7	29	-	2 HA
S03	11;6	0;0	1	10	-	12	2 CI
S04	14;4	0;11	4	10	-	25	1 CI
S05	11;6	0;0	<1	11	63	-	2 HA
S06	13;2	0;6	<1	13	72	-	2 HA
S07	14;0	3;6	3	11	65	-	2 HA
S08	11;10	4;0	4	7	58	-	2 HA
S09	13;4	5;0	5	8	53	-	2 HA
S10	10;0	8;0	9	1	NA	-	2 HA
S11	12;2	0;0	5	7	-	27	1 CI, 1 HA
S12	14;2	1;0	4	10	55	-	2 HA
S13	11;5	2;6	2	9	83	-	2 HA
S14	12;3	0;0	2	10	-	8	2 CI
S15	12;0	4;0	4	8	NA	-	2 HA
M (SD)	12;3 (1;3)	2;3 (2;4)	3 (2)	9 (3)	59.8 (15.9)	19.3 (8.6)	
Min	10;0	0;0	<1	1	28.8	8	
Max	14;4	8;0	9	13	83.3	27	

Notes: Subj = Subject. yr;mth = age in terms of number of years and months. Dx = diagnosis. Tx = Intervention. Unaided PTA = pure tone average of decibel thresholds at 500, 1000, and 2000 Hz when not wearing hearing aids. Age of intervention could only be calculated using the year in which the child received hearing technology as reported by the parent, which means that number of months could not be calculated. Hearing age = number of years since first hearing aid fitting or, if have received a cochlear implant, then activation of first cochlear implant. CI = cochlear implant. HA = hearing aid. NA = not available.

Table 3 *Individual parent responses on the Parent Questionnaire to the question: "On a scale of 1 to 7 (with 1 meaning not at all and 7 meaning fluently), how well do you feel you can:"*

Subject	Understand Sign Language	Use Sign Language
S01, S02, S05, S06, S07, S08, S09, S11, S12, S13, S15	1	1
S03	3	3
S04	1	2
S10	6	4
S14	2	2

Table 4 *Order of administration of counterbalanced measures using a 4x4 Latin Balanced Square*

Subject	First	Second	Third	Fourth
S01	OWLS II	TOSCRF	CPQ	ASL-RST
S02	TOSCRF	ASL-RST	OWLS II	CPQ
S03	ASL-RST	CPQ	TOSCRF	OWLS II
S---	CPQ	OWLS II	ASL-RST	TOSCRF
S04	OWLS II	TOSCRF	CPQ	ASL-RST
S---	TOSCRF	ASL-RST	OWLS II	CPQ
S05	ASL-RST	CPQ	TOSCRF	OWLS II
S06	CPQ	OWLS II	ASL-RST	TOSCRF
S07	OWLS II	TOSCRF	CPQ	ASL-RST
S08	TOSCRF	ASL-RST	OWLS II	CPQ
S09	ASL-RST	CPQ	TOSCRF	OWLS II
S10	CPQ	OWLS II	ASL-RST	TOSCRF
S11	OWLS II	TOSCRF	CPQ	ASL-RST
S12	TOSCRF	ASL-RST	OWLS II	CPQ
S13	ASL-RST	CPQ	TOSCRF	OWLS II
S14	CPQ	OWLS II	ASL-RST	TOSCRF
S---	OWLS II	TOSCRF	CPQ	ASL-RST
S15	TOSCRF	ASL-RST	OWLS II	CPQ
S---	ASL-RST	CPQ	TOSCRF	OWLS II
S---	CPQ	OWLS II	ASL-RST	TOSCRF

Notes: S--- = Subject position not used in study

Table 5 *Individual scores and group mean (M), standard deviation (SD), minimum (min) and maximum (max) scores for OWLS II standard scores with oral only presentation of items, standard scores with oral plus text presentation of items, number responses changed after text presentation, and percent responses changed after text presentation and TOSCRF standard scores*

Subject	OWLS II				TOSCRF
	SS Oral only	SS Oral + text	Number responses changed	% responses changed	SS
S01	82	88	4	9.5	80
S02	97	98	1	1.6	77
S03	88	90	2	6.5	102
S04	66	69	7	26.9	99
S05	77	77	1	2.0	78
S06	93	93	2	3.2	95
S07	91	92	5	10.4	100
S08	85	87	7	23.3	87
S09	88	89	5	11.4	85
S10	72	75	2	3.0	75
S11	54	53	3	5.6	87
S12	40	42	5	7.9	75
S13	95	103	11	22.4	92
S14	90	97	11	14.7	91
S15	77	78	1	3.1	71
M	79.7	82.1	4.5	10.1	86.3
(SD)	(16.1)	(16.9)	(3.3)	(8.3)	(10.0)
Min	40	42	1	1.6	71
Max	97	103	11	26.9	102

Notes: OWLS II = Oral and Written Language Scales, Second Edition. TOSCRF = Test of Silent Contextual Reading Fluency. SS = standard scores

Table 6 *Individual z-score scores for Oral and Written Language Scales, Second Edition (OWLS II) subcategories: lexical (lex), syntactic (syn) and supralinguistic (supra) with group mean (M), standard deviation (SD), minimum (Min) and maximum (Max) scores accompanied by a visual representation of z-scores more than -1 SD (◆), within one SD (■) and more than +1 SD (⊙) from the group mean for each category*

Subject	Z-scores			Standard Deviations		
	Lex	Syn	Supra	Lex	Syn	Supra
S01	.41	-.11	-.47	■	■	■
S02	1.24	1.10	.36	⊙	⊙	■
S03	.41	.29	-.19	■	■	■
S04	-.69	-.38	.08	■	■	■
S05	-1.51	.03	-.19	◆	■	■
S06	.69	.83	1.47	■	■	⊙
S07	.69	1.24	.64	■	⊙	■
S08	.14	.29	.08	■	■	■
S09	.69	.43	.92	■	■	■
S10	-1.24	-1.18	-1.03	◆	◆	◆
S11	-1.51	-1.72	-1.86	◆	◆	◆
S12	-1.51	-2.26	-1.86	◆	◆	◆
S13	.69	1.10	.92	■	⊙	■
S14	1.51	.56	1.19	⊙	■	⊙
S15	.14	-.24	-.19	■	■	■
M (SD)	0.01 (1.03)	0.00 (1.04)	-0.01 (1.01)			
Min	-1.51	-2.26	-1.86			
Max	1.51	1.24	1.47			

Table 7 *Individual scores for American Sign Language - Receptive Skills Test (ASL-RST) number signs produced in vocabulary check, number signs produced or recognized in vocabulary check, number practice items correct in test and standard score with mean (M) and standard deviation (SD) for each set of data*

	Vocabulary Check out of 20			ASL-RST		
Subject	Signs produced	Signs recognized	Total signs	Practice items correct out of 3	Raw Score out of 42	Standard Score
S01	1	4	5			
S02	8	2	10			
S03	2	9	11			
S04	3	16	19	1	26	89
S05	0	8	8			
S06	0	9	9			
S07	0	4	4			
S08	2	8	10			
S09	0	6	6			
S10	0	5	5			
S11	5	6	11			
S12	6	5	11			
S13	0	NA	NA			
S14	0	9	9			
S15	4	9	13			
M (SD)	2.1 (2.6)		9.4 (3.9)			
Min	0	2	4			
Max	8	16	19			

Notes: NA = not administered

Table 8 *Individual scores, group means (M), standard deviations (SD) and ranges for the Classroom Participation Questionnaire (CPQ) subscales Understanding Teacher (UT), Understanding Students (US), Positive Affect (PA) and Negative Affect (NA) and for the total CPQ score*

	Subscales				CPQ Total Score*
	UT	US	PA	NA	out of 12.00
Subject	out of 4.00	out of 4.00	out of 4.00	out of 4.00	
S01	4.00	3.25	3.50	1.75	8.50
S02	2.75	2.50	3.00	2.00	8.25
S03	3.25	3.00	4.00	1.00	10.25
S04	2.50	2.75	2.75	1.25	8.00
S05	2.33	3.00	3.25	1.50	8.58
S06	3.50	3.25	3.75	1.25	10.50
S07	4.00	4.00	4.00	1.00	12.00
S08	4.00	3.75	3.50	1.00	11.25
S09	4.00	3.75	3.75	1.00	11.50
S10	2.67	2.25	2.75	1.50	7.67
S11	2.00	2.00	2.00	1.75	6.00
S12	2.25	2.50	2.50	2.25	7.25
S13	4.00	4.00	3.25	2.00	11.25
S14	2.88	2.88	3.25	1.25	9.01
S15	4.00	3.75	4.00	1.25	11.75
M	3.21	3.11	3.28	1.45	9.45
(SD)	(0.76)	(0.64)	(0.60)	(0.41)	(1.88)
Min	2.00	2.00	2.00	1.00	6.00
Max	4.00	4.00	4.00	2.25	12.00

Notes: *Total CPQ score was calculated by adding up the scores for the Understanding Teachers, Understanding Students, and Positive Affect subscales. Min = minimum. Max = maximum.

