

## RESEARCH-BASED INSTRUCTIONS TO INCREASE COMMUNICATION SKILLS FOR STUDENTS WITH SEVERE DISABILITIES

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*Communication skills are of great importance for children with developmental disabilities to be functional and independent in their own lives. This paper provides results of a comprehensive literature review on current researched-based intervention strategies that appear effective to increase communication skills for students who have severe disabilities. Researchers typically have combined intervention strategies and the actual effectiveness of isolated procedures is less clear. This review is aimed at investigating these isolated procedures and attempts to link research and practice in the area of communication.*

The ability to communicate in meaningful and acceptable ways is fundamental for participation in our society. Without an effective means of communication, individuals with moderate and severe disabilities can experience the phenomenon of *learned helplessness* (Guess, Benson, & Siegel-Causey, 1985). Communication skills are essential for everyday social and learning interactions. Most students with severe disabilities need systematic instruction to learn communication forms and strategies that are easily understood by others. Efficiently teaching functional skills so that students can participate in everyday interactions is the primary goal for systematic instruction in communication (Snell & Brown, 2006). *Persons with severe disabilities are individuals who require extensive ongoing support on more than one major life activity in order to participate in integrated community settings and to enjoy a quality of life that is available to citizens with fewer or no disabilities* (TASH, 1991, p. 19). Most individuals who are severely disabled are limited in their ability to communicate, though these skills can become functional with appropriate intervention.

Communication is the key to learning because what we learn depends on interactions with others. Every time at least two people come together, communication can occur. Although all human beings communicate, some individuals, due to the severity of their disabilities, may have limited communication skills. Individuals with severe and multiple disabilities may not have full access to, or full control of, the multiple means by which most individuals communicate (e.g., speech, facial expressions, body movements, gazing, gesturing, touching, and print). This inability to express themselves as others does not indicate that these individuals have nothing to say, nor does it diminish their need and right to communicate, but it can result in less interaction with others. Therefore, teaching communicative should be a very high priority in order to provide the best possible tool for these students to achieve their desired outcome without resorting to unconventional forms, such as challenging behaviors.

A communicative action is successful when the partner understands the learner's message. In general, success is reflected when a person obtains what he or she wants to receive or accomplish. Although the partner may decide not to do what the individual asks him or her to do, success is obtained when the partner acknowledges the learner's communicative act. By experiencing success, communicative responses are shaped and become less ambiguous (Snell & Loncke, 2002). Researchers have documented different strategies for teaching communication skills to students who have severe communication difficulties. The current trend is to teach communication in ways that match the learner's regardless of the mode of expression. What are the research / evidence-based intervention

strategies to increase communication skills for individuals / students who have severe communication deficits / difficulties? Please see Table 1 for a summary of research findings.

**Table 1:**  
**Summary of Research Findings**

Study	Subjects	Methods	Findings
Behavior Indicator and Functional Communication Training to Establish an Initial Sign Repertoire With A young Child With Severe Disabilities (Dragow, Halle, Ostrosky, & Harbers, 1996).	A four year old girl.	Functional Communication Training (FCT).	The results showed successful acquisition and discriminated use of six signs to replacing existing behavior. The findings also indicated that generalized use of the sign "no" did not occur in the untaught situations.
The Picture Exchange Communication System: Communication Outcomes for Young Children With Disabilities (Schwartz, Garfinkle, & Bauer, 1998).	31 preschool children (29 girls, two boys).	Picture Exchange Communication System (PECS).	The results of the study found that all 31 children learned to use the PECS system within an average of 14 months. The children also demonstrated generalized use of the system and 44% of the children showed increase in spoken language after using PECS.
Functional Communication Training Using Assistive Devices: Recruiting Natural Communities of Reinforcement, (Durand, 1999).	Five students (5-11 years old)	Functional Communication Training (FCT), using assistive technology in school and community.	The study indicated that the communication devices help decrease problem behaviors in all five students and that can be used in the community.
Teaching the Condition use of Communication Requests to Two School-Age Children With Severe Developmental Disabilities (Reichle & Johnson, 1999).	Two students (Seven year old boy, and Nine year old boy).	Conditional use of Communication Requests.	The findings suggested that the conditional discriminations were established quickly. Both learners generalized their conditional discriminations to other contexts within classroom.
Communication Patterns of Youth With Mental Retardation With and Without Their Speech-output Communication Devices (Ronski, Sevcik, & Adamson, 1999).	13 males subjects (13-28 years old).	Speech-Output device, WOLF, was used to exam the effect on the subjects when engaging in a conversation.	The results showed that the speech-output communication device had a positive effect on the participants' communication with and without unfamiliar partners and enhance the ability to engage in the conversation.
Effects of Prelinguistic Communication Levels on Initiation and Repair of Communication in Children With Disabilities (Brady, Steeples, & Fleming, 2005).	45 children Three -six years old (23 boys, 22 girls).	Plays activities are used to examine the effects of expressive the receptive language on initiated and repair behaviors.	The conclusion of the study found that the levels of prelinguistic communication development predict commenting abilities in children with severe disabilities but did not appear to predict the likelihood to repair communication breakdown. The results suggested that children with gestures that are more basic and vocal skills communicate less frequency, but they also appear less adapt to understand social rules of conversational exchange.

