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The Profiles of Students With Significant Cognitive Disabilities and Known Hearing Loss

Karen Erickson*, Nancy Quick

University of North Carolina at Chapel Hill

*Correspondence should be sent to Karen Erickson, Center for Literacy and Disability Studies, University of North Carolina at Chapel Hill, 321 South Columbia Street, Suite 1100, Chapel Hill, NC 27599-7335 (e-mail: erickson@unc.edu).

Abstract

The present study describes the characteristics of students in Grades 3–12 with significant cognitive disabilities (SCD) and known hearing loss. The study analyzed results of a survey of teachers of students with SCD (n = 38,367) who were slated to participate in an alternate assessment based on alternate achievement standards in 14 states in the United States. Analysis revealed similar profiles in academic achievement and symbolic language use combined with an increased incidence of additional sensory impairments among students with SCD and known hearing loss compared to their peers without known hearing loss. Results suggest that hearing loss may be underidentified and underserved among students with SCD and point to the need for improved hearing screenings and evaluations combined with services delivered by teams that follow a model of interprofessional practice.

Children with significant cognitive disabilities (SCD) and hearing loss face a formidable set of challenges unique to multiple disabilities. The presence of either a SCD or even mild levels of hearing loss has the potential to interfere with communication, language, and literacy outcomes (Antia, Jones, Reed, & Kreimeyer, 2009; Cameto et al., 2010; Easterbrooks & Beal-Alvarez, 2012; Kearns, Towles-Reeves, Kleinert, Kleinert, & Thomas, 2011; Moeller, Tomblin, Yoshinaga-Itano, Connor, & Jerger, 2007; Reed, Antia, & Kreimeyer, 2008). When SCD and hearing loss are combined, the result is "complicative" rather than "additive" (Wiley & Moeller, 2007) because the presence of one disability reduces the potential for compensation due to the presence of one or more additional disabilities (Knoors & Vervloed, 2003). Although the prevalence of hearing loss among the general population of students is approximately 0.05% (Boulet, Boyle, & Schieve, 2009), hearing loss has been reported among the population of students with SCD as high as 6 to 8% (Cameto et al., 2010; Kearns et al., 2011). Increasing our understanding of the presumed "complicative" effect specific to SCD and hearing loss is an important first step toward identifying the supports and services that may help students with SCD with known hearing loss (SCD-HL) maximize their outcomes in communication, language, and literacy.

Students With SCD and Hearing Loss

There are many reasons for the gap in the literature on the students with SCD-HL. First, the population of children with SCD is a low-incidence population which poses challenges for conducting research (Snell et al., 2010). Though children with any degree of intellectual disability represent at least 7.3% of all students receiving special education services in the United States (U.S. Department of Education, 2014), the approximate percent of students with SCD is around 1%. As a group of students who receive special education services under a variety of disability categories (e.g., autism, multiple disabilities, traumatic brain injury, etc.), students with SCD have cognitive impairments that prevent them from attaining grade-level achievement standards, even with the very best instruction and appropriate accommodations (U.S. Department of Education, 2005). Students with SCD have an intellectual disability that is "characterized by significant limitations both in intellectual functioning and adaptive behavior as expressed in conceptual, social, and adaptive skills" (American Association of Intellectual and Developmental Disabilities, 2009).

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Our understandings of students with SCD-HL are further limited by the fact that this group of students has not traditionally been expected to participate in academic learning. Education for students with SCD has historically focused on social integration and life-skills training rather than language or academic instruction derived from the general education content (Cameron & Cook, 2013; Ruppar, Dymond, & Gaffney, 2011). The *No Child Left Behind Act of 2001* (No Child Left Behind [NCLB], 2002) held schools in the United States accountable for promoting access to and progress in the general curriculum for all students. Although this legislation led to some reports of increased access to the general curriculum for students with SCD (Wehmeyer, Lattin, & Argan, 2001; Wehmeyer, Lattin, Lapp-Rincker, & Agran, 2003), the field is still working to maximize access today (Kleinert et al., 2015; Ryndak, Moore, Orlando, & Delano, 2008). In a recent survey, 9% of teachers of students with SCD disagreed or strongly disagreed with the statement that academic instruction is important for their students, and many provided instruction fewer than three times per week in various academic areas (e.g., reading 7%, math 13%, social studies 50%, and science 57%; Cameto et al., 2010).

A third reason for the lack of knowledge regarding comorbidity of SCD and hearing loss is the background training of professionals who serve the population of students with SCD. Among those teachers that serve children with SCD in the United States, 95% report that they are certified in special education (Cameto et al., 2010), which is a certification that typically requires little to no specific information about students with hearing loss. For example, hearing loss is not mentioned in the initial or advanced preparation standards for special education teachers from the Council for Exceptional Children (CEC, 2012). In addition to the standards, CEC has Specialty Sets that explicate initial and advanced knowledge and skills required for special education teachers (CEC, 2012). Except in the cases of the Specialty Set that specifically addresses teachers of the deaf and hard of hearing (DHH) or deafblindness, there are no references to knowledge and skills regarding hearing loss.

Those professionals who do have background and training in hearing loss and its impact on communication and academic outcomes are often not included in service provision or report not having sufficient time to address the need (Brook, 2012). For example, in one urban school district, only 50–60% of the students with documented hearing loss under the special education categories of intellectual disability and multiple disabilities had audiological services documented as a related service on their IEPs (Borders, Meinzen-Derr, Wiley, Bauer, & Embury, 2015). Similarly, teachers of the DHH reported that they were far more likely to provide services to students with hearing loss who are identified with the special education category of hearing impairment (32%) than those who are identified with the category of intellectual disability or multiple disabilities (0–4%; Borders et al., 2015), and speech-language pathologists provided more minutes of service per month to students with hearing loss under the special education category of hearing impairment than any other category. Misguided eligibility policies and practices, such as cognitive referencing, contribute to the limited access to services experienced by many students with SCD and SCD-HL (National Joint Committee for the Communication Needs of Persons With Severe Disabilities, 2002). Cognitive referencing has been denounced by national and governmental agencies because it does not consider individual needs as mandated by the Individuals with Disabilities Education Act of 1997 (IDEA, 1997), but it continues to exist in practice (American Speech-Language-Hearing Association [ASHA], 2015).

