

A Selection of Peer-Reviewed Publications Supporting the Use of AAC Teaching Methods that Lead to Typing

Despite assertions to the contrary, abundant peer-reviewed evidence exists to support the use of the Rapid Prompting Method (RPM), facilitated communication (FC), and similar AAC teaching methodologies that are used to teach individuals who cannot rely primarily on speech to communicate by typing or pointing to letters on a letterboard. Some of this research provides evidence that people who are unable to communicate with speech **cannot be assumed to lack intelligence or the ability or desire to communicate socially**, and therefore should be presumed capable of understanding and expressing complex language. This evidence demonstrates that **most intelligence assessments are unreliable** for people with motor control challenges. It also shows that **autism primarily is a neuro-motor and sensory condition**, rather than a social or behavioral one as previously believed.

Some of this research provides evidence of the **need for and role of well-trained communication partners** in both teaching and supporting the use of AAC, especially in users with motor disabilities. The research stresses the **importance of communication choice, the existence of individual idiosyncrasies in communication, and the need to tailor AAC training, methods, equipment, and supports to individual needs**.

The research literature also indicates that **the AAC field as a whole is in its infancy**. In fact, researchers have been unable to show through *any* randomized controlled trial that *any* form of AAC that allows someone to communicate their thoughts in open-ended manner is efficacious for nonspeaking autistics. Thus, attempts to ban types of AAC that are not “evidence-based” would result in banning *all* existing forms of AAC for nonspeaking autistics.

Over 150 peer-reviewed articles supportive of the concept of using RPM, FC, and related methods as AAC teaching methodologies (methods used to teach someone how to spell and type independently) are listed below with their abstracts and links to the full articles. Articles behind “paywalls” can often be obtained for free by contacting the authors. Articles are organized in the following categories:

- (1) [RPM-Specific Literature](#) (8)
- (2) [FC-Specific Literature](#) (29)
- (3) [Other AAC Literature](#) (24)
- (4) [Autism-Specific Literature](#) (56)
- (5) [Literature on Presuming Competence; Qualitative Studies on Experience](#) (16)
- (6) [General Communication Literature](#) (18)
- (7) [Evidence and Research-Related Literature \(Generally\)](#) (4)

I. Rapid Prompting Method-Related Literature

Jaswal, V.K., Wayne, A., & Golino, H. (2020), *Eye-tracking reveals agency in assisted autistic communication*, Nature: Scientific Reports, 10, 7882 (open access [here](#))

Abstract: About one-third of autistic people have limited ability to use speech. Some have learned to communicate by pointing to letters of the alphabet. But this method is controversial because it requires the assistance of another person—someone who holds a letterboard in front of users and so could theoretically cue them to point to particular letters. Indeed, some scientists have dismissed the possibility that any nonspeaking autistic person who communicates with assistance could be conveying their own thoughts. In the study reported here, we used head-mounted eye-tracking to investigate communicative agency in a sample of nine nonspeaking autistic letterboard users. We measured the speed and accuracy with which they looked at and pointed to letters as they responded to novel questions. Participants pointed to about one letter per second, rarely made spelling errors, and visually fixated most letters about half a second before pointing to them. Additionally, their response times reflected planning and production processes characteristic of fluent spelling in non-autistic typists. These findings render a cueing account of participants' performance unlikely: The speed, accuracy, timing, and visual fixation patterns suggest that participants pointed to letters they selected themselves, not letters they were directed to by the assistant. The blanket dismissal of assisted autistic communication is therefore unwarranted.

Major Point: This study, while not about RPM per se, studied 9 individuals who had learned to communicate by pointing to letters on a letterboard that is held by a trained assistant, and debunks the conventional wisdom that nonspeaking autistic individuals are incapable of communicating their own thoughts when using assisted communication like what is taught with RPM and similar teaching methodologies.

Deacy, E., Jennings, F., & O'Halloran, A. (2016), *Rapid Prompting Method (RPM): A suitable intervention for students with ASD?* REACH Journal of Special Needs Education in Ireland, 29:2, 92-100 (paywall access [here](#))

Abstract: Rapid Prompting Method (RPM) has been suggested as an intervention suitable for use with individuals with Autistic Spectrum Disorders (ASD). The authors present a review of current research in the area. Three studies qualified for inclusion and findings were summarised into four categories. Findings appear to indicate an association between RPM and a decrease in repetitive behaviours. Further research in the area of RPM is warranted in order for it to be considered as a qualifying evidence-based practice.

Major Point: “It is apparent that there is a lack of research evidence on RPM and this needs to be addressed by the academic community. This is not unique to RPM, as Wong, Odom, Hume, Cox, Fettig, Kucharczyk, Brock, Plavnick, Fleury and Schultz, (2014) report that there are only twenty-seven interventions that can be classified as evidence-based practices.”

McQuiddy, V., & Brennan, A.M. (2016), *Occupational Therapy Using Rapid Prompting Method: A Case Report*, Autism Open Access, 6:165 (open access [here](#))

Abstract: Individuals with autism spectrum disorders that are nonverbal or have significantly limited verbal ability often demonstrate difficulties with learning and communication that impact their ability to participate in everyday, functional activities. Healthcare providers and educators that provide intervention for individuals with autism spectrum disorders utilize a variety of interventions and treatment techniques while tailoring their interventions to consider the unique needs of the individual with autism. This case report reviews how incorporating Rapid Prompting Method, a relatively new teaching technique for individuals with autism spectrum disorders, into occupational therapy treatment for a young adult male with autism with significantly limited verbal ability improved his functional participation, including communication, behavior, and engagement in routine activities of daily living.

Major Point: Case study highlighting idea that many difficulties and behavioral issues related to non-verbal or minimally verbal autism may be reduced with the Rapid Prompting Method, a relatively new intervention providing an alternative form of teaching and communication

Chen, G.M., Yoder, K.J., Ganzel, B.L., Goodwin, M.S., & Belmonte, M.K. (2012), *Harnessing Repetitive Behaviours to Engage Attention and Learning in a Novel Therapy for Autism: An Exploratory Analysis*, Frontiers in Psychology, 3:12 (open access [here](#))

Abstract: Rigorous, quantitative examination of therapeutic techniques anecdotally reported to have been successful in people with autism who lack communicative speech will help guide basic science toward a more complete characterisation of the cognitive profile in this underserved subpopulation, and show the extent to which theories and results developed with the high-functioning subpopulation may apply. This study examines a novel therapy, the “Rapid Prompting Method” (RPM). RPM is a parent-developed communicative and educational therapy for persons with autism who do not speak or who have difficulty using speech communicatively. The technique aims to develop a means of interactive learning by pointing amongst multiple-choice options presented at different locations in space, with the aid of sensory “prompts” which evoke a response without cueing any specific response option. The prompts are meant to draw and to maintain attention to the communicative task—making the communicative and

educational content coincident with the most physically salient, attention-capturing stimulus—and to extinguish the sensory–motor preoccupations with which the prompts compete. Video-recorded RPM sessions with nine autistic children ages 8-14 years who lacked functional communicative speech were coded for behaviours of interest. An analysis controlled for age indicates that exposure to the claimed therapy appears to support a decrease in repetitive behaviours and an increase in the number of multiple-choice response options without any decrease in successful responding. Direct gaze is not related to successful responding, suggesting that direct gaze might not be any advantage for this population and need not in all cases be a precondition to communication therapies.

Major Point: Highlights motor and sensory based approach of RPM and hypothesizes its possibilities as a communicative therapy for those with non-speaking autism

Bonneh, Y.S., Belmonte, M.K., Pei, F., Iversen, P.E., Kenet, T., Akshoomoff, N., Adini, Y., Simon, H.J., Moore, C.I., Houde, J.F., & Merzenich, M.M. (2008), *Cross-modal extinction in a boy with severely autistic behaviour and high verbal intelligence*, *Cognitive Neuropsychology*, 25:5, 635-652 (paywall access [here](#))

Abstract: Anecdotal reports from individuals with autism suggest a loss of awareness to stimuli from one modality in the presence of stimuli from another. Here we document such a case in a detailed study of A.M. [Tito Mukhopadhyay], a 13-year-old boy with autism in whom significant autistic behaviours are combined with an uneven IQ profile of superior verbal and low performance abilities. Although A.M.'s speech is often unintelligible, and his behaviour is dominated by motor stereotypies and impulsivity, he can communicate by typing or pointing independently within a letter board. A series of experiments using simple and highly salient visual, auditory, and tactile stimuli demonstrated a hierarchy of cross-modal extinction, in which auditory information extinguished other modalities at various levels of processing. A.M. also showed deficits in shifting and sustaining attention. These results provide evidence for monochannel perception in autism and suggest a general pattern of winner-takes-all processing in which a stronger stimulus-driven representation dominates behaviour, extinguishing weaker representations.

“A.M. ... could not initiate communication on his own and was not able to interact with people unless his mother gave him the means to do so, such as setting up his laptop computer in close proximity and prompting him to begin typing. However, once prompted he was able to communicate independently without any physical facilitation, using a keyboard or a letter board or by handwriting. He was also able to answer questions related to his perception during the experiments. Vocal prompting by his mother using brief words such as “go” or “come on”, sometimes repeated several times, was often necessary to reestablish attention and to enable response. This prompting did not cue a

particular response, but rather appeared critical for initiating any response at all. For example A.M. would not move and point during the first few experimental trials unless prompted vocally by his mother. This initiation problem and the need for prompting usually diminished when the experiment reached a steady pace. Interestingly, when the sequence of trials was interrupted A.M. often failed to suppress his ongoing pointing. A.M. was able to sustain a question-and-answer period for extensive interval, sometimes 2 to 3 hours long, with 5- to 10-minute breaks every 10 to 15 minutes.”

Shoener, R.F., Kinnealey, M., & Koenig, K.P. (2008), *You Can Know Me Now If You Listen: Sensory, Motor, and Communication Issues in a Nonverbal Person With Autism*, American Journal of Occupational Therapy, 62:5, 547-553 (open access [here](#))

Abstract: This case report describes an intensive approach to treating autism and provides an intersection between a first-person narrative paired with intervention and outcomes. In-depth conversations between a person with autism and an occupational therapist provide insight into understanding differences and difficulties in sensory processing and regulation, praxis, and communication. Individuals with autism may be intellectually and emotionally intact but hampered by deficits that interfere with the ability to move the body efficiently. These sensorimotor deficits underlie the ability to communicate with others and to develop relationships. This article illustrates the benefits of an intensive therapeutic program designed to address sensory and motor differences underlying communication, as well as the vital role the occupational therapist plays in addressing these underlying differences to improve functional communication and social participation.

Major Point: Case study of 18-year-old who learned through RPM to type independently at age 14

Ochs, E., Solomon, O., & Sterponi, L. (2005), *Limitations and transformations of habitus in Child-Directed Communication*, Discourse Studies, 7:4-5, 547-583 (paywall access [here](#))

Abstract: This article offers an alternative approach to paradigms that cast culture solely as a nurturing influence on children’s language development. It proposes a dimensional model of Child-Directed Communication (CDC) to delineate ways in which a community’s habitus may impede the communicative potential of children with neuro-developmental conditions such as severe autism. It argues that certain features of Euro-American CDC are ill-adapted for autistic children. Due to inertia, caregivers often find themselves unable to transcend the limitations of CDC habitus. Yet, occasionally, a transformation in CDC emerges that more effectively engages children with impairments. The article analyzes one such transformation forged in the niche of a unique mother–son relationship in India and then introduced in the USA.



Major Point: Describes key CDC strategies developed by Soma Mukhopadhyay to effectively communicate with her severely autistic son and with US children with this disorder; considers if and how a communicative innovation can become a default communicative practice and overcome the problems posed by a community's habitus for talking to autistic children.

Gernsbacher, M.A. (2004), *Language is More than Speech: A Case Study*, The Journal of Developmental and Learning Disorders, 8: 79-96 (open access [here](#))

Abstract: Some individuals face severe challenges with producing oral language (i.e., speech). In this article a case study of a child who experienced severe challenges with speech development is presented. Medical records, historical home videos, audio recordings, and photographs, in conjunction with an extensive journal maintained by the child's mother provide the basis for this report, which profiles the child's development from birth to age 8;0. This child's development demonstrates the necessity of distinguishing between language—the mental representation of concepts and their relations—and speech—one means for communicating mental representations.

Major Point: Case study drawing from detailed records kept by mother of individual who communicates by spelling using "an adapted form of RPM," and demonstrating that lack of speech cannot be assumed to mean lack of language or intelligence

II. Facilitated Communication Literature

Faure, P., Legou, T., & Gepner, B. (2021), *Evidence of Authorship on Messages in Facilitated Communication: A Case Report Using Accelerometry*, *Frontiers in Psychiatry* (open access [here](#))

Abstract: Facilitated communication (FC) belongs to augmentative and alternative methods of communication. Currently, FC is very rarely and unofficially used with people suffering from verbal/communicative disorders or neurodevelopmental disorders such as intellectual deficiency or autism spectrum disorder (ASD). FC consists of physical support exerted by a facilitator at the hand/wrist/forearm/elbow of a patient/participant, aimed at helping him/her to point at pictures/words, and sometimes to type letters/words on a keyboard. Given most of (but not all) validation studies using control procedures failed to confirm that ASD participants themselves were authoring the messages via FC, this method has been massively disputed and rejected. However, firm and definitive conclusions for/against the validity of FC requires more robust demonstrations, particularly when considering the motor participation of both protagonists. We present here a case report investigating the motor contribution of both protagonists during a typing process using the non-invasive technique of accelerometry. A 17-year-old boy diagnosed with congenital deafness, ASD, and developmental delay, and his facilitator, were equipped with small accelerometers fixed on their index finger, aimed at transforming index acceleration along the three spatial axes into electric signals. Typing on a PC keyboard was performed under three support conditions: hand support, forearm support, elbow support, plus a solo-typing condition. Accelerometric signals and video data were recorded during four FC sessions. We measured and compared the typing speed, the number/percentage of acceleration peaks produced by the participant or by the facilitator first, and those of “signal under detection threshold” in the facilitator, the time offset between acceleration peaks of both protagonists, and the difference of the amount of acceleration between them, across the different support conditions. Results indicate that in the hand support, most of the time, acceleration motions of the participant’s index finger preceded those of the facilitator’s index finger. Then, the more distal the physical support (i.e., [farther] from the participant’s hand), the slower the speed of typing, the higher the percentage of “signal under detection threshold” in the facilitator, the bigger the motor contribution from the participant. Altogether, in all the support conditions, the participant’s authorship or, at least, co-authorship on the messages seems warranted. Finally, accelerometry seems relevant to objectivize authorship or co-authorship in FC and delineate various forms of FC.