Responses to Communication Breakdowns by Nonverbal Children With Developmental Disabilities (Erbas, 2005).	Three preschool children (two boys and one girl).	Opportunities with three types of listener feedback conditions served to evoke repair behaviors by the subjects.	All 3 children used different repair behaviors across three conditions to achieve their communication goals. The study found that all subjects produced more repair behaviors in gestural conditions than others. The repetition was the choice of repair strategy.
Parents' Perspectives on the Communication Skills of Their Children With Severe Disabilities (Stephenson & Dowrick, 2005).	10 children (Four-nine years old) nine boys, one girl.	Parents were interviewed about the forms of communication used by their children.	Parents described a wide range of behavior, including the use of facial expression, body movement, vocalization, gestures, word approximation and words, formal and made-up signs, objects and picture symbols, as communicative behaviors.
The Effect of Picture Communication Symbols on the Verbal Comprehension of Commands by Young Children With Autism (Preis, 2006).	Five students (Three girls, two boys).	Alternating treatments design was used to assess the effect of picture symbols on each participant's respond to verbal commands. The alternating treatment involved the presentation of verbal commands with and without picture symbols.	The findings of the study indicated that visual supports, especially picture communication symbols, are more effective in prompting the generalization and maintenance of acquired skills for young children with disabilities.
Teaching Augmentative and Alternative Communication to Students With Severe Disabilities (Snell, Chen, & Hoover, 2006).	40 research articles from 11 journals (published between 1993-2003), 93 subjects (from birth to 21 years old).	Description analysis of peer-reviewed, single subject design, intervention research on AAC.	The review lends support to a number of teaching strategies that appear effective when building AAC skills in beginning communicators with S.D. The review indicated that a variety of antecedent and consequence have been reported to improve AAC communication with S.D. whose communication ranges from nonsymbolic to symbolic AAC. The review identified weaknesses in the database: little reporting of generalization and maintenance of outcomes, infrequent involvement of teachers and parents, infrequent measurement of partner behavior, poor reporting of treatment integrity, and contexts that less often included general education and disabled peers.

#### *Responses to Communication Breakdowns*

Successful communication depends on conditions such as participants' motivation to share information, the participants' decision on the form of communication to convey the information, the participants' awareness of the occurrence of communication breakdown, and their effect to repair them (Roth & Speakman, 1994; Scudder & Tremain, 1992). Repairing a communication breakdown is defined as a skill to maintain communication by first noticing that a targeted message is not conveyed and then making necessary modifications (Alexander, Wetherby, & Prizant, 1997). In hope of extending the current research on repairing behavior of nonverbal children with developmental disabilities, Erbas (2005) studied the different types of listener feedback on repair behaviors of three nonverbal children