Profiles of Students With SCD

Little is known about the communication, language, literacy, motor, and sensory profiles among students with SCD-HL. Recently, however, a number of multistate surveys have documented the profiles among students with SCD who participate in alternative assessments. These surveys were designed for the purpose of ensuring access to appropriate services as well as improving instruction (Cameto et al., 2010; Kearns et al., 2011; Towles-Reeves, Kearns, Kleinert, & Kleinert, 2009). The surveys provide information regarding the academic, motor, and sensory profiles of students with SCD. This combination is especially important in the current study because sensory and motor skills can have a profound impact on the communication input and output channels among students with SCD-HL.

Expressive communication

Notable difficulties in expressive communication are observed among students with SCD, with 70% (Cameto et al., 2010) to 82% (Towles-Reeves et al., 2012) of students reportedly functioning at symbolic levels of communication. The percentages at the early symbolic language level range from 10% to 26%, and the percentages at the presymbolic language level range from 7% to 17% (Cameto et al., 2010; Kearns et al., 2011; Towles-Reeves et al., 2009). Among students who are presymbolic, only about half are intentional communicators (Towles-Reeves et al., 2012). Importantly, the distribution of students with SCD communicating at each of the three symbolic levels tends to remain stable across elementary, middle, and high school levels (Kearns et al., 2011).

Receptive language and literacy

Students with SCD struggle with language and literacy in general. Only 46% (Cameto et al., 2010) to 49% (Towles-Reeves et al., 2012) of students with SCD are able to independently follow one- and two-step directions presented through spoken words, sign or print. Given supports, such as gestures, pictures, objects, or models, an additional 37% (Towles-Reeves et al., 2012) to 42% (Cameto et al., 2010) can follow simple one- and two-step directions. Similarly, only 33–50% of students with SCD can read single words and simple sentences (Cameto et al., 2010; Kearns et al., 2011), and between 13% and 35% of students with SCD cannot read at all (Towles-Reeves et al., 2009, 2012).

Motor

High levels of significant motor dysfunction impacting leg, arm, and head mobility have been reported among students with SCD, ranging from 15% to 24% (Cameto et al., 2010; Kearns et al., 2011). Kearns et al. (2011) also noted an inverse relationship between language levels and motor involvement, with students who communicated at a presymbolic level more likely to have motor challenges. Given that students with SCD often require augmentative and alternative communication (Towles-Reeves et al., 2009), high levels of motor involvement may preclude children from successfully accessing communication technology or using unaided modes of communication like sign language.

Sensory

Research regarding visual skills among students with SCD fairly consistently finds that 7–10% have visual impairments (Kearns et al., 2011; Towles-Reeves et al., 2009, 2012). However, the rate of hearing loss among students with significant disabilities has varied from below 1% to as high as 8% (Cameto et al., 2010; Kearns et al., 2011; Towles-Reeves et al., 2009, 2012). However, a growing body of research regarding the hearing status of

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individuals with intellectual disabilities, suggests that hearing loss may be underidentified among students with SCD. For example, studies among Special Olympics athletes with a range of intellectual disability indicate that 19–48% have undetected hearing loss, including severe to profound hearing loss (Evenhuis, Theunissen, Denkers, Verschuure, & Kemme, 2001; Hild et al., 2008; Meuwese-Jongejeugd et al., 2006; Neumann et al., 2006). Furthermore, a population study of 1,598 adults with varied degrees of cognitive disability in the Netherlands suggests that as many as one in three have hearing loss (Meuwese-Jongejeugd et al., 2006).

Underidentification of hearing loss among students with SCD
There are a variety of reasons hearing loss may be underidentified in this population of students. Although Universal Newborn Hearing Screening is the standard of care in many developed nations, nearly half of infants who do not pass their newborn hearing screening are lost to follow-up in the United States (ASHA, 2008). Many students with SCD have a variety of medical and health issues (Cameto et al., 2010), that may be prioritized over hearing loss due to reasons of survival or visibility. The presence of other more visible disabilities may result in delays in diagnosing hearing loss, known as "diagnostic overshadowing" (Beers, McBoyle, Kakande, Dar Santos, & Kozak, 2014; Fitzpatrick, Lambert, Whittingham, & Leblanc, 2014). School-age hearing screenings are not implemented in every state, and the requirements widely vary among those states that have them (American Speech-Language-Hearing Association, 2012). Educators may not refer students for screenings because they are often not trained in evaluating the impact of both cognitive disabilities and hearing loss, and some language and social behaviors can be attributed to both populations (Camarata, 2013; Fitzpatrick et al., 2014). Each of these reasons may contribute to the low rates of identification of hearing loss among students with SCD.

Personal amplification among students with SCD
Among individuals with intellectual disabilities that have known hearing loss, past research has indicated that hearing aids are rarely used by persons with SCD (van Schrojenstein Lantman-de Valk et al., 1997). Similarly, among the studies of Special Olympics athletes with known hearing loss, only half of those who had been fitted with hearing aids wore them (Hild et al., 2008). Some athletes with known severe sensorineural hearing loss had never been fitted with hearing aids (Sinha, Montgomery, Herer, & McPherson, 2008). Most of the athletes with amplification had old hearing aids that needed repair or new fitting, or cochlear implants that required check-ups (Neumann et al., 2006). In addition, 32–65% of the athletes were referred for otolaryngologist consultation due to ear wax which completely occluded the external ear canal (Hild et al., 2008; Sinha et al., 2008). These studies point to the fact that individuals with intellectual disabilities are at greater risk of having hearing health needs that go undetected, unserved or underserved. They also suggest that students with SCD may present with similar unidentified or untreated hearing loss.

The Current Study

Given the reduced or limited access to oral language that results from hearing loss and its cascading effects on education achievement (Moeller & Tomblin, 2015), students with SCD-HL are likely to face challenges developing their full communication, language, and literacy potential. Although the problems associated with undetected and untreated hearing loss among students with SCD cannot be ignored, the purpose of this study is to increase understandings of students with SCD and known hearing loss to inform the development of supports and services that maximize outcomes. The specific research questions are: (a) What are the sensory, motor, language, and literacy profiles of students with SCD-HL? (b) Are there differences in the sensory, motor, language, and literacy profiles of students with SCD based on the presence of a known hearing loss?