Key Quotations: “[I]n the hand support condition, in 83% of cases, the acceleration peak of the participant preceded that of the facilitator, and that the percentage of signals under the detection threshold in the facilitator increased from 0% in the hand support

condition to almost 25% in the forearm condition and to almost 50% in the elbow condition.” “This result showed that most of the time, the participant was not passively supported or influenced by the facilitator but instead that he contributed actively to motion acceleration toward the letters, and preceded the facilitator, which seems to objectivize his strong contribution to authorship on the messages. Besides, the typing speed was faster in the hand condition than in the other two support conditions, supporting the idea that the hand condition was the most effective for physically supporting the participant.” “Altogether, it is likely that the more proximal the physical support (i.e., closer to the hand of B.L.), the more B.L.’s motor disturbances (such as his lack of motor anticipation and initiative, repetitive or disorganized movements, perseveration, dyspraxia, and slowness) are supported and therefore attenuated by FC, as revealed by a faster speed of typing, a bigger motor contribution from the facilitator, and a similar amount of acceleration between the two protagonists. This parallel between proximal support and a higher level of help/facilitation on the motor disturbances of participants during FC was first observed by Crossley and Remington-Gurney. Indeed, motor peculiarities/disturbances and executive dysfunction are very frequent if not universal in individuals on the whole autism spectrum, and from the beginning of their life. As said above, the physical support exerted by the facilitator during FC seems to filtrate and compensate these motor impairments.”

Williams, R.M. (2020), *Falsified Incompetence and Other Lies the Positivists Told Me*, Canadian Journal of Disability Studies, 9:5, 214-244 (open access [here](#))

Abstract: Facilitated Communication (FC) is a technique of supported communication for non-speaking people with motor movements commonly understood as spasmodic, dyspraxic, or otherwise unruly. FC is a contentious site of scientific conflict where highly circumscribed quantitative experiments have been unable to reckon with the lived reality of typers. The debate over the efficacy of FC centers around broader arguments of what counts as scientific rigor and validity. In this paper, I remind readers that experiential data is, in fact, empirical. Qualitative analysis is scientifically rigorous. Adopting technologies of analysis from Chela Sandoval’s “Methodology of the Oppressed,” I explore a rhetorics of evacuation deployed by skeptics that result in the erasure of FC user agency, testimony, and experience. I invite readers to explore how these rhetorics extend beyond FC and into the wider field of education research.

McKee, A., & Gomez, A.S. (2020), *The Voices of Typers: Examining the Educational Experiences of Individuals Who Use Facilitated Communication*, Disability Studies Quarterly, 40:4 (open access [here](#))

Abstract: As the number of students with autism grows, professionals must find ways to understand how to best educate this student population. Although current research addresses teaching students with autism, studies on educating autistic students with

limited or unreliable verbal speech is nominal. In this qualitative study, interviews with eight autistics who type using the method facilitated communication are analyzed in relation to their educational experiences. The study resulted in a number of key findings that play significant roles in the participants' educational experiences, including (a) the notion of disability hierarchy and the presumption of competence, (b) the importance of building relationships and the perceptions of friendship, (c) developing a sensory friendly environment, and (d) understanding behavior and body movement. Results suggest that the educational needs of these students must be reexamined. Teachers must establish a deeper understanding of the disability and develop innovative practices to best meet the needs of autistic students with limited or unreliable verbal speech in their classrooms.

Mintz, K. (2017), *Ableism, ambiguity, and the Anna Stubblefield case*, *Disability & Society*, 32:10, 1666-1670 (open access [here](#))

Abstract: This article discusses the ongoing case of Anna Stubblefield, a former Rutgers University philosophy professor who was convicted of the sexual assault of an African American man with cerebral palsy. On appeal, the conviction was reversed, and as of this submission Stubblefield is awaiting news from the state of New Jersey Supreme Court as to whether there will be a retrial. This piece engages with Sherry's article in this journal, and dissects the many layers of ableism at play in this case, arguing that justice will not be served until the alleged victim gets to be heard.

Major Point: The author—a Stanford PhD student who has cerebral palsy and communicates with AAC—identifies many levels of ableism in the Stubblefield case.

Ashby, C., Jung, E., Woodfield, C., Vroman, K., & Orsati, F. (2015), "*Wishing to go it alone*": *The complicated interplay of independence, interdependence and agency*, *Disability and Society*, 30:10, 1474-1489 (paywall access [here](#))

Abstract: Some individuals with disabilities for whom verbal speech is not reliable use facilitated communication to express thoughts and ideas. While they may require intensive physical support initially, the goal is independent typing. However, this emphasis on fading support and independence bears consideration. We utilize a Disability Studies lens to frame practices around independence and the complicated interplay between interdependence, agency and voice. Based on qualitative analysis of communication training sessions, we present four findings: the complexity of the message versus fading of physical support, the emotional dimensions of independence, the facilitator's navigation of multiple roles, and the importance of facilitating agency. We also share implications of reframing independence and facilitating agency for the communication training process.

Major Point: Independence is a nuanced, complex and fluid concept; this paper examines those complexities in the lives of individuals working on fading support for communication.

Wilson, M., de Jonge, D., de Souza, N., & Carlson, G. (2014), *Facilitated Communication Training: Exploration of perceptions of ability and reducing physical support*, Disability Studies Quarterly, 34:1 (open access [here](#))

Abstract: A growing number of people who use Facilitated Communication Training (FCT) are becoming independent of physical support. In response, this research investigated changes in family members' perceptions of their son or daughter following the introduction of FCT, and how physical support was reduced over time. Semi-structured interviews were conducted with people who use FCT, their family members and their facilitators. It was found that once people commenced using FCT, they revealed unexpected abilities, thoughts and feelings which changed the way their family members perceived them. A number of strategies appeared to assist people who use FCT to reduce physical support. FCT was found to have had a profound impact on the lives of people and to assist in developing communication access without physical support.

Cardinal, D., & Falvey, M. (2014), *The Maturing of Facilitated Communication: A Means Toward Independent Communication*, Research and Practice for Persons with Severe Disabilities, 39:3, 189-194 (open access [here](#))

Abstract: Facilitated communication (FC) can be a successful means for people to learn to communicate effectively and independently. The preponderance of peer-reviewed articles supports FC as a useful tool for developing communication skills. While there has been a chasm of difference in qualitative versus quantitative studies on FC, researchers have produced a body of current literature confirming the method. Many people with significant intellectual disabilities, through the use of FC, have been able to demonstrate their ability to successfully communicate. We, as a profession, now need to respond with collaborative scholarship. In addition, revised position statements must be developed reflecting the past research findings and encouraging future research.

Major Point: Traces the research history of FC and articulates the ways that studies in the last two decades have validated the effectiveness of the method

Bigozzi, L., Zanobini, M., Tarchi, C., Cozzani, F., & Camba, R. (2012), *Facilitated communication and autistic children: the problem of authorship*, *Life Span and Disability*, 15:2, 55-74 (open access [here](#))

Abstract: This paper explores the authorship of the written production of children with autism who need to be physically and emotionally supported by a competent interlocutor in order to communicate. Facilitated Communication is a technique developed for this purpose. However, a significant part of the scientific community considers it a controversial technique because of the difficulty in determining the authentic author of the message. The aim of this study is to examine the written communication of six autistic boys in order to investigate and determine direct or indirect evidence of authorship. In particular, the focus is on the process of communication itself, to find behaviours or written expressions that could disprove the hypothesis of a direct influence of the facilitator. Six secondary school students diagnosed with autism participated in this study. Each student participated in 8 sessions of facilitated communication, 4 with one parent at home, 4 with an educator at school, both parent and educator assuming the role of facilitator. According to our data, evidence of authorship was represented in all categories supporting our hypothesis that facilitated communication can be authentically based both on authentic interactions and messages between both partners.

Major Point: Focuses on authenticity of facilitated communication and finds evidence of authorship in messages written by participants during facilitated communication sessions

Grayson, A., Emerson, A., Howard-Jones, P., & O'Neil, L. (2012), *Hidden communicative competence: Case study evidence using eye-tracking and video analysis*, *Autism*, 16:1, 75-86 (paywall access [here](#))

Abstract: A facilitated communication (FC) user with an autism spectrum disorder produced sophisticated texts by pointing, with physical support, to letters on a letterboard while their eyes were tracked and while their pointing movements were video recorded. This FC user has virtually no independent means of expression, and is held to have no literacy skills. The resulting data were subjected to a variety of analyses aimed at describing the relationship between the FC user's looking and pointing behaviours, in order to make inferences about the complex question of 'authorship'. The eye-tracking data present a challenge to traditional 'facilitator influence' accounts of authorship, and are consistent with the proposition that this FC user does indeed author the sophisticated texts that are attributed to him; he looks for longer at to-be-typed letters before typing them, and looks ahead to subsequent letters of words before the next letter of the word is typed.

Major Point: Uses video-tracking to verify that the facilitated communication users' eye gaze targets letters before they move their hand toward the target

Bernardi, L., & Tuzzi, A. (2011), *Analyzing Written Communication in AAC Contexts: A Statistical Perspective*, *Augmentative and Alternative Communication*, 27:3, 183-194 (paywall access [here](#))

Abstract: This research note focuses on some of the opportunities provided by the statistical analysis of textual data, by illustrating examples of the use of lexicon-based quantitative measures with texts within a particular context of augmentative and alternative communication. The corpus is composed of 12 essays produced by six individuals with autism and six participants without disabilities in a control group during sessions of facilitated communication. The study raises questions that can be answered thanks to the statistical methods implemented in the text analysis framework and other procedures that may be used to identify the characteristics of texts (and their writers) and compare texts (or subcorpora). The aim is to discuss strengths, weaknesses, opportunities, and threats of the approach and to highlight its connections to qualitative approaches.

Tuzzi, A. (2009), *Grammar and lexicon in individuals with autism: A Quantitative analysis of a large Italian corpus*, *Intellectual and Developmental Disabilities*, 47:5, 373-385 (paywall access [here](#))

Abstract: Statistical and linguistic procedures were implemented to analyze a large corpus of texts written by 37 individuals with autism and 92 facilitators (without disabilities), producing written conversations by means of PCs. Such texts were compared and contrasted to identify the specific traits of the lexis of the group of individuals with autism and assess to what extent it differed from the lexis of the facilitators. The purpose of this research was to identify specific language features using statistical procedures to analyze contingency lexical tables that reported on the frequencies of words and grammatical categories in different subcorpora and among different writers. The results support the existence of lexis and distributional patterns of grammatical categories that are characteristic of the written production of individuals with autism and that are different from those of facilitators.

Major Point: Establishes that the grammatical and lexical patterns of language produced by autistic individuals using FC are quantitatively different from language produced by their non-autistic facilitators

Tuzzi, A., Cemin, M., & Castagna, M. (2004), "Moved deeply I am" Autistic language in texts produced with FC, JADT 2004: 7es Journées internationales d'Analyse statistique des Données Textuelles, 1097-1105 (open access [here](#))

Abstract: Using texts produced through Facilitated Communication (FC), this work is aimed at identifying the characteristic features of the language used by autistic subjects and understanding when these distinctive elements may distinguish it from the language of facilitators. Preliminary results shows that autistic subjects actually use a special style of writing; this finding supports the hypothesis that texts are the fruit of individual production of autistic subjects, not inevitably influenced by facilitators. This first work, based on a restricted sample which is not necessarily representative, is important because it has permitted to better specify criteria by which subjects, texts, analyses to carry out and software to be employed will be chosen in future studies. Such a protocol may be later applied to a broader interdisciplinary project involving linguistics, statistics, computer science, pedagogy, neurology, psychology, social sciences and ethical-philosophy. This new project, named "EASIEST" (Autistic Expression: Interdisciplinary Study with Statistic-Textual data processing) is based on the idea that in the specific case of autism, each form of communication represents a resource to be evaluated even if this seems atypical and controversial.

Niemi, J., & Kärnä-Lin, E. (2002), *Grammar and Lexicon in Facilitated Communication: A Linguistic Authorship Analysis of a Finnish Case*, *Mental Retardation*, 40:5, 347-357 (paywall access [here](#))

Abstract: This case study adds a new dimension to the discourse on the authorship issue in facilitated communication. The linguistic structure produced by a young Finnish man with severe cerebral palsy was examined. Data are based on transcripts he produced from 1993 until 1996 after facilitated communication had been introduced to him. In the data analysis, as explicit criteria for his idiosyncrasies, we used patterns typical of children acquiring Finnish as their first language and those found in normal slips of the tongue, acquired aphasia, and specific language impairment. Based on the analysis (i.e. the idiosyncrasy and agrammaticality of word-forms and sentences), we strongly suggest that his output can hardly be a product of any other speaker of Finnish, including that of his facilitators.