with disabilities. Three preschool children (three -four years old) with developmental disabilities participated. An alternating treatments design was used to compare the effect of different types of listener feedback or breakdowns on subjects' communication repairs. The study focused on two areas: motivation and environment. Specifically, the author examined ways to control motivation status of the subjects by assessing individual preferences used to create motivating opportunities for the subjects. In addition, Erbas examined repair opportunities in the naturally occurring environment. An alternating treatment design was implemented to compare the effects of different listeners' feedback to evoke repair behaviors for nonverbal students with disabilities. Four ways that communication is broken down was examined: repetition, recast, addition and reduction. Repetition means repeating the same repair behavior. Recast, on the other hand, means completely using a different repair strategy to communicate. Addition means using the same strategy, plus adding an additional gesture or vocalization. Last, reduction is any subtraction made from the first repair strategy.

Discrete categorization was implemented for this study because the behaviors had discrete beginning and endings. Video recordings were also implemented to gather data and interobserver agreement was used to evaluate the subjects' communication repair behaviors. In addition, parents and teachers were also interviewed. Observations for this study were completed using the ABC (antecedent, behavior, and consequence) recording method. Last, a paired preference assessment was conducted to see what snacks would be chosen by the students. In this study, opportunities with three different types of feedback or breakdowns served to evoke repair behaviors by the subjects. These were gesture response, wrong response, and ignore. Gesture response is when a request was not accurately received; a gesture response would be used. The wrong response is when a behavior occurs and the listener responds with a wrong response. The ignore condition is when a behavior occurs and the listener intentionally does not listen or pay attention. These were all used to see how they would affect communication. Findings indicated that the gesture response condition was used the highest percentage of the time with all three children. The results showed that all children used different repair behaviors across the different conditions to achieve their communicative goals at snack time routines. In addition, the children produced more repairs in the response to the gesture response condition than the others. The aforementioned findings provide evidence that the students can detect communication breakdowns and can attempt to correct them.

#### *Effects of Prelinguistic Communication*

Brady, Fleming, and Steeples (2005) examined the effects of expressive and receptive language levels on initiated and repaired communication with children with developmental disabilities. The participants were forty-five children between the ages of three and six years old with severe delays in expressive communication. Some of the participants communicated with twelve or fewer spoken words, communicated with gestures and vocalization, and 41 of the 45 had below average IQ scores. This particular population was selected as children with developmental disabilities rely on prelinguistic gestures and vocalization well into their toddler and preschool years instead of just using them in their early years like most children (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979; Bruner, 1975; Butterworth, & Grover, 1988; Sugarman, 1984.) Each child engaged in thirteen play activities where the researchers presented opportunities for the children to initiate communication. The script was designed to provide opportunities for six communicative requests (imperatives) and seven communicative comments (declaratives). The researchers also used three different child-initiated communicative acts during each task: (a) request for clarification, when the researchers ask "What?" after the child initiated a communication act, (b) non-acknowledgement, when the researcher pretended not to notice the child's communication attempt and continued interacting with the materials, and (c) topic shift, when the researcher responded inappropriately following the child's initiated communication act. For example, the researcher responds to a request for help to open a container by commenting about the contents, *I like bubbles, too*. The conclusion of this research found that the levels of prelinguistic communication development predict commenting abilities in children with developmental disabilities, but it did not appear to predict the likelihood to repair communication breakdowns. The results indicated that in regard children with autism or Down syndrome did not respond differently from other children regardless of their diagnosis. Expressive communication levels and receptive communication scores were a significant predictor to initiated communication. They were both statistically significant predictors of comments and expressive communication levels were statistically significant in predicting the initiated request after IQ was controlled. The researchers found that prelinguistic children were motivated to initiate communication, and the results from their study extended their understanding of the course of prelinguistic development in children with intellectual disabilities. Not only did the researchers find that children with more basic gestures and vocal skills communicated less frequently,

but they also appear less adept to understand social rules of conversational exchange. The outcome of this study documented important distinctions between levels of paralinguistic development in children with disabilities.