Table 9 *Number of participants (N = 15) that chose each response option for selected background questions (numbers 1, 4, 6 and 10) from the Classroom Participation Questionnaire*

#	Question	Response Options	N
1	*How often does your family use sign language?*	Never	12
		Sometimes	3
		Often	0
		Always	0
4	*How do you like best for hearing students to communicate with you?*	Speech	11
		Speech & Sign	1
		Writing Notes	2
		Writing Notes and Speech	1
6	*How do you like best for hearing teachers to communicate with you?*	Speech	12
		Speech & Sign	1
		Writing Notes and Speech	2
10	*How many other deaf/hoh students are in your class?*	0	15
		1-2	0
		3-4	0
		5+	0

Table 10 *Pairwise comparisons based on estimated marginal means for CPQ subscales: Understanding Teacher (1), Understanding Students (2), Positive Affect (3) and Negative Affect* (4)*

(I) Measure	(J) Measure	Mean Difference (I - J)	Standard Error	Significance
1	2	.100	.086	1.000
	3	-.075	.116	1.000
	4	-.341	.179	.467
2	1	-.100	.086	1.000
	3	-.175	.103	.678
	4	-.441	.153	.071
3	1	.075	.116	1.000
	2	.175	.103	.678
	4	-.267	.118	.243
4	1	.341	.179	.467
	2	.441	.153	.071
	3	.267	.118	.243

Notes: *The Negative Affect subscale provides scores that are the inverse of the Positive Affect subscale, that is, high scores on the former indicate high negative feelings whereas high scores on the latter indicate high positive feelings. Negative Affect raw score has been translated to its inverse score in order to allow comparison with the other subscales

Table 11 *Independent samples t-test results as a function of sex, presence or absence of cochlear implant (CI), presence or absence of preferred communication modes other than speech (Comm Mode), and presence or absence of additional disabilities (Dis) for the following measures: OWLS II standard scores, TOSCRF standard scores, number of signs produced in the ASL-RST vocabulary check, and the CPQ total score*

Variable	Subgroup			
	Sex	CI	Comm Mode	Dis
	male = 7 female = 8	yes = 5 no = 10	speech only = 7 speech plus = 8	yes = 5 no = 10
OWLS II	t (13) = -.252 *p* =.805 SE = 9.075	t (13) = .418 *p* =.683 SE = 9.564	t (13) = .896 *p* =.387 SE = 8.829	t (13) = .742 *p* =.471 SE = 9.430
TOSCRF	t (13) = .915 *p* =.377 SE = 5.230	t (13) = -1.588 *p* = .136 SE = 5.226	t (13) = 1.711 *p* =.111 SE = 4.875	t (13) = .622 *p* =.545 SE = 5.627
ASL signs	t (13) = -1.109 *p* =.288 SE = 1.347	t (13) = -.135 *p* = .895 SE = 1.479	t (13) = -2.205 *p* =.053 SE = 1.150	t (13) = -1.722 *p* =.109 SE = 1.336
CPQ	t (13) = 1.378 *p* =.191 SE = .944	t (13) = 1.812 *p* = .112 SE = .966	t (13) = 1.323 *p* =.208 SE = .948	t (13) = 1.975 *p* =.070 SE = .938

Notes: OWLS II = Oral and Written Language Scales, Second Edition. TOSCRF = Test of Silent Contextual Reading Fluency. ASL-RST = American Sign Language - Receptive Skills Test. CPQ = Classroom Participation Questionnaire. CI = cochlear implant

Table 12 *Bivariate correlations for chronological age (CA), grade, age of diagnosis of hearing level (AgeDx), cochlear implantation (CI), hearing age (HAge), and classroom participation scores (CPQ) using Pearson product-moment correlation coefficient*

	CA	Grade	AgeDx	CI	HAge	CPQ
CA						
Grade	r = .887**					
	p = .000					
AgeDx	r = -.318	r = -.393				
	p = .248	p = .147				
CI	r = .029	r = .038	r = -.567*			
	p = .918	p = .894	p = .028			
HAge	r = .568*	r = .629*	r = -.720**	r = .091		
	p = .027	p = .012	p = .002	p = .748		
CPQ	r = .053	r = .157	r = .293	r = -.428	r = .331	
	p = .852	p = .576	p = .290	p = .112	p = .229	

* $p < .05$
** $p < .01$

Table 13 *Linear regression statistics (R^2 values, ANOVA statistics and significance) for OWLS II raw scores with predictor variables hearing age (HAge), cochlear implantation (CI) and classroom participation (CP) accompanied by coefficients statistics, including B values, Standard Error of B value (SE-B), beta (ß), t values and significance (p), for each predictor variable*

	Regression Model			Coefficients				
Dependent Variable	R^2	*F* *(df)*	*p*					
Predictor Variables				*B*	*SE-B*	*ß*	*t*	*p*
OWLS II Enter Method	.545	4.289 (3,11)	.029					
HAge				.631	1.217	.116	.519	.614
CI				5.317	7.019	.177	.758	.465
CP				5.785	1.921	.743	3.011	.012
OWLS II Stepwise Method	.498	12.878 (3,11)	.003					
HAge				.162			.767	.216
CI				.210			.964	.268
CP				5.494	1.531	.705	3.589	.003

Notes: OWLS II = *Oral and Written Language Scales*, Second Edition

Table 14 *Linear regression statistics (R^2 values, ANOVA statistics and significance) for TOSCRF raw scores using enter and stepwise methods with predictor variables hearing age (HAge), cochlear implantation (CI) and classroom participation (CP) accompanied by coefficients statistics, including B values, Standard Error of B value (SE-B), beta (ß), t values and significance (p), for each predictor variable*

	Regression Model			Coefficients				
Dependent Variable	R^2	*F* *(df)*	*p*					
Predictor Variables				*B*	*SE-B*	*ß*	*t*	*p*
TOSCRF Enter Method	.506	3.761 (3,11)	.044					
HAge				5.034	2.610	.450	1.929	.080
CI				27.142	15.051	.439	1.803	.099
CP				5.072	4.120	.316	1.231	.244
TOSCRF Stepwise Method	.353	7.096 (3,11)	.019					
HAge				6.649	2.496	.594	2.664	.019
CI				.293			1.350	.202
CP				.091			.371	.717

