

Research Article

Instruction Using Augmentative and Alternative Communication Supports: Description of Current Practices by Speech-Language Pathologists Who Work With Children With Autism Spectrum Disorder

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Purpose: The aim of this research study was to examine common practices of speech-language pathologists (SLPs) who work with children with autism spectrum disorder (ASD) with respect to whether or not SLPs consider processing differences in ASD or the effects of input during their instruction.

Method: Following a qualitative research method, how SLPs instruct and present augmentative and alternative communication systems to individuals with ASD, their rationale for method selection, and their perception of the efficacy of selected interventions were probed. Semistructured interviews were conducted as part of an in-depth case report with content analysis.

Results: Based on completed interviews, 4 primary themes were identified: (a) *instructional method*, (b) *input provided*, (c) *decision-making process*, and (d) *perceived efficacy of treatment*. Additionally, one secondary theme, *training and education received*, was identified.

Conclusions: Clinicians reported making decisions based on the needs of the child; however, they also reported making decisions based on the diagnostic category that characterized the child (i.e., ASD). The use of modeling when teaching augmentative and alternative communication to individuals with ASD emerged as a theme, but variations in the method of modeling were noted. SLPs did not report regularly considering processing differences in ASD, nor did they consider the effects of input during instruction.

Augmentative and alternative communication (AAC) is an evidence-based form of assistive technology that uses both unaided and aided forms of communication for individuals with complex communication needs (CCN). AAC systems can vary from low-tech/no-tech—including picture cards and letter boards—to high-tech systems that include speech-generating devices (SGDs). A specific AAC system is identified for each individual with CCN through careful evaluation of an individual's skills and needs. Individuals who may benefit from the use of

AAC include those diagnosed with apraxia of speech, cerebral palsy, traumatic brain injury, aphasia, progressive degenerative diseases, and various developmental disorders, including autism spectrum disorder (ASD).

ASD is a neurodevelopmental disorder that can have a significant impact in an individual's adaptive living skills and ability to use social communication. A diagnosis of ASD is characterized by lasting and persistent impairments in social language and social development, behaviors that are restrictive and/or repetitive in nature that affect daily routines, and an onset in early childhood (American Psychiatric Association, 2013). Individuals with ASD experience a wide array of social, cognitive, and language differences. These individuals have persistent speech and language deficits that may include limited verbal output, with approximately 30% of individuals having limited expressive language skills (Tager-Flusberg & Kasari, 2013).

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Because of their significant communication needs, individuals with ASD with limited expressive language require the use of AAC supports.

AAC supports commonly include visual stimuli that are paired with auditory input during instruction, requiring competency in both visual and auditory perception and processing and the integration of these two input modalities. Differences in visual and auditory perception and processing as well as difficulty with integration of multiple modalities have been reported for individuals with ASD (Baum, Stevenson, & Wallace, 2015; Simmons et al., 2009). Therefore, differences in auditory and visual perception and processing may have an impact on the efficiency of AAC supports when used with individuals with ASD.

The integration of multiple perceptual modalities has been reported to be particularly problematic for individuals with ASD (J. G. H. Williams, Massaro, Peel, Bosseler, & Suddendorf, 2004). For example, some of the reported perceptual integration difficulties for individuals with ASD include the inability to integrate flashes of light with sound beeps like typically developing peers (Stevenson et al., 2014), variations in brain activation as measured through functional magnetic resonance imaging studies during dual-task performance (García-Villamizar & Sala, 2002), and problems with detection of the synchrony of auditory streams of speech with oral motor movements (Righi et al., 2018). Additionally, Stevenson et al. (2015) found that individuals with ASD were less likely to recognize the synchronicity of dual inputs and displayed a preferential eye gaze to information that was presented with less synchrony, in the order of visual before auditory information.

The complex information processing model of ASD (Minshew, Goldstein, & Siegel, 1997) argues that the additional demands for integration of multimodal information lead to decreased and larger variation in performance for participants diagnosed with ASD as compared to age- and ability-matched typically developing peers. Individuals with ASD are thought to rely on lower order or more basic information processing strategies that use reduced neural networks (Minshew & Williams, 2007). As information processing demands increase, as occurs when multiple types of information must be integrated, then the processing demands surpass the processing capacity of the individual with ASD, resulting in degradation of performance (D. L. Williams, Goldstein, & Minshew, 2006).

