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Educator-Perceived Effects of Autism Spectrum Disorder on Deaf Children:

A National Survey Study

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Submitted under the supervision of Dr. Myra Beth Bundy at Eastern Kentucky University
in partial fulfillment of the requirements for the University Honors Program.

Abstract

The relationship between autism spectrum disorders and deafness continues to be one that is relatively unexplored. When autism and deafness occur together, a diagnosis of either condition may be missed or diagnosed late. For example, a deaf child may be diagnosed severely autistic only because it seems that comprehension and receptive abilities are lacking and a hearing test is simply not administered. Conversely, an individual may be diagnosed as deaf because a physician explains away atypical behavior as characteristic of being deaf, failing to consider autism. Truth is, however, it is highly probable that the two occur together, more so than previously thought (Garreau, Barthelemy, & Sauvage, 1984 as cited in Roper et al., 2003). In this survey study, this relationship is explored further, surveying the administrators of schools for the deaf around the nation. In doing so, those with first-hand experience describe: the areas in which deaf children with autism struggle the most, methods that best help this population of students learn, and which approaches to communication work best.

Keywords: Deaf, Autism Spectrum Disorder, Comorbidity, Communication, Undergraduate Research Thesis

The Effects of Autism Spectrum Disorder on Deaf Children: A National Survey Study

The Diagnostic and Statistical Manual of Mental Disorders, 5th Edition

(American Psychiatric Association, 2013) uses five criteria to define Autism Spectrum Disorder, or ASD. Criterion A relates to deficits in social communication and social interaction including deficits in social-emotional reciprocity such as basic conversational skills and emotions as well as difficulties building relationships with other people. These characteristics were exemplified in a study conducted by Jones and Schwartz (2009) on social communication differences in children with autism compared to typically developing children. In their observational study, Jones and Schwartz recorded typical conversation between family members at the dinner table and observed how the children interacted and provided input to the conversation. Their results showed that children with autism less frequently started conversation, commented on others' conversation, interacted for an ongoing period of time through turn-taking, and responded less often compared to typically developing children. This is a sampling of the kinds of problems with social function and communication that persons with autism may experience. Unfortunately, for some individuals on the spectrum, the art of conversation may never be mastered. Nonverbal communicative abnormalities such as lack of eye contact and facial expressions as well as the misunderstanding of common gestures are also included in Criterion A. In fact, Cigman (2007) maintains, "they find gesture and other body language as difficult to use and understand as speech" (p. 27). Furthermore, Attwood (2007) outlines some of the non-verbal communication problems seen specifically in Asperger's Disorder in the diagnosis chapter of his book. Asperger's Disorder is no longer a diagnostic option in the newly revised DSM-5 (American Psychiatric

Association, 2013). Rather, clinicians would now provide an Autism Spectrum Disorder diagnosis with specifiers indicating the individual's intellectual and language impairments or lack thereof (DSM-5, 2013). According to Attwood, individuals with Asperger's Disorder often make many social faux pas by either not noticing when their audience is bored and uninterested, or by saying things before considering how the listener will interpret the message.

DSM-5 Criteria B defines ASD with regards to patterns of repetitive behaviors whether these behaviors incorporate motor movements, speech, use of fixed daily routines, obsessive tendencies towards specific interests, and heightened or lessened sensitivity to certain sensory inputs. Symptoms described must significantly impair everyday living (Criterion D), must have presented themselves in the "early developmental period" (Criterion C), and cannot be due to another intellectual disability (Criterion E) in order to be congruent with a diagnosis of Autism Spectrum Disorder (American Psychiatric Association, 2013). The presentation of symptoms of ASD vary from one individual to the next, hence the reason ASD is a *spectrum* disorder. In fact, (Schulz, 2013) stated that just like snowflakes, no two individuals with autism are exactly the same.

The characteristics just described are the most current diagnostic criteria, but ASD has been given several definitions over the years. Leo Kanner, who is credited with the "discovery" of autism in 1943 described seven features of autism including the inability to relate to others, poor language skills, repetitive verbal utterances, or echolalia, repetitive behaviors, skilled memories, obsession with routines, and a "normal" appearance with "good cognitive potential" (Vernon & Rhodes, 2009). By 1967, Bruno

Bettelheim theorized that the cause of autism was that of cold-hearted parents whom he called “refrigerator parents,” who had essentially forced their children into an isolated state of mind. Bettelheim then proceeded to separate the children from their parents so that both could obtain therapy but by the 1970’s this was found to be ineffective. Over time, the symptoms now associated with ASD were given other names such as childhood schizophrenia and infantile autism. Today, it is recognized that several disorders are similar to each other and yet are very different disorders. Thus, children are given a diagnosis on the *autism spectrum*, which, according to the previous diagnostic criteria in DSM-IV-TR, consisted of such diagnoses like Autistic disorder, Asperger’s Disorder, or Pervasive Developmental Disorder not otherwise specified (PDD), to name a few (Vernon & Rhodes, 2009). Many times, the disorder does not impair an individual so severely that they are incapable of participating in everyday activities. However, due to their “aloofness and indifference to others and elaborate repetitive routines” society – adults and children alike – may cast them aside as the “other” (Cigman, 2007).