Notes: TOSCRF = *Test of Silent Contextual Reading Fluency*

Appendix E: Figures

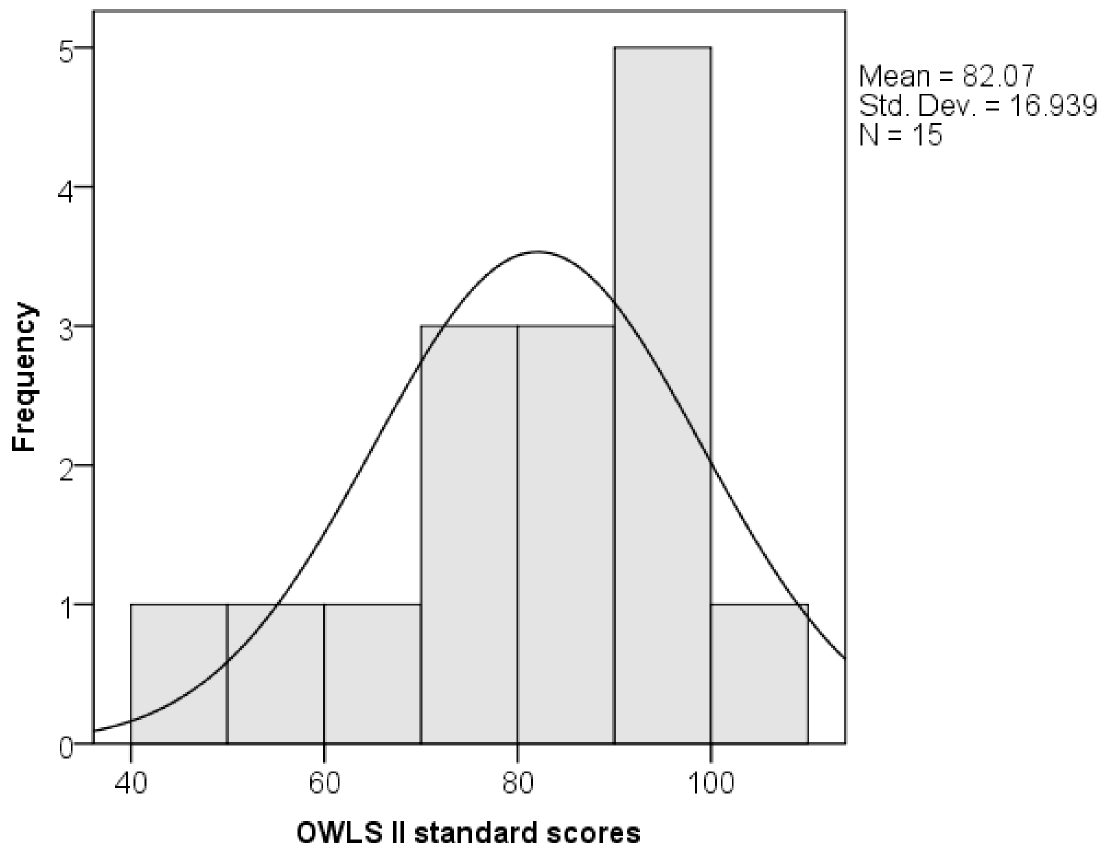

Figure 1. *Histogram showing frequency of scores on the English comprehension measure (OWLS II) with bell curve line of sample*

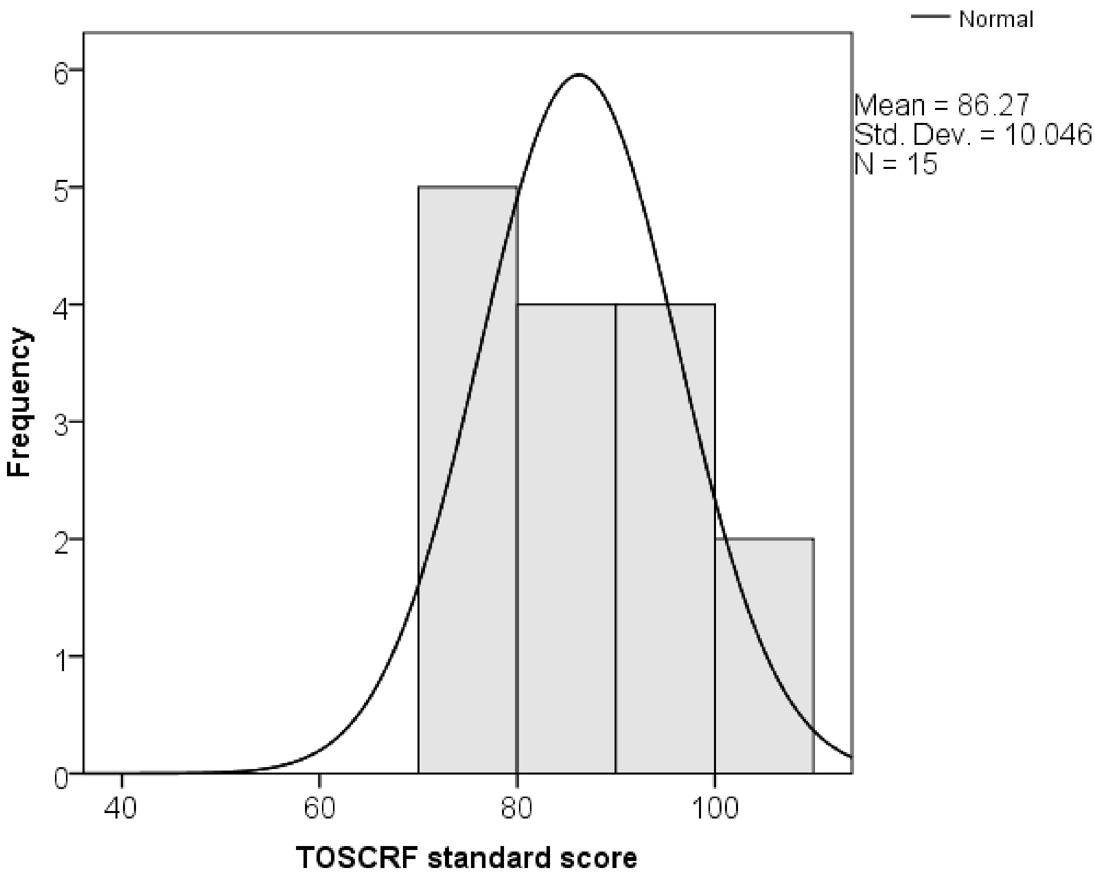

Figure 2. *Histogram showing frequency of scores on the English literacy measure (TOSCRF) with bell curve line of sample*

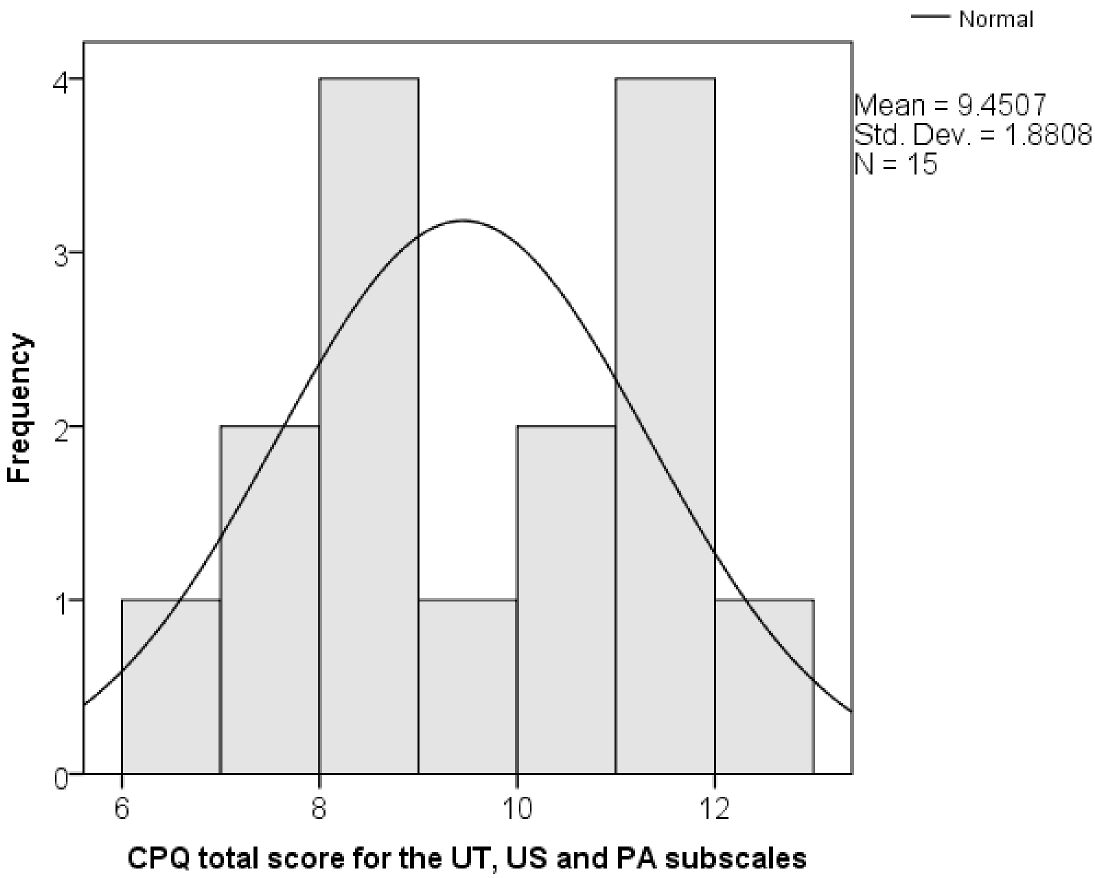

Figure 3. *Histogram showing frequency of scores (max = 12) on the classroom participation measure (CPQ) with bell curve line of sample*