The differences in visual and auditory perception and processing as well as integration of multiple modalities may have clinical implications for the way we present AAC systems to individuals with ASD. Many forms of modeling the use of AAC, such as System for Augmenting Language (Ronski, Sevcik, Robinson, & Bakeman, 1994), aided language stimulation (ALS; Goossens', 1989; Harris & Reichle, 2004), or aided AAC (Binger, Maguire-Marshall, & Kent-Walsh, 2011), include dual input. For example, ALS uses a decreased rate of speech with points to a small number of graphic symbols (Goossens', 1989); however, the visual and auditory input is presented simultaneously. Aided AAC modeling includes multiple forms of input,

including verbalizations from the communication partner, vocal output from the individual's SGD, and the visual stimuli of the communication system itself (Binger, Berens, Kent-Walsh, & Taylor, 2008). Therefore, the consideration that speech-language pathologists (SLPs) give to methods of presentation when implementing AAC supports with individuals with ASD is of interest—specifically manipulation of multimodal inputs.

Much of the current research in the field of communication sciences and disorders related to augmentative communication combines users of AAC based on specific educational, skill, and/or age ranges rather than by diagnostic category (Binger, Kent-Walsh, Ewing, & Taylor, 2010; Tönsing, Dada, & Alant, 2014). By combining diagnostic groups into a broader category such as CCN, specific variables (i.e., method of input) that may affect individuals related to their underlying learner characteristics are not examined. For example, a study completed by Drager et al. (2006) included two individuals with ASD, with noted improvement in language skills, but did not specifically address the effects of variables such as modality or synchronicity of input that may have differentially affected the performance of the individuals with ASD.

Although the use of language modeling is the gold standard for AAC instruction, there is limited research that focuses on the specific effects of auditory and visual input on individuals with ASD when implementing and instructing the use of an AAC system (Allen, Schlosser, Brock, & Shane, 2017). Furthermore, little is known about the specific method of implementation used by SLPs in typical practice with individuals diagnosed with ASD (Allen et al., 2017; Ganz, 2015). It is not known whether SLPs consider potential problems with processing or integration of auditory and visual information when instructing children with ASD on the use of AAC systems. It is also not known whether any specific adaptations to typically used methods are made related to potential learning differences in individuals with ASD.

The current study was proposed to determine what is currently occurring when SLPs are working with individuals with ASD who use AAC supports, specifically whether or not SLPs consider processing differences in ASD or the effects of modality and synchronicity of input during their instruction. Although many researchers have provided evidence-based practices for the use of AAC, it is not clear how these practices are implemented and adapted by clinicians based on specific learner characteristics. The aim of this research study is to provide information on what is occurring during routine practice by SLPs who work with individuals with ASD who benefit from AAC strategies. This information is needed to guide future efficacy research in AAC implementation and modeling with individuals with ASD.

The specific research questions that were addressed in this study were as follows:

1. What specific methods are SLPs using when providing instruction on the use of an AAC system to individuals with ASD?

2. What is the rationale for method selection?
3. Does the client's diagnosis of ASD affect their decision?
4. What is the perceived efficacy of the method that is used?

Method

The current study was conducted according to a qualitative research paradigm, under the social constructivist framework, using an in-depth case report with content analysis. This approach allowed the researcher to discover “in-practice” behaviors of SLPs who work with individuals with ASDs who communicate using AAC. The constructivist paradigm in qualitative research is a method of inquiry that relies on reflection to determine individual truths or daily realities, which is the primary focus of this study (Ponterotto, 2005). The social constructivist approach was appropriate for this study because of its reliance on the realities of participants, the focus on context (i.e., work as an SLP), and the mutual relationship between the researcher and participants based on previous experiences (i.e., background working as an SLP; Walker, 2015). The SLPs participated in semistructured interviews. During these interviews, information was collected regarding (a) what specific methods of implementation are used when modeling an AAC system to individuals with ASD, (b) reasons for method selection, and (c) perceived benefit of the selected method. The responses from the completed interviews were transcribed and then analyzed and coded for themes to describe the current practices of SLPs with this population.

Procedure

SLPs who work with individuals with ASD who communicate using AAC supports were recruited by posting information about the study on online forums and social media outlets (i.e., Facebook groups and American Speech-Language-Hearing Association [ASHA] Special Interest Group postings). SLPs were screened by the first author for inclusion criteria (see Participants section). Following the screening, SLPs who met the stated requirements participated in a one-time, semistructured interview, which was based on Benson (2010). Interview questions included specific methods of instruction used, rationale for method selection, perceived effectiveness of the method, knowledge in language modeling (trainings received, etc.), and diagnostic implications for method selection. After data collection was completed, the audio recordings were transcribed and stored for later coding and data analysis. A detailed description of each element of the procedures is provided in the following sections.

Participants

Purposive sampling of SLPs that focus on the implementation of AAC systems with individuals with ASD was completed. In addition to requiring that the SLP be working with individuals with ASD, the respondents were required

to hold a state license for their location of practice and national certification in speech-language pathology (i.e., ASHA's Certificate of Clinical Competence). An initial sample size of five to 10 SLPs across various locations and settings was proposed. Participant recruitment and interviews continued until data saturation was met, characterized by consistent themes with no new themes emerging. Final sample size was nine SLPs from six states within the United States. Specific demographic information is provided in Table 1.