Major Point: Validates authorship of FC user by distinguishing between linguistic structure of language produced by the user and that of his facilitators and other Finnish speakers

Olney, M.F. (2001), *Evidence of Literacy in Individuals Labeled with Mental Retardation*, Disability Studies Quarterly, 21:2 (open access [here](#))

Abstract: Facilitated communication (FC) is a technique that involves provision of physical support to an individual who has few or no verbal communication skills in order to allow that person to point or type. There have been many papers published that have failed to validate FC. This study examines reading ability in a group of individuals considered to have mental retardation who also use FC. Nine individuals and their regular facilitators participated in a controlled study in which FC users were asked to respond to multiple-choice, vocabulary-based computer game items in both nonblind and blind conditions. Sessions were taped, analyzed, and scored. Although none of the participants had revealed literacy in previous assessments, four responded to game items at a greater-than-chance level.

Major Point: “This study has four critical implications. First, the abilities of FC users and others with severe disabilities ought to be viewed as open-ended rather than fixed. ... Researchers and professionals should not allow the limitations indicated by tested performance to prevent experimentation with literacy and other academic activities. Second, as Ogletree et al. (1993) have suggested, FC should be evaluated independently for each person. Third, the process and context of testing have an impact on performance. Individuals who do not reveal their abilities to read and comprehend written language in clinical testing may do so in more informal activities and settings. Fourth, FC may be a useful tool in assessment of language skills. This study suggests that FC may provide the level of physical and emotional support needed for individuals with significant communication impairments to perform maximally. Clearly, the dialogue about the usefulness and validity of FC is not finished. Research is needed that replicates tests of facilitation that appear to work for FC users. It would appear that it is premature to close the book on FC. We have yet to discover who may indeed benefit from facilitated communication.”

Emerson, A., Grayson, A., & Griffiths, A. (2001), *Can't or won't? Evidence relating to authorship in facilitated communication*, International Journal of Language and Communication Disorders, 36: 98-103 (paywall access [here](#))

Abstract: Most experimental evaluations of Facilitated Communication (FC) provide no evidence that this technique is valid. Important as they are, controlled test-based studies have characteristically not done justice to the complexity of the issues which surround FC. This paper summarises a long term evaluation project involving various forms of data collection. In this study too, controlled testing has shown very little evidence for the validity of the technique. In contrast, other sources of data, including records of naturally occurring message passing and intensive video analysis have provided evidence that the communication skills of some FC users have been enhanced. An overview of the

project is presented, and discussed in relation to the blurring of findings (observations of behaviour) and inferences (judgements of communicative competence) in the extant literature.

Emerson, A., Griffiths, A., Prentice, A., Cosham, T., Howard-Jones, P., & Grayson, A. (1998), *Evaluation of Facilitated Communication*, *International Journal of Language & Communication Disorders*, 33 Suppl. 397-402 (paywall access [here](#))

Abstract: Two case studies are presented to demonstrate the effectiveness of Facilitated Communication (FC). A wide variety of sources of data have been examined and consistent behaviour found within FC interactions. There are indications that changes in behaviour of both people resulted at least in part from the use of FC.

Cardinal, D.N., Hanson, D., & Wakeham, J. (1996), *Investigation of authorship in facilitated communication*, *Mental Retardation*, 34:4, 231-242 (paywall access [here](#))

Abstract: We examined whether facilitated communication users, under controlled conditions, could transmit rudimentary information to a naive facilitator. Forty-three students across 10 classrooms were shown a single randomly selected word with their facilitator out of the room. The facilitator then entered the room and asked the student to type the word, which was recorded exactly as typed and later evaluated; approximately 3,800 attempts were conducted over a 6-week period. Results showed that (a) under controlled conditions, some facilitated communication users can pass accurate information and (b) measurement of facilitated communication under test conditions may be significantly benefited by extensive practice of the test protocol, which could partially account for the inability of several past studies to verify facilitated communication-user originated output.

Major Point: Message passing study exploring the conditions under which message passing can be successful, suggesting that research design adopted unnecessary “over control” in early authorship studies

Sheehan, C.M., & Matuozzi, R.T. (1996), *Investigation of the Validity of Facilitated Communication Through the Disclosure of Unknown Information*, *Mental Retardation*, 34:2, 94-107 (paywall access [here](#))

Abstract: Three individuals (8, 10, and 24 years old with diagnoses of autism and mental retardation) participated in a message-passing format to determine whether they could disclose information previously unknown to their facilitators. Results showed valid facilitated communication from each participant. The facilitated speakers participated in 14 sessions, each lasting approximately 1 to 1.5 hours. A wide range of information was collected, coded, and analyzed for validity, consistency, language difficulties, behavioral

compliance, and style of facilitation. Out of 720 communicative interactions, participants disclosed 77 incidents of unknown information. Each participant revealed unique behaviors and styles of responding, and all were able to demonstrate genuinely independent communication through disclosure of specific information previously unknown to a facilitator, although much inconsistency was noted. Results suggest that a phenomena as complex as facilitated communication eludes a cursory exploration.

Major Point: Study demonstrating genuinely independent communication of FC users who disclosed information previously unknown to their facilitator, while also failing in some instances to disclose relevant information

Weiss, M.J., Wagner, S.H., & Bauman, M.L. (1996), *A Validated Case Study of Facilitated Communication, Mental Retardation*, 34:4, 220-230 (paywall access [here](#))

Abstract: The case of a 13-year-old boy with autism, severe mental retardation, and a seizure disorder who was able to demonstrate valid facilitated communication was described. In three independent trials, short stories were presented to him, followed by validation test procedures with an uninformed facilitator providing physical support to the subject's arm. In Trials 1 and 3, several specific answers were provided that clearly indicated that the young man, not the uninformed facilitator, was the source of the information. Moreover, some responses seemed to imply that the subject was employing simple inferential and abstract reasoning. This case study adds to the small, but growing number of demonstrations that facilitated communication can sometimes be a valid method for at least some individuals with developmental disabilities.

Major Point: Three independent trials of information passing were conducted with third-party referees observing Trials 2 and 3 for added independent verification. Responses in Trials 1 and 3 indicate the young man was the author of answers provided and not the uninformed facilitator.

Biklen, D., Saha, N., & Kliewer, C. (1995), *How Teachers Confirm the Authorship of Facilitated Communication: A Portfolio Approach, Research and Practice for Persons with Severe Disabilities*, 20:1, 45-56 (paywall access [here](#))

Abstract: Facilitated communication has been characterized as an alternative to speech that involves providing physical and emotional support to individuals with severe communication impairments as they type or point to letters or pictures (Biklen, 1993). The method has been described as relevant for individuals who cannot speak, whose speech is extremely limited (e.g., echolalic, comprising a few words) and who cannot point independently and reliably (Biklen, Morton, Gold, Berrigan, & Swaminathan, 1992; Crossley 1992). Qualitative and controlled studies of the method demonstrate its usefulness for some individuals and that facilitators may influence the communication of

some individuals. This qualitative study of seven speech and language teachers and classroom teachers working with 17 students, focused on how and on what basis the teachers determined for themselves that the words typed were authored by their students and not by them, the facilitators. The teachers provided and described evidence for 13 of the 17 students of message passing skills (i.e., typing information not known to their facilitators that could be verified as accurate). The teachers noted that 3 of these 13 and 4 of the total 17 achieved some independent typing beyond typing their names and the date. Sixteen of the 17 students were judged by their teachers to have confirmed their typing/communication ability by virtue of other features: unique physical characteristics in typing or pointing, personal themes, recurring phrases, and stylistic qualities. These features appeared in their individual work but not in others, even though several shared facilitators. These findings suggest the potential value of a communication portfolio approach to documenting individuals' abilities to communicate with facilitation.

Major Point: Finds evidence of successful message-passing for 13 out of 17 participants; proposes a portfolio approach for documenting authorship of individuals who type to communicate with support

Janzen-Wilde, M.L., Duchan, J.F., & Higginbotham, D.J. (1995), *Successful use of facilitated communication with an oral child*, Journal of Speech and Hearing Research, 38(3): 658-676 (open access [here](#))

Abstract: A 6½ -year-old child's oral and spelled utterances were compared over a 3-month period as he was trained to use Facilitated Communication (FC), a method of augmentative and alternative communication. The child's language with FC was significantly better than his oral language in length of utterances, novelty of utterances, and syntactic complexity. His language with FC also contained more function words and over time was more intelligible and required less verbal scaffolding than his oral communication. Evidence that he was authoring his own messages during his facilitated spelling was found in his idiosyncratic use of language and his ability to convey verifiable information that was unknown to the facilitator. The strongest evidence came later with his ability to type messages without physical support. The results suggest the potential for using FC with children who have some functional oral skills but cannot express themselves fully in the oral modality. The method can serve as a means of investigating language potential and as a transition to literacy and independent typed communication.

Heckler, S. (1994), *Facilitated communication: A response by child protection*, Child Abuse & Neglect, 18:6, 495-503 (paywall access [here](#))

Abstract: Using a new technology called facilitated communication, a 7-year-old autistic child reported that she had been sexually abused. Because this method of reporting was

the first of its kind at Hennepin County's (Minneapolis) Child Protection Agency, steps were taken not only to understand facilitated communication, but also to assess the reliability of the child's report. This article includes a description of the client's complaint, the subsequent referral process that it provoked, and a background description of the client and family situation. It also describes the client's method of communication, including the assessment procedure that was devised to examine her communication production. The article ends with a summary of results from implementation of the assessment procedures, and a discussion of the limitations of these procedures. What is evident is that facilitated communication cannot be ignored.

Major Point: In this case, we found convincing evidence that facilitated communication worked best when a neutral facilitator was used, and when we allowed the child to just talk. We compared all responses with what the facilitator could have known and could not have known to determine that it was the child who was doing the talking. For uses of protecting children, this kind of evidence should not be ignored, but should be considered as only as part of an overall case presentation. To dismiss this evidence simply because the technology is not fully understood at this time could allow continued abuse to some of the most vulnerable members of our society.

Botash, A.S., Babuts, D., Mitchell, N., O'Hara, M., Lynch, L., & Manuel, J. (1994), *Evaluations of Children Who Have Disclosed Sexual Abuse via Facilitated Communication*, Archives of Pediatric Adolescent Medicine, 148:12, 1282-1287 (paywall access [here](#))

Summary: The researchers reviewed 1,096 documented sexual abuse allegations made between January 1990 and March 1993 to the Child Abuse Referral and Evaluation (CARE) program at the State University of New York Health Science Center in Syracuse, New York. Of the 1,096 allegations, only 13 (1.2%) were made using facilitated communication (FC). Of those 13 allegations made by FC, eight were substantiated by additional evidence or perpetrator confession.

Biklen, D., Morton, M.W., Gold, D., Berrigan, C., & Swaminathan, S. (1992), *Facilitated Communication: Implications for individuals with autism*, Topics in Language Disorders, 12:4, 1-28 (paywall access [here](#))

Abstract: Describes the use of facilitated communication (FC) with 43 students and young adults (aged 3–26 yrs) with autism. The authors examined the processes that teachers and others used to help Ss get started with FC, as well as strategies teachers used to help Ss with echoed speech to type nonecholalic communications. Unobtrusive measures were used to verify Ss' abilities to communicate their own thoughts through facilitated means. The implications of FC for other behaviors associated with autism are discussed. Conditions that assisted Ss in getting started with FC were communication

content (i.e., open-ended conversation), physical support for the typing task, and attitudinal support in creating opportunities for communication. It is noted that different forms of participation in society would depend as much on support from the people around Ss as from the Ss' own capacities.

Major Point: Describes key components of FC (physical, emotional, and communicative support), provides recommendations starting FC, and highlights the importance of a supportive environmental context for typer success

Calculator, S.N., & Singer, K.M. (1992), *Preliminary validation of facilitated communication*, Topics in Language Disorders, 12:4, ix-xvi (paywall access [here](#))

Abstract: In a sample size of five, the authors compared PPVT-R results with and without FC to validate the impact of FC on uncovering students' underlying communication skills. Distractors were used for facilitators. Three of the five subjects showed big differences when facilitated. A fourth also did with a different facilitator. "The risk of harming subjects by subjecting them to testing may be more an artifact of the way in which such testing is conducted than its mere use. The examiner who communicates a lack of expectation and creates a negative testing environment is certainly one who could adversely affect any child's performance."

Major Point: Emphasizes the negative impact examiners can have on a testing environment and raises issues with how students are assessed

Crossley, R., & Remington-Gurney, J. (1992), *Getting the words out: Facilitated communication training*, Topics in Language Disorders, 12:4, 29-45 (paywall access [here](#))

Abstract: Examines the DEAL Communication Centre's use of facilitated communication training with 430 intellectually impaired individuals who attended the Australian facility from 1986 to 1990. 117 Ss had autism, 81 Down's syndrome, 5 Rett's syndrome, 5 tuberous sclerosis, 3 phenylketonuria, and 219 Ss had other types of intellectual impairment not related to those mentioned. More than half of the Ss showed that they had the potential to use spelling to augment their speech. Many grew able to communicate through typing and produced written language of such complexity as to challenge the beliefs about the language of people diagnosed as autistic or significantly impaired.