Method

The Dynamic Learning Maps™ (DLM®) Alternate Assessment Consortium developed an online survey, the First Contact Survey, in order to gather information regarding students slated to complete the DLM alternate assessment based on alternate achievement standards. The DLM alternate assessment is used by states across the United States to meet the accountability requirements of federal laws and assesses grade level content at a reduced breadth and complexity with achievement standards that are different than those applied to all students without SCD. The primary purpose of the First Contact Survey was to inform the development of items and the delivery platform for the DLM alternate assessment (DLM, 2013). The 65-question First Contact Survey was distributed through Qualtrics (2013) and included questions in the following categories: student demographics (9 questions), educator and facility information (7 questions), special education placement and setting characteristics (2 questions), sensory capabilities (9 questions), motor skills (5 questions), communication (10 questions), computer access (4 questions), engagement with and attention to instruction (4 questions), and academic skills in reading, writing, and mathematics (15 questions). Specific examples of items and possible answers are included in more detail within the results. Important to this investigation, the First Contact Survey specifically asked teachers to indicate if the student had a known hearing loss. As such, students are described throughout the results in two groups: those students whose teachers indicated they had a known hearing loss and those who did not.

Evidence of the reliability of the First Contact Survey was gathered in the first half of 2012. Pairs of educators with first-hand experience with individual students independently completed the survey about students with SCD (n= 299) from seven different states. Results revealed acceptable inter-rater consistency with exact agreements ranging from .63 to above .80, and adjacent agreements at .90 and above. Intraclass correlation coefficients ranged from .579 [.498, .651] to .899 [.862, .911] (DLM, 2012).

The survey employed skip-logic to present or withhold questions as appropriate (e.g., only ask about hearing technologies when *has known hearing loss* is marked "yes"). Additionally, respondents were not required to answer every question. As a result, the number of responses available for analysis varied across questions, and all surveys were considered valid as long as information was provided about the eligibility category under which the student received special education services. Completing the entire survey took approximately 12–15 min depending on the total number of items presented and answered.

Recruitment

Educators were recruited to complete the survey by members of the DLM consortium who were employed by state departments

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of education in 14 states. The directive given to educators was to complete the survey for every student who would take the state's alternate assessment based on alternate achievement standards in March through June of 2013. The state departments of education were each invested in the success of the DLM alternate assessment and understood that the First Contact Survey would provide valuable data to guide the effort. Furthermore, educators were predisposed to complete all activities linked to their state's alternate assessment based on alternate achievement standards given their role in the mandated accountability system. Unfortunately, educators were not contacted directly, but via their local education agencies. As a result, data are not available to determine a response rate.

Respondents

Professionals in 14 states completed 44,787 First Contact Surveys between November 1, 2012 and May 1, 2013. While surveys were only completed for students who would take the alternate assessment in their state, the total sample included a number of students receiving special education services under eligibility categories that, by definition, preclude intellectual disabilities. For example, the IDEA (2004) definition of specific learning disability includes a statement that indicates that it does "not include a learning problem that is primarily the result of … mental retardation" (Statute: Title I/A/602/30). As such, the surveys for students receiving special education under these eligibility categories were excluded from the pool for the current analyses. Specifically, surveys were excluded for students who received special education services under the following eligibility categories: (a) specific learning disability; (b) speech or language impairment; (c) emotional disturbance; (d) orthopedic impairment; (e) other health impairment; (f) hearing impairment; and (g) visual impairment. Although it is possible that students receiving services in these categories experience SCD, they were excluded in order to focus more accurately on students whose cognitive disabilities have a significant impact on intellectual functioning and/or adaptive behavior. A total of 38,367 surveys were retained for students receiving services under the following categories: (a) autism (n = 10,417, 27.2%); (b) deafblindness (n = 68, 0.2%); (c) developmental delay (n = 1,475, 3.8%); (d) intellectual disability (n = 19,575, 51.0%); (e) multiple disabilities (n = 6,244, 16.3%); (f) traumatic brain injury (n = 370, 1.0%); and (g) noncategorical (n = 218, 0.6%). Among those students with known hearing loss, 85% of the students received services under the categories of intellectual disability (n = 672, 40.7%) or multiple disabilities (n = 733, 44.3%). The number of surveys completed in each state with and without the excluded surveys is provided in Table 1.

Professional role was reported on 38,367 of the included surveys. Special education teachers completed 98.4%. General education teachers (n = 114), paraprofessionals (n = 47), speech-language pathologists (n = 38), occupational therapists (n = 29), physical therapists (n = 11), school nurses (n = 9), school psychologists (n = 20), and others (n = 329) completed the remaining surveys. Most respondents reported holding Master's (n = 20,560; 53.6%) or Bachelor's (n = 16,730; 43.6%) degrees. Years of experience ranged from 0 to 30 years (M = 12.56, SD 9.18). The number of surveys completed by each respondent cannot be determined with the available de-identified data.

Results

Student Demographics

Gender was reported for 13,483 (35.4%) females and 24,649 (64.6%) males. The sample was roughly consistent with the racial/ethnic composition of the United States, with racial and ethnic background reported as Black or African American (n = 9,532; 24.8%), Hispanic (n = 2,126; 5.5 %), White (n = 22,979; 59.9%), Multiracial (n = 1,907; 5.0%), Asian (n = 741; 1.9%), Native Hawaiian or Pacific Islander (n = 80; 0.2%), and Other (n = 451; 1.2%). The grade level for each of the students was fairly evenly distributed across Grades 3 through 8 (12.6–13.3% at each grade level) when U.S. law requires annual administration of the alternate assessment. In Grades 9 through 12, when states determine the single year that the assessment will be administered, the distribution was more erratic (3.4%, 6.4%, 9.1%, and 2.3%, respectively).

Table 1. Number and percent of survey respondents by state in the United States

	All surveys		Surveys retained after exclusions	
State	%	*n*	%	*n*
Iowa	3.5	1,550	3.8	1,471
Kansas	6.8	3,030	6.4	2,472
Michigan	17.8	7,959	15.5	5,963
Mississippi	6.6	2,953	6.6	2,518
Missouri	12.8	5,749	12.7	4,868
New Jersey	<0.02	8	<0.02	7
North Carolina	15.3	6,838	16.7	6,408
Oklahoma	6.1	2,754	5.9	2,269
Utah	5.3	2,375	5.4	2,056
Vermont	0.4	200	0.4	152
Virginia	15.7	7,018	16.6	6,353
Washington	1.9	837	1.8	685
West Virginia	5.1	2,305	5.6	2,135
Wisconsin	2.7	1,191	2.6	991
Other	<0.05	20	0.05	19
	100	44,787	100	38,367

Education Settings

Educators were asked to identify where each student received special education services from a continuum of least to most restrictive settings such as "regular class" or "residential facility." The vast majority of students were served in separate classrooms (n = 25,439; 68.9%), spending less than 40% of the day with their peers without disabilities. A chi-square test of independence (Table 2) revealed a significant association between the primary eligibility category and educational placement for the students in the sample [$\chi^2(30) = 3294.035$, $p < .001$, Cramer's V = .13]. Effect size V value was consistent with a weak effect (Rea & Parker, 1992). This weak relationship reveals a minimally acceptable association between students' primary eligibility category and educational placement. All students were most likely to be educated in separate special education classrooms, and more than other students, students with classified multiple disabilities were more likely to be placed in a separate school.