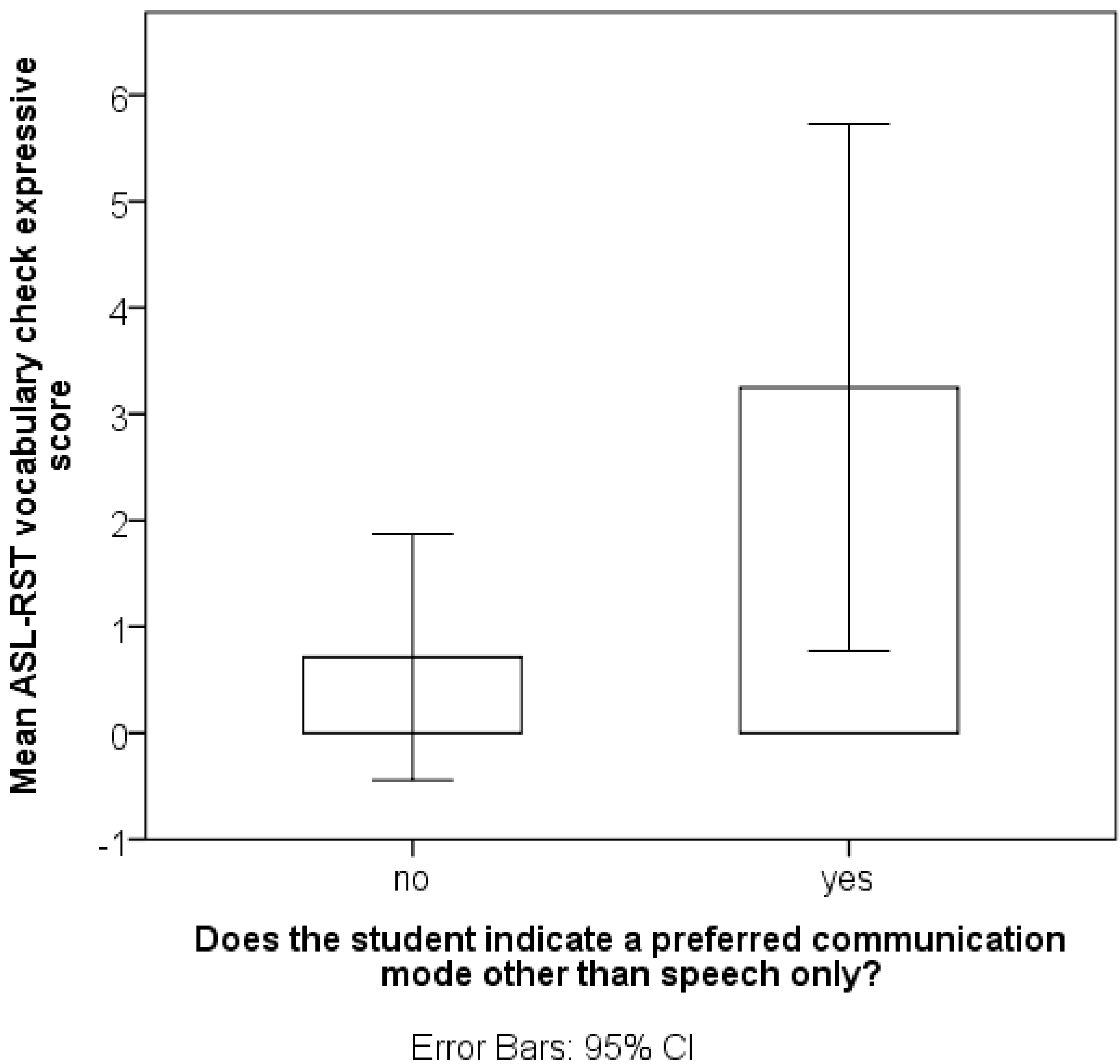

Figure 4. *Bar graph with error bars displaying the mean ASL expressive vocabulary scores for participants who indicated preference for communicating exclusively with speech (n = 7) compared to participants who indicated another preferred mode of communication as well as speech (n = 8)*

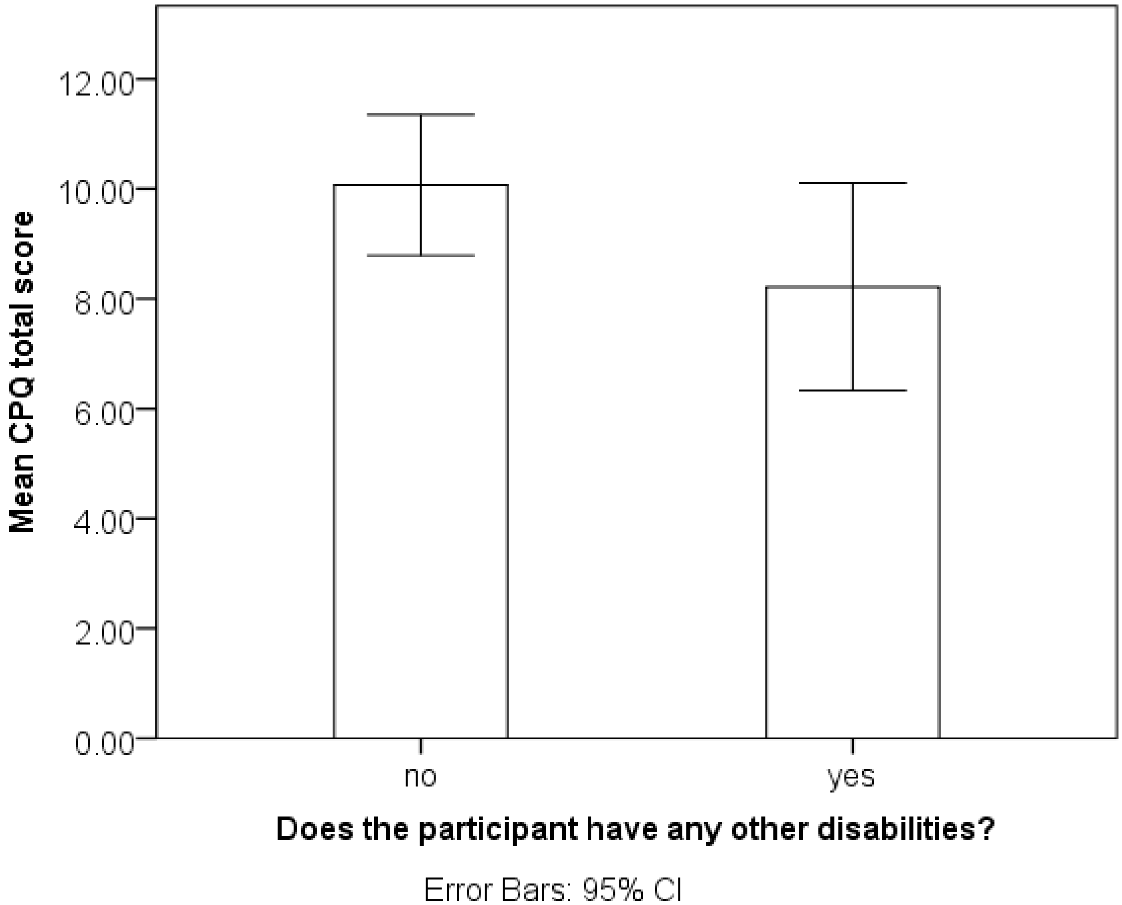

Figure 5. *Bar graph with error bars displaying the mean classroom participation scores out of 12 for participants with no additional disabilities (n = 10) compared to participants with additional disabilities (n = 5)*