Major Point: Study of 430 intellectually impaired individuals with various diagnoses finding more than 50% demonstrated potential for speech augmentation through spelling

Crossley, R. (1992), *Getting the words out II: Case studies in facilitated communication training*, Topics in Language Disorders, 12:4, 46-59 (paywall access [here](#))

Abstract: Presents case studies of (1) a woman with athetoid cerebral palsy who was 13 in 1974 and had lived in a mental institution for 9 yrs; (2) a 25-yr-old woman with phenylketonuria; and (3) a 12-yr-old boy with Down's syndrome. The cases recount how these patients with different diagnoses, each of whom had been labeled as significantly intellectually impaired, developed communication through spelling. Each patient required physical assistance to overcome neuromotor problems affecting his or her ability to access a communication aid. Training in nonspeech communication enabled them to challenge the labels they had been given.

Major Point: Study of three individuals, each with a different diagnosis, who all were able to develop communication through spelling, all requiring physical assistance to overcome neuromotor challenges

Biklen, D., & Schubert, A. (1991), *New Words: The Communication of Students with Autism*, Remedial and Special Education, 12:6, 46-57 (paywall access [here](#))

Abstract: People with autism have a variety of communication difficulties that have been assumed to be related to cognitive deficits. The communication difficulties include an inability to speak words, speaking with echolalia or repetition of words or phrases previously heard, pronominal reversals, seeming inattentiveness, problems with social interaction, and lack of responsiveness to external events. This study reports on the effects of a method called facilitated communication in helping students with autism to unlock their ideas and to communicate through typing. The 21 students in this study reveal unexpected literacy and numeracy skills. The content and form of their communication challenges traditional assumptions about autism, especially the ability of people with autism to analyze and use language.

Major Point: Early qualitative study comparing spoken communication versus typed communication (FC) of individuals with autism, suggesting that with support, individuals may exhibit previously unknown competencies such as math or reading. Includes examples of typer authorship such as typing information unknown to the facilitator and unique spelling or typographical errors.

Biklen, D. (1990), *Communication Unbound: Autism and Praxis*, Harvard Educational Review, 60: 291-314 (paywall access [here](#))

Abstract: Presents a qualitative study of a facilitative communication method developed by R. Crossley and colleagues in Melbourne, Australia. People who have been labeled severely autistic can selectively communicate with certain facilitators and in certain



circumstances. In so doing, they not only challenge widely held assumptions about autism and the ability of people with autism to communicate, but also illustrate the effectiveness of an education-through-dialogue approach in which teachers and students learn from each other and where school validates personal expression. An outline of attitudinal dimensions and the range of skills needed for the practice of facilitated communication is included.

Major Point: First peer-reviewed article in the United States describing FC; challenges validity of competence assessments of individuals with autism who do not use their physical voices to communicate

III. Other AAC Literature

McNaughton D., Light, J., Beukelman, D.R., Klein, C., Nieder, D., & Nazareth, G. (2019), *Building Capacity in AAC: A Person-Centred Approach to Supporting Participation by People with Complex Communication Needs, Augmentative and Alternative Communication*, 35:1, 56-68 (paywall access [here](#))

Abstract: Effective communication is based both on the capacity of the person with complex communication needs, and of other key stakeholders (including communication and education professionals, family members, community partners, and healthcare professionals), to ensure that appropriate AAC supports are provided. In this paper, we describe strategies to build awareness of AAC and to assist people with complex communication needs in obtaining needed services; to build the knowledge, skills, and attitudes of AAC service providers; to provide instruction for people with complex communication needs, as well as communication partners and advocates; and to develop communication supports in society more broadly. We also provide an agenda for building capacity in research and development activities to support full participation by people with complex communication needs throughout society.

Light, J., McNaughton, D., Beukelman, D., Fager, S.K., Fried-Oken, M., Jakobs, T., & Jakobs, E. (2019), *Challenges and Opportunities in Augmentative and Alternative Communication: Research and Technology Development to Enhance Communication and Participation for Individuals with Complex Communication Needs, Augmentative and Alternative Communication* (open access [here](#))

Abstract: The field of augmentative and alternative communication (AAC) has witnessed significant changes since its inception. AAC services are now considered for a much greater number of individuals with complex communication needs and there are many more AAC options available as communication supports, including a proliferation of technologies. The scope and options for communication within society have increased substantially to include a wide array of digital and social media. Individuals with complex communication needs have increased expectations for participation and engagement across a full range of environments—education, employment, family, healthcare, and community living. Despite these advances, there remain critical challenges that must be addressed. This paper discusses key advances in the AAC field, delineates challenges, and discusses future directions to address these challenges, specifically as they relate to research and development to enhance AAC interventions and technologies for individuals with complex communication needs and their families.

Brignell, A., Chenausky, K.V., Song, H., Zhu, J., Suo, C., & Morgan, A.T. (2018), *Communication interventions for autism spectrum disorder in minimally verbal children*, Cochrane Database of Systematic Reviews 2018, Issue 11, Art. No.: CD012324 (paywall access [here](#))

Abstract: There is limited evidence that verbally based and AAC interventions improve spoken and non-verbal communication in minimally verbal children with ASD. Both studies included in this review reported gains in aspects of verbal or non-verbal communication (or both) for some children immediately after the intervention. Neither of the interventions resulted in improvements in verbal or non-verbal communication that were maintained over time for most children. We rated the overall quality of the evidence as very low because we only found two eligible studies, and they involved few participants. Furthermore, both studies had some methodological limitations that increased their risk of bias.

Key Quotations: “Historically, most studies that have investigated communication interventions for children with ASD have focused on the language development of verbal children. Little attention has been given to children who are minimally verbal At present there is no consensus on what the most effective intervention approach for minimally verbal children with ASD may be. We cannot assume that interventions that work for verbal children will also work for children who are minimally verbal, so a systematic review to evaluate the existing evidence on interventions for this population is needed. ... In this review, we aim to address two main questions. First, are communication interventions beneficial for minimally verbal children with ASD and, if so, which type of intervention is the most effective? Second, do the outcomes of preschool and school-age children with ASD differ when such interventions are applied?”
“Clinicians, families and consumers should be aware of the lack of evidence for the effectiveness of communication interventions for minimally verbal children with ASD. If they choose to use these interventions, they should carefully monitor the child’s progress and adapt as indicated.”

Gernsbacher, M. (2018), *More Shared Responsibility for “More Appropriate Communication,” Perspectives of the ASHA Special Interest Groups, 3:2, 58-67* (open access [here](#))

Abstract: The term “more appropriate communication” appears in more than 400 scholarly articles (according to Google Scholar). I examined the first 100 scholarly articles that pertained to communication between humans (rather than communication between computer networks). The question I sought to answer was who, according to the scholarly literature, bears responsibility for achieving “more appropriate communication?” Of the 100 scholarly articles examined, only a slim minority (N = 7) imply that more appropriate communication is a responsibility shared among two or

more communication partners, and most of these articles address more appropriate communication between literal peers, such as undergraduate students with other undergraduate students. The majority of scholarly articles (N = 61) imply that the responsibility for more appropriate communication lies with the more powerful communication partners (i.e., people who have more status, experience, or resources). The remaining third of the scholarly articles (N = 32) imply that responsibility for more appropriate communication lies with the less powerful communication partners, and these less powerful communication partners are frequently children with developmental disabilities. I conclude by suggesting that the responsibility for more appropriate communication, particularly with developmentally disabled children, either should be assumed by the more powerful communication partners or should be shared.

Major Point: “[T]he responsibility for more appropriate communication, particularly with developmentally disabled children, either should be assumed by the more powerful communication partners or should be shared.”

Morin, K.L, Ganz, J.B., Gregori, E.V., Foster, M.J., Gerow, S.L., Genç-Tosun, D., & Hong, E.R. (2018), *A systematic quality review of high-tech AAC interventions as an evidence-based practice*, *Augmentative and Alternative Communication*, 34:2, 104-117 (paywall access [here](#))

Abstract: Although high-tech augmentative and alternative communication (AAC) is commonly used to teach social-communication skills to people with autism spectrum disorder or intellectual disabilities who have complex communication needs, there is a critical need to evaluate the efficacy of this approach. The aim of this systematic review was to evaluate the quality of single-case experimental design research on the use of high-tech AAC to teach social-communication skills to individuals with autism spectrum disorder or intellectual disabilities who have complex communication needs, to determine if this intervention approach meets the criteria for evidence-based practices as outlined by the What Works Clearinghouse. Additionally, information on the following extended methodological standards is reported on all included studies: participant description, description of setting and materials, interventionist description, baseline and intervention description, maintenance, generalization, procedural integrity, and social validity. The results from 18 multiple-baseline or multiple-probe experiments across 17 studies indicate that using high-tech AAC to teach social-communication skills to individuals with autism spectrum disorder or intellectual disabilities and complex communication needs can be considered an evidence-based practice, although the review of comparison (i.e., alternating treatment) design studies did not indicate that high-tech AAC is significantly better than low-tech AAC.

Major Point: High tech AAC is evidence-based practice in teaching social-communication skills to individuals with autism spectrum disorder or intellectual disabilities and complex communication needs.

Kent-Walsh, J., & Binger, C. (2018), *Methodological advances, opportunities, and challenges in AAC research*, *Augmentative and Alternative Communication*, 34:2, 93-103 (paywall access [here](#))

Abstract: Since its inception in 1985, the AAC journal has been publishing scientific articles related to the field of augmentative and alternative communication (AAC) that (a) report research concerning assessment, treatment, rehabilitation, and education of people who use or have the potential to use AAC systems and (b) cover theory, technology, and systems development relevant to AAC. The journal has maintained a consistent focus on the science and practice of AAC while also advancing in varied and impressive ways. Among the many developments apparent in AAC over the years, methodological advancements emerge as pivotal within the evolution of the science of AAC. This report examines the state of the science in behavioral AAC research with specific regard to changes and opportunities in research methodology. Illustrations from articles published in Volume 1 (1985) and Volume 32 (2016) of AAC are used in this paper to frame commentary on (a) contextual consideration in conducting AAC research, (b) types of research design, (c) considerations of procedural rigor, and (d) future methodological directions and resources. If the AAC field is to meet the goal of ensuring that all individuals with complex communication needs achieve their full potential, meaningful questions must be posed to address key problems, and rigorous scientific methods must be employed to answer these questions.

Major Point: Provides an overview of the progression of AAC research methodologies dating back to 1985; emphasizes need for continued research to ensure the communication needs of all individuals are met to enable achievement of their full potential

Ganz, J.B., Morin, K.L., Foster, M.J., Vannest, K.J., Tosun, D.G., Gregori, E.V., & Gerow, S.L. (2017), *High-technology augmentative and alternative communication for individuals with intellectual and developmental disabilities and complex communication needs: a meta-analysis*, *Augmentative and Alternative Communication*, 33:4, 224-238 (paywall access [here](#))

Abstract: The use of mobile technology is ubiquitous in modern society and is rapidly increasing in novel use. The use of mobile devices and software applications ("apps") as augmentative and alternative communication (AAC) is rapidly expanding in the community, and this is also reflected in the research literature. This article reports the social-communication outcome results of a meta-analysis of single-case experimental

research on the use of high-tech AAC, including mobile devices, by individuals with intellectual and developmental disabilities, including autism spectrum disorder. Following inclusion determination, and excluding studies with poor design quality, raw data from 24 publications were extracted and included 89 A-B phase contrasts. Tau-U nonparametric, non-overlap effect size was used to aggregate the results across all studies for an omnibus and moderator analyses. Kendall's S was calculated for confidence intervals, p-values, and standard error. The omnibus analysis indicated overall low to moderate positive effects on social-communication outcomes for high-tech AAC use by individuals with intellectual and developmental disabilities.

Major Point: “. . . low to moderate positive effects on social-communication outcomes for high-tech AAC use by individuals with intellectual and developmental disabilities”

Holyfield, C., Drager, K.D.R., Kremkow, J.M.D., & Light, J. (2017), *Systematic review of AAC intervention research for adolescents and adults with autism spectrum disorder*, *Augmentative and Alternative Communication*, 33:4, 201-212 (paywall access [here](#))

Abstract: Much of augmentative and alternative communication (AAC) research for individuals with autism spectrum disorder has focused on young children. Given that the lives, communication, strengths, and needs of adolescents and adults with autism spectrum disorder are quite different from those of young children, the purpose of the current study was to consolidate current AAC intervention research findings specific to these individuals. A systematic review was conducted to identify and evaluate relevant research. Results indicate that AAC intervention benefits adolescents and adults with autism spectrum disorder. However, more research is urgently needed. Future research focused on supporting communicative functions other than requesting (e.g., social closeness, information transfer) while participating in contexts important to the lives of adolescents and adults may be particularly valuable.

Major Point: AAC can benefit adolescents and adults with ASD, but more research is needed.

Iacono, T., Trembath, D., & Erickson, S. (2016), *The role of augmentative and alternative communication for children with autism: current status and future trends*, *Neuropsychiatric Disease and Treatment*, 12: 2349-2361 (open access [here](#))

Abstract: Augmentative and alternative communication (AAC) interventions are used for children with autism, often as stand-alone communication interventions for those who are minimally verbal. Our aim was to synthesize the evidence for AAC interventions for children (up to 21 years), and then consider the role of AAC within established, comprehensive, evidence-based autism interventions targeting learning across multiple developmental domains. We completed a systematic search of three databases (OVID

Medline, PsycINFO, ERIC) as well as forward citation and hand searches to identify systematic reviews of AAC intervention efficacy research including children with autism, published between 2000 and March 2016 in peer-reviewed journals. Data pertaining to the quality indicators of included studies, effect sizes for intervention outcomes, and evidence for effectiveness were extracted for descriptive analysis. The search yielded 17 systematic reviews. Most provided indicators of research quality for included studies, of which only relatively few provided conclusive results. Communication targets tended to be focused on teaching children to make requests. Still, effect size measures for included studies indicated that AAC was effective to highly effective. There is growing evidence for the potential benefits of AAC for children with autism, but there is a need for more well-designed studies and broader, targeted outcomes. Furthermore, a lack of evidence for the role of AAC within comprehensive intervention programs may account for a tendency by autism researchers and practitioners to neglect this intervention. Attempts to compare evidence for AAC with other interventions for children with autism, including those in which the use of AAC is delayed or excluded in pursuit of speech-only communication, must take into account the needs of children with the most significant learning needs. These children pose the greatest challenges to achieving large and consistent intervention effects, yet stand to gain the most from AAC interventions.