The SLPs who were interviewed ranged in age from 27 to 39 years ($M = 32.7$ years). All participants were female, and all but one participant held a master's degree¹ ($n = 8$). The participants completed their degrees at different institutions of higher education in the United States and in the United Kingdom. The reported number of years of experience in the field of speech-language pathology ranged from less than 1 year to 17 years, with years of experience working with individuals with ASD ranging from 3 to over 17 years and in the area of AAC from 3 to 15 years.² The participants reported experiences working with individuals with ASD that included providing professional services as an SLP and work as a behavior support technician (i.e., therapeutic support staff worker) or clinical experience while completing their clinical training during their graduate education. The participants provided services in public and private schools ($n = 3$), intermediate units (which provide contracted services, $n = 1$), outpatient pediatric centers ($n = 2$), and private practice settings ($n = 3$). The individuals on the caseloads served by the participants ranged from early childhood (i.e., aged 2–5 years) to early adulthood (aged 18–21 years).

Researcher Characteristics

The first author conducted all interviews. The first author is a doctoral student in the Department of Communication Sciences and Disorders at The Pennsylvania State University. She previously received a master's degree in speech-language pathology and a postgraduate certification in applied behavior analysis; she is a state- and nationally certified SLP. The first author's background in the areas of AAC and ASD includes 7 years of clinical experience, specializing in the evaluation and implementation of AAC systems across the life span as well as instructing preservice clinicians in AAC at the graduate level.

The first author knew three of the participants through previous employment and educational interactions. The first author did not know the remaining six participants before the commencement of the research study. All research

¹The participant who did not hold a master's degree received their education and initially practiced outside of the United States and subsequently received reciprocal licensure privileges through ASHA and their state licensing board.

²The participant with more years of experience than years of service as an SLP reported experience from previous work as a therapeutic support staff worker.

Table 1. Participant characteristics.

Participant	Age	State	Setting	Years working with AAC/ASD	Age ranges of caseload
Alanna	31	Pennsylvania	Intermediate unit	AAC: 9 ASD: 9	5–21 years
Breanne	32	Pennsylvania	Outpatient pediatric center	AAC: 8 ASD: 8	Birth to 21 years
Maya	32	Virginia	Outpatient/inpatient center	AAC: 8 ASD: 8	5–21 years
Deanna	30	New Jersey	Private school	AAC: 7 ASD: 7	5–21 years
Ashley	39	New York/New Jersey	Private practice	AAC: 17 ASD: 17	Birth to 21 years
Rebecca	28	Maryland	Private school	AAC: 3 ASD: 3	5–21 years
Jennifer	38	Virginia	Private practice	AAC: 13 ASD: 13	Birth to 21 years
Tina	38	New Jersey	Private practice	AAC: 14 ASD: 14	5–21 years
Danielle	27	Arizona	Public high school and home health	AAC: 3 ASD: 3	5–21 years

Note. AAC = augmentative and alternative communication; ASD = autism spectrum disorder.

participants were informed of the title and rationale of the study, that is, general goals of learning typical practices of SLPs who work with individuals with ASD who use AAC systems and personal background of the respondents. Additionally, the first author discussed the general goals of the study with participants, including determination of future directions for research and dissemination of the findings.

Human Subject Protection

Approval was received from The Pennsylvania State University Institutional Review Board prior to commencement of the study. Verbal consent was obtained from each participant before conducting the interviews. Transcripts and audio recordings are maintained in a secure location. All collected data, including interviews and transcripts, were designated with an alphanumeric code instead of the participant's name to ensure confidentiality.

Setting

Participants were residents of the states of Pennsylvania, New Jersey, New York, Virginia, Maryland, and Arizona. Participants were recruited through online forums and responded to initial screening questions via e-mail to ensure that they met the requirements for participation. Interviews took place in a setting of convenience for the SLP; the settings included in the home ($n = 1$) and via web-based video conferences ($n = 8$; i.e., Google Hangouts or FaceTime). Online and in-person interviews included only the participant and the first author and lasted between 14 and 40 min ($M = 25$ min). All interviews were audio-recorded for later transcription and analysis.