#### *Functional Communication Training (FCT)*

Functional communication training (FCT) has been an effective strategy for replacing challenging behavior with more socially acceptable behavior that serves the same communicative function. Drasgow, Halle, Ostrosky, and Harbers (1996), examined the application of FCT, which was extended, to replacing behavior that was communicative, but not identified as challenging. In their study, signs for five specific activities were taught as requests and one sign was taught as a protest. Three purposes were identified for their investigation: (a) to determine the effects of the instructional strategy on sign acquisition; (b) to assess the generalized use of the protest sign in a context that varied from that of instruction; and (c) to assess the discriminated use of the newly acquired signs (e.g., Would they be withheld on occasions similar to those of instruction when their use was unnecessary?). The participant, Mary, was four years four months old at the start of this study. Physicians reported that Mary might have autism or Rett's syndrome, but no conclusive diagnosis had been made at the time of the study. Although Mary was nonverbal, she engaged in behavior that appeared to serve the functions of requesting and rejecting. She appeared to use signaling behavior (i.e., eye contact, loud vocalizations, leading, extending arms to an adult) in other situations where her intent was unclear.

This study took place in three settings over 15 months. It began in Mary's initial school placement, continued in her summer school program, and was placed in her new school placement and all settings were quite similar. The classroom environments were arranged with various activity centers and had similar routines (e.g., short structured, group times, free play, snack time), and each setting included an outdoors playground. A within subject multiple baseline design (Bear, Wolf, & Risley, 1968) across behaviors was implemented in the study. Three signs were targeted for teaching as specific requests in each of the first two baselines and a general reject sign was taught in the third baseline. The introduction and teaching of the signs was staggered in time across the three baselines. The teaching strategies included modeling, physical prompts, and reinforcement. Seven new signs were targeted for teaching and included: eat, drink, swing, open (the door), bubbles, stairs, and no. The new target was taught only in situations in which behavioral indication occurred; no behavioral indication meant that the situation was not used for teaching. The results of the intervention indicated that Mary acquired five and used six of the seven targeted signs; stairs had been acquired previously and bubbles did not evoke behavioral indication after the initial days of intervention and, therefore, did not receiving training. As each new sign was acquired and used spontaneously, use of the old forms serving function was proportionately reduced. This perfect inverse relationship suggests the functional equivalence of these two alternative forms. For the second purpose, the study indicated that generalized use of protest sign did not occur in the untaught situations. Mary learned to shake her head *no* when offered unpreferred items (instead of pushing away); however, she continued to pull away, scream, or flop to the floor when accompanied to unpreferred activities. The study also indicated that Mary used the new signs in a discriminated fashion 84 % of the time. This study demonstrated that using behavioral indication to identify teaching opportunities and then teaching in naturally occurring situations are effective instructional strategies for establishing an initial communication repertoire in a young child with severe disabilities.

Durand (1999) evaluated the effectiveness of functional communication training (FCT) as an intervention of severe disabilities. He conducted this assessment in two settings: school, and community. The FCT is supposed to decrease these behaviors in those two settings: aggression, self-injury, and severe tantrums. This study analyzed the effect of FCT on decreasing or eliminating these behaviors. Three studies were conducted on five students. The first study involved functional assessment of the problem behaviors. The second study included teaching students to use assistive devices to request the stimuli and assessment of the effect it has on their problem behaviors. The third study was to assess whether the new communication skills work in the community. The five students demonstrated problem behaviors and a need for assistive technology. To prepare the teachers, parents, and other related staff they all attend a series of workshops on FCT. The workshop was three days long and presented to them by the author. The workshop involved discussion of the functional nature of problem behavior, instruction in various functional assessment procedures, instruction in teaching students to use assistive devices, instruction in FCT, and assistance in developing individualized intervention plans for each student. The classroom teachers introduced the sessions in community environments with no additional prompts and having their device continually available. The findings

proved that the students were able to use the device in new situations without prompts, and the adults were able to respond appropriately to the students. This study showed that the communication devices help decrease problem behaviors and that they can be used in the community by students who have severe communication deficits.