Respondents were asked to identify the location of a student's school from among four choices based on the population of the area surrounding the school. Students were educated in a range of urban–rural settings. Among 38,367 responses, 5,619 (14.6%) attended school in a rural community (less than 2,500 people), 13,242 (34.5%) in a small town (less than 25,000 people), 11,385 (29.7%) in a large town (less than 250,000 people), and 8,121 (21.2%) in an urban environment (more than 250,000 people).

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Hearing Loss

Educators were asked to indicate if each student had a known hearing loss. When hearing loss was indicated, educators were then asked if the student used one of four types of corrective assistance. Across the sample, 1,653 (4.3%) students were reported to have a known hearing loss. Nearly half of these students used no hearing aid (n = 807, 48.8%). Students who did use hearing aids were more likely to use bilateral (n = 482, 29.2%) than unilateral (n = 189, 11.4%) aids. Less than one quarter of the students with known hearing loss used an FM system (n = 362, 21.9%), and a small portion was reported to have a cochlear implant (n = 123, 7.43%). Among the students who used an FM system more than 90% also used a hearing aid or cochlear implant (n = 320, 91.1%).

Respondents were asked to report on all modes of expressive symbolic communication used by students, including speech, aided AAC, and sign language. Chi-square tests of independence (Table 3) revealed a significant association between hearing status and form of expressive communication for the students in the sample across all forms of expressive communication including use of speech [$\chi^2(1) = 398.365$, $p < .001$, Cramer's $V = .117$], sign language [$\chi^2(1) = 913.586$, $p < .001$, Cramer's $V = .156$], aided AAC [$\chi^2(1) = 125.753$, $p < .001$, Cramer's $V = .057$], and combining speech, sign language, and/or aided AAC [$\chi^2(1) = 90.710$, $p < .001$, Cramer's $V = .049$]. While the associations were significant, the effect size for speech, aided AAC, and the combination of speech, sign language, and/or aided AAC are all very weak (Rea & Parker, 1992). The effect size for sign use was slightly higher, but still weak. Nonetheless, students with known hearing loss were less likely to use speech, but more likely to use sign language. Among students with known hearing loss who used sign language (n = 451), 67% (n = 304) used American Sign Language, 5.6% (n = 25) used Signed Exact English, and 26.7% (n = 120) used a hybrid, idiosyncratic, or personalized system. Among students known to have hearing loss who use sign language, the vast majority used only one sign at a time to communicate for a restricted range of purposes (n = 313, 69.4%). A smaller portion combined two signs for a broader range of purposes (n = 81, 18.0%), and an even smaller portion combined three or more signs to meet a variety of purposes (n = 57, 12.6%).

A chi-square test of independence (Table 4) indicated a significant association between eligibility category and hearing status [$\chi^2(6) = 1945.583$, $p < .001$, Cramer's $V = .225$]. The effect size indicated a moderate association between eligibility category and hearing status (Rea & Parker, 1992) with known hearing loss most strongly associated with students eligible under the multiple disabilities and deafblindness categories, and students with no known hearing loss most likely to be associated with the autism category.

A chi-square test of independence (Table 5) revealed a significant but negligible association between education placement and hearing status [$\chi^2(4) = 161.977$, $p < .001$, Cramer's $V = .065$]. Regardless of hearing status, the majority of students were most likely to be placed in separate classroom settings. The strongest association between hearing status and placement was found between students with SCD-HL and placement in more restrictive settings compared to their peers with no known hearing loss, such as separate schools, hospitals, residential, or homebound settings.

Respondents reported that a higher proportion of students with SCD-HL have uncorrected vision loss, health impairments (e.g., fragile medical condition, seizures, therapy, or treatment that prevents instruction access), and physical impairments (e.g. head, arm, and leg mobility) than their peers without known hearing loss. Chi-square tests of independence (Table 6) revealed a significant association between hearing status and uncorrected vision loss [$\chi^2(1) = 1103.134$, $p < .001$, Cramer's $V = .170$], health impairments [$\chi^2(1) = 77.435$, $p < .001$, Cramer's $V = .045$], and the ability to walk [$\chi^2(1) = 224.985$, $p < .001$, Cramer's $V = .077$]. The effect size for the association between hearing status and uncorrected vision loss was weak but minimally acceptable, while the effect sizes for the other associations were negligible (Rea & Parker, 1992).

Language Complexity

Expressive language

Respondents were asked to describe the students' syntactic complexity based on their ability to regularly combine 1, 2, or 3 spoken words, signs, or symbols. As previously stated, about 70% of students with hearing loss who communicated with sign language used only single signs to meet a restricted range of

Table 2. Educational placement: cross-tabulation of primary special education eligibility category by educational placement

	Educational placements						
Special education eligibility category	Regular class	Resource room	Separate class	Separate school	Residential facility	Home-bound/ hospital	Total
Autism	2.3%* (244)	10.7%* (1,112)	72.7%* (7,576)	13.1% * (1,364)	0.7% (68)	0.5%* (53)	100% (10,417)
Deafblindness	1.5% (1)	8.8% (6)	63.2% (43)	11.8% (8)	13.2%* (9)	1.5% (1)	100% (68)
Developmental delay	3.1% (46)	16.5%* (244)	60.1%* (887)	18.8%* (277)	1.0% (15)	0.4%* (6)	100% (1,475)
Intellectual disability	3.4%* (673)	18.6%* (3,641)	70.7%* (13,841)	6.5%* (1,267)	0.3%* (55)	0.5%* (98)	100% (19,575)
Multiple disabilities	1.8%* (112)	6.9%* (429)	59.6%* (3,720)	25.8%* (1,609)	2.2%* (138)	3.8%* (236)	100% (6,244)
Traumatic brain injury	4.6%* (17)	16.8% (62)	65.7% (243)	8.4%* (31)	1.9%* (7)	2.7%* (10)	100% (370)
Noncategorical	5.5%* (12)	25.7%* (56)	59.2%* (129)	7.8% (17)	0.5% (1)	1.4% (3)	100% (218)
Total	2.9% (1,105)	14.5% (5,550)	68.9% (26,439)	11.9% (4,573)	0.8% (293)	1.1% (407)	100% (38,367)

Note. Numbers in parentheses reflect frequency. Regular class, education in a regular classroom with special education and related services outside the regular classroom for ≤20% of the school day; resource room, special education and related services outside of the regular classroom for 21–60% of the school day; separate class, special education and related services outside the regular class for >60% of the school day; separate school, special education and related services in a public or private separate day school for students with disabilities, at public expense, for >50% of the school day; residential facility, special education in a public or private residential facility, at public expense, for >50% of the school day; homebound/hospital environment, residing in and receiving special education in a hospital or homebound program.