More recently, a great deal of time and energy is being put toward the research of differences in the Theory of Mind (ToM) in individuals with autism. Theory of Mind is described by Peterson, Wellman, and Liu (2005) as “the awareness of how mental states . . . govern the behavior of self and others” (p. 502). In other words, ToM is one’s cognitive ability to not only recognize emotions and feelings but to apply it to oneself and understand that such mental states vary from person to person. Baron-Cohen, Leslie, and Frith (1985) found that 80% of children on the autism spectrum failed the same standardized false belief test that was passed by mostly all normally developing preschoolers that were also sampled. Put another way, 80% of children with a higher

biological age and autism failed to recognize that beliefs and unrealistic mental states are based on knowledge and that behavior can predict mental states (as cited in Peterson et al., 2005). Theory of Mind, or the lack of/delayed development of ToM, could perhaps be an explanation to many of the difficulties that individuals with ASD face. For example, the abnormal conversation skills illustrated in Jones and Schwartz's study as typical for children with ASD might be explained by the lack of ToM. The lack of Theory of Mind capabilities may serve as an explanation as to why Cigman (2007) claims that gestural and body language is as difficult to decipher as speech sounds. Body language is in a sense a mental state as it is in many ways a subconscious portrayal of a message. Due to a lack of ToM, individuals with autism, find it difficult to interpret the message. Finally, ToM research might explain why Attwood (2007) asserts that individuals with autism speak without considering how the listener will interpret their own message. ToM deficits limit their ability to consider how the audience would respond and also hinders their ability to recognize that their audience is completely uninterested. The research devoted to understanding ToM in individuals with autism is overwhelming while offering many answers. That said, there is also evidence that indicates similar changes in ToM in children who are Deaf (Peterson, 2002; Peterson et al., 2005; Peterson, Wellman, & Slaughter, 2012).

The Merriam-Webster Dictionary (2013) defines deafness in the medical sense as "lacking or deficient in the sense of hearing." Within the culture, though, there is a strong distinction between "deaf" and "Deaf" amongst people who cannot hear. The following is an excerpt from the book *Deaf in America: Voices from a Culture* (1988) in which the authors Carol Padden and Tom Humphries summarize the difference most effectively:

“We use the lowercase deaf when referring to the audiological condition of not hearing, and the uppercase Deaf when referring to a particular group of deaf people who share a language – American Sign Language (ASL) – and a culture. The members of this group have inherited their sign language, use it as a primary means of communication among themselves, and hold a set of beliefs about themselves and their connection to the larger society. We distinguish them from, for example, those who find themselves losing their hearing because of illness, trauma or age...” (p. 183).

This information coincides nicely with research conducted by Peterson and colleagues until as recently as 2012. Early tests examining ToM in deaf children of hearing parents revealed that approximately 90% of those children had delayed ToM (Marschark, 1993 as cited in Peterson et al., 2005). The delays seen in these deaf children were similar to the ToM delays seen in children on the autism spectrum. This pattern of deaf children showing signs of the same delayed ToM as autistic children yet possessing “normal intelligence” can also be seen in many different countries who educate deaf children differently and also use different sign languages (Peterson et al., 2005). However, as Peterson et al.’s (2005) study reveals, communication is an important aspect with regards to ToM. Peterson et al. (2005) sought to gain a better understanding of ToM in children with autism and deaf children compared to their “normal” developing peers with regards to five components: diverse desires, diverse beliefs, perceptual access to knowledge, false belief, and hidden emotion. Results from their study revealed that ToM development was not delayed because of deafness but because of a “linguistically deprived environment” (Peterson et al., 2005). In other words, language and language development is essential to developing abstract thinking such as recognizing mental states. Specifically, Peterson et al. (2005) found that Deaf children from Deaf families, exposed to sign language and constant communication, have performed much better on standard ToM tests compared to other deaf children who were late to learn a sign

language or who grew up in oral settings (Peterson et al., 2005). Thus, according to the words of Padden and Humphries, Deaf children – who have mentors who are Deaf and are immersed into Deaf culture and ASL – fare better than deaf children when ToM is tested, making communication an extremely important element in a child's development. It is not the simple fact that these children are deaf that correlates to low scores, but instead it is because language was not readily available at the most necessary times of their lives. The same principle can be applied to children with autism. Children with autism grow up in a world in which information is shared and gathered in ways that are foreign to them. Thus, delayed ToM in children with autism could also be attributed to deprivation of solid linguistic interaction.