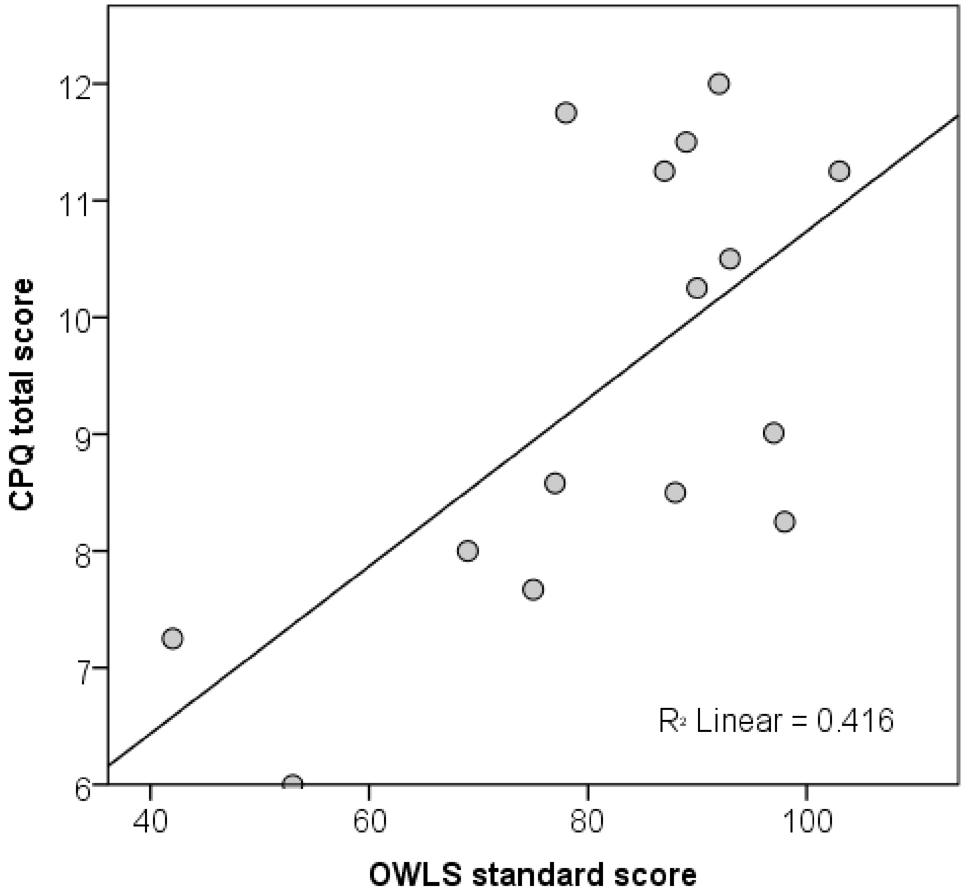

Figure 6. *Scatter plot of standard scores for English comprehension (OWLS II) by total raw score for classroom participation (CPQ)*

Bibliography

Allen, E.A., & Hammill, D.D. (2011). *Can the Test of Silent Contextual Reading Fluency accurately predict reading comprehension?* Unpublished paper presented at the Society for the Scientific Study of Reading, Annual Convention. St. Petersburg, FLA.

Allen, E.A., & Rogers, L. (2008). *Measuring Reading Comprehension in Groups: A Review of the Test of Silent Contextual Reading Fluency.* Unpublished paper presented at the International Dyslexia Association Annual Convention. Seattle, WA.

Anderson, K.L. (2001). Kids in noisy classrooms: What does the research really say? *Journal of Educational Audiology, 9*, 21-33.

Andrews, J.F., & Rusher, M. (2010). Codeswitching techniques: Evidence-based instructional practices for the ASL/English bilingual classroom. *American Annals of the Deaf, 155(4),* 407-424. doi:10.1353/aad.2010.0036

Antia, S.D., Reed, S., & Shaw, L. (2011). Risk and resilience for social competence: Deaf students in general education classrooms. In D. H. Zand and K.J. Pierce (Eds.), *Resilience in Deaf Children: Adaptation through Emerging Adulthood* (pp. 139-167). New York: Springer. doi:10.1007/978-1-4419-7796-0_6

Antia, S.D., Sabers, D.L., & Stinson, M.S. (2007). Validity and reliability of the Classroom Participation Questionnaire with deaf and hard of hearing students in public schools. *Journal of Deaf Studies and Deaf Education, 12(2),* 158-171. doi:10.1093/deafed/enl028

Antia, S.C., Jones, P.B., Reed, S., & Kreimeyer, K.H. (2009). Academic status and progress of deaf and hard-of-hearing students in general education classrooms. *Journal of Deaf Studies and Deaf Education, 14(3),* 293-311. doi:10.1093/deafed/enp009

Aram, D., Most, T., & Simon, A.B. (2008). Early literacy of kindergartners with hearing impairment: The role of mother-child collaborative writing. *Topics in Early Childhood Special Education, 28(1),* 31-41. doi:10.1177/0271121408314627

Archbold, S. & Wheeler, A. (2010). Cochlear implants: family and young people's perspectives. In M. Marschark and P. Spencer (Eds.), *Oxford Handbook of Deaf Studies, Language, and Education, Volume 2* (pp. 226-240). New York: Oxford University Press.

Atlantic Provinces Special Education Authority. (2011). *Annual Report 2010-2011.* Retrieved from the APSEA Library.

Atlantic Provinces Special Education Authority. (2012). *Main Page: Student Services*. Retrieved from http://www.apsea.ca/MainPage/services.php.

Beer, J., Harris, M.S., Kronenberger, W.G., Frush Holt, R., & Pisoni, D.B. (2012). Auditory skills, language development, and adaptive behavior of children with cochlear implants and additional disabilities. *International Journal of Audiology, 51*, 491-498. doi:10.3109/14992027.2012.664291

Bell, S.M., McCallum, S., Kirk, E.R., Fuller, E.J., & McCane-Bowling, S. (2007). Investigation of the psychometric attributes of the Test of Silent Contextual Reading Fluency. *Assessment for Effective Intervention, 33(1),* 39-46. doi:10.1177/15345084070330010501

Belzner, K.A., & Seal, B.C. (2009). Children with cochlear implants: A review of demographics and communication outcomes. *American Annals of the Deaf, 154(3),* 311-333. doi:10.1353/aad.0.0102

Blamey, P.J. (2003). Development of spoken language by deaf children. In M. Marschark and P. Spencer (Eds.), *Oxford Handbook of Deaf Studies, Language, and Education, Volume 2* (pp. 281-291). New York: Oxford University Press.

Bond, M., Mealing, S., Anderson, R., Elston, J., Weiner, G., Taylor, R.S., Hoyle, M., Liu, Z., Price, A., & Stein, K. (2009). The effectiveness and cost-effectiveness of cochlear implants for severe to profound deafness in children and adults: A systematic review and economic model. *Health Technology Assessment*, *13(44),* 1-171. http://hdl.handle.net/10871/11533

Boudreault, P., & Mayberry, R.I. (2006). Grammatical processing in American Sign Language: Age of first-language acquisition effects in relation to syntactic structure. *Language and Cognitive Processes, 21(5)*, 608-635. http://dx.doi.org/10.1080/01690960500139363

Calderon, R. (2000). Parental involvement in deaf children's education programs as a predictor of child's language, early reading, and social-emotional development. *Journal of Deaf Studies and Deaf Education, 5(2),* 140-155.

Capek, C.M., Grossi, G., Newman, A.J., McBurney, S.L., Corina, D., Roeder, B., & Neville, H.J. (2009). Brain systems mediating semantic and syntactic processing in deaf native signers: Biological invariance and modality specificity. *Proceedings of the National Academy of Sciences of the U.S.A, 106(21),* 8784-8789. www.pnas.org/cgi/doi/10.1073/pnas.0809609106

Carrow-Woolfolk, E. (2011). *Oral and Written Language Scales, 2nd Edition.* Torrance, CA: Western Psychological Services.

Cawthon, S.W. (2004). Schools for the deaf and the No Child Left Behind Act. *American Annals of the Deaf, 149(4),* 314-323.

Chamberlain, C., & Mayberry, R.I. (2008). American Sign Language syntactic and narrative comprehension in skilled and less skilled readers: Bilingual and bimodal evidence for the linguistic basis of reading. *Applied Psycholinguistics, 29*, 367-388. doi:10.1017/S014271640808017X

Connor, C.M., Hieber, S., Arts, H.A., & Zwolan, T.A. (2000). Speech, vocabulary, and the education of children using cochlear implants: Oral or Total Communication?. *Journal of Speech, Language and Hearing Research, 43,* 1185-1204.

Corina, D., & Singleton, J. (2009). Developmental social cognitive neuroscience: Insights from deafness. *Child Development, 80(4),* 952-967.