Major Point: Analyzes 17 systematic reviews of the AAC literature and finds very little high quality AAC research on the autistic population, and those with the most significant learning needs. Most AAC research evaluates the effectiveness of requesting methods rather than AAC that enables robust communication. The paper questions the appropriateness of randomized controlled trial studies in assessing the effectiveness of AAC for those with complex communication needs. “The underlying tenets of AAC research are that communication is multimodal and that individuals differ in terms of those modalities that may best suit their learning needs and preferences.”

Brady, N.C., Bruce, S., Goldman, A., Erickson, K., Mineo, B., Ogletree, B.T., Paul, D., Rowski, M., Sevcik, R., Siegel, E., Schoonover, J., Snell, M., Sylvester, L., & Wilkinson, K. (2016), *Communication services and supports for individuals with severe disabilities: Guidance for assessment and intervention*, American Journal on Intellectual and Developmental Disabilities, 121:2, 121-138 (open access [here](#))

Abstract: The National Joint Committee for the Communication Needs of People With Severe Disabilities (NJC) reviewed literature regarding practices for people with severe disabilities in order to update guidance provided in documents originally published in 1992. Changes in laws, definitions, and policies that affect communication attainments by persons with severe disabilities are presented, along with guidance regarding assessment and intervention practices. A revised version of the Communication Bill of Rights, a powerful document that describes the communication rights of all individuals, including those with severe disabilities is included in this article. The information

contained within this article is intended to be used by professionals, family members, and individuals with severe disabilities to inform and advocate for effective communication services and opportunities.

Major Point: Revises the Communication Bill of Rights

DiStefano, C., Shih, W., Kaiser, A., Landa, R., & Kasari, C. (2016), *Communication growth in minimally verbal children with ASD: The importance of interaction*, *Autism Research*, 9: 1093-1102 (paywall access [here](#))

Abstract: Little is known about language development in children with Autism Spectrum Disorders (ASD) who remain minimally verbal past age 5. While there is evidence that children can develop language after age 5, we lack detailed information. Studies of this population generally focus on discrete language skills without addressing broader social-communication abilities. As communication and social deficits are both inherent to ASD, an examination of not only what language skills are acquired, but how those skills are used in interactions is relevant. Research in typical development has examined how communication interchanges (unbroken back-and-forth exchanges around a unified purpose) develop, which can be used as a framework for studying minimally verbal children. This study examined the interchange use by 55 children with ASD over the course of a 6-month play and engagement-based communication intervention. Half of the children received intervention sessions that also incorporated a speech-generating device (SGD). Interchanges were coded by: frequency, length, function, and initiator (child or adult). Results indicated that children initiated a large proportion of interchanges and this proportion increased over time. The average length and number of interchanges increased over time, with children in the SGD group showing even greater growth. Finally, children's total number of interchanges at baseline was positively associated with their spoken language gains over the course of intervention. This study supports the crucial relationship between social engagement and expressive language development, and highlights the need to include sustained communication interchanges as a target for intervention with this population.

Sennot, S.C., Light, J.C., & McNaughton, D. (2016), *AAC modeling intervention research review*, *Research and Practice for Persons with Severe Disabilities*, 41: 101-115 (paywall access [here](#))

Abstract: A systematic review of research on the effects of interventions that include communication partner modeling of aided augmentative and alternative communication (AAC) on the language acquisition of individuals with complex communication needs was conducted. Included studies incorporated AAC modeling as a primary component of the intervention, defined as the communication partners (a) modeling aided AAC as they speak and (b) participating in the context of a naturalistic communication interaction.

This review used a best-evidence approach, including nine single-case studies, with 31 participants, and 70 replications, and one quasi-experimental randomized group design study, including 63 participants. The results of the review indicated that AAC modeling intervention packages led to meaningful linguistic gains across four areas including (a) pragmatics, marked by increases in communication turns; (b) semantics, marked by receptive and expressive vocabulary increases; (c) syntax, marked by multi-symbol turn increases; and (d) morphology, marked by increases in target morphology structures.

Major Point: AAC modeling can be an effective means to improve language abilities.

Smith, M. (2016), *Evidence for Impact and Impact of Evidence, Augmentative and Alternative Communication*, 32:4, 227-232 (paywall access [here](#))

Abstract: The author reflects on the new focus of research in measuring impact of the study to make a difference. She agrees that in research, difficulties are encountered in forging the link between practice and research evidence. An overview of different perspectives about evidence-based practice (EBP), the value of evidence and meaningful research impact is given. The author suggests the need for collaboration in measuring evidence and its impact for structuring interventions to maximize benefits.

Major Point: Points out the value and relevance of a variety of forms of “evidence,” specifically in understanding the use of AAC.

Hengst, J., McCartin, M., Valentino, H., Devanga, S., & Sherrill, M. (2016), *Mapping Communicative Activity: A CHAT Approach to Design of Pseudo-Intelligent Mediators for Augmentative and Alternative Communication (AAC)*, *Outlines, Critical Practice Studies*, 17:1, 5-38 (open access [here](#))

Abstract: The development of AAC technologies is of critical importance to the many people who are unable to speak intelligibly (or at all) due to a communication disorder, and to their many everyday interlocutors. Advances in digital technologies have revolutionized AAC, leading to devices that can “speak for” such individuals as aptly as it is illustrated in the case of the world famous physicist, Stephen Hawking. However, given their dependence on prefabricated language (and constant management by teams of people), current AAC devices are very limited in their ability to mediate everyday interactions. We argue here that the limits of AAC are firstly theoretical—grounded in prosthetic models that imagine AAC devices as replacements for damaged body parts and in transmission models of language production as communication. In contrast, our multidisciplinary team aims to design pseudo-intelligent mediators (PIMs) of communication by blending strengths of human mediators with features of current AAC technologies. To inform the design process, we report here our initial situated studies focusing on the distributed nature of everyday communicative activities conducted with

potential AAC/PIM users. Our analysis focuses on the discursive alignments of these participants and their interlocutors, attending especially to the various ways their personal aides function as human mediators. Specifically, we focus on mapping the communicative activity around each of these differently-abled individuals (the majority of whom have cerebral palsy) as they navigated a university campus. We profile the everyday interactional patterns within functional systems and across settings, and present close discourse analysis of one interaction to highlight the diverse roles personal aides adopted in mediating communication. Finally, we argue that attending to differently “abled” bodies as they move through everyday communicative environments pushes CHAT to more fully theorize physicality, individual mobilities, and the roles of bodies in the laminated assemblage of functional systems.

Major Point: Describes the many elements of communication and support that go into enabling people with and without disabilities to communicate, characterizing AAC as much more than a device; uses examples of Stephen Hawking and AAC users on a college campus

McNaughton, D., & Light, J. (2015), *What We Write about When We Write About AAC: The Past 30 Years of Research and Future Directions*, *Augmentative and Alternative Communication*, 31:4, 261-270 (open access [here](#))

Abstract: For the past 30 years, the Augmentative and Alternative Communication (AAC) journal has both documented and instigated change in the field of AAC. We reviewed the papers published in the AAC journal from 1985–2014 in order to identify trends in research and publication activities. Intervention research made up the largest proportion of the four types of research (i.e., intervention, descriptive, experimental, and instrument and measurement development) reported in the journal. Intervention research has most commonly focused on the individual with complex communication needs, and most frequently on younger individuals (aged 17 and younger) with developmental disabilities. While much has been learned in the past 30 years, there continues to be a need for high quality research in a large number of areas. There is a special need for reports of interventions with older individuals with complex communication needs as a result of acquired disabilities, and for information on effective interventions for the communication partners of persons with complex communication needs.

Major Point: Notes that the field of AAC emerged only in the mid-1980s, and there is very little published research (a) on AAC interventions that allow the user to communicate more than just simple requests, (b) conducted in the natural environment, (c) using natural communication partners rather than researchers themselves, (d) conducted over more than a six-week intervention period, and (e) on adults with complex communication needs

Kent-Walsh, J., Murza, K.A., Malani, M.D., & Binger, C. (2015), *Effects of Communication Partner Instruction on the Communication of Individuals Using AAC: A Meta-Analysis*, *Augmentative and Alternative Communication*, 31:4, 271-284 (paywall access [here](#))

Abstract: The purpose of this study was to conduct a systematic review and meta-analysis of the augmentative and alternative communication (AAC) partner instruction intervention literature to determine (a) the overall effects of partner interventions on the communication of individuals using AAC, and (b) any possible moderating variables relating to participant, intervention, or outcome characteristics. Seventeen single-case experimental design studies (53 participants) met the inclusion criteria and were advanced to the full coding and analysis phase of the investigation. Descriptive analyses and effect size estimations using the Improvement Rate Difference (IRD) metric were conducted. Overall, communication partner interventions were found to be highly effective across a range of participants using AAC, intervention approaches, and outcome measure characteristics, with more evidence available for participants less than 12 years of age, most of whom had a diagnosis of autism spectrum disorder or intellectual/developmental disability. Aided AAC modeling, expectant delay, and open-ended question asking were the most frequently targeted communication partner interaction skills. Providing a descriptive overview, instructor modeling, guided practice, and role plays were the most frequently incorporated communication partner intervention activities within the included studies.

Major Point: Reviews 17 studies of communication partner interventions, finding such interventions are very important to the communication of individuals who use AAC

Ashby, C., & Kasa, C. (2013), *Pointing Forward: Typing for Academic Access*, *Perspectives on Augmentative and Alternative Communication*, 22: 143-156 (open access [here](#))

Abstract: For students who do not demonstrate reliable verbal speech, utilization of augmentative and alternative communication, both low-tech and high-tech, can be an effective way of engaging meaningfully in the academic and social opportunities of the classroom. This article discusses the benefits of drawing on a variety of communication supports, including typing to communicate, and outlines key principles and practices for the successful inclusion of students who type in academic classes. Key principles include universal design, presuming competence, writing effective IEP goals, and successful classroom strategies.

Radtke, J.V., Baumann, B.M., Garrett, K.L., & Happ, M.B. (2011), *Listening to the Voiceless Patient: Case Reports in Assisted Communication in the Intensive Care Unit*, Journal of Palliative Medicine, 14:6, 791-795 (open access [here](#))

Abstract: Communication problems experienced by nonspeaking, critically ill patients in the Intensive Care Unit (ICU) have serious implications for the physical and psychological well-being of patients and the quality of their care. These problems are most profound for those with prolonged critical illnesses who are at the highest risk of dying. Recently, speech language pathologist (SLP) services have been used to provide augmentative and alternative communication (AAC) assistance to this vulnerable group of patients, their caregivers, and medical staff. Here we present three clinical cases that illustrate the application of AAC strategies across different levels of illness severity and communication impairment for nonspeaking patients in the ICU. Both high-tech communication devices with voice output and low-tech options were used for each patient according to their motor and cognitive abilities. To accommodate fluctuations in patient status and communication needs, multiple AAC strategies were integrated into the communication repertoire and tailored for each case. Medical personnel involved in these cases attributed enhanced communication efficiency, improved ventilator weaning trials, and increased patient engagement to the AAC techniques. This approach has the potential to improve symptom communication and to ease suffering for seriously ill ICU patients with speech limitations.

Major Point: Advocates using multiple AAC strategies with ICU patients who have difficulty communicating

Snell, M.E., Brady, N., McLean, L., Ogletree, B.T., Siegel, E., Sylvester, L., Mollica, B.M., Paul, D., Ronski, M.A., & Sevcik, R. (2010), *Twenty years of communication intervention research with individuals who have severe intellectual and developmental disabilities*, American Journal on Intellectual and Developmental Disabilities, 115:5, 364-380 (open access [here](#))

Abstract: This literature review was conducted to evaluate the current state of evidence supporting communication interventions for individuals with severe disabilities. Authors reviewed 116 articles published between 1987 and 2007 in refereed journals meeting three criteria: (a) described a communication intervention, (b) involved one or more participants with severe disabilities, and (c) addressed one or more areas of communication performance. Many researchers failed to report treatment fidelity or to assess basic aspects of intervention effects including generalization, maintenance, and social validity. The evidence reviewed indicates that 96% of the studies reported positive changes in some aspects of communication. These findings support the provision of communication intervention to persons with severe disabilities. Gaps in the research were reported with recommendations for future research.

Key Quotations: “The vast majority (74.8%) of the communication intervention research we reviewed did not measure the maintenance of the target skills three months or longer following intervention.” “[W]hen communication function was measured, more than half of the studies assessed regulating the behavior of others as in requesting. What seemed surprising, however, was that 33% of the studies did not report measuring any communication function.” “Two-thirds (67.8%) of the studies meeting inclusion criteria used single-subject research designs and involved a small number of participants in a given study.” “This review identified only four studies (3.5%) meeting the inclusion criteria in which a treatment group was compared with a control or contrast group.” “Only about 30% of the 116 studies we reviewed reported any measure of treatment fidelity; and this finding is similar to those reported in other communication review papers. Documentation of fidelity of implementation is an essential requirement of quality research. Including treatment fidelity measures in future studies is of paramount importance.” “In this review, we found that researchers assessed generalization only half of the time, while maintenance of effects and social validity were measured less than one fourth and one sixth of the time respectively. It is of value to practitioners to know whether an intervention can produce communication skills that will transfer beyond instructors, instructional setting, or the specific forms taught and that will endure over time.” “To advance toward evidence-based practices in communication intervention for individuals with severe disabilities, researchers must carry out a higher quality of research than generally has been evident over the past 20 years. This means that researchers first must define their participants in more thorough and standard ways. Furthermore, researchers need to document acceptable fidelity of implementation. Their tests of the intervention should include an assessment of generalization to another setting and measurement of maintenance beyond the experimental intervention. Finally, researchers need to describe their interventions methodically, including setting, interventionist, methods of implementation, treatment intensity and duration, as well as to identify the specific components of the intervention. With these improvements it will be possible to assess the evidence base of practices that yield predictable positive effects on the communication of individuals with severe disabilities.”