Although deafness and autism are clearly two distinct entities by definition, the warning signs of both are very similar and as a result, doctors often misdiagnose one for the other. For example, a Deaf child may be diagnosed severely autistic only because it seems that comprehension and receptive abilities are lacking and a hearing test is simply not administered or an individual is only diagnosed with deafness because a physician ignorantly explains away atypical behavior as characteristic of being deaf, failing to consider autism. If it is so easy to confuse individual diagnoses, how often are the two occurring together? How often do deaf children get diagnosed with autism or how often does a child with autism go deaf? What are the complications of such an occurrence? As it turns out, a comorbid diagnosis is very complex and difficult to come by and as a result, statistics vary from throughout the research on what exactly the comorbid prevalence of deafness and autism truly is.

Szymanski and Brice (2008) reported on the results of the 2006-07 version of the

Annual Survey of Deaf and Hard of Hearing Children in Youth put out by Gallaudet Research Institute. Results from this survey concluded that 469 deaf and hard of hearing children in the US also had autism. This translates to about 1 in 76. In 2008 the estimated prevalence of autism in hearing children was about 1 in 150 so this was a startling statistic – almost twice the national prevalence rate! Also, the data of this particular study was skewed because not every deaf person was surveyed so the data is perhaps an *underrepresentation*. More recent estimations define the prevalence rate to be almost identical to that of the general, hearing population, which is about 1 in 91 (Kogan et al. 2009 cited in Shield, 2011). In 2012, Szymanski, Brice, Lam, and Hotto (2012) set out to find a prevalence rates for the co-occurrence of autism and other disabilities, including deafness. Szymanski et al. (2012) used data collected from the 2009–2010 Annual Survey of Deaf and Hard of Hearing Children in Youth that the Gallaudet Research Institute sends out each year. Data from a total of 37,828 Deaf and Hard of Hearing Children was received from school-based administrators. Survey data indicated that 39.9% (n=12, 595) of all deaf children included in the Annual Survey were reported to have an additional disability in general. Of those, 1.9% (n=611) reported a diagnosis of autism and hearing loss, most often in males (ratio 3:1). Overall, the prevalence rate of ASD in deaf children as reported by schools was 1 in 53 deaf children also had a diagnosis of autism. The comorbid rates vary dramatically between researchers and from year to year. Because both autism and deafness sometimes present themselves in children in similar ways, the diagnostic process becomes clouded. Of even greater concern, though, is the fact that there exists no official method of testing a deaf child for autism. In fact, the Autism Diagnostic Observation Schedule, one of the key instruments used in diagnosing autism,

says specifically that it is *not* to be used with children who are deaf. The instrument tests all the criteria for determining autism including communication. The test, however, succeeds in only observing spoken communication – a task that may prove to be especially difficult for a child who is also deaf (Szymanski & Brice, 2008).

The core challenges associated with ASD include motor, social, and communication challenges. These challenges might prove to be even more troublesome if the child was also deaf. Sign language – a visual language using various handshapes, facial expressions, and gestures – is often used by deaf people to communicate. In order for deaf children to learn and communicate with sign language, imitation of sign is necessary. Based on ToM research, imitation in and of itself might prove to be difficult since it requires taking on another's point of reference. But as Cossu et al. (2012) point out, imitation might prove to be difficult because of the lack of motor capabilities sometimes associated with ASD. In this study, Cossu et al. (2012) investigated possible damage to the Mirror Neuron Mechanism in children with autism compared to two control groups of children matched for chronological age, and chronological younger age, respectively. They were asked to perform the imitation of actions tasks, production of pantomime tasks, and comprehension of pantomimes tasks. Overall findings suggest that in children with ASD, motor cognition was significantly worse than both chronologically matched controls and controls of younger chronological age. Also, results showed that children with ASD found it especially difficult to make a motor plan and understand the “why” of a comprehension action unless context is provided. Further, children with ASD had trouble labeling the “what” of a pantomime action when context clues weren't available. Thus, perhaps children with ASD simply do not have the necessary skills that

come from experience related to motor cognition and planning, which are essential skills for the use of signed languages. The challenges are seen first-hand in Shield and Meier's (2012) study. In this study, the sign parameters of location, movement, palm orientation, and handshape were coded and judged for correctness. Overwhelmingly, results indicated that palm-reversal errors to be the most common type of error while in conversation and when asked to fingerspell words, as much as 40% of the time! Shield and Meier (2012) attribute the overwhelming tendency for the Deaf children with ASD to engage in palm orientation reversal to self-other mapping failure, or for the purposes of this paper, lack of ToM.