*Cells with significant (p < .05) adjusted standardized residuals.

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Table 3. Communication modality: cross-tabulation of hearing status by modes of expressive communication

Hearing status	Uses speech only			Uses sign			Uses aided AAC			Combines speech, sign and/or AAC		
	Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total
No known hearing loss	65.1%* (23,888)	34.9%* (12,821)	100% (36,709)	7.2%* (2,589)	92.8%* (33,168)	100% (25,757)	20.2%* (7,398)	79.8%* (29,344)	100% (36,642)	8.2%* (2,996)	91.8%* (33,713)	100% (36,709)
Known hearing loss	37.4%* (618)	62.6%* (1,035)	100% (1,653)	28.2%* (458)	71.8%* (1,164)	100% (1,622)	31.6%* (522)	68.4%* (1,129)	100% (1,651)	14.8%* (245)	85.2%* (1,408)	100% (1,653)
Total	93.0% (35,674)	7.0% (2,688)	100% (38,362)	8.2% (3,047)	91.8% (34,332)	100% (37,379)	20.7% (7,920)	79.3% (30,373)	100% (38,293)	8.4% (3,241)	91.6% (35,121)	100% (38,362)

Note. Numbers in parentheses are frequency of students in each category.
*Cells with significant ($p < .05$) adjusted standardized residuals.

communication purposes. Chi-square tests of independence (Table 7) revealed a significant association between hearing loss and the number of spoken words [$\chi^2(2) = 52.712$, $p < .001$, Cramer's $V = .043$] and signs [$\chi^2(2) = 92.768$, $p < .001$, Cramer's $V = .176$] students used in expressive communication. The effect size of association between students with hearing loss and number of spoken words used was negligible, but the association between hearing loss and number of signs was weak and minimally acceptable (Rea & Parker, 1992). Among students who used signs, there was a stronger association between students with SCD-HL and the use of 2 or 3 sign combinations.

Among students reported to use aided AAC ($n = 7,700$), only 741 (9.7%) were reported to combine three or more symbols to meet a variety of communicative purposes; 1,583 (20.6%) combined two symbols to meet a variety of communicative purposes; and 5,372 (69.8%) used single symbols for a restricted range of communicative purposes. A chi-square test of independence did not reveal a significant association between the expressive use of aided AAC by students with and without known hearing loss [$\chi^2(2) = 4.515$, $p = .105$].

Receptive language

Educators were asked the percentage of time (0%, none to 20%, 21–50%, 51–80%, more than 80%) a student demonstrated skills such as looking at objects, performing simple actions, responding appropriately or following two-step directions. To reduce the large number variables to a smaller set, we collapsed the responses into dichotomous groups: skill demonstrated at least 50% of the time and less than 50% of the time. A chi-square test of independence (Table 8) revealed a significant but negligible association between hearing status and the ability to respond appropriately in any modality at least 50% of the time to: (a) a favored item [$\chi^2(1) = 241.456$, $p < .001$, Cramer's $V = .079$], (b) phrases and sentences [$\chi^2(1) = 256.727$, $p < .001$, Cramer's $V = .082$], and (c) two-step directions [$\chi^2(1) = 190.193$, $p < .001$, Cramer's $V = .070$]. Students with SCD-HL demonstrated these receptive language skills less often than their peers without known hearing loss.

Literacy Skills

Reading

Respondents were asked to identify the percentage of time (0%, none to 20%, 21–50%, 51–80%, more than 80%) students demonstrated a variety of reading skills from emergent to advanced literacy. To reduce the large number variables to a smaller set, we collapsed the responses into dichotomous groups: skill demonstrated at least 50% of the time and less than 50% of the time. Chi-square tests of independence (Table 9) revealed a significant but negligible association between hearing status and (a) an understanding of the purpose of print or braille [$\chi^2(1) = 191.919$, $p < .001$, Cramer's $V = .071$]; (b) the ability to identify individual words without symbol support [$\chi^2(1) = 145.729$, $p < .001$, Cramer's $V = .062$]; (c) the ability to read text without symbol support but without comprehension [$\chi^2(1) = 88.425$, $p < .001$, Cramer's $V = .048$]; and (d) the ability to read text without symbol support with comprehension [$\chi^2(1) = 80.486$, $p < .001$, Cramer's $V = .046$]. Students with SCD-HL demonstrated these reading skills less often than their peers without known hearing loss, but all of the effect sizes were very weak.

Writing

Educators were asked to identify the percentage of time (0%, none to 20%, 21–50%, 51–80%, more than 80%) students demonstrated

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Table 4. Special education eligibility category: cross-tabulation of hearing status by eligibility

	Educational placements							
Hearing status	Autism	Deafblindness	Developmental delay	Intellectual disability	Multiple disability	Traumatic brain injury	Noncategorical	Total
No known hearing loss	28.1%* (10,314)	<1%* (18)	3.8% (1,407)	51.5%* (18,902)	15.0%* (5,510)	1.0% (351)	0.6% (207)	100% (36,709)
Known hearing loss	6.1%* (101)	3.0%* (50)	4.1% (68)	40.7%* (672)	44.3%* (733)	1.1% (19)	0.6% (10)	100% (1,653)
Total	27.1% (10,415)	0.2% (68)	3.8% (1,475)	51.0% (19,574)	16.3% (6,243)	1.0% (370)	0.6% (217)	100% (38,362)

Note. Numbers in parentheses reflect frequency. Regular class, education in a regular classroom with special education and related services outside the regular classroom for ≤20% of the school day; resource room, special education and related services outside of the regular classroom for 21–60% of the school day; separate class, special education and related services outside the regular class for >60% of the school day; separate school, special education and related services in a public or private separate day school for students with disabilities, at public expense, for >50% of the school day; residential facility, special education in a public or private residential facility, at public expense, for >50% of the school day; homebound/hospital environment, residing in and receiving special education in a hospital or homebound program.
*Cells with significant ($p < .05$) adjusted standardized residuals.