Dammeyer, J. (2010). Psychosocial development in a Danish population of children with cochlear implants and deaf and hard-of-hearing children. *Journal of Deaf Studies and Deaf Education, 15(1),* 50-58. doi:10.1093/deafed/enp024

Davidson, K., Lillo-Martin, D., & Pichler, D.C. (2014). Spoken English language development in native signing children with cochlear implants. *Journal of Deaf Studies and Deaf Education, 19(2),* 238-250. doi:10.1093/deafed/ent045

DeLana, M., Gentry, M.A., & Andrews, J. (2007). The efficacy of ASL/English bilingual education: Considering public schools. *American Annals of the Deaf, 152(1),* 72-87.

Dyck, M.J., Farrugia, C., Shochet, I.M., & Holmes-Brown, M. (2004). Emotion recognition/understanding ability in hearing or vision-impaired children: Do sounds, sights, or words make the difference? *Journal of Child Psychology and Psychiatry, 24(4),* 789-800.

Easterbrooks, S.R., & Huston, S.G. (2008). The signed reading fluency of students who are Deaf/hard of hearing. *Journal of Deaf Studies and Deaf Education, 13(1),* 37-54. doi:10.1093/deafed/enm030

Easterbrooks, S.R., & O'Rourke, C.M. (2001). Gender differences in response to auditory-verbal intervention in children who are deaf or hard of hearing. *American Annals of the Deaf, 146(4),* 309-319. doi:10.1353/aad.2012.0162

Easterbrooks, S.R., Lederberg, A.R., & Connor, C.M. (2010). Contributions of the emergent literacy environment for young children who are deaf. *American Annals of the Deaf, 155(4),* 467-480. doi:10.1353/aad.2010.0024

Enns, C.J., & Herman, R.C. (2011). Adapting the *Assessing British Sign Language Development: Receptive Skills Test* into American Sign Language. *Journal of Deaf Studies and Deaf Education, 16(3),* 362-374. doi:10.1093/deafed/enr004

Eriks-Brophy, A., & Whittingham, J. (2013). Teachers' perceptions of the inclusion of children with hearing loss in general education settings. *American Annals Of The Deaf, 158(1),* 63-97.

Eriks-Brophy, A., Durieux-Smith, A., Olds, J., Fitzpatrick, E., Duquette, C., & Whittingham, J. (2006). Facilitators and barriers to the inclusion of orally educated children and youth with hearing loss in schools: Promoting partnerships to support inclusion. *Volta Review, 106(1),* 53-88.

Gallaudet University. (n.d.). *Suggested Scales of Development and Assessment Tools* [list on webpage]. Retrieved from: http://www.gallaudet.edu/clerc_center/information_and_resources/cochlear_implant_education_center/resources/suggested_scales_of_development_and_assessment_tools.html

Garrison, W., Long, G., & Stinson, M. (1994). The Classroom Communication Ease Scale. *American Annals of the Deaf, 139(2)*, 132-140. doi:10.1353/aad.2012.0050

Geers, A.E., & Hayes, H. (2011). Reading, writing, and phonological processing skills of adolescents with ten or more years of cochlear implant experience. *Ear & Hearing, 32(1),* 49S-59S.

Geers, A.E., & Moog, J.S. (1992). Speech perception and production skills of students with impaired hearing from oral and total communication education settings. *Journal of Speech and Hearing Research, 35,* 1384-1393.

Geers, A.E., & Nicholas, J.G. (2013). Enduring advantages of early cochlear implantation for spoken language development. *Journal of Speech, Language and Hearing Research, 56*, 643-653. doi:10.1044/1092-4388(2012/11-0347)

Geers, A.E., Nicholas, J.G., & Moog, J.S. (2007). Estimating the influence of cochlear implantation on language development in children. *Audiological Medicine, 5*, 262-273. doi:10.1080/16513860701659404

Geers, A.E., Nicholas, J.G., & Sedey, A.L. (2003). Language skills of children with early cochlear implantation. *Ear & Hearing, 24(1S)*, 46-58. doi:10.1097/01.AUD.0000051689.57380.1B

Goodman, R. (1997). The strengths and difficulties questionnaire: A research note. *Journal of Child Psychology and Psychiatry, 38,* 581–586.

Gresham, F.M., & Elliott, S.N. (1990). *Social Skills Rating System*. Circle Pines, MN: American Guidance Service.

Hadjikakou, K., Petridou, L., Stylianou, C. (2008). The academic and social inclusion of oral deaf and hard-of-hearing children in Cyprus secondary general education: Investigating the perspectives of the stakeholders. *European Journal of Special Needs Education, 23(1),* 17-29. http://dx.doi.org/10.1080/08856250701791211

Hammill, D.D., Wiederholt, J.L., & Allen, E.A. (2006). *Test of Silent Contextual Reading Fluency*. Austin, TX: PRO-ED.

Harcourt Brace Educational Measurement. (1997). *Stanford Achievement Test series, 9^{th} Edition: Spring Multilevel Norms Book.* San Antonio, TX: Author.

Hauser, P.C., & Marschark, M. (2008). What we know and what we don't know about cognition and deaf learners. In M. Marschark and P.C. Hauser (Eds.), *Deaf cognition: Foundations and outcomes* (pp. 439-457). Oxford, New York: Oxford University Press.

Hintermair, M. (2006). Parental resources, parental stress, and socioemotional development of deaf and hard of hearing children. *Journal of Deaf Studies and Deaf Education, 11(4)*, 493-513. doi:10.1093/deafed/enl005

Hintermair, M. (2011). Health-related quality of life and classroom participation of Deaf and hard-of-hearing students in general schools. *Journal of Deaf Studies and Deaf Education, 16(2),* 254-271. doi:10.1093/deafed/enq045

Humphries, T., Kushalnagar, P., Mathur, G., Napoli, D.J., Padden, C., Rathmann, C., & Smith, S.R. (2012). Language acquisition for deaf children: Reducing the harms of zero tolerance to the use of alternative approaches. *Harm Reduction Journal, 9(16),* 16-24.

Hyde, M., & Punch, R. (2011). The modes of communication used by children with cochlear implants and the role of sign in their lives. *American Annals of the Deaf, 155(5),* 535-549.

Jamieson, J.R., Zaidman-Zait, A., & Poon, B. (2011). Family support needs as perceived by parents of preadolescents and adolescents who are deaf or hard of hearing. *Deafness & Education International, 13(3),* 110-130. doi:10.1179/1557069X11Y.0000000005

Kent, B., & Smith, S. (2006). They only see it when the sun shines in my ears: Exploring perceptions of adolescent hearing aids users. *Journal of Deaf Studies and Deaf Education, 11,* 461-476. doi:10.1093/deafed/enj044

Kirk, K.I., Miyamoto, R.T., Lento, C.L., Ying, E., O'Neill, T., & Fears, B. (2002). Effects of age at implantation in young children. *The Annals of Otology, Rhinology & Laryngology, 111(5),* 69-73.

Kluwin, T.N. (1993). Cumulative effects of mainstreaming on the achievement of deaf adolescents. *Exceptional Children, 60(1)*, 73-81.

Kluwin, T.N., Stinson, M.S., & Colarossi, G.M. (2002). Social processes and outcomes of in-school contact between deaf and hearing peers. *Journal of Deaf Studies and Deaf Education, 7(3)*, 200-13.

Kovelman, I., Shalinsky, M.H., White, K.S., Schmitt, S.N., Berens, M.S., Paymer, N., & Petitto, L.A. (2009). Dual language use in sign-speech bimodal bilinguals: fNRIS brain-imaging evidence. *Brain & Language, 109,* 112-123. doi:10.1016/j.bandl.2008.09.008

Kreimeyer, K.H., Crooke, P., Drye, C., Egbert, V., & Klein, B. (2000). Academic and social benefits of a co-enrollment model of inclusive education for deaf and hard-of-hearing children. *Journal of Deaf Studies and Deaf Education, 5(2),* 174-185.

Lederberg, A.R., Schick, B., & Spencer, P.E. (2013). Language and literacy development of deaf and hard-of-hearing children: Successes and challenges. *Developmental Psychology, 49(1),* 15-30. doi: 10.1037/a0029558.

Leigh, G. (2008). Changing parameters in deafness and deaf education: Greater opportunity but continuing diversity. In M. Marschark and P.C. Hauser, (Eds.), *Deaf Cognition: Foundations and Outcomes* (pp. 24-51). New York: Oxford University Press.

Leigh, J., Dettman, S., Dowell, R., & Sarant, J. (2012). Evidence-based approach for making cochlear implant recommendations for infants with residual hearing. *Ear & Hearing, 32(3),* 313-322.