The ability to pick up on certain social cues is a necessity for social success. It is already understood that children with autism sometimes find it difficult to zero in on these often finite but necessary cues. But do deaf children of typical cognition have the same difficulties? According to one study by Ludlow, Heaton, Rosset, Hills, and Deruelle (2010), they do. In this study, both deaf children and controls were shown happy, sad, and angry faces in upright and inverted positions. Results indicated that deaf children were less able than the controls to perform emotion recognition on the faces of the static flashcards. Bradley, Krakowski, and Thiessen (2008) contend that, as with hearing children on the spectrum, social skills must be directly taught to deaf children with autism possibly due to challenges with imitation. And so, ToM plays another role the challenges associated with autism.

Much research exists concerning communication challenges seen on the autism spectrum from defining the problems to addressing the problems. However, as with other areas, research investigating the communication challenges deaf children on the spectrum

experience is also limited. Paradoxically, it is impossible to discuss the communication challenges that deaf children with autism face without also mentioning motor and social challenges. Sign language is a form of communication often used by people who are deaf. To the common outsider, sign languages look like random acts of hand-flapping but any culturally Deaf person will explain that the language is much more complex in that one must employ space, gesture, and even eye gaze in order to accurately send and receive messages from other users. One core way that autism may affect communication in Deaf persons is with regards to facial expression. Facial expression is essential in sign language. Many ideas are represented with the same sign or handshape and only differ and are able to change meaning because of the expression and eye gaze used (Reilly, McIntire, & Bellugi, 1990 as cited in Ludlow et al., 2010). Further, facial expressions in sign languages are also a key element in recognizing proper grammar (Ludlow et al., 2010). A common characteristic for autism spectrum disorders is that there is a “reduced tendency” to pay attention to faces and expression. Specifically, an individual with autism may refuse to or not be able to ever look another person in the eye (Dawson, Webb, & McPartland, 2005 as cited in Ludlow et al., 2010). Therefore, a Deaf individual who relies heavily on facial expression for clues of comprehension and context would have a difficult time communicating both expressively and receptively if they also had autism. Deaf children with autism encounter other problems related to the perspective taking required when using sign languages – ASL in particular. In ASL, the signer and “listener” do not share the same visual perspective with regards to the signs being produced because they are usually facing each other. Thus, in order for comprehension of the message to occur, individuals using ASL must learn to take on the visual perspective

of others. As Baron-Cohen, Leslie and Frith (1985) point out, however, this process requires use of ToM which has already been determined to be delayed in individuals with an autism spectrum disorder (cited in Shield, 2011). Thus, a Deaf child with autism may have an especially hard time communicating, specifically when trying to express or comprehend that which is greatly space oriented. Perspective taking is also important when a Deaf child is learning signs for the first time. Children learn signs by mimicking their teachers which could be particularly problematic for Deaf children who also have autism as a common characteristic of autism spectrum disorders includes difficulties in motor coordination (Shield, 2011). Thus, the logic is circular and intensely multifaceted such that whatever motor difficulties and social challenges a deaf individual on the spectrum faces will most certainly affect their ability to communicate.

The purpose of the current survey study was to gain insight into which challenge(s) associated with autism have the most adverse affects on deaf children with autism based on the perspective of administrators from schools for the deaf in the United States. Due to the complexities associated with sign language and the resulting circular tendency for motor and social challenges to then affect communication in general, it was hypothesized that professionals and administrators of schools for the deaf would indicate communication to be the most challenging aspect for deaf children with autism.

Method

Participants

Participants for the study included educative and administrative staff of Deaf residential schools across the United States. A complete list of these residential schools

were found through the Laurent Clerc National Deaf Education Center at Gallaudet University's website, a center that strives to provide information and assistance for parents and professionals so that the needs of children from birth to 21 who are deaf or hard of hearing (Schools and Programs, n.d.). Each school's website provided by the Laurent Clerc Center was individually visited and an administrator was selected for participation in the survey study. It should be noted that some school's websites failed to provide a complete list of faculty and instead a generic email address was provided for the institution. If this was the case, that generic email was selected for participation in the survey study.