Data Collection

Sampling occurred once per SLP. Files were stored on a secured, password-protected web platform (i.e., PSU Box) and were identified with a participant code (no names) to ensure confidentiality. After the interview was completed, trained research assistants were provided access to the audio recordings for transcription. The first author completed transcriptions for 56% of the interviews (i.e., five of the nine interviews). Two undergraduate research assistants were trained to transcribe recorded interviews. The reliability of the transcripts was 86% between the first author and the two undergraduate research assistants. Specific variations from first author transcripts as compared to one undergraduate researcher's transcripts were the inclusion of fillers, such as "umm" and "uhh" in the written document by the undergraduate researcher. Each research assistant transcribed 22% of the interviews (i.e., two interviews per research assistant). All interview questions and responses were transcribed on a Microsoft Word (Microsoft Office 2016, Version 16.14.1) document, with demographic data being omitted for confidentiality. Additional field notes were taken by the first author, including observed physical behaviors that might be needed for clarification when transcribing the audio recordings. All obtained information was compiled to identify primary and axial themes across participants.

Data Analysis

Once transcription of the participant interviews was completed, the text was copied and moved to a Microsoft Excel (Microsoft Office 2016, Version 16.14.1) file where it was unitized into individual units of meaning that were to be coded. Data analysis followed qualitative methodology as described in Creswell and Poth (2017). Coding was

completed by the first author and a trained research assistant who was an undergraduate student in a communication sciences and disorders program. Training in qualitative research methods and data analysis was provided to the research assistant by the first author. After training, the research assistant then participated in independent and then group consensus coding, with the first author using sample transcripts to establish reliability for coding. Training continued until 80% agreement on code identification was met.

To determine themes and codes, the first author and a trained research assistant first read the transcripts to familiarize themselves with the data, memoing specific content notes. Before assigning any units of meaning or determining themes, the primary researcher and undergraduate research assistant bracketed, or acknowledged, any biases of expected outcomes. After these initial readings, the participant responses were partitioned into units of meaning (i.e., areas of content) and assigned initial codes and axial codes to summarize meaning. These meaning codes were then combined into categories, followed by the collapsing of categories into overarching themes that represent the data as a whole (Saldaña, 2015). All coding was conducted by the first author and the trained research assistant. The first author reviewed coded information and identified primary and secondary themes that were relevant across participants and research questions by combining interrelated coded units of meaning. Inductive reasoning for theme emergence was used, removing researcher biases related to expected outcomes (Creswell & Poth, 2017).

By using memos and bracketed biases, the researcher focused on the natural emergence of themes. Additionally, the first author reviewed theme emergence with the undergraduate research assistant who had minimal prior knowledge in AAC and ASD. Themes were then triangulated by being reviewed with the second author, a licensed, certified SLP. Reliability checks were also completed by an additional doctoral student, who was a licensed, certified SLP currently enrolled in a program in communication sciences and disorders. The doctoral student who completed reliability underwent training in qualitative research methods as part of their doctoral studies (see Interobserver Reliability section).

Theme Identification

Interviews were conducted over a period of 6 weeks. From the completed interviews ($n = 9$), 1,599 individual units of meaning were identified and coded by the first author and trained research assistant. Participant responses were generated in response to the researcher's open-ended questions, as well as participant-led discussions. From the participants' responses to the first author's questions, individual units of meaning were identified and constructed themes that best characterized the responses recorded. Several of the themes that were identified were specifically related to the topics of the researcher's questions (i.e., methods used, decision making, perceived efficacy, impact of diagnosis, and training/education); however, the axial, or subordinate, themes within these main themes were novel and

were not in response to any specific question or direction from the researcher (i.e., no specific method was queried or mentioned by the first author). Additionally, the emergent themes of the inclusion of vocabulary selection and specific clinical challenges related to typical practice as an SLP were based on independent participant discussions and responses. From a heterogeneous group of SLPs, consistent themes related to the central topic of discussion occurred without overt direction from the researcher. Furthermore, specific information within the established themes was provided by the respondents and was unique, not suggested by the researcher or the interview questions related to the overall themes (e.g., modeling as a primary instruction method).

Interobserver Reliability

Two of the nine transcripts (i.e., 22% of the data) were coded independently by both the undergraduate research assistant and the primary researcher to determine percentage of agreement as a measure of reliability. Agreement between the undergraduate research assistant and the primary researcher was 86%. To determine thematic code reliability, the primary researcher randomly identified 20% of the coded data using an Excel (Microsoft Office 2016, Version 16.14.1) randomization function. Once data were selected, a separate doctoral student was provided with alphanumeric codes that related to the themes and was instructed to code each line. Interrater reliability for thematic codes was determined to be 87.7% for overall themes. Axial theme disagreements were resolved through group discussions and triangulation of codes between the first and second authors and undergraduate research assistants. By completing separate independent and group coding for reliability with a trained undergraduate research assistant for units of meaning, as well as independent coding at the theme level by an additional doctoral student for agreement, themes and codes were determined using objective methodology and personal biases were minimized.