#### *Communication Requests*

Reichle and Johnson (1999) researched how to teach two students with severe disabilities to request a desired snack in different situations. The researchers wanted to observe and teach the students to make a request for the snack even if the snack was right in front of them or across the room to insure that the students understood this form of communication. The participants or subjects were two male students attending elementary school. One student was seven years old and the other was nine years old. The seven-year-old boy was severely intellectually disabled, nonverbal, and prone to seizures. When they started the investigation he would communicate using idiosyncratic gestures (tapping on the table), and facial expressions (grimace to show dislike). He was integrated into a regular education kindergarten classroom to participate in art, physical education, morning circle, and free play. The rest of the day he was in a self contained classroom with four other classmates. The nine year old boy was severely intellectually disabled and nonverbal. He could communicate through idiosyncratic gestures, vocalization, and physical direction of an adult in his environment, as well as use a graphic general request symbol (Mary- Johnson black and white line drawing) in a communication wallet. He was included in a third grade regular education class during music, physical education, social studies, and spent the remainder of the day in a self- contained classroom. As a result of this study, the researchers found that if the item were in close proximity to the participants (6-8 in.) they would take it. If the item was not in close proximity to the participants (18-24 in.), the subjects would use a communicative request. The results suggested that the conditional discriminations were established quickly and both learners generalized their conditional discriminations to other contexts within classroom. The study demonstrates the importance of attending to conditional discriminations when teaching communication requests.

#### *Picture Exchange Communication System*

Functional communication requires that children be able to generalize communication skills from training to other settings and situations, and to the events experienced in daily living (Horner & Budd, 1985). To meet this functional criterion, children need to use the skills not only across environments, but also spontaneously at contextually appropriate times and in a variety of settings. Schwartz, Garfinkle, and Bauer (1998) investigated the use of the Picture Exchange Communication System (PECS) for children with severe disabilities. The purpose of their studies was to examine PECS as a way of teaching functional communication skills to children with severe communication difficulties. The study examined the rate of acquisition of PECS. The participants were thirty-one young children enrolled in an integrated, university affiliated preschool program. Their ages ranged from three to six years old and 16 of the children had been diagnosed with autism. Other participating children had been diagnosed with Down syndrome, Angelman's syndrome, or other developmental disabilities. All interventions took place in the children's classrooms, which had the same structure and types of activities, including small group activities, two large-group circles, snack, free choice, and outside time. The Boardmaker for Windows (1995) computer program generated pictures used in the PECS investigation. Both black-and-white and colored symbols were used. All children started with 2 x 2 inch symbols, and the symbols for some children were changed to 1 x 1 inch as they became more independent and facile with the system. Instructional strategies were consistent with the PECS Training Manual, which involved the amount and type of materials to use with instructional strategies, prompting strategies, and the criteria to be achieved. The training program steps in this study were: basic exchange, distance and persistence, discrimination, sentence building, and PECS with peers. All children in the study had symbols available to them throughout the classroom during the entire school day. To facilitate PECS use, systematic opportunities to use PECS were integrated into the school day. This was done by identifying preferred materials, integrating these materials into planned activities, and requiring children to request the materials. The instructors continuously assisted children in using PECS symbols to communicate with one another and with adults to request materials, make comments, and solve problems. This study suggested that children who learn PECS use the system across settings. Children demonstrated generalized use of the system communicating with different people across settings and demonstrated mastery of different communicative functions. Furthermore, 44 % of the children in the study demonstrated marked increase in spoken language after using PECS.

Preis (2006) also investigated picture communication symbols. She asked three questions when she started her study: (a) Will verbal requests presented in conjunction with picture communication symbols result in a higher number of correct responses for following directions than verbal requests alone? (b) Will commands achieved generalize to a novel therapist under those same conditions? and (c) Will the command achieved maintain over time? There were five participants in this study that met the criteria for autistic disorder as stated in the Diagnostic and Statistical manual Disorders (American Psychiatric Association, 2000). The five participants ranged in age from five to seven years old (three girls, two boys). All of the students had no prior experiences using picture communication system as means of following directions except for organization (i.e., schedules, labels). The study took place in a university speech-language pathology center and there were three phases: command acquisition, generalization, and maintenance. Each of the phases had a treatment A and treatment B. Treatment A involved the presentation of verbal commands with an associated picture symbol, and Treatment B was without picture symbols. The picture symbols were commercial produced four-inch black and white line drawings (Mayer-Johnson Company, 1994) with text accompanying each picture. Both treatments consisted of verbal commands involving body movement, manipulative materials, or identification of pictured items. The results of this study suggest that visual supports, specifically picture communication symbols, are more effective in prompting the generalization and maintenance of acquired skills for following verbal directions for young children with autism. Therefore, experts have suggested that visual cues for children with autism be included as a consideration when designing any intervention program (Quill, 1995).