Survey Instrument

A unique survey was created for this study. Using the online survey generator called Survey Monkey, a series of ten questions were devised in order to assess the educator and administrator perceived effects of Autism Spectrum Disorder on deaf students. Survey Monkey allowed for the creation of "pages" with a new page of question(s) not appearing until after the previous was submitted. Page 1 of questions asked (Q1) the participants' position at the school, (Q2) how long the participant had held their current position at their school, (Q3) and how long the participant had been working with deaf students in general. Page 2 of questions was more related to the deaf students of the participants' schools and asked the participants (Q4) how many children on the autism spectrum had been taught at their school in the last 10 years and (Q5) what the age ranges of those children were. Page 3 of the survey consisted of a single question (Q6) and asked the participants to list and briefly describe up to five qualities, characteristics, and/or behaviors they, based on their experience as administrators, had found to be most

unique for their deaf students on the autism spectrum. Page 4 also consisted of a single question (Q7) that asked participants to rank six challenges associated with ASD per DSM-5 guidelines from 1 – 6, where 1 is least challenging and 6 is most challenging. Specifically, the question asked “To the best of your knowledge, did/do these children with ASD seem to present more difficulties/differences in areas of motor coordination, sensory differences, repetitive behaviors, communication, social interaction, or imagination/flexible thinking? Question 6 and Question 7 are very similar in that they both address and ask for administrator feedback concerning challenge areas for children who are both deaf and have autism. However, the order the questions were asked is very important to note. Question 6 was asked before Question 7 in order to obtain administrator input prior to being influenced by information presented in Question 7. By placing Question 7 on a separate page, reactivity issues were avoided. Page 5 consisted of only Question 8 (Q8) which invited participants to describe the methods they had found to be most effective in helping deaf students with autism manage the challenges described in Questions 6 and 7 and learn. Participants were invited to list and describe up to ten methods. Pages 6 and 7 of the survey contained Questions 9 (Q9) and 10 (Q10), respectively, and addressed communication strategies directly. Question 9 asked the participants to describe whether the use of American Sign Language – which is typically used for instruction and communication in schools for the deaf – seemed to improve communication abilities in children with autism or if it was more likely that motor coordination or other difficulties kept the children from signing. Lastly, Question 10 (Q10) asked the participants which method of communication worked best with their students who were both deaf and had a diagnosis of autism. Participants were given three

choices: (1) American Sign Language (ASL), (2) Picture Exchange Communication System (PECS), and (3) Other (please specify).

Procedure

In March of 20213, after approval from the Institutional Review Board of Eastern Kentucky University was obtained, the survey was sent via email through the online Survey Monkey system so that responses could be collected anonymously. A survey link was sent to an administrator of each school for the deaf in the United States. Seventy-eight such schools were identified. Sixteen voluntarily chose to complete the survey resulting in a 20% response rate.

Results

The purpose of this survey study was to gain knowledge as to which challenges associated with autism become even more challenging when a child is also deaf. It was predicted that administrators of deaf schools would more often describe communication to be the most difficult challenge of autism for their deaf students.

Page 1 Survey Results: Position, Length Serve, Experience

Sixteen survey responses were received. Positions at the school for respondents included the following: Principal (5 respondents), Director (4 respondents), President/CEO (2 respondents), Teacher (2 respondents), and the following single respondent positions: Special Needs Team Leader, Speech Language Pathologist, and Assistant to the Superintendent. Respondents reported having held these current positions for an average of 5.8 years, with a range between 1 and 27 years. Respondents were also asked how long they had been working with deaf students. The average of years of experience with deaf students was 21.1 years.

Page 2 Survey Results: Prevalence and Age Range

Respondents were asked how many students with a diagnosis of ASD had been taught at their school in the past 10 years. The average number of students was 16.9, ranging from 3 to 45. Many responses included qualifiers such as “about”, “approximately”, and “hard to say”, indicating that providing this estimate was not automatic and further illustrates the fact that diagnosing ASD in deaf children is quite complex (Szymanski and Brice, 2008; Kogan et al. 2009; Shield, 2011; & Szymanski et al., 2012).

Age ranges of the deaf students on the autism spectrum served at respondents’ schools varied, but the following description captures the range. Ten schools served the whole range of children covered under the Individuals with Disabilities Education Act (IDEA) — from early childhood to 21 years of age. Two schools specialized in the middle to early high school range; two specialized in preschool to middle school, and one was for preschool-aged children only. One respondent left this question blank.

Page 3 Survey Results: Challenges – Qualitative Data

Webster-Stratton and Spitzer (1996) describe the qualitative method of grounded theory as a useful way to analyze qualitative data. This method is useful in that it allows researchers to organize qualitative data into categories that share a common conceptual theme. This method was used in order to analyze the results obtained from Question 6 which asked participants to list and briefly describe up to five qualities, characteristics, and/or behaviors they had found to be most unique for their deaf students on the autism spectrum. Based on criteria for autism spectrum disorder described in the DSM-5, three

core categories were determined and used as an encoding system for autism characteristics that the administrators reported. All characteristics created and named by participants of this survey study could be grouped into these Core Categories. The following are the three broad areas:

Social-Communication
Sensory-Repetitive Behaviors and Interests
Associated Features

Within these 3 broad categories, responses could also be subdivided into the following behavioral groups and are discussed below. Refer to Table 1 for a complete breakdown of categories, their respective subcategories, and number of responses in each.