Results

Based on the results from the completed interviews, primary and secondary themes were identified (see Table 2). All themes were determined through a review of coded information and the grouping/pairing of similar codes and units of meaning. Identification of primary and secondary themes was based on relevance to the research questions proposed at the initiation of the research study. Themes that were directly related to the research questions were classified as primary themes, and those that were not related but still relevant to the practices of SLPs were classified as secondary themes. The four primary themes were as follows: (a) *instructional method*, (b) *input provided*, (c) *decision-making process*, and (d) *perceived efficacy of treatment*. The secondary theme that was identified was *training and education received*.

Table 2. Identified themes.

Primary themes	Secondary theme
Instructional methods "Modeling" Aided language stimulation Client-led instruction Avoiding the prompt dependency Direct instruction Presumed competence	Trainings/education received Most training and education received on the job Limited education in AAC or ASD during preservice training Use of online trainings and vendor-specific trainings Independent research using online resources such as journals, blogs, webinars, and support groups Continuing education/certification-specific training
Input provided Verbal Visual Synchronous Asynchronous Gestural cueing Least to most cueing	
Decision making Individualized/client specific Language goals/targets Diagnostic characteristics Experience and background Current trend in field/research	
Perceived efficacy Perceived from client responses Perceived from observed increase in communicative functions Perceived from use of new skills Anecdotal/personal belief	

Note. AAC = augmentative and alternative communication; ASD = autism spectrum disorder.

Primary Themes

Instructional Method

The theme of *instructional method* included specific means of instruction, as well as descriptive instructional practices that participants used in routine practice. All participants reported the use of various low- and high-tech AAC supports during instruction. The axial themes included in *instructional method* included *modeling*, *ALS*, *client-led instruction*, *avoiding prompt dependency*, *direct instruction*, and *presumed competence*.

Modeling. Modeling was the most commonly reported instructional method for individuals with ASD who use AAC. All participants ($n = 9$) reported using some form of modeling when instructing their students/clients in the use of their AAC system. As indicated earlier, modeling was mentioned by the participants without a specific probe from the researcher. Modeling practices such as the type of procedure and the type of input provided varied from participant to participant. For example, Tina stated:

So, what I'm saying is exactly what I'm modeling on the device. At other times it might be I'm modeling the response that I'm expecting from them. It might be that we're reading a book and we're talking about animals and we go into the wild animals and I'm just modeling based on what's available in that vocabulary file.

ALS. The second most frequently reported instructional method, similar to the first, was ALS. ALS was first described by Goossens' (1989) as the structured implementation

of paired verbal speech with the simultaneous identification of graphic symbols. Multiple other versions of ALS occur in the AAC literature; however, they do not necessarily follow a structured method of implementation (i.e., decreased speech rate and number of symbols present; Drager, 2009). Five of the nine participants reported using ALS; however, the description of actual methods when using this form of instruction varied across participants. For example, Danielle reported occasionally providing multiple modes of input simultaneously during ALS,

I'll add in the visual supports of either like a social story or a first then board and model it using their device, using the verbal language on top of that.

or sometimes limiting modes of input,

...but I won't say anything because I know that language bombardment with some of my students could just too much.

Client-led instruction and decreasing prompt dependency. Two additional methods of implementation within this theme reported by the participants were *client-led instruction* ($n = 6$) and *decreasing prompt dependency* of their clients ($n = 5$). *Client-led instruction* included following preferences of clients for material selection and allowing client interests to shape the therapy session. For example, Danielle stated:

So a lot of what and how I make those decisions is what is their body, what is the words that they're saying, what is that communicating to me?

The instructional method of *decreasing prompt dependency* included avoiding physical cues, such as hand-over-hand and fading cues toward independent responses as rapidly as possible. An example from Deanna on reducing the prompt dependency was as follows:

...a lot of my boys don't like to be touched, um, and if you start doing it with the physical prompts, like, a full physical prompt, they will just hold out their arm or their finger on every trial and it's a little bit harder for them to become independent with that skill.

Direct instruction. Additional subthemes within *instructional methods* included direct instruction and the concept of presumed competence. Direct instruction included discrete trials and explicit therapy trials. An example from Tina is as follows:

So, one thing we do is that you know work more in a discrete trial type setting where he has a token board and for every two or three opportunities he's earning a token where I'm saying you know with a list of cards and I'll say..., "Oh find want" you know "stop, go, more" and then we'll do the word combination.

Presumed competency. The concept of presumed competence included the clinician assuming receptive understanding of verbal instructions by the client, speaking at age-appropriate levels, and the ability of clients to learn when provided with appropriate instruction. The following quote illustrates the assumption of presumed competence as described by Breanne:

I try to start with a level of assumed competence that I see where the student is as I presume that they can do things and then kind of back pedal from there.