Flippin, M., Reszka, S., & Watson, L.R. (2010), *Effectiveness of the Picture Exchange Communication System (PECS) on Communication and Speech for Children With Autism Spectrum Disorders: A Meta-Analysis*, American Journal of Speech-Language Pathology, 19:2, 178-195 (open access [here](#))

Abstract: This meta-analysis reviews the current empirical evidence for PECS in affecting communication and speech outcomes for children with ASD. A systematic review of the literature on PECS written between 1994 and June 2009 was conducted. Quality of scientific rigor was assessed and used as an inclusion criterion in computation of effect sizes. Effect sizes were aggregated separately for single-subject and group

studies for communication and speech outcomes. Results: Eight single-subject experiments (18 participants) and 3 group studies (95 PECS participants, 65 in other intervention/control) were included. Results indicated that PECS is a promising but not yet established evidence-based intervention for facilitating communication in children with ASD ages 1–11 years. Small to moderate gains in communication were demonstrated following training. Gains in speech were small to negative. Conclusions: This meta-analysis synthesizes gains in communication and relative lack of gains made in speech across the PECS literature for children with ASD. Concerns about maintenance and generalization are identified. Emerging evidence of potential preintervention child characteristics is discussed. Phase IV was identified as a possibly influential program characteristic for speech outcomes.

Major Point: Finds that PECS is a promising but not yet evidence-based intervention for facilitating communication in children with ASD ages 1 to 11 years

Lasker, J., & Bedrosian, J. (2009), *Promoting acceptance of augmentative and alternative communication by adults with acquired communication disorders*, *Augmentative and Alternative Communication*, 17:3, 141-153 (paywall access [here](#))

Abstract: This article discusses components of the AAC Acceptance Model, a theoretical framework for understanding the factors involved in the acceptance of augmentative and alternative communication (AAC) by adults with acquired communication disorders. To clarify the AAC Acceptance Model, a case study is provided of an individual with acquired aphasia and apraxia of speech who seemed initially to be an “ideal” candidate for optimal use of AAC. A trial period conducted prior to acquisition of an AAC system included analysis of the client’s communication behaviors using an AAC loaner device in conversation with unfamiliar partners in the clinical setting. After a device was acquired, the individual was reluctant to use it in public places with unfamiliar partners. Clinicians employed specific treatment techniques to promote AAC acceptance. Intervention focused on increasing the user’s communicative effectiveness and comfort level in community-based interactions. This case study highlights the importance of all three branches of the AAC Acceptance Model (milieu, person, and technology) in the clinical decision-making process. In addition, the case study illustrates the need for appropriate clinical outcome measures for adults with aphasia.

Major Point: Finds that familiar communication partners and settings are important to AAC users’ ability to communicate using AAC, even when users are not developmentally disabled but acquired their disability as adults

Mirenda, P. (2008), *A Back Door Approach to Autism and AAC, Augmentative and Alternative Communication*, 24:3, 220-234 (paywall access [here](#))

Abstract: The conventional view is that most individuals with autism or pervasive developmental disorder-not otherwise specified (PDD-NOS) have no significant motor impairments but do have severe intellectual disabilities. These assumptions impact the nature and types of augmentative and alternative communication (AAC) interventions that are typically provided, which tend to be narrowly focused on basic, functional communication skills such as requesting. However, recent research has provided evidence that challenges these assumptions and suggests the potential of intervention approaches targeting motor, language, and literacy development. The author encourages practitioners and researchers to examine current assumptions about autism and to invent and investigate new ways to support people with autism to communicate.

Major Point: Advocates for new ways to support people with autism to communicate

Kent-Walsh, J., & McNaughton, D. (2005), *Communication Partner Instruction in AAC: Present Practices and Future Directions, Augmentative and Alternative Communication*, 21:3, 195-204 (open access [here](#))

Abstract: The success of communicative interaction is dependent on the communication skills of each individual participating in the exchange. Accordingly, in the case of an interaction involving an individual using augmentative and alternative communication (AAC), the success of the interaction depends not only on the skills of this individual, but also on those of the communication partner. Current literature indicates that communication partner instruction is a critical intervention component. Furthermore, there is evidence that, with instruction, communication partners can learn to use facilitative interaction skills and strategies to better support the communication of individuals using AAC. To date, however, little attention has been paid to the most effective and efficient instructional methods for communication partner intervention programs. Therefore, in this paper, we propose an eight-step strategic model for use in communication partner instruction programs, and identify future research directions related to this model.

Major Point: Discusses the importance of skilled and well-trained communication partners in interactions between individuals with complex communication needs who use AAC and others. Notes that little attention has been paid to communication partner instruction and proposes avenues for more research and focus in this important aspect of AAC.



Wu, Y., & Voda, J. (1985), *User-Friendly Communication Board for Nonverbal, Severely Physically Disabled Individuals*, Archives of Physical Medicine and Rehabilitation, 66:12, 827-828 (open access [here](#))

Abstract: The inability to communicate personal needs, feelings, and ideas is a frustrating barrier for nonverbal patients with severe physical disabilities. It hampers the physician-patient relationship and medical services. This problem has been diminished with the use of a new communication board for patients with brain stem involvement. The communication board display is comprised of 36 squares in a 6 X 6 matrix. The alphabet is arranged in this matrix according to the normal sequence, and each row begins with a vowel. Selection of a desired alphabet letter is done by naming the vowels vertically until the appropriate row is reached, then the individual consonants horizontally until the proper one is indicated by the patient. With this new arrangement, the patient, attendant, or staff can memorize and functionally use the new communication board in a few minutes.

Major Point: An article by a physician and speech-language pathologist from 1985 describing how patients, staff, and caregivers can use letterboards to help individuals with disabilities to communicate

IV. Autism-Specific Literature

Miller, H.L., Sherrod, G.M, Mauk, J.E., Fears, N.E., Hynan, L.S., & Tamplin, P.M. (2021), *Shared Features or Co-Occurrence? Evaluating Symptoms of Developmental Coordination Disorder in Children and Adolescents with Autism Spectrum Disorder*, *Journal of Autism and Developmental Disorders* (paywall access [here](#))

Abstract: Motor differences are common in Autism Spectrum Disorder (ASD), but rarely evaluated against diagnostic criteria for Developmental Coordination Disorder (DCD). We aimed to determine whether motor problems in ASD represent the possible co-occurrence of DCD. We retrospectively reviewed standardized assessments and parent-reports to evaluate motor ability in 43 individuals with ASD against diagnostic criteria for DCD, and compared to 18 individuals with DCD. Over 97% of cases in the ASD group scored below the 16th percentile in motor ability, with most below the 5th percentile. Over 90% of cases in the ASD group met criteria for co-occurring DCD. Motor challenges are a clinically-significant problem in ASD; systematically assessing the prevalence of co-occurring ASD+DCD is necessary to optimize assessment and intervention.

Key Quotations: “Developmental Coordination Disorder (DCD; previously referred to as dyspraxia; see Gibbs et al. 2007; Blank et al. 2019) is a neurodevelopmental disorder (NDD) characterized by poor motor coordination and difficulty learning motor skills.” “Our results suggest that the potential for undiagnosed cooccurrence of DCD among children and adolescents with ASD is high, poorly-recognized, and clinically-significant.”

Bhat, A.N. (2020), *Is Motor Impairment in Autism Spectrum Disorder Distinct From Developmental Coordination Disorder? A Report from the SPARK Study*, *Physical Therapy*, 100(4): 633-644 (open access [here](#))

Abstract: Motor impairments are pervasive in Autism Spectrum Disorder (ASD); however, children with ASD rarely receive a dual diagnosis of Developmental Coordination Disorder (DCD). The Simons Foundation SPARK study engaged families affected by ASD through an online study. A total of 16,705 parents of children with ASD completed the DCDQ. We obtained our final SPARK dataset (n = 11,814) after filtering out invalid data, using stronger cut-offs to confirm ASD traits, and excluding children with general neuromotor impairments/intellectual delays. We compared DCDQ total and subscale scores from the SPARK dataset with published norms for each age between 5 and 15 years. The proportion of children with ASD at risk for a motor impairment was very high at 86.9%. Children with ASD did not outgrow their motor impairments and continued to present with a risk for DCD even into adolescence. Yet, only 31.6% of children were receiving physical therapy services. Using a large sample of children with

ASD, this study shows that a risk for motor impairment or DCD was present in most children with ASD and persists into adolescence; however, only a small proportion of children with ASD were receiving physical therapist interventions. A diagnosis of ASD must trigger motor screening, evaluations, and appropriate interventions by physical and occupational therapists to address the functional impairments of children with ASD while also positively impacting their social communication, cognition, and behavior. Using valid motor measures, future research must determine if motor impairment is a fundamental feature of ASD.

Key Quotations: “This study joins the copious literature confirming the pervasive nature of motor impairments in children and adolescents with ASD.” “Using the SPARK study database, the largest ASD sample in the United States, this study found that at least 86.9% of the children with ASD are at risk for DCD throughout childhood and adolescence, whereas only 15.1% of this sample held a dual diagnosis of DCD/motor delay. Children with ASD never outgrew their motor difficulties. Motor impairments are clearly under-recognized, under-diagnosed, and under-treated in children with ASD.”

Sandbank, M., Bottema-Beutel, K., Crowley, S., Cassidy, M., Dunham, K., Feldman J.I., Crank, J., Albarran, S.A., Raj, S., Mahbub, P., & Woynaroski, T.G. (2020), *Project AIM: Autism intervention meta-analysis for studies of young children*, *Psychological Bulletin*, 146: 1-29 (paywall access [here](#))

Abstract: In this comprehensive systematic review and meta-analysis of group design studies of nonpharmacological early interventions designed for young children with autism spectrum disorder (ASD), we report summary effects across 7 early intervention types (behavioral, developmental, naturalistic developmental behavioral intervention [NDBI], TEACCH, sensory-based, animal-assisted, and technology-based), and 15 outcome categories indexing core and related ASD symptoms. A total of 1,615 effect sizes were gathered from 130 independent participant samples. A total of 6,240 participants, who ranged in age from 0-8 years, are represented across the studies. We synthesized effects within intervention and outcome type using a robust variance estimation approach to account for the nesting of effect sizes within studies. We also tracked study quality indicators, and report an additional set of summary effect sizes that restrict included studies to those meeting prespecified quality indicators. Finally, we conducted moderator analyses to evaluate whether summary effects across intervention types were larger for proximal as compared with distal effects, and for context-bound as compared to generalized effects. We found that when study quality indicators were not taken into account, significant positive effects were found for behavioral, developmental, and NDBI intervention types. When effect size estimation was limited to studies with randomized controlled trial (RCT) designs, evidence of positive summary effects existed only for developmental and NDBI intervention types. This was also the case when

outcomes measured by parent report were excluded. Finally, when effect estimation was limited to RCT designs and to outcomes for which there was no risk of detection bias, no intervention types showed significant effects on any outcome.

Major Point: This comprehensive systematic review and meta-analysis finds that there is no robust evidence to support the use of the most widely used autism interventions today, confirming that the field remains in its infancy and has a long way to go to determine the best ways to support young children with autism.

Licari, M.K., Alvares, G.A., Varcin, K., Evans, K.L., Cleary, D., Reid, S.L., Glasson, E.J., Bebbington, K., Reynolds, J.E., Wray, J., & Whitehouse, A.J.O. (2020), *Prevalence of Motor Difficulties in Autism Spectrum Disorder: Analysis of a Population-Based Cohort*, *Autism Research*, 13: 298-306 (paywall access [here](#))

Abstract: Motor impairment is not currently included in the diagnostic criteria or evaluation of autism. This reflects the lack of large-scale studies demonstrating its prominence to advocate for change. We examined the prevalence of motor difficulties at the time of diagnosis in a large sample of children with autism utilizing standardized assessment, and the relationship between motor difficulties, core autism symptomology, and other prominent clinical features. Vineland Adaptive Behavior Scales were administered to children from the Western Australian Register for Autism Spectrum Disorders aged ≤ 6 years ($N = 2,084$; 81.2% males, 18.8% females). Prevalence of motor difficulties was quantified based on scores from the motor domain of the Vineland and then compared to other domains of functioning within the Vineland (communication, daily living, and socialization), the DSM criteria, intellectual level, age, and gender. Scores on the Vineland indicated that 35.4% of the sample met criteria for motor difficulties (standard score < 70), a rate almost as common as intellectual impairment (37.7%). Motor difficulties were reported by diagnosing clinicians in only 1.34% of cases. Motor difficulties were common in those cases meeting diagnostic criteria for impairments in nonverbal behavior and the presence of restricted and repetitive behaviors. The prevalence of motor difficulties also increased with increasing age of diagnosis ($P < 0.001$). Findings from the present study highlight the need for further consideration of motor difficulties as a distinct specifier within the diagnostic criteria for ASD. In this population-based cohort that included 2,084 children with autism aged ≤ 6 years, over one-third met the criteria for motor difficulties, a rate almost as common as intellectual disability. This study demonstrates that motor difficulties are a prominent feature of the autism phenotype requiring further consideration in both the diagnostic criteria and evaluation of autism.