Social-Communication

Communication and Language Challenges. Responses in this category (n=7) were related to problems/difficulties with or extreme delays in communication. One respondent specifically wrote that the deaf students with autism at their school had difficulties with learning ASL.

Social Challenges. Responses in this subcategory (n=10) were placed in this category because they illustrate social-behavioral difficulties of ASD per DSM-5 guidelines. A few respondents (n=3) indicated poor eye contact as a unique challenge for their deaf students with autism. The other responses (n=7) were related to social difficulties with other students (e.g., “enjoys parallel activities next to other students,” “withdrawn from peers; preferring to play alone,” and “often do not like to socialize with other students”).

Sensory-Repetitive Behaviors and Interests

Compulsive and Repetitive Behaviors and Play. Responses in this subcategory (n=6) are those that participants mentioned that were indicative of general and play behaviors that tended to be compulsive and repetitive in nature (e.g., “narrow range of play behaviors” and “show repetitive or routine behavior”).

Behaviors Relating to Sensory Sensitivity/Differences. Grouped into this subcategory (n=7) are responses that indicate sensitivity to certain sensory inputs and other sensory differences (e.g., “body rocking,” “hand flapping,” “tactile defensiveness,” and “easily over-stimulated”).

Schedule and Structure need. There were several responses (n=7) from participants that indicated transition difficulties and the need for daily structure were unique challenges for their deaf students with autism (e.g., “do not like when [the] schedule changes,” “likes rules,” “need for visual schedules,” and “need for strong, clear behavior plan”).

Associated Features

Emotional-Behavioral Challenges. This subcategory was created for the four responses related to other emotional issues (e.g., “atypical (odd) behaviors,” and “elopement”).

Cognitive and Learning Differences. Responses in this category (n=4) are related to differences in cognitive functioning and/or difficulties in school (e.g., “good memory – visual,” “. . . difficulty with developing self-care skills,” and “struggle academically in at least one area”).

For Question 7 of the survey, participants were presented with 6 possible categories of challenges, as drawn from DSM-5 criteria. These included Communication, Motor Coordination, Social Interaction, Sensory Differences, Repetitive Behaviors, and Imagination/Flexible Thinking. Analysis indicated that Communication was most often ranked as the most challenging aspect of behavior and development. Fifty-five % of respondents (n=6, as five participants skipped this question) ranked Communication highest. In other words, over half of the participants selected Communication as the most challenging area of difficulty for their deaf students on the autism spectrum. In order, the next most frequently chosen challenging behaviors were Social Interaction Challenges (given a rank of 5 by 36.36% of participants), then Imagination/Flexible Thinking (given a rank of 4 by 27.27% of participants), Repetitive Behaviors (given a rank of 3 by 36.36% of participants), and then Sensory Differences (given a rank of 2 by 36.36% of participants). Motor coordination was least often ranked as challenging (given a rank of 1 by 45.45% of participants). See Figure 1.

Notably, there were no respondents that chose Sensory Differences and Motor Challenges as the most challenging area, even though this area was selected by respondents and received a total of n=20 responses when asked to express and describe challenging behaviors (see Question 6 results).

A Chi Square statistic was calculated to assess whether participants selected one behavior more than others as most challenging. Results from the Chi Square Test (n=10) indicated a score of 18.24, with degrees of freedom 5 and $p < 0.003$. Results that Communication was selected most often as most challenging was statistically significant according to the Chi Square Test. This provides evidence against the null hypothesis and

suggests that participants did find communication to be the most challenging behavior for their students with probability of results due to chance less than 1%.

Page 5 Survey Results: Effective Methods

For Question 8 of the survey participants were invited to describe some of the techniques (up to ten) they found to be most helpful in managing the challenges that their students diagnosed with autism face and help them learn. Participants mentioned a total of sixty-three techniques. After data were collected, patterns of responses emerged and the qualitative method of grounded theory was used again to organize responses into the following ten domains:

- Visual schedule and checklists
- Processing time
- Communication strategies
- Environmental structure and routine
- Behavioral
- Social assistance/instructive
- Staff/parental resources
- Sensory
- Teacher/student ratio
- Specialized instructive techniques

When the following categories emerged, we noted that most of them could be grouped as specific strategies aimed at addressing the core characteristics of autism spectrum disorders. The remaining categories were general intensity of education and support categories. Refer to Table 2 for a complete breakdown of categories, their respective subcategories, and number of responses in each. When grouped into core autism characteristics and intensity of instruction areas, the categories appear as follows:

Social-Communication

Communication Strategies. Responses that belong to this subcategory (n=5) include those that participants mention help facilitate and improve communication abilities in their deaf students with autism (e.g., “use of ASL,” “communication cards or choice boards”). Perhaps the most interesting response was “less complex expressive communication adult to student.” It is unknown if the school for the deaf that this response came from uses ASL as its primary method of communication. However, if this particular school does primarily use ASL, this response is of certain interest since it specifically references using a *less* expressive approach for its deaf students with autism.