#### *Parents' Perspectives*

In 2005, Stephenson, and Dowrick explored the behaviors that parents interpret as communication and how the development of communication skills of children with severe disabilities depends partly on the responsivity of a partner. The researchers found their participants at two special schools in the suburban western Sydney in New South Wales, Australia. These schools work with students who have are moderate to severe intellectual disabilities. The researchers chose ten parents that have children between the ages of 4 and 9 years old with little or no spoken language. Nine of the students were boys and one was a girl. The researchers interviewed the parents about how their child communicates and how they, as parents, communicate with their child. During these interviews, nine mothers showed up (three were single parents), and one interview was with both parents. The first interview was for collecting background information (including age and gender of child, language(s) spoken at home, household composition, child's strengths, and information about the child's disabilities). The next section of the interview questioned parents about the child's current method of communication at home and school. The communicative behaviors were behaviors that researches have explored, such as intelligible words, manual sign, use of aids such as pictures or tangible symbols, gestures, reaching, pointing, physical manipulation, self-directed behavior, aversive behaviors directed at others, vocalizations or sounds, eye contact, and facial expression (Cirrin & Rowland, 1995; Donnellan, Mirenda, Mesaros & Fassbender, 1984; Lobato, Barrera, & Feldman, 1981; Ogletree et al., 1992; Ronski, Sevcik, Reumann, & Pate, 1989; Rowland & Stremel-Campbell, 1987). The third section of the interview was concentrated on commonly identified communication behaviors such as requesting, commenting, getting attention, providing information, refusing or rejecting, answering, greeting, intoning, and maintaining and terminating interactions (Reichle, 1997). Parents were then asked how their child accomplished this. After interviewing the parents, the researchers asked teachers and family members for their feedback. After the interview they then transcribed the interviews from their tape recorder. The transcribed document was then given to the parent(s) to review and make corrections. The interview and the parents' revision of the documentation allowed them to understand the context in which the behaviors occurred and how they were perceived. Parents described a wide range of behaviors, including the use of facial expressions, body movements, vocalizations, gestures, word approximations and words, formal and made-up signs, and objects and picture symbols, as communicative behaviors. To be able to communicate and understand a child with severe to moderate disabilities you need to communicate with the parent and the teacher to understand and be co-adhesive for the child.

#### *Speech-Output Communication Devices*

Ronski, Sevcik, and Adamson (1999) investigated the communication skills of 13 youth with moderate or severe mental retardation and how they communicated with a *standard partner* with and without access to their augmented communication devices. The subjects were 13 ambulatory males with moderate or severe disabilities with little to no functional speech who had been participants in a two-year longitudinal study of symbol acquisition and use (Ronski & Sevcik, 1996). At the time of the

study (1999) the participants ranged from 13.17 to 28.67 years old. The subjects all had a minimum of five years of communication experience using the system for Augmenting language which consists of five components: (a) speech-output device, the WOLF (Adamlab, 1988), (b) individualize symbol vocabulary, using arbitrary visual graphic symbol, (c) opportunities to use the device at home, and in the community on the daily bases, (d) augmented communicative input from adult partners, and (e) a resource feedback mechanism. The subjects had a mean of 69.0 vocabulary items on their WOLFs (range 41-104 symbols). Each participant was observed in two conditions: speech output device condition and no device condition. During both of these conditions, they were videotaped interacting with a trained but unfamiliar adult female partner. The room that they observed the interaction was always in a lounge located in the participant's school or workplace. The participants were seated at the large table where there was popcorn paraphernalia placed on the table. During the first condition, the participant's WOLF was available for them to use. The participants had 10-27 symbols to choose from, including words such as hello, thank you, help, more, good-bye, I want, excuse me, glass, ketchup, drink, and me. When the symbols were pressed the corresponding individual English word was spoken. Symbols could be pressed in sequence to form a combination (Wilkinson, Ronski, & Sevcik, 1994).