Input Provided

The theme of *input provided* focuses on the mode of information provided by the participants (SLPs) to their clients with ASD who use AAC. Throughout the semi-structured interviews, participants shared information and details regarding the various modes of *input provided* to their clients during instruction, including *verbal, visual, synchronous, asynchronous, gestural cueing, and least to most cueing*. Verbal and visual input was equally discussed and listed by all participants when providing instruction to their clients with ASD who use AAC. Maya stated,

...I'd say in general that I'm providing more verbal and audio, um, output for those kids.

Additionally, participants ($n = 4$) listed the use of gestural instruction within visual input. An example for the use of visual and verbal input from Danielle includes the following:

So, given a visual cue first and wait for their response, um, and then if they still don't respond or initiate, then I will show them the visual cue and then kind of point on their device. Um, you know, what are we asking? Um, and then from there then I will verbally model it and then wait again.

Sequence of input. Additionally, participants discussed the sequence of their input, specifically whether it was synchronous ($n = 4$) or asynchronous ($n = 1$). Asynchronous input was the provision of visual models separate from verbal information, whereas synchronous input was the provision of spoken words while pointing to or activating associated symbols on the client's device. As described by Breanne:

What that looks like is I would speak using a grammatically correct sentence and I would use their device to highlight key words in it. So if I were to say, 'oh, you want more cookies' I might touch MORE COOKIES or WANT COOKIES as I'm talking.

Least to most prompting. Several participants described using least to most prompting or cues when providing input and instruction to their clients; however, only one of the participants specifically labeled this as *least to most cueing*. For example, regarding the amount of cueing provided, Jennifer stated:

...I try to use a least to most prompting hierarchy... sometimes I start by just doing aided language stimulation to see if that's enough...or you know, I try to follow that least to most prompting hierarchy in terms of, you know, asking open ended questions...you know, and then going from there.

Decision-Making Process

Throughout the interviews, the participants discussed their process of making decisions about activities to be used, the type of input provided, therapy goals, and treatment in general. The theme of *decision-making process* includes many axial themes, including *individualized/client specific, language goals/targets, diagnostic characteristics, experience and background, and current trend in field/research*; however, the most prominent theme was *individualized, client-specific decision making*. For example, when discussing her caseload, Rebecca stated,

...I make my decisions differently for each of them (clients),

and Ashley stated,

...depending on their levels of interest and if you're not using what interests them, um, especially initially, then you're not going to get like the progress that you need...

Diagnosis specific. Whereas the participants reported that the diagnosis of ASD affected their decision making, the specific ways in which the diagnosis of ASD was considered varied. For example, some participants discussed being aware of the clinical characteristics of ASD, such as challenging behaviors and need for routine, when deciding on activities for their clients; for example, Deanna stated,

...the level of autism definitely plays a role in my decision making.

Other participants discussed their tendency to provide an AAC system earlier with a diagnosis of ASD. For example, Alanna stated,

The diagnosis of autism is often going to lead me to go to an AAC device a little earlier perhaps.

The overarching theme of individualization or personalization, however, outweighed a client's diagnostic characteristics when making treatment decisions.

Personal background and work experience. An additional theme when participants discussed their decision-making process included personal background and work experience. An example of this type of response was from Deanna:

Um, but I think, like, my biggest thing was actually going into the field and learning, so once I got my first job I knew, I mean, I knew I wanted to be in the autism population, but working the past 8 years with autism it's just been the biggest learning....

Goals, targets, and trends. When selecting activities for their clients, participants ($n = 5$) discussed focusing on overall language goals and targets when making decisions about materials and activities for their clients. The participants discussed current trends in the field and in research as influencing their decision-making process, for example, "... (I) research on my own into what's current in practice in AAC and working with other professionals...."

Perceived Efficacy of Treatment

The identified theme of *perceived efficacy of treatment* included different types of evidence including *client responses, increases in communicative functions, the use of new skills, and anecdotal*, including *parent report and subjective changes in client responses*.

Client response. Client responses included both accuracy in responses as well as behaviors and affect during treatment. An illustrative response from Alanna was as follows:

You have to gauge their interest in their want to use it and they want to communicate. See what they like. It's a good gauge if it's effective or not. If they're not going to want to use the device to want to communicate something to you it's not going to be as effective because they're not going to use that modality every day and generalize it to other situation.

Observational. Additional means for determining efficacy of treatments included the observation of improved communicative functions and the clients' use of a new skill. Improved communicative functions included using their AAC system for more than one language function (e.g., requesting). For example, Danielle stated,

So I guess what I see is kids talking to other people about things other than requesting and that's how I know it's successful.