Social Assistance/Instructive. Responses in this subcategory (n=6) indicate methods that participants use in order to instruct social skills both directly and indirectly (e.g., “direct instruction on social skills [through the] classroom, social stories,” and “narrative storytelling (teaching them story through fairy tales”).

Sensory-Repetitive Behaviors and Interests

Visual Schedule and Checklists. Responses in this subcategory (n=8) are all very similar to each other and highlight the use of “picture cues” and “to-do task checklist[s]” as useful techniques to help students overcome challenges.

Environmental Structure and Routine. Certain responses (n=12) were placed in this category because they mention techniques that revolve around the students’ environment and need for structured routine (e.g., “advanced warning of changes to the daily schedule when possible,” “calming classroom environments,” and “uncluttered and minimal visuals in [the] classroom”).

Sensory. Three of the participants' responses were put into the subcategory of sensory techniques and included responses such as "sensory breaks," "brushing," and "occupational therapy."

Associated Features

Processing Time. Three more responses from the survey mentioned the use of processing time strategies for both student and teacher (e.g., "time to process," "patience [from teacher]," and "wait time (from 30-90 seconds, allows them time to locate the answer in their heads)").

Behavioral. Responses in this subcategory (n=9) included techniques that address behavioral difficulties (e.g., "simple behavior consequence charts," and "positive reinforcement"). Interestingly, two different respondents specifically mentioned the use of ABA strategies – Applied Behavioral Analysis strategies – that are designed to reinforce or eliminate certain behaviors.

Instructional Individualization and Intensity

Staff/Parental Resources. Several responses (n=8) about useful techniques were directly related to the staff of the institution and how they worked with the students (e.g., "staff remaining calm when working with [the] student," "teachers who understand autism," and "working with parents").

Teacher/Student Ratio. Four responses indicated that a certain student-teacher ratio was an important consideration and useful technique when working with deaf students with autism (e.g., "one-on-one assistance," and "group learning activities").

Specialized Instructive Techniques. It was clear from a few responses (n=5) that there are certain techniques that can be specialized for the student in order to help them learn (e.g., “story maps,” “video modeling,” and “repetition of tasks and information”).

Page 6 Survey Results: American Sign Language

Based on their experience, participants were asked whether the use of ASL seemed to improve communication abilities in their students diagnosed with autism or whether they believed that motor coordination difficulties hindered the children from being able to sign effectively. Ten participants answered this question and six participants skipped. Forty percent (n=4) of the results indicated that ASL was beneficial for the students' learning (e.g., “ASL is the language of their lives,” and “ASL is a godsend”). One participant said that they did “not [have] much success teaching ASL” but failed to elaborate further as to whether motor coordination was the reason ASL had not been incorporated successfully. Fifty percent of participants (n=5) gave responses that indicated that some students benefitted from the use of ASL while others struggled with that particular method of communication (e.g., “varies,” and “Depends on the student”). One respondent specifically addressed the fact that “sometimes motor control interferes [with communication through ASL].” A Chi Square goodness of fit test was conducted to assess whether participants chose one of these three categories at a significantly higher rate than would be expected given random selection. Results did not show a significant difference between participant choice for the 3 categories ($X^2 = 2.60$, $df = 2$, $p < 0.2722$). Future research with a larger sample size and/or controlling for student variables such as cognitive functioning level or visual impairment may offer further insight on this question.

Page 7 Survey Results: Best Communication Method

A total of eleven responses were collected. When asked which method of communication seemed to work best, three respondents answered ASL, four respondents answered with Picture Exchange Communication System (PECS), and four respondents answered with the category of “Other” and were asked to please specify. Responses centered on a common theme: that a total communication approach seemed to work best. In other words, the use of several methods of communication (ASL, PECS, communication boards, even spoken language) worked best in certain situations when communicating with deaf children with autism. Again, A Chi Square goodness of fit test was conducted to assess whether participants chose one of these three categories at a significantly higher rate and not due to chance. Results were not significant between participant choices for the 3 categories ($X^2 = 0.184$, $df = 2$, $p < 0.9123$).