Three weeks after the speech-output device condition each participant was videotaped without the speech-output device. After the conditions were videotaped six trained coders, who were not aware of the study, coded the data. The results showed that the speech-output communication device had a positive effect on the participants' communication with an unfamiliar partner. The three conversational interactions of appropriateness of the information conveyed, clarity of conversational focus, and exact information content conveyed, were influenced. In conclusion, the findings emphasize the important role of augmented communication devices with unfamiliar partners, facilitate specific and clear communication, and enhance their ability to engage in a conversation.

#### *Augmentation and Alternative Communication*

In 2006, Snell, Chen, and Hoover conducted a description analysis of peer-reviewed, single subject design, intervention research on augmentative and alternative communication (ACC) for individuals with severe disabilities. This review examined seven years of research, published in English starting in 1997 and ending in 2003 on ACC communications that were applied to persons with severe disabilities from birth to 21 years of age. The focus of the review was on identifying evidence-based interventions that enable individuals to communicate with others using ACC alone or with words. The researchers started the review by identifying the criteria for selecting research to include in the database. These criteria were modified from a previous study to include interventions addressing prelinguistic or ACC communication with others. The forty research articles from 11 journals were located through electronic searches using ERIC and PsycINFO and determined to meet the seven criteria requirements as follows: (a) it was published in peer-refereed journal in English between 1997-2003, (b) its participant(s) were aged 21 years or younger, (c) its participant (s) had a severe disability, (d) target communication forms were either prelinguistic or symbolic AAC expressive responses, (e) a single subject experimental research design was implemented with one or more participant, individual student data were graphically displayed and reliability estimates for the dependent variables were reported and acceptable, (f) the independent variable was educational, involving a teaching intervention, and (g) the dependent variable(s) included interactive communication responses that were not spoken, but other responses (e.g., eye contact, receptive skills, reduction of problem, speaking) also may have been measured. In the database of 40 studies, 93 individuals met the age and disability criteria. The participants were primarily from preschool/elementary schools and male, with a majority having autism or severe disabilities.

The percentage of studies with one or more individuals between age zero and five was 50 %, ages 6-11 (52.5%), 12-17 (25%), and 18-21 (5%), whereas 92.5% of the research had one more male participant and 42.5% had one or more female participants. The percentage of studies with one or more participants identified as having autism was 65%, severe disabilities 50%, moderate mental retardation 17.5%, developmental delay 17.5%, sensory impairments 15%, attention disorders 5 %, emotional disorders 2.5%, and traumatic brain injury 2.5%. Interventions were planned and implemented by experimenters or research assistants/ therapists in all 40 studies. The AAC research evaluation instrument used to code studies in the database was organized into four categories: general, functional assessment, reinforced assessment, and intervention. Intervention research was conducted in one or several settings including the special education classroom (47.5%), in-patient settings and the general educational classroom (22.5%), the home (20%), instructional school settings beyond the classroom (e.g., cafeteria, library, recess) (12.5%), empty classroom (12.5%), the community (7.5%), and



outpatient clinics (5%). By selection, all studies measured participants and ACC communication. Specifically, simple aided/iconic forms (e.g., objects, pictures, communication books) were measured in 47.7% of the database, unaided symbolic gestural communication (e.g., conventional gestures, manual signs) 45%, prelinguistic forms (e.g., looking at or reaching for an object, stiffening of the muscles, vocalizations, leading another) 36.5%, and device-aided/iconic symbolic forms on speaking devices 35%. Unaided spoken communication was also measured in 40% of the studies. The requesting function was addressed in 87.5% of the database; the function of engaging another in social interaction (e.g., requesting social routine, greeting, calling) was addressed in 37.5%, and the function of establishing joint attention (e.g., directing another's attention to an object, event, or topic) was addressed in 30% of the database. Although the majority of research assessed interactions with adult partners (90%), peer/sibling interaction was measured in 17.5% of the database. Dependent measures addressed spontaneous, self-initiated communication in 82.5% of the studies, whereas communication elicited in response to a partner was measured in 50% of the research, and imitative communication was measured in 5% of the research. Additional student-dependent variables addressed by this database included disruptive behavior (35%), destructive behavior (32.5%), skills (social, academic; 22.5%), eye contact (7.5%), and engagement (5%).