Jaswal, V.K., & Akhtar, N. (2019), *Being versus appearing socially uninterested: Challenging assumptions about social motivation in autism*, Behavioral and Brain Sciences, 42, e82: 1-73 (open access [here](#))

Abstract: Progress in psychological science can be limited by a number of factors, not least of which are the starting assumptions of scientists themselves. We believe that some influential accounts of autism rest on a questionable assumption that many of its behavioral characteristics indicate a lack of social interest – an assumption that is flatly contradicted by the testimony of many autistic people themselves. In this article, we challenge this assumption by describing alternative explanations for four such behaviors: (a) low levels of eye contact, (b) infrequent pointing, (c) motor stereotypies, and (d) echolalia. The assumption that autistic people's unusual behaviors indicate diminished social motivation has had profound and often negative effects on the ways they are studied and treated. We argue that understanding and supporting autistic individuals will require interrogating this assumption, taking autistic testimony seriously, considering alternative explanations for unusual behaviors, and investigating unconventional – even idiosyncratic – ways in which autistic individuals may express their social interest. These steps are crucial, we believe, for creating a more accurate, humane, and useful science of autism.

Major Point: Argues that the conventional wisdom that infers social motivation from stereotypically autistic behaviors needs to be questioned

Welch, C., Polatajko, H., Rigby, P., & Fitch, M. (2019), *Autism Inside Out: Lessons from the Memoirs of Three Minimally Verbal Youths*, Disability and Rehabilitation, 41:19, 2308-2316 (paywall access [here](#))

Abstract: To date, research exploring experiences and perspectives of people who have severe autism and are minimally verbal, has been sparse. Objectives: To build new understanding based on insider perspectives of people who have severe autism and are minimally verbal. We took interest in how these perspectives support, challenge, or augment current depictions of autism in academic literature. Adopting a descriptive qualitative approach, three memoirs written by youths who have severe autism and are minimally verbal were examined using inductive thematic analysis. Analytic methods followed a recursive process of coding, collating, mapping, reviewing, creating clear themes, and then reporting using compelling extracts. Analysis generated an overarching theme regarding the youths' concern that the way they are perceived from the outside does not match the people they are on the inside. In explaining this mismatch, the youths identify differences in the way their brains work, as well as difficulty controlling their bodies. These youths emphasize concepts of embodiment and physical control as central to their experiences of autism. Findings highlight the need for research exploring insider perspective and the development of innovative methods to gain insight

into the understanding and interests of people who are minimally verbal. Implications for rehabilitation: The development of a communication system (hi-tech or low tech) should be a top priority for intervention when serving clients who have severe autism and are minimally verbal. When working with clients who have severe autism and are minimally verbal, clinicians should be cautious in applying and interpreting assessments of intelligence and understanding, since difficulties with verbal output and movement control can obscure results. To improve information gathering and therapeutic outcomes, clinicians and educators should use varied assessment and intervention techniques, administered across multiple sessions, and environments. Consideration should be given to difficulties with movement initiation and movement inhibition when guiding and interpreting behaviors.

Coderre, E.L., Chernenok, M., O'Grady, J., Bosley, L., Gordon, B., & Ledoux, K. (2019), *Implicit Measures of Receptive Vocabulary Knowledge in Individuals With Level 3 Autism*, *Cognitive and Behavioral Neurology: Official Journal of the Society for Behavioral and Cognitive Neurology*, 32:2, 95-119 (open access [here](#))

Abstract: Implicit measures of cognition are essential for assessing knowledge in people with Level 3 autism because such individuals are often unable to make reliable overt behavioral responses. In this study, we investigated whether three implicit measures—eye movement (EM) monitoring, pupillary dilation (PD), and event-related potentials (ERPs)—can be used to reliably estimate vocabulary knowledge in individuals with Level 3 autism. Five adults with Level 3 autism were tested in a repeated-measures design with two tasks. High-frequency ‘known’ words (eg, *bus*, *airplane*) and low-frequency ‘unknown’ words (eg, *ackee*, *cherimoya*) were presented in a visual world task (during which EM and PD data were collected) and a picture-word congruity task (during which ERP data were collected). Using a case-study approach with single-subject analyses, we found that these implicit measures have the potential to provide estimates of receptive vocabulary knowledge in individuals with Level 3 autism. Participants differed with respect to which measures were the most sensitive and which variables best predicted vocabulary knowledge. These implicit measures may be useful to assess language abilities in individuals with Level 3 autism, but their use should be tailored to each individual.

Cooper, R.A., & Simons, J.S. (2019), *Exploring the neurocognitive basis of episodic recollection in autism*, *Psychonomic Bulletin & Review*, 26, 163-181 (open access [here](#))

Abstract: Increasing evidence indicates that the subjective experience of recollection is diminished in autism spectrum disorder (ASD) compared to neurotypical individuals. The neurocognitive basis of this difference in how past events are re-experienced has been debated and various theoretical accounts have been proposed to date. Although each existing theory may capture particular features of memory in ASD, recent research

questions whether any of these explanations are alone sufficient or indeed fully supported. This review first briefly considers the cognitive neuroscience of how episodic recollection operates in the neurotypical population, informing predictions about the encoding and retrieval mechanisms that might function atypically in ASD. We then review existing research on recollection in ASD, which has often not distinguished between different theoretical explanations. Recent evidence suggests a distinct difficulty engaging recollective *retrieval* processes, specifically the ability to consciously reconstruct and monitor a past experience, which is likely underpinned by altered functional interactions between neurocognitive systems rather than brain region-specific or process-specific dysfunction. This integrative approach serves to highlight how memory research in ASD may enhance our understanding of memory processes and networks in the typical brain. We make suggestions for future research that are important for further specifying the neurocognitive basis of episodic recollection in ASD and linking such difficulties to social developmental and educational outcomes.

Key Quotations: “Measuring recollection necessarily involves measuring the ability to retrieve episodic details, involving the search for, reconstruction, and evaluation of a memory, but successful recollection is also reliant on how effectively information was encoded, involving the perception, integration, and transformation of sensory features into a memory representation. If either of encoding or retrieval is dysfunctional, then episodic recollection can be substantially diminished.” “Thus, details of events may well be encoded to some extent in ASD but the way in which they are encoded, stored, and reconstructed could lead to difficulty recollecting information with the same level of detail as seen in neurotypical individuals.”

Nahmias, A.S., Pellecchia, M., Stahmer, A.C. and Mandell, D.S. (2019), *Effectiveness of community-based early intervention for children with autism spectrum disorder: a meta-analysis*, *Journal of Child Psychology and Psychiatry*, 60(11):1200-1209 (open access [here](#))

Abstract: Research trials of early intervention (EI) programs for children with autism spectrum disorder (ASD) generally demonstrate medium-to-large gains, on average, compared with “treatment as usual,” in different developmental domains. Almost all children with ASD receive their treatment through community-based services, however, and studies suggest that evidence-based interventions rarely make their way into community practice. Understanding the effectiveness of community-based EI and factors associated with these effects is the first step in developing strategies for wide-scale implementation of effective EI. Studies of community-based EI for children with ASD were identified through a systematic search. Changes in cognitive, communication, social, and adaptive functioning from pre-treatment to post-treatment were assessed using standardized mean gain scores. Effect sizes were estimated using random effects models. Moderators of interest included type of community EI program, year of

publication, intervention duration, and sample selection. Moderator effects were assessed using analysis of variance of mixed-effects models and meta-regression analyses. Forty-six groups from 33 studies met inclusion criteria (1,713 participants, mean age 37.4 months, 81.1% male). There were small but statistically significant gains in each of the four domains. Hedges's g ranged from 0.21 for adaptive behavior to 0.32 for communication outcomes, after removing outliers and correcting for publication bias. EI programs associated with universities and hospitals were superior, on average, to other community EI programs for cognitive and adaptive behavior outcomes. Intervention duration was negatively associated with effect sizes for communication and adaptive behavior outcomes. These results indicate that there remains a large gap between outcomes observed in community settings and those reported in efficacy trials.

Key Quotation: "A surprising finding was that, at the group level, intervention duration was negatively associated with communication and adaptive behavior outcomes."

Stedman, A., Taylor, B., Erard, M., Peura, C., & Siegel, M. (2018), *Are Children Severely Affected by Autism Spectrum Disorder Underrepresented in Treatment Studies? An Analysis of the Literature*, Journal of Autism and Developmental Disorders, 49:4, 1378-1390 (open access [here](#))

Abstract: Despite significant advances in autism research, experts have noted that children severely affected by autism spectrum disorder (ASD) appear to have been understudied. Rigorous analysis of this observation has been limited, and the representation of severity has not been well-described. We assessed three domains of severity (communication ability, cognitive functioning, and adaptive functioning) in 367 treatment studies of children with ASD published 1991–2013. We found that the proportion of studies that included the severely affected population decreased significantly over time, as well as wide variability in measurement and reporting. Inadequate representation of the full autism spectrum in the literature could lead to an unbalanced picture of ASD and leave behind those with arguably the greatest need.

Bailey, B., & Arciuli, J. (2018), *Subskills associated with spelling ability in children with and without autism spectrum disorders*, Autism & Developmental Language Impairments, 3:1-12 (open access [here](#))

Abstract: Effective literacy instruction demands a clear understanding of the subskills that underpin children's reading and writing abilities. Some previous research on reading has questioned whether the same subskills support literacy acquisition for typically developing children and children with autism spectrum disorders. This study examined the subskills associated with spelling ability in a group of 20 children with ASD aged 5-12 years (ASD group). A group of 20 typically developing children matched for age and word spelling accuracy (TD group) provided comparative data. Participants completed

standardised assessments of vocabulary, phonological awareness, letter knowledge and word spelling. Errors produced in response to the word spelling assessment were analysed for evidence of phonological awareness. In addition, all spelling attempts were analysed for evidence of phonological, orthographic, and morphological awareness, 'linguistic awareness', using the Computerised Spelling Sensitivity System. Correlation and regression analyses showed statistically significant relationships between phonological awareness and word spelling accuracy for children in the ASD and TD groups. Spelling errors produced by both groups contained evidence of phonological awareness. Analysis of all spelling attempts showed that the overall level of linguistic awareness encoded by children in the ASD and TD groups was not significantly different. These findings provide evidence that phonological awareness and other subskills support spelling in children with autism spectrum disorders as they do in typically developing children. The similar spelling profiles exhibited by children with autism spectrum disorders and their typically developing peers suggest that these populations may benefit from literacy instruction that targets the same underpinning subskills.

Wu, D., Jose, J., Nurnberger, J. & Torres, E. (2018), *A Biomarker Characterizing Neurodevelopment with applications in Autism*, *Nature: Scientific Reports*, 8:614, 1-14 (open access [here](#))

Abstract: Despite great advances in neuroscience and genetic studies, our understanding of neurodevelopmental disorders is still quite limited. An important reason is not having objective psychiatric clinical tests. Here we propose a quantitative neurodevelopment assessment by studying natural movement outputs. Movement is central to behaviors: It involves complex coordination, temporal alterations, and precise dynamic controls. We carefully analyzed the continuous movement output data, collected with high definition electromagnetic sensors at millisecond time scales. We unraveled new metrics containing striking physiological information that was unseen neither by using traditional motion assessments nor by naked eye observations. Our putative biomarker leads to precise individualized classifications. It illustrates clear differences between Autism Spectrum Disorder (ASD) subjects from mature typical developing (TD) individuals. It provides an ASD complementary quantitative classification, which closely agrees with the clinically assessed functioning levels in the spectrum. It also illustrates TD potential age-related neurodevelopmental trajectories. Applying our movement biomarker to the parents of the ASD individuals studied in the cohort also shows a novel potential familial signature ASD tie. This paper proposes a putative behavioral biomarker to characterize the level of neurodevelopment with high predicting power, as illustrated in ASD subjects as an example.

An, K., Ikeda, T., Yoshimura, Y., Hasegawa, C., Saito, D., Kumazaki, H., Hirose, T., Minabe, Y., & Kikuchi, M. (2018), *Altered Gamma Oscillations during Motor Control in Children with Autism Spectrum Disorder*, *Journal of Neuroscience* 38:36, 7878-7886 (open access [here](#))

Abstract: Autism is hypothesized to result in a cortical excitatory and inhibitory imbalance driven by inhibitory interneuron dysfunction, which is associated with the generation of gamma oscillations. On the other hand, impaired motor control has been widely reported in autism. However, no study has focused on the gamma oscillations during motor control in autism. In the present study, we investigated the motor-related gamma oscillations in autism using magnetoencephalography. Magnetoencephalographic signals were recorded from 14 right-handed human children with autism (5 female), aged 5-7 years, and age- and IQ-matched 15 typically developing children during a motor task using their right index finger. Consistent with previous studies, the autism group showed a significantly longer button response time and reduced amplitude of motor-evoked magnetic fields. We observed that the autism group exhibited a low peak frequency of motor-related gamma oscillations from the contralateral primary motor cortex, and these were associated with the severity of autism symptoms. The autism group showed a reduced power of motor-related gamma oscillations in the bilateral primary motor cortex. A linear discriminant analysis using the button response time and gamma oscillations showed a high classification performance (86.2% accuracy). The alterations of the gamma oscillations in autism might reflect the cortical excitatory and inhibitory imbalance. Our findings provide an important clue into the behavioral and neurophysiological alterations in autism and a potential biomarker for autism. Currently, the diagnosis of autism has been based on behavioral assessments, and a crucial issue in the diagnosis of autism is to identify objective and quantifiable clinical biomarkers. A key hypothesis of the neurophysiology of autism is an excitatory and inhibitory imbalance in the brain, which is associated with the generation of gamma oscillations. On the other hand, motor deficits have also been widely reported in autism. This is the first study to demonstrate low motor performance and altered motor-related gamma oscillations in autism, reflecting a brain excitatory and inhibitory imbalance. Using these behavioral and neurophysiological parameters, we classified autism and control group with good accuracy. This work provides important information on behavioral and neurophysiological alterations in patients with autism.