Using new skills focused on the client carrying over a learned skill or replacing a previous behavior with the

use of the AAC system. Anecdotal and personal impressions for perceived efficacy included personal experience over time and subjective judgments of improvement in client responses or behaviors. For example, Jennifer stated:

Um, I like to read research articles...but I'd say...I guess probably just anecdotally what I've seen over the years from clinical experience, things that I've done wrong, things that have been successful. Or I wouldn't say wrong, but things that I don't think were successful or facilitative, I've learned from them after reflective practice....

Secondary Theme: Education and Training Received

The secondary theme *education and training received* arose during the interviews with the participants. This secondary theme was not specifically related to the overarching research questions posed at the initiation of this study but provided relevant information regarding the overall focus on the routine practice of SLPs when implementing AAC with users with ASD.

The theme *education and training received* revealed axial themes *most training and education received on the job; limited education in AAC or ASD during preservice training; use of online trainings and vendor-specific trainings; independent research using online resources such as journals, blogs, webinars, and support groups; and continuing education/certification-specific training*.

Preservice training. Level of education received in both AAC and ASD at the preservice level was limited. Limited education included receiving only a brief course in AAC that covered specific devices and minimal information regarding intervention and evaluation ($n = 5$). For example, Rebecca stated,

I had one course in graduate school. I think it was a half a semester course.

Participants who did not receive an ASD-specific course ($n = 6$) reported that they received their education in ASD through other courses in their undergraduate and graduate programs.

On-the-job training and independent research. Education and training in both AAC and ASD on the job ($n = 9$), whether it be through employer in-service or from peer collaboration, were commonly reported. Primary education and training in the fields of AAC and ASD came from continuing education courses and independent research. Participants also listed the use of webinars, peer-reviewed journals, Internet blogs, online group forums, and social media communities. For example, Maya shared the following statement:

Um, well, just lots of research on my own. Um, I, you know, I follow all the major blogs and all that....

The final axial theme within *education and trainings received* reported by participants was vendor-specific trainings, including both webinars and in-person trainings.

Discussion

Using an in-depth case report with content analysis, the typical practices of SLPs who work with individuals diagnosed with ASD who require AAC support were reviewed during structured interviews. Given the similarities in practices across the participants, only nine participants were required to meet saturation of data (i.e., no new codes assigned). Within this small sample set, however, multiple regions of the United States of America, different ages, and work settings (schools, private practice, etc.) were represented. Despite the heterogeneity of the group with respect to age, geographic location, education, and nationality, several consistent themes emerged from the responses of the participants.

One of the most consistent themes noted across all the participants was the provision of some form of modeling of an AAC device when instructing their clients. It is important to note that the target of modeling was not prompted by the first author but was provided by the participants during responses to general probes about therapy sessions and the introduction of tasks. Based on previous studies, various forms of aided AAC modeling and input are reported to be effective forms of instruction for individuals who are diagnosed with ASD and use AAC (e.g., Allen et al., 2017; O'Neill, Light, & Pope, 2018). Therefore, the group of clinicians who were interviewed for this study appeared to be aware of this evidence-based practice for their clients who require the use of AAC supports.

Although all the participants discussed the provision of modeling for their clients, the specific mechanisms of “modeling” varied from participant to participant. Throughout all participant interviews, only one specific technique was mentioned (i.e., ALS). While some SLPs discussed providing simultaneous auditory and visual input to their clients (i.e., speech in conjunction with the use of the AAC system), others described either providing only one form of input or an asynchronous presentation of dual input (i.e., verbal and then visual or vice versa).

Furthermore, the description of the way the modeling was performed was not necessarily consistent with the modeling approach that had been named by the participant. For example, several participants stated that they used ALS; however, the description of their delivery of dual input was not consistent with Goossens' original ALS protocol (Goossens', 1989). Specifically, participants discussed providing multiple modes of input to their clients but did not reduce their speaking rate and limit the number of symbols presented to their client; also, they did not provide this instruction with a static symbol set but used an SGD instead. The inconsistency in the use of terminology by these participants may reflect the lack of consistency in the terminology used for evidence-based AAC modeling practices in the literature. For example, the term *aided language stimulation* is often used synonymously with aided AAC modeling when describing the provision of both speech and aided models during AAC instruction (Drager, 2009).

Presentation methods were described during the participants' discussions of modeling the use of AAC systems. Presentation of information was described as occurring either synchronously (at the same time) or asynchronously (separately); however, the SLPs did not emphasize the synchronicity of input as a variable they explicitly manipulated. Participants reported progress for their clients but did not attribute this progress to manipulation of any specific variables. While these reports are promising for the outcomes of the clients who are served, they do not provide information regarding which variables were promoting positive changes in these individuals (verbal input, visual input, order of input, etc.).