This review supports a number of teaching strategies that appear effective when building AAC skills in beginning communicators with severe disabilities. Because researchers typically have combined intervention strategies, the effectiveness of isolated procedures is less clear. Although it is common to classify early communication by their naturalistic features, these classifications lack universal acceptance and do not clearly predict effectiveness. However, the review indicated that a variety of antecedent and consequence intervention components, typically used in combination, improve AAC communication in learners with severe disabilities from birth to 21 years whose communication ranges from nonsymbolic to symbolic AAC. These findings are consistent with the results of other reviews of children with autism and other severe disabilities learning to communicate with or without AAC (Goldstein, 2002; Hepting & Goldstein, 1996; Hwang & Hughes, 2000a; Mirenda, 2001; Reichle, 1997; Ronski & Sevcik, 1997). Furthermore, these findings extend the understanding of effective communication methods to a more recent seven-year period and with the population of individuals who do not use spoken words as their primary communication mode. When problem behavior and communication were targeted, functional communication training (FCT) was the method of choice. This review also identified several general weaknesses in this database: little reporting of generalization and maintenance of outcomes, infrequent involvement of teachers and parents, infrequent measurement of partner behavior, poor reporting of treatment integrity, and contexts that less often included general education and non disabled peers.

### Conclusion

Communication skills are of great importance for children with developmental disabilities to be functional and independent in their own lives. Most scholars today agree that with appropriate instruction and support, individuals *with severe disabilities can learn to communicate effectively regardless of the nature and / or cause of their underlying impairments* by using either idiosyncratic or symbol forms (National Joint Committee for the Communication Needs of Persons with Severe Disabilities, 2002a, p. 148, 2002b). Individuals who have severe communication deficits can always improve their communication by becoming more effective and efficient in their interactions, using socially appropriate signals, and expanding their communicative functions. The outcomes of this comprehensive literature review lend support to a number of evidence-based intervention strategies that appear effective to increase communication skills for individuals who have severe communication disabilities. The key to the effectiveness of the interventions described in this paper has been the emphasis on intervention in daily and natural situations and the importance of participant understanding of communication as an interactive process in which they play an integral role. By attempting to identify partner needs, transfer research into a user-friendly resource, and provide inservice training in an applied and practical fashion, some concerns have been addressed and skills and knowledge enhanced. The field, and most particularly our students, will benefit from continuing attempts to link research and practice in the crucial area of communication intervention. Additionally, the intervention strategies referred to as *naturalistic* from the peer-reviewed research article by Snell, Chen, & Hoover (2006) appears to be the most effective method. There are many different ways to communicate without symbols, and nonsymbolic communication can be very powerful (Snell & Brown, 2006). The goal is to use methods or strategies that incorporate students' nonsymbolic skills and build on their repertoires of communication skills so that they can understand and use more sophisticated symbolic skills to improve overall quality of life. The finding from this comprehensive

literature review suggests that children with severe disabilities can learn to communicate by engaging in a variety of communication methods. The current trend to include students with severe disabilities in general education classrooms with their peers has shown positive affect to all students. Therefore, it is important for parents and teachers to consider the most effective communication intervention strategy in order to promote and enhance their child's abilities to communicate. For future researchers, it is important that they continue to research communication skills and investigate which acquired skills generalize and are maintained for children with severe disabilities. This review demonstrates the link between current researched-based intervention strategies and practice that increase communication skills for students with severe disabilities. Communication skills are of great importance for children with developmental disabilities to be functional and independent in their own lives and all professionals and parents must work together so students can improve their communication skills at school, in the community, and at home.

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