Discussion

The current study was able to determine from the self-report data collected from Question 6 that Sensory-Repetitive Behaviors and Interests are the most unique difference found in deaf students with autism as reported by the participants who are educators for the deaf. These results fail to support the proposed hypothesis, which predicted communication to be the most challenging factor for deaf students with autism. That said, when participants were asked to rank six challenges that were provided, over half of the respondents ranked Communication as the most challenging aspect for their deaf students with a diagnosis of autism, a result that was shown to be statistically significant. With the results from these two questions asked, we can at best conclude that the hypothesis is partially supported. What can ultimately be concluded, though? Is it possible to conclude that communication is *the* most challenging aspect that deaf children

with autism face? I do not believe it is that simple to conclude. With regards to deaf children with autism, the logic becomes circular. Joint attention, flexible thinking and ToM difficulties, motor clumsiness, repetitive behaviors, and social awkwardness were all responses awarded by one participant or another – in one form of the question or another – as “the most challenging” hurdle for deaf students with autism. Seventy percent of respondents found ASL or a total communication approach to be the most effective method of communication for their students (see Question 10) and thus, all of the differences previously listed (joint attention, flexible thinking, etc.) all contribute towards communication in the end.

Further complicating matters is the question of identity. Are these students Deaf and have autism or do these students with autism just happen to be deaf as well? Research indicates that recently, these children are being viewed as Deaf first because of the importance of education. Furthermore, parents often fight with the school boards to keep their Deaf child with autism out of a special needs program for hearing children and instead in an educational environment in which communication revolves around Deaf culture as an attempt to keep communication the focus for these children since sign language as a “communication approach . . . not only enhances communication but also improves behavior, social skills, and self-regulation” (Miller and Funayama, 2008). Szymanski et al. (2012), too, said that the communication opportunities available in deaf residential schools promoted better behavior and social inclusion.

Certainly awareness needs to be raised and appropriate diagnostic tools developed in order to ensure the best management and education for this very special population of students. It is important for all educators to be made aware of the challenges associated with autism since they can potentially be more so for deaf students with autism. This is

also true for mainstream teachers – those not in deaf residential schools – since not all parents recognize that these children should identify as deaf first and, as a result, place them in regular public school.

There were several strengths associated with this study. First of all, this is a relatively unexplored area of study. This was the initial exploration into the concerns and resources of a small group of administrators and teachers to deaf children. Thus, any information provided from results from the survey is beneficial to advancing knowledge in this area. Secondly, there was no deliberate bias of the sample used. This was a national survey study and therefore, the only bias that exists is based upon those that chose to respond to the survey sent to them. Lastly, because this study gathered mostly qualitative data we have the ability to infer what the concerns are for deaf children with autism based on administrative perspective and which methods are helpful for this population so that future research can design studies around these aspects.

Despite the strengths of the study, there were certainly several limitations. While surveys were intentionally and initially sent via email to someone who the researcher perceived to be administrative superior, it is possible that the surveys were forwarded on to someone else in the school. Thus the reason why respondents report such variability could be position at the school. Secondly, although the survey was sent to a sample of over seventy schools for the deaf, only sixteen people actually responded to the survey. Furthermore, the survey was designed in such a way that participants had the opportunity to skip questions and as a result, some surveys were incomplete, making the sample size even smaller. A third limitation is with regards to the qualitative method of grounded theory that was used to analyze the qualitative responses obtained from participants.

While this method is useful in chunking categorical responses provided by survey data, it is susceptible to subjectivity and bias by the researchers and data analysts.

It is highly encouraged that future research investigates the communication challenges further. Future research is needed in order to determine why ASL is sometimes not the best method of communication. There are cultural considerations to take into account. For example, if these children identify as deaf first, ASL must be adopted in order to maintain their “Deaf” identity, according to Padden and Humphries. Further research should explore whether motor clumsiness, social ineptness, cognitive delays, or a combination of each is the reason why ASL is sometimes unsuccessful. More insight into this topic could tremendously help educators teach these young people more efficiently while also instilling their culture into them.

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Table 1.

Qualitative Categories of Challenges Described by Educators of Deaf Children with ASD

Core Categories	Sub-Categories	n
Social Communication	Communication and Language Challenges	7
	Social Challenges	10
Sensory-Repetitive Behaviors and Interests	Compulsive and Repetitive Behaviors and Play.	6
	Behaviors Relating to Sensory Sensitivity/Differences	7
	Schedule and Structure need	7
	Emotional-Behavioral Challenges	4
Associated Features	Cognitive and Learning Differences	4

Table 2.

Qualitative Groupings of Effective Methods Used to Help Students Learn Described by Educators of Deaf Children with ASD

Core Categories	Sub-Categories/Domains	n
Social Communication	Communication Strategies	5
	Social Assistance/Instructive	6
Sensory-Repetitive Behaviors and Interests	Visual Schedule and Checklists	8
	Environmental Structure and Routine	12
	Sensory	3
Associated Features	Processing Time	3
	Behavioral	9
Instructional Individualization and Intensity	Staff/Parental Resources	8
	Teacher/Student Ratio	4
	Specialized Instructive Techniques	5

Figure 1. Quantitative Responses of Challenges Described by Educators of Deaf Children with ASD