Table 5. Educational placement: cross-tabulation of hearing status by educational placement

	Educational placements					
Hearing status	Regular class	Resource room	Separate class	Separate school	Residential/hospital/ homebound facility	Total
No known hearing loss	2.9% (1,062)	14.6%* (5,372)	69.0%* (25,336)	11.8%* (4,332)	1.7%* (607)	100% (36,709)
Known hearing loss	2.5% (42)	10.7%* (177)	66.6%* (1,101)	14.6%* (241)	5.6%* (92)	100% (1,653)
Total	2.9% (1,004)	14.5% (5,549)	68.9% (26,437)	11.9% (4,573)	1.8% (699)	100% (38,362)

Note. Numbers in parentheses reflect frequency. Regular class, education in a regular classroom with special education and related services outside the regular classroom for ≤20% of the school day; resource room, special education and related services outside of the regular classroom for 21–60% of the school day; separate class, special education and related services outside the regular class for >60% of the school day; separate school, special education and related services in a public or private separate day school for students with disabilities, at public expense, for >50% of the school day; residential facility = special education in a public or private residential facility, at public expense, for >50% of the school day; homebound/hospital environment = residing in and receiving special education in a hospital or homebound program.
*Cells with significant ($p < .05$) adjusted standardized residuals.

various writing skills from early to more advanced writing. To reduce the large number variables to a smaller set, we collapsed the responses into dichotomous groups: skill demonstrated at least 50% of the time and less than 50% of the time. Two chi-square tests of independence (Table 10) revealed a significant but negligible association between hearing status and the ability to use spelling to write (a) simple sentences and phrases [$\chi^2(1) = 130.648$, $p < .001$, Cramer's $V = .058$]; and (b) paragraph length text [$\chi^2(1) = 87.565$, $p < .001$, Cramer's $V = .048$]. Students with SCD-HL demonstrated these writing skills less often than their peers who did not have known hearing loss.

Discussion

The First Contact Survey was designed to support the implementation of the DLM Alternate Assessment among eligible students with SCD. The current study analyzed the data for the purpose of understanding if the subset of students with SCD-HL differed from their peers who did not have known hearing loss. The results of the survey confirmed existing research as well as added information about the profiles of students with SCD-HL.

The rate of prevalence of hearing loss in the current study (4.3%) was on the lower end of the range of what has been previously reported among students with SCD (2.1–8%; Cameto et al., 2010; Kearns et al., 2011), and much lower than what has been reported among adults with various degrees of intellectual impairment (24–33%) (Herer, 2012; Meuwese-Jongejeugd et al., 2006). It is important to note that these results were based on reports from educators and were not verified with audiological assessment. The lower rates suggest the possibility of unidentified hearing loss among the students in this sample, or untreated hearing loss that is not recognized by at least some educational professionals. Under-reporting of hearing loss has been identified among paid caregivers of adults with intellectual disabilities (McShea, Fulton, & Hayes, 2015). Whether the hearing loss is unidentified, unknown to the teacher who completed the survey, or untreated, these findings reflect the "invisible" nature of hearing loss compared to other more prominent intellectual, motor, and behavioral challenges. It is this "invisible" nature of hearing loss that results in diagnostic overshadowing, as is reported in the literature of children with autism (Beers et al., 2014; Fitzpatrick et al., 2014), and is most likely to occur when other challenges are prominent.

Students with SCD-HL in the current study were more likely than their peers without hearing loss to qualify for special education services under the eligibility category of multiple disabilities. This could be indicative of the fact that students with more complex needs are more likely to undergo more thorough medical examinations that include audiological assessment. It could also simply reflect that fact that identification of a hearing loss in the presence of known intellectual disabilities results in these students being classified as having multiple disabilities.

One important finding of the current study is that approximately half of the students with SCD-HL did not utilize any form

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Table 6. Co-occurring visual, health, and physical impairments: cross-tabulation of hearing status by visual, health, and physical impairments

	Visual impairment			Health impairment			Mobility		
Hearing status	No known visual impairment	Known visual impairment	Total	No known health impairment	Known health impairment	Total	Able to walk	Unable to walk	Total
No known hearing loss	93.9%* (34,474)	6.1%* (2,235)	100% (36,709)	88.2%* (32,384)	11.8%* (4,325)	100% (36,709)	93.0%* (34,128)	7.0%* (2,581)	100% (36,709)
Known hearing loss	72.6%* (1,200)	27.4%* (453)	100% (1,653)	19.0%* (314)	81.0%* (1,339)	100% (1,653)	83.1%* (1,373)	16.9%* (280)	100% (1,653)
Total	93.0% (35,674)	7.0% (2,688)	100% (38,362)	87.9% (33,723)	12.1% (4,639)	100% (38,362)	92.5% (35,501)	7.5% (2,861)	100% (38,362)

Note. Numbers in parentheses are frequency of students in each category.
*Cells with significant ($p < .05$) adjusted standardized residuals.

Table 7. Expressive language: cross-tabulation of hearing status by expressive use of words and signs

	Speech				Sign			
Hearing status	Combines 3 or more words	Combines 2 words	Uses single words	Total	Combines 3 or more words	Combines 2 words	Uses single words	Total
No known hearing loss	68.2%* (18,736)	21.5%* (5,898)	10.3%* (2,836)	100% (27,470)	4.4%* (111)	8.7%* (221)	86.9%* (2,204)	100% (2,536)
Known hearing loss	56.6%* (499)	28.7%* (253)	14.6%* (129)	100% (881)	12.6%* (57)	18.0%* (81)	69.4%* (313)	100% (451)
Total	67.8% (19,235)	21.7% (6,151)	10.5% (2,965)	100% (28,351)	5.6% (168)	10.1% (302)	84.3% (2,517)	100% (2,987)

Note. Numbers in parentheses are frequency of students in each category.
*Cells with significant ($p < .05$) adjusted standardized residuals.

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Table 8. Receptive language skills: cross-tabulation of hearing status by receptive language skills

Hearing status	Responds appropriately in any modality to favored item >50%			Responds appropriately in any modality to phrases and sentences >50%			Responds appropriately in any modality to 2-step directions >50%		
	Yes	No	Total	Yes	No	Total	Yes	No	Total
No known hearing loss	80.0%* (29,353)	20.0%* (7,356)	100% (36,709)	74.2%* (27,231)	25.8%* (9,478)	100% (36,709)	62.1%* (22,808)	37.9%* (13,901)	100% (36,709)
Known hearing loss	64.1%* (1,060)	35.9%* (593)	100% (1,653)	56.4%* (932)	43.6%* (721)	100% (1,653)	43.5%* (748)	54.7%* (905)	100% (1,653)
Total	79.3% (30,413)	20.7% (7,949)	100% (38,362)	73.4% (28,163)	26.6% (10,199)	100% (38,362)	61.4% (23,556)	38.6% (14,806)	100% (38,362)

Note. Numbers in parentheses are the frequency of students in each category.
*Cells with significant ($p < .05$) adjusted standardized residuals.