Participants described making decisions based on their clients' specific needs. Some areas for individualized decision making included AAC system selection, specific therapy tasks, and goals of treatment. To best meet the needs of their clients, SLPs reported that they based treatment decisions on evidence-based practices and incorporated the specific goals and preferences of their clients. Several participants reported that they understood and were aware of underlying differences in individuals with ASD, such as clinical features and behavioral profiles, and incorporated this information into their treatment plans. The individualized and client-centered practices of the SLPs who were interviewed align with many of the current guidelines for individuals with disabilities, such as Individuals with Disabilities Education Act (2004). These findings are similar to those in a previous study conducted by Dietz, Quach, Lund, and McKelvey (2012). Across both the current study and the study by Dietz et al. (2012), experienced SLPs who specialize in AAC tend to make individualized decisions for the identification and implementation of their clients' devices.

A secondary theme that emerged was related to the modes of education or training received in both AAC and ASD for the participants. It was not surprising that this included on-the-job training, continuing education, and independent research using peer-reviewed journals; however, more surprising was the reliance on social media and blogs for information related to clinical practice. Dissemination of information via social media and Internet-based resources (e.g., blogs) may have a greater effect than peer-reviewed sources of research for practicing SLPs. Dissemination through blogs and Internet postings may be problematic because the lack of a peer-reviewing process may allow for information that is not empirically supported to be propagated across a large group of individuals. This has implications for the diffusion of research about evidence-based practices.

Limitations

While the small sample size of this study was beneficial for the in-depth inductive analysis of the procured data, it is also a possible limitation. The use of a qualitative method of research limits the generalizability of the findings to other populations and settings; however, as

noted earlier, the heterogeneous nature of the sample accounts for some of the variability that occurs in the general population. The recruitment of participants through national and international platforms allowed participants from diverse backgrounds to be included. A larger study of SLPs' daily practices specifically related to the thematic findings of this study may provide more generalizable information for the larger community of SLPs. Additionally, because of the scope of this study, only SLPs who work with individuals who utilize AAC supports and are diagnosed with ASD were included. This limited population does decrease the generalizability of findings to the field of speech-language pathology as a whole.

Clinical Implications

There are several clinical implications that can be derived from this study. These clinical implications include improved treatment mechanisms for individuals with ASD that account for processing differences, improved in-service and continuing education trainings for SLPs, and better means for dissemination of research through social media and Internet forums.

Participants discussed recognizing differences in individuals with ASD and selecting treatments based on individual characteristics; however, in their descriptions of the treatments, the SLPs did not always account for the implications of the timing of multiple modes of input that may be an important variable in the response of the individual with ASD to treatment. To better meet the needs of clinical practice, further research in this area is needed.

Additionally, based on the variability in education at the preservice level, many SLPs reported receiving the bulk of their education through independent research, on-the-job training, and continuing education. However, one of the findings of this study was the inconsistency with regard to the implementation of evidence-based practice. These practices are systematically designed by researchers to establish efficacy but are not always translated faithfully in clinical practice. To better meet the needs of individuals who require the use of AAC, enhanced in-service trainings on evidence-based practices may need to be made available. The diffusion of research may be bolstered by the use of web-based and social media forums to disseminate and train professionals in evidence-based practices. An improved means for dissemination of research is required to ensure that clinicians are using evidence-based practices with fidelity.

Conclusion

Based on this case report with content analysis, SLPs are incorporating evidence-based practices into their intervention programming and are providing individualized instruction. Research in the fields of cognitive and neuropsychology have demonstrated that individuals with ASD display differences in their perception and integration of multiple streams of input; however, these findings are not reflected in clinical practice. SLPs do not appear to be

attending to the potential implications of modality and synchronicity of input on the efficient learning of individuals with ASD when using AAC supports. The lack of attention to the potential effects of synchronicity in intervention planning by practicing SLPs may reflect the lack of attention to the effects of multiple modality streams during AAC instruction on the efficiency of learning for individuals with ASD in current intervention research.

Future Directions

Future research studies to explore the implications of the order and timing of multiple inputs of information during instruction of AAC supports for individuals with ASD are warranted. The manipulation of order and synchrony of multiple modalities of sensory information (i.e., auditory and visual) during instruction in a controlled setting, as well as generalized to naturalistic environments, should be investigated—with a long-term goal of identifying the most efficient, efficacious form of instruction.

Although not the primary focus of this study, it was also revealed that SLPs are primarily relying on social media and blogs to gain access to information on clinical practice. The translation of evidence-based practices from research to practice is not consistent (as evidenced by inconsistent implementation of approaches such as ALS). Future studies could also investigate how and where SLPs are currently accessing information on clinical practice and the potential effects on the implementation of evidence-based practices.

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