Cooper, R.A., & Simons, J.S. (2018), *Exploring the neurocognitive basis of episodic recollection in autism*, *Psychonomic Bulletin Review*, 1-19 (open access [here](#))

Abstract: Increasing evidence indicates that the subjective experience of recollection is diminished in autism spectrum disorder (ASD) compared to neurotypical individuals. The neurocognitive basis of this difference in how past events are re-experienced has been debated and various theoretical accounts have been proposed to date. Although each

existing theory may capture particular features of memory in ASD, recent research questions whether any of these explanations are alone sufficient or indeed fully supported. This review first briefly considers the cognitive neuroscience of how episodic recollection operates in the neurotypical population, informing predictions about the encoding and retrieval mechanisms that might function atypically in ASD. We then review existing research on recollection in ASD, which has often not distinguished between different theoretical explanations. Recent evidence suggests a distinct difficulty engaging recollective retrieval processes, specifically the ability to consciously reconstruct and monitor a past experience, which is likely underpinned by altered functional interactions between neurocognitive systems rather than brain region-specific or process-specific dysfunction. This integrative approach serves to highlight how memory research in ASD may enhance our understanding of memory processes and networks in the typical brain. We make suggestions for future research that are important for further specifying the neurocognitive basis of episodic recollection in ASD and linking such difficulties to social developmental and educational outcomes.

Major Point: Observes substantial differences in episodic memory between autistic and neurotypical individuals; provides a theoretical basis for why subjecting autistic students of FC and RPM to tests that rely on perception and memory and querying them about their past may be inappropriate

Friedner, M., & Block, P. (2017), *Deaf studies meets autistic studies*, *The Senses and Society*, 12:3, 282-300 (paywall access [here](#))

Abstract: What might deaf studies and autistic studies have in common? Why, in many cases, is deafness considered to be a norm to be analyzed through linguistic and cultural frameworks, while autism is (still) seen as pathological? Utilizing ethnographic research, participation in two conferences on autism and sign language, and an analysis of deaf peoples' and autistic peoples' self-(re)presentation, we attend to sensory solidarities that might exist between deaf and autistic people, communities, and studies. We argue that an analysis of the two fields side-by-side offers important insights into new ways of conceptualizing sociality, identity, and community both in the specific cases of deafness and autism, and more broadly. Additionally, attending to deaf and autistic peoples' language and communication desires and practices opens up analytic and empirical space for considering interdependent and multimodal communicative approaches.

Major Point: Draws parallels between communicative and cultural components of individuals who identify as Deaf and Autistic, arguing that Deaf studies offers a new frame to interpret autism not as pathology but as a linguistic and cultural minority group

Subramanian, K., Brandenburg, C., Orsati, F., Soghomonian, J.J., Hussman, J.P., & Blatt, G.J. (2017), *Basal Ganglia and Autism – A Translational Perspective*, Autism Research, 10:11, 1751-1775 (paywall access [here](#))

Abstract: In typically developing individuals, the basal ganglia plays an important role in: eye movement, movement coordination, sensory modulation and processing, eye-hand coordination, action chaining, and inhibition control. Genetic models have proved to be useful toward understanding cellular and molecular changes at the synaptic level in the basal ganglia that may in part contribute to these autism-related behaviors. In autism, basal ganglia functions in motor skill acquisition and development are altered, thus disrupting the normal flow of feedback to the cortex. Habit learning, action selection and performance are modulated by the basal ganglia, a collection of groups of neurons located below the cerebral cortex in the brain. In autism, there is emerging evidence that parts of the basal ganglia are structurally and functionally altered disrupting normal information flow. The basal ganglia through its interconnected circuits with the cerebral cortex and the cerebellum can potentially impact various motor and cognitive functions in the autism brain.

Major Point: Neuroscience research providing further support for the existence of motoric differences in the autistic population

Ostrolenk, A., Forgeot d’Arc, B., Jelenic, P., Samson, F., & Mottron, L. (2017), *Hyperlexia: Systematic review, neurocognitive modelling, and outcome*, Neuroscience & Biobehavioral Reviews, 79: 134-149 (open access [here](#))

Abstract: Hyperlexia is defined as the co-occurrence of advanced reading skills relative to comprehension skills or general intelligence, the early acquisition of reading skills without explicit teaching, and a strong orientation toward written material, generally in the context of a neurodevelopmental disorder. In this systematic review of cases (N = 82) and group studies (including 912 participants of which 315 are hyperlexic), we address: whether the hyperlexic profile is associated with autism and why, whether models of non-autistic reading can teach us about hyperlexia, and what additional information we can get from models specific to autistic cognitive functioning. We find that hyperlexia, or a hyperlexic-like profile, characterises a substantial portion of the autistic spectrum, in which the subcomponents of the typical reading architecture are altered and dissociated. Autistic children follow a chronologically inverted path when learning to read, and make extended use of the perceptual expertise system, specifically the visual word form recognition systems. We conclude by discussing the possible use of hyperlexic skills in intervention.

Torres, E.B., & Denisova, K. (2016), *Motor Noise is Rich Signal in Autism Research and Pharmacological Treatments*, Nature: Scientific Reports, 6: 37422 (open access [here](#))

Abstract: The human body is in constant motion, from every breath that we take, to every visibly purposeful action that we perform. Remaining completely still on command is a major achievement as involuntary fluctuations in our motions are difficult to keep under control. Here we examine the noise-to-signal ratio of micro-movements present in time-series of head motions extracted from resting-state functional magnetic resonance imaging scans in 1048 participants. These included individuals with autism spectrum disorders (ASD) and healthy-controls in shared data from the Autism Brain Imaging Data Exchange (ABIDE) and the Attention-Deficit Hyperactivity Disorder (ADHD-200) databases. We find excess noise and randomness in the ASD cases, suggesting an uncertain motor-feedback signal. A power-law emerged describing an orderly relation between the dispersion and shape of the probability distribution functions best describing the stochastic properties under consideration with respect to intelligence quotient (IQ-scores). In ASD, deleterious patterns of noise are consistently exacerbated with the presence of secondary (comorbid) neuropsychiatric diagnoses, lower verbal and performance intelligence, and autism severity. Importantly, such patterns in ASD are present whether or not the participant takes psychotropic medication. These data unambiguously establish specific noise-to-signal levels of head micro-movements as a biologically informed core feature of ASD.

Major Point: Finds excess noise and randomness in fMRI scans of autistic participants

Denisova, K., Zhao, G., Wang, Z., Goh, S., Huo, Y., & Peterson, B.S. (2016), *Cortical interactions during the resolution of information processing demands in autism spectrum disorders*, Brain and Behavior, 7:2, e00596 (open access [here](#))

Abstract: Our flexible and adaptive interactions with the environment are guided by our individual representation of the physical world, estimated through sensation and evaluation of available information against prior knowledge. When linking sensory evidence with higher-level expectations for action, the central nervous system (CNS) in typically developing (TD) individuals relies in part on distributed and interacting cortical regions to communicate neuronal signals flexibly across the brain. Increasing evidence suggests that the balance between levels of signal and noise during information processing may be disrupted in individuals with Autism Spectrum Disorders (ASD). Participants with and without ASD performed a visuospatial interference task while undergoing functional Magnetic Resonance Imaging (fMRI). We empirically estimated parameters characterizing participants' latencies and their subtle fluctuations (noise accumulation) over the 16-min scan. We modeled hemodynamic activation and used seed-based analyses of neural coupling to study dysfunction in interference-specific connectivity in a subset of ASD participants who were nonparametrically matched

to TD participants on age, male-to-female ratio, and magnitude of movement during the scan. Stochastic patterns of response fluctuations reveal significantly higher noise-to-signal levels and a more random and noisy structure in ASD versus TD participants, and in particular ASD adults who have the greatest clinical autistic deficits. While individuals with ASD show an overall weaker modulation of interference-specific functional connectivity relative to TD individuals, in particular between the seeds of Anterior Cingulate Cortex (ACC) and Inferior Parietal Sulcus (IPS) and the rest of the brain, we found that in ASD, higher uncertainty during the task is linked to increased interference-specific coupling between bilateral anterior insula and prefrontal cortex. Subtle and informative differences in the structure of experiencing information exist between ASD and TD individuals. Our findings reveal in ASD an atypical capacity to apply previously perceived information in a manner optimal for adaptive functioning, plausibly revealing suboptimal message-passing across the CNS.

Bal, V.H., Katz, T., Bishop, S.L., & Krasileva, K. (2016), *Understanding definitions of minimally verbal across instruments: Evidence for subgroups within minimally verbal children and adolescents with autism spectrum disorder*, Journal of Child Psychology and Psychiatry, 57:12, 1424-1433 (paywall access [here](#))

Abstract: Minimally verbal (MV) children with autism spectrum disorder (ASD) are often assumed to be profoundly cognitively impaired and excluded from analyses due to challenges completing standardized testing protocols. A literature aimed at increasing understanding of this subgroup is emerging; however, the many methods used to define MV status make it difficult to compare studies. Understanding how different instruments and definitions used to identify MV children affect sample composition is critical to advance research on this understudied clinical population. The MV status of 1,470 school-aged children was defined using five instruments commonly used in ASD research. MV sample composition was compared across instruments. Analyses examined the proportion of overlap across MV subgroups and the extent to which child characteristics varied across MV subgroups defined using different definitions or combinations of measures. A total of 257 children were classified as MV on at least one instrument. Proportion of overlap between definitions ranged from 3% to 100%. The stringency of definition (i.e. few-to-no vs. some words) was associated with differences in cognitive and adaptive functioning; more stringent definitions yielded greater consistency of MV status across instruments. Cognitive abilities ranged from profoundly impaired to average intelligence; 16% had NVIQ ≥ 70 . Approximately half exhibited verbal skills commensurate with nonverbal cognitive ability, whereas half had verbal abilities significantly lower than their estimated NVIQ. Future studies of MV children must carefully consider the methods used to identify their sample, acknowledging that definitions including children with 'some words' may yield larger samples with a wider range of language and cognitive abilities. Broadly defined MV samples may be particularly important to delineate factors interfering with language development in the

subgroup of children whose expressive impairments are considerably below their estimated nonverbal cognitive abilities.

Major Point: Posits the existence of subgroups among minimally verbal autistic individuals, while noting the difficulty of reliably assessing cognitive ability in this population

Focaroli, V., Taffoni, F., Parsons, S.M., Keller, F., & Iverson, J.M. (2016), *Performance of Motor Sequences in Children at Heightened vs. Low Risk for ASD: A Longitudinal Study from 18 to 36 Months of Age*, *Frontiers in Psychology*, 7:724 (open access [here](#))

Abstract: Recent research shows that motor difficulties are a prominent component of the behavioral profile of autism spectrum disorder (ASD) and are also apparent from early in development in infants who have an older sibling with ASD (High Risk; HR). Delays have been reported for HR infants who do and who do not receive an eventual diagnosis of ASD. A growing body of prospective studies has focused on the emergence of early motor skills primarily during the first year of life. To date, however, relatively little work has examined motor skills in the second and third years. Thus, the present research was designed to investigate motor performance in object transport tasks longitudinally in HR and LR (Low Risk) children between the ages of 18 and 36 months. Participants (15 HR children and 14 LR children) were observed at 18, 24, and 36 months. Children completed two motor tasks, the Ball Task and the Block Task, each of which included two conditions that varied in terms of the precision demands of the goal action. Kinematic data were acquired via two magneto inertial sensors worn on each wrist. In the Block Task, HR children reached more slowly (i.e., mean acceleration was lower) compared to LR children. This finding is in line with growing evidence of early delays in fine motor skills in HR children and suggests that vulnerabilities in motor performance may persist into the preschool years in children at risk for ASD.

Major Point: Finds that children at high risk of a later ASD diagnosis experience persistent fine motor delays between the ages of 18 and 36 months; provides further evidence of a motor component to autism

LeBarton, E.S., & Iverson, J.M. (2016), *Associations between gross motor and communicative development in at-risk infants*, *Infant Behavior and Development*, 44:59-67 (open access [here](#))

Abstract: Infants' advances in locomotion relate to advances in communicative development. However, little is known about these relations in infants at risk for delays in these domains and whether they may extend to earlier achievements in gross motor development in infancy. We examined whether advances in sitting and prone locomotion are related to communicative development in infants who have an older sibling with

autism spectrum disorder (ASD) and are at risk for motor and communication delays (heightened-risk; HR). We conducted a longitudinal study with 37 HR infants who did not receive an ASD diagnosis at 36 months. Infants were observed monthly between the ages of 5 and 14 months. We assessed gross motor development using the Alberta Infant Motor Scales (AIMS) and recorded ages of onset of verbal and nonverbal communicative behaviors. Results indicated increased presence of early gross motor delay from 5 to 10 months. In addition, there were positive relations between sitting and gesture and babble onset and between prone development and gesture onset. Thus, links between gross motor development and communication extend to at-risk development and provide a starting point for future research on potential cascading consequences of motor advances on communication development.

Robledo, J., & Donnellan, A.M. (2016), *Supportive Relationships in Autism Spectrum Disorder: Perspectives of Individuals with ASD and Supporters*, Behavioral Sciences, 6