Lieu, J.E., Tye-Murray, N., Karzon, R.K., & Piccirillo, J.F. (2010). Unilateral hearing loss is associated with worse speech-language scores in children. *Pediatrics, 125(6)*, e1348-e1355. doi:10.1542/peds.2009-2448

Luckner, J.L., & Urbach, J. (2012). Reading fluency and students who are deaf or hard of hearing: Synthesis of the research. *Communication Disorders Quarterly, 33*, 230-241. doi:10.1177/1525740111412582

Marschark, M., Lang, H.G., & Albertini, J.A. (2002). *Educating deaf students: From research to practice*. Oxford, New York: Oxford University Press.

Marschark, M., Spencer, P.E., Adams, J., & Sapere, P. (2011). Evidence-based practice in educating deaf and hard-of-hearing children: Teaching to their cognitive strengths and needs. *European Journal of Special Needs Education, 26(1)*, 3-16. doi:10.1080/08856257.2011.543540

Mayberry, R.I. (2010). Early language acquisition and adult language ability: What sign language reveals about the critical period for language. In M. Marschark and P. Spencer (Eds.), *Oxford Handbook of Deaf Studies, Language, and Education, Volume 2* (pp. 281-291). New York: Oxford University Press.

Mayberry, R.I. & Squires, B. (2006). Sign language: Acquisition. In K. Brown, (Editor-in-Chief), *Encyclopedia of Language & Linguistics, Second Edition, volume 11*, (pp. 291-296). Oxford: Elsevier.

Mayberry, R.I., del Guidice, A.A., & Lieberman, A. (2011). Reading achievement in relation to phonological coding and awareness in Deaf readers: A meta-analysis. *Journal of Deaf Studies and Deaf Education, 16(2),* 164-188. doi:10.1093/deafed/enq049

Mayberry, R.I., Chen, J., Witcher, P, & Klein, D. (2011). Age of acquisition effects on the functional organization of language in the adult brain. *Brain & Language, 119,* 16-29. doi:10.1016/j.bandl.2011.05.007

McConkey Robbins, A., Green, J.E., Waltzman, S.B. (2004). Bilingual oral language proficiency in children with cochlear implants. *Archives of Otolaryngology - Head & Neck Surgery, 130(5),* 644-647. doi:10.1001/archotol.130.5.644

Meinzen-Derr, J., Wiley, S., & Choo, D.I. (2011). Impact of early intervention on expressive and receptive language development among young children with permanent hearing loss. *American Annals of the Deaf, 155(5),* 580-591.

Merrell, K.W., & Gueldner, B.A. (2010). *Social and Emotional Learning in the Classroom: Promoting Mental Health and Academic Success.* Guilford Press: New York.

Mitchell, R. E., & Karchmer, M. A. (2004). Chasing the Mythical Ten Percent: Parental Hearing Status of Deaf and Hard of Hearing Students in the United States. *Sign Language Studies, 4(2),* 138-163.

Mitchell, R.E., & Karchmer, M.A. (2005). Parental hearing status and signing among deaf and hard of hearing students. *Sign Language Studies, 5(2),* 231-244. doi:10.1353/sls.2005.0004

Mitchell, R. E., & Karchmer, M. A. (2006). Demographics of Deaf Education: More Students in More Places. American Annals Of The Deaf, 151(2), 95-104.

Moeller, M.P. (2000). Early intervention and language development in children who are deaf and hard-of-hearing. *Pediatrics, 106(3)*, E43-E52. doi: 10.1542/peds.106.3.e43

Moeller, M.P., & Schick, B. (2006). Relations between maternal input and theory of mind understanding in deaf children. *Child Development, 77(3),* 751-766.

Moeller, M.P., Tomblin, J.B., Yochinaga-Itano, C., MacDonald Connor, C., & Jerger, S. (2007). Current state of knowledge: Language and literacy of children with hearing impairment. *Ear & Hearing, 28(6)*, 740-753.

Moores, D.F. (2008). Inclusion, itinerant teachers, and the pull-out model [Editorial]. *American Annals of the Deaf, 153(3),* 273-274.

Moores, D. F. (2010). The history of language and communication issues in deaf education. In M. Marshark & P. E. Spencer (Eds.), *The Oxford handbook of deaf studies, language, and education* (Vol. 2, pp. 17–30). New York, NY: Oxford University Press.

National Association of the Deaf. (2011). *NAD Action Alert: Preserve State Schools for the Deaf.* Webpage retrieved from http://nad.org/news/2011/2/nad-action-alert-preserve-state-schools-deaf.

National Association of State Directors of Special Education, Incorporated. (n.d.). *Assessment Tools for Students who are Deaf or Hard of Hearing.* Retrieved from http://www.nasdse.org/portals/0/documents/assessmenttools.pdf

New Brunswick Department of Education and Early Childhood Development. (n.d.). *Anglophone School District Information*. Webpage retrieved from http://www.gnb.ca/0000/SchoolDistricts.asp

Newman, A.J., Bavelier, D., Corina, D., Jezzard, P., & Neville, H.J. (2002). A critical period for right hemisphere recruitment in American Sign Language processing. *Nature Neuroscience, 5(1),* 76-80. doi:10.1038/nn775

Newman, A.J., Supalla, T., Hauser, P.C., Newport, E.L., & Bavelier, D. (2010). Prosodic and narrative processing in American Sign Language: An fMRI study. *NeuroImage, 52,* 669-676. doi:10.1016/j.neuroimage.2010.03.055

Nova Scotia Department of Education. (2008). *Special Education Policy.* Retrieved from http://studentservices.ednet.ns.ca/sites/default/files/speceng.pdf

Nunes, T., Pretzlik, U., & Olsson, J. (2001). Deaf children's social relationships in mainstream schools. *Journal of Deaf Education International, 3*, 123-136. doi:10.1002/dei.106

Nussbaum, D., Waddy-Smith, B., & Doyle, J. (2012). Students who are deaf and hard of hearing and use sign language: Considerations and strategies for developing spoken language and literacy skills. *Seminars in Speech and Language, 33(4),* 310-321. http://dx.doi.org/10.1055/s-0032-1326912.

Obel, C., Dalsgaard, S., Stax, H.P., & Bilenberg, N. (2003). Spørgeskema om barnets styrker og vanskeligheder (SDQ-Dan): Et nyt instrument til screening for psykopatologi i alderen 4-16 år [Danish]. *Ugeskrift for laeger, 165(5),* 462-265.

Penhune, V.B., Cismaru, R., Dorsaint-Pierre, R., Petitto, L.A., & Zatorre, R.J. (2003). The morphometry of auditory cortex in the congenitally deaf measured using MRI. *NeuroImage, 20,* 1215-1225. doi:10.1016/S1053-8119(03)00373-2

Pénicaud, S., Klein, D., Zatorre, R.J., Chen, J., Witcher, P., Hyde, K., & Mayberry, R.I. (2011). Structural brain changes linked to delayed first language acquisition in congenitally deaf individuals. *NeuroImage, 66,* 42-49. http://dx.doi.org/10.1016/j.neuroimage.2012.09.076

Peterson, C.C. (2004). Theory-of-mind development in oral deaf children with cochlear implants or conventional hearing aids. *Journal of Child Psychology and Psychiatry, 45(6),* 1096-1106.

Petitto, L.A., Zatorre, R.J., Gauna, K., Nikelski, E.J., Dostie, D., & Evans, A.C. (2000). Speech-like cerebral activity in profoundly deaf people processing signed languages: Implications for the neural basis of human language. *Proceedings of the National Academy of Sciences of the United States of America, 97(25)*, 13961-13966.

Power, D., & Leigh, G.R. (2003). Curriculum: Cultural and communicative contexts. In M. Marschark and P.E. Spencer (Eds.), *Oxford handbook of deaf studies, language and education* (pp. 38-51). Oxford University Press: New York, USA.

Province of Nova Scotia. (2014). *Enrolments by Board (historical).* Webpage retrieved from http://stats-summary.ednet.ns.ca/historical-board

Punch, R., & Hyde, M. (2011). Social participation of children and adolescents with cochlear implants: A qualitative analysis of parent, teacher and child interviews. *Journal of Deaf Studies and Deaf Education, 16(4),* 474-493. doi:10.1093/deafed/enr001

Qi, S., & Mitchell, R.E. (2011). Large-scale academic achievement testing of deaf and hard-of-hearing students: Past, present, and future. *Journal of Deaf Studies and Deaf Education, 7(1)*, 1-18. doi:10.1093/deafed/enr028

Quinn, G.P., & Keough, M.J. (2002). Multiple regression and correlation. In G. P. Quinn & M. J. Keough (Eds.), *Experimental Design and Data Analysis for Bioligists* (pp. 111-142). Cambridge, UK: Cambridge University Press.