Table 9. Reading skills: cross-tabulation of hearing loss by ability to read words and text

Hearing status	Understands the purpose of print or braille			Identifies individual words without symbol support			Reads text presented without symbol support but without comprehension			Reads text presented without symbol support with comprehension		
	Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total
No known hearing loss	68.0%* (24,944)	32.0%* (11,765)	100% (36,709)	51.5%* (18,740)	48.9%* (17,969)	100% (36,709)	39.2%* (14,399)	60.8%* (22,310)	100% (36,709)	29.4%* (10,796)	70.6%* (25,913)	100% (36,709)
Known hearing loss	51.6%* (853)	48.4%* (800)	100% (1,653)	35.9%* (593)	64.1%* (1,060)	100% (1,653)	27.7%* (458)	72.3%* (1,195)	100% (1,653)	19.2%* (317)	80.8%* (1,336)	100% (1,653)
Total	67.2% (25,797)	32.8% (12,565)	100% (38,362)	50.4% (19,333)	49.6% (19,029)	100% (38,362)	38.7% (14,857)	61.3% (23,505)	100% (38,362)	29.0% (11,113)	71.0% (27,249)	100% (38,362)

Note. Numbers in parentheses are the frequency of students in each category.
*Cells with significant ($p < .05$) adjusted standardized residuals.

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Table 10. Writing skills: cross-tabulation of hearing status by ability to write simple sentences and paragraphs

Hearing status	Writes simple sentences and phrases			Writes paragraph length text		
	Yes	No	Total	Yes	No	Total
No known hearing loss	36.5%* (13,388)	63.5%* (23,321)	100% (36,709)	20.2%* (7,417)	79.8%* (29,292)	100% (36,709)
Known hearing loss	22.7%* (375)	77.3%* (1,278)	100% (1,653)	10.8%* (179)	89.2%* (1,474)	100% (1,653)
Total	35.9% (13,763)	64.1% (24,599)	100% (38,362)	19.8% (7,596)	80.2% (30,766)	100% (38,362)

Note. Numbers in parentheses are frequency of students in each category.
*Cells with significant (p < .05) adjusted standardized residuals.

of amplification or hearing technology. Similar trends have been noted in studies among Special Olympics athletes with milder degrees of intellectual impairment (Hild et al., 2008; Sinha et al., 2008). It is possible that students with SCD do not use hearing aids or cochlear implants due to challenges of pre- and post-amplification/implantation audiological assessment. Infrequent use of personal hearing technology may also reflect challenges with appropriate educational support, which has been reported by parents of children with complex needs who utilize cochlear implants (Mulla, Harrigan, Gregory, & Archbold, 2013). Educators may not fully understand the connection between hearing and the development of oral language, verbal cognition, and psycho-social development. Professionals working with these students may not know how to assess auditory function or recognize subtle changes. Therefore in the absence of perceived immediate benefit, trial periods with hearing technology may be discontinued and the long-term effects of maximizing auditory access to language input may not be recognized. The limited literature that has examined the use of hearing aids among children with milder intellectual disability has documented improved social functioning and language skills, as well as reports of better progress in education and learning after appropriate trial periods (McDermott, Williams, Kuo, Reid, & Proops, 2008; Trevisi, Ciorba, Aimoni, Bovo, & Martini, 2016). Furthermore, children with global delays who receive cochlear implants make gains in speech perception and auditory function that result in improved quality of life related to awareness of environmental sounds, safety, family interaction, communication, and social skills (Archbold et al., 2015; Isarin et al., 2015; Wiley, Jahnke, Meinzen-Derr, & Choo, 2005; Wiley, Meinzen-Derr, Grether, Choo, & Hughes, 2012). However, the gains they experience are smaller compared to children with less severe additional disabilities (Edwards, 2007).

The limited use of hearing technology among the sample in this study was surprising. With the implementation of universal newborn hearing screening, as well as the broadening candidacy criteria in pediatric cochlear implantation to include children with complex communication needs (Edwards, 2007; Wakil, Fitzpatrick, Olds, Schramm, & Whittingham, 2014; Wiley et al., 2012), limited access to hearing technology was not expected. Though not part of our planned analysis, post hoc questions arose about the impact of age on the use of hearing technologies. It was hypothesized that younger students would be more likely to have benefitted from universal newborn screening and changing candidacy criteria for cochlear implants. In line with this hypothesis, 53% of all elementary-aged students and only 46% of all secondary-aged students used either hearing aids or cochlear implants. When comparing these groups, elementary-aged students generally showed higher percentages of cochlear implant or bilateral hearing aid use but lower percentages of unilateral hearing aid use than older students in the sample.

Students with SCD-HL were more likely to have complex profiles of sensory needs than their peers without hearing loss. In fact, the students with SCD-HL were more than four times as likely to be reported as having a visual impairment. Comorbidity of hearing loss and additional disabilities among students with SCD is not surprising as studies have suggested that up to 45% of the entire population of children with hearing loss have additional disabilities (Berrettini et al., 2008; Birman, Elliott, & Gibson, 2012; Hamzavi et al., 2000). In the current study, the higher percentages of motor disabilities reported among SCD-HL were of little statistical relevance, and, regardless of hearing status, approximately 1 out of 10 students with SCD has a motor disability. Although the incidence of motor disabilities between the two populations is similar, the compounding of physical and hearing disabilities has profound implications for communication among students with SCD-HL. The presence of hearing loss restricts or reduces access to linguistic input, and potentially requires compensation through the visual modality. In contrast, the presence of motor disabilities increases the likelihood of reduced or restricted access to a communication output system, whether it be oral speech or AAC. Therefore, the compounding of SCD, hearing loss, and other disabilities points to the need for a cadre of professionals to address the complexities associated with intellectual, sensory, communicative, and physical limitations. It also points to the need for vigilance in attending to the language input and output needs of students so that hearing loss is not over-shadowed and forgotten as other, more obvious needs are addressed.

One unexpected finding was the very marginal effect size of the association between hearing status and receptive language or expressive speech skills among students with SCD. The presence of hearing loss was expected to have an important negative impact on language due to reduced or restricted access to linguistic input, as observed among peers without additional disabilities. Furthermore, what the current study added is that students with SCD-HL who communicate using sign have significantly more 2 and 3 sign combinations compared to peers without known hearing loss. This finding may reflect the fact that students respond differently to input based on hearing status, or more likely, that there are differences in exposure based on hearing status. For example, students with SCD-HL are more likely to depend on sign language in order to compensate for restrictions in communication input and output. Therefore, professionals working with these children are more likely to provide more intensive language modeling with sign language. In contrast, students without known hearing loss are more likely to depend on sign language to compensate for restrictions in communication output. Therefore, professionals working with these children are more likely to use oral language for communication input, and provide less frequent modeling of sign language for communication output, thereby reducing sign language exposure and uptake.

Contrary to our expectations, there were not meaningful associations between hearing loss and literacy skills in the

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current sample. A significant effect was expected given the recognized effect of hearing loss on students with no additional disabilities (Easterbrooks & Beal-Alvarez, 2012; Lederberg, Schick, & Spencer, 2013; Moeller et al., 2007; Reed et al., 2008). It is possible that the emphasis on sight word instruction that dominates the research literature (Browder et al., 2006) and practice (Erickson, Hanser, Hatch, & Sanders, 2009) with students with SCD masks the impact of hearing loss on the literacy outcomes reported in this study. As more students with SCD with and without hearing loss receive literacy instruction that comprehensively addresses all aspects of literacy (e.g., decoding, fluency, vocabulary, comprehension, etc.), the differences based on hearing loss may become more pronounced.

Implications

The results of this study suggest that hearing loss may be underidentified and underserved among students with SCD. Though unidentified hearing loss is more likely among students born prior to implementation of Universal Newborn Hearing Screening, the fact that nearly half of infants who do not pass their newborn hearing screening are lost to follow-up (ASHA, 2008) means that unidentified hearing loss remains a valid concern. School-age hearing screenings are not implemented in every state, and the requirements vary widely among those states that have them (ASHA, 2012). More advocacy efforts are needed to ensure that all students, including those with SCD, receive hearing screenings by screeners who have been appropriately trained. Given the diagnostic overshadowing reported in the literature among children with autism (Beers et al., 2014; Fitzpatrick et al., 2014), students with SCD may require hearing screening referrals to pediatric audiologists who have experience in evaluating students with complex disabilities. As hearing loss is more frequently associated with multiple disabilities, the presence of complex needs should signal the need for more careful consideration of auditory function. Furthermore, SCD-HL need to be evaluated for appropriate assistive listening technology, and educators must receive appropriate support and training to monitor and troubleshoot device use, so that students have consistent, optimal access to oral language and general education content.

According to Title II of the Americans with Disabilities Act of 1990, schools are required "to ensure that students with disabilities receive communication that is as effective as communication with others through the provision of appropriate auxiliary aids and services" (Gupta, Yudin, & Lhamon, 2014). As educators we are ethically bound and legally mandated to ensure that all students with SCD have access to and opportunities to develop communication and language skills to the maximum extent possible. The results of this study suggest that students with SCD-HL use more 2 and 3 sign combinations than students without known hearing loss. More research is needed to determine if this difference is explained by input frequency in a visual modality, but the quantity and quality of language input is important for influencing language growth in typically developing children (Hart & Risely, 1995; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991) and children learning to use aided AAC (Sennott, Light, & McNaughton, 2016). Rich language input positively affects children's language development by increasing the frequency and variety of words, as well as by increasing the number of different referents associated with words in different sentence contexts (Hoff, 2003). Given that students with SCD require extensive, repeated individualized instruction (Erickson, 2013), even greater frequency of language exposure is needed in order to allow students to map between form and meaning. This modeling becomes even more important when students utilize a visual modality. Nevertheless, adults have been reported to talk less with young children that have complex communication needs (Blockberger & Sutton, 2003). As language expansion is an area of instructional need for many students with SCD, more consideration should be given to ensuring that students are being provided with sufficient linguistic models in the appropriate modality for developing symbolic language, regardless of hearing status.

Given the incidence of motor disabilities, as well as increased likelihood of additional sensory disabilities among students with SCD-HL, troubleshooting these complex effects on receptive and expressive modes of communication are best accomplished in the context of interprofessional practice model (World Health Organization, 2010). Such a model would bring together the speech-language pathologist, audiologist, teacher of the DHH, special and general educator, occupational therapist, and physical therapist to work in concert with family members to maximize student outcomes.

Increased advocacy efforts that ensure students with SCD-HL are fit with appropriate hearing technology, have consistent access to a communication system, and are empowered with functional communication, are likely to positively influence academic outcomes. Given the strong link between audition, language, and academic success, more demands are made on the expertise of speech-language pathologists and teachers of the DHH in addressing the linguistic and metalinguistic foundations of curriculum learning, as well as the contribution of learner characteristics, instructional content, and practice for students with SCD-HL (American Speech-Language-Hearing Association, 2004, 2010). Students with SCD have had less opportunity to benefit from support services due to the historical use of cognitive referencing (Nelson et al., 1996; Rhyner, 2000). The limited communication and academic profiles of SCD-HL suggest this group of students could benefit from more services by professionals who have backgrounds in audiology, language, and communication.

Though most students with SCD are capable of learning general academic content, student exposure to instructional content is influenced by educator beliefs in the likelihood of improved academic performance (Browder et al., 2012; Cameron & Cook, 2013; Erickson et al., 2009). As educator beliefs of student capacity are in part informed by perceptions of communication ability, professionals with expertise in hearing loss have the potential to not only improve communication outcomes for students with SCD-HL, but indirectly increase student exposure to general academic content (Ruppar et al., 2011).

Conclusion

The results of this study suggest that some students with SCD may have unidentified hearing loss, and approximately half of the students with identified hearing loss are not using personal hearing technology. Students with SCD-HL demonstrate a similar incidence of motor disabilities but a higher incidence of additional sensory disabilities. Unexpectedly, there were not meaningful differences between students SCD and students SCD-HL across reported language and literacy skills. As professionals with expertise in hearing loss have not traditionally served this population of students, these reported outcomes likely represent underachievement among students with SCD due to limited understanding of the role audition plays in language and cognition. Professionals with background in hearing

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loss are needed on intraprofessional teams to ensure that students with SCD-HL, who are capable of learning, reach their full communicative and academic potential.

Conflicts of Interest

No conflicts of interest were reported.

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