Rhoades, E.A. (2001). Lexical-Semantic and Morphosyntactic Language Assessment in Auditory-Verbal Intervention: A Position Paper. *Volta Review, 103(3)*, 169-184.

Richardson, J.T.E., Marschark, M., Sarchet, T., & Sapere, P. (2010). Deaf and hard-of-hearing students' experiences in mainstream and separate postsecondary education. *Journal of Deaf Studies and Deaf Education, 15(4),* 358-382. doi:10.1093/deafed/enq030

Rose, S., McAnally, P., Barkmeier, L., Virnig, S., & Long, J. (2008). *Technical Report #9: Silent Reading Fluency Test: Reliability, Validity, and Sensitivity to Growth for Students who are Deaf and Hard of Hearing at the Elementary, Middle School, and High School Levels.* Research Institute on Progress Monitoring: Minneapolis, MN.

Russell, D. & McLeod, J. (2009). Educational interpreting: Multiple perspectives of our work. In J. Mole (Ed.), *International Perspectives on Educational Interpreting* (pp. 128-144). Direct Learned Services Ltd: Brassington, UK.

Sarant, J.Z., Holt, C.M., Dowell, R.C., Rickards, F.W., & Blamey P.J. (2008). Spoken language development of oral preschool children with permanent childhood deafness. *Journal of Deaf Studies and Deaf Education, 14(2),* 205-217. doi:10.1093/deafed/enn034

Schick, B., Williams, K., & Kupermintz, H. (2006). Look who's being left behind: Educational interpreters and access to education for deaf and hard-of-hearing students. *Journal of Deaf Studies and Deaf Education, 11(1),* 3-20. doi:10.1093/deafed/enj007

Schick, B., de Villiers, J, de Villiers, P., & Hoffmeister, R. (2007). Language and theory of mind: A study of deaf children. *Child Development, 78(2),* 376-396.

Schick, B., Skalicky, A., Edwards, T., Kushalnagar, P., Topolski, T., & Patrick, D. (2013). School placement and perceived quality of life in youth who are deaf or hard of hearing. *Journal of Deaf Studies and Deaf Education, 18(1),* 47-61. doi:10.1093/deafed/ens039

Schönweiler, R., Ptok, M., & Radü, H.–J. (1998). A cross-sectional study of speech and language abilities of children with normal hearing, mild fluctuating conductive hearing loss, or moderate to profound sensorineural hearing loss. *International Journal of Pediatric Otorhinolaryngology,* 44, 251-258.

Slobodzian, J.T. (2010). The devil is in the details: Issues of exclusion in an inclusive educational environment. *Ethnography and Education, 4(2),* 181-195. Doi: 10.1080/17457820902972804

Speech-Language & Audiology Canada. (2014, February). *Universal Newborn Hearing Screening in Canada* [Position Paper]. Retrieved from sac-oac.ca/system/files/resources/SAC-OAC-UNHS-PP_EN.pdf

Spencer, L.J. (2004). Individual differences in language performance after cochlear implantation at one to three years of age: Child, family, and linguistic factors. *Journal of Deaf Studies and Deaf Education, 9(4),* 395-412. doi:10.1093/deafed/enh033

Spencer, L.J. & Tomblin, J.B. (2008). Evaluating phonological processing skills in children with prelingual deafness who use cochlear implants. *Journal of Deaf Studies and Deaf Education, 14(1),* 1-21. doi:10.1093/deafed/enn013

Spencer, P.E., & Marschark, M. (2010). *Evidence-Based Practice in Educating Deaf and Hard-of-Hearing Students.* New York, USA: Oxford University Press.

Statistics Canada. (2008). *Degree of Hearing Limitation in Children Aged 5 to 14, by Geographical Region, Canada, 2006.* Retrieved from http://www.statcan.gc.ca/pub/89-628-x/2008005/t/5201114-eng.htm.

Statistics Canada. (2012a). *Population by sex and age group.* Retrieved from http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/demo10a-eng.htm.

Statistics Canada. (2012b). *Back to school… by the numbers.* Webpage retrieved from http://www42.statcan.ca/smr08/2012/smr08_167_2012-eng.htm.

Stinson, M., and T. Kluwin. (2011). Educational consequences of alternative school placements. In M. Marschark and P.E. Spencer (Eds.), *Oxford Handbook of Deaf Studies, Language, and Education, Volume 1* (pp. 47-62). New York: Oxford University Press.

Stinson, M., Long, G., Reed, S., Kreimeyer, K., Sabers, D., & Antia, S.D. (2006). *Classroom Participation Questionnaire-Revised: Deaf/Hard-of-Hearing Students* [Unpublished questionnaire].

Stredler-Brown, A. (2010). Communication choices and outcomes during the early years: An assessment and evidence-based approach. In M. Marschark and P.E. Spencer (Eds.), *Oxford Handbook of Deaf Studies, Language, and Education, Volume 2* (pp. 473-477). New York: Oxford University Press.

Strong, M., & Prinz, P. (2000). Is American Sign Language skill related to English literacy?. In C. Chamberlain, J.P. Morford and R.I. Mayberry (Eds.), *Language Acquisition by Eye* (pp. 131-141). Mahwah, NJ: Lawrence Erlbaum Associates.

Strube, M.J. (2003). Statistical analysis and interpretation in a study of prelingually deaf children implanted before five years of age. *Ear & Hearing, 24(Suppl. 1),* S15-23.

Szagun, G., & Stumper, B. (2012). Age or experience? The influence of age at implantation and social and linguistic environment on language development in children with cochlear implants. *Journal of Speech, Language, and Hearing Research, 55*, 1640-1654. doi:10.1044/1092-4388(2012/11-0119)

Traxler, C.B. (2000). The Stanford Achievement Test, 9th edition: National norming and performance standards for deaf and hard-of-hearing students. *Journal of Deaf Studies and Deaf Education, 5(4),* 337-348.

Vogel-Walcutt, J.J., Schatschneider, C., & Bowers, C. (2011). Social-emotional functioning of elementary-age deaf children: A profile analysis. *American Annals of the Deaf, 156(1)*, 6-22.

Vohr, B.R., Topol, D., Watson, V., St Pierre, L., & Tucker, R. (2014). The importance of language in the home for school-age children with permanent hearing loss. *Acta Paediatrica, 103*, 62-69. doi:10.1111/apa.12441

Wake, M., Hughes, E.K., Poulakis, Z., Collins, C., & Rickards, F.W. (2004). Outcomes of children with mild-profound congenital hearing loss at 7 to 8 years: A population study. *Ear & Hearing, 25(1),* 1-8. doi:10.1097/01.AUD.0000111262.12219.2F

Watkin, P., McCann, D., Law, C., Mullee, M., Petrou, S., Stevenson, J., Worsfold, S., Yuen, H.M, & Kennedy, C. (2007). Language ability in children with permanent hearing impairment: The influence of early management and family participation. *Pediatrics, 120(3),* e694-e701. doi:10.1542/peds.2006-2116

Wheeler, A., Archbold, S., Gregory, S., & Skipp, A. (2007). Cochlear implants: the young peoples' perspective. *Journal of Deaf Studies and Deaf Education, 12,* 303-316. doi:10.1093/deafed/enm018

Wiederbolt, J.L., & Blalok, G. (2000). *Gray Silent Reading Tests.* Austin, TX: PRO-ED.

Wiederbolt, J.L., & Bryant, B.R. (2001). *Gray Oral Reading Test - Fourth Edition.* San Antonio, TX: Pearson Education.

Wray, D., Flexer, C., & Vaccaro, V. (1997). Classroom performance of children who are deaf or hard of hearing and who learned spoken languge through the auditory-verbal approach: An evaluation of treatment efficacy. *The Volta Review, 99,* 107-119.

Yoshinaga-Itano, C., Baca, R.L., & Sedey, A.L. (2010). Describing the trajectory of language development in the presence of severe-to-profound hearing loss: A closer look at children with cochlear implants versus hearing aids. *Otology & Neurotology, 31,* 1268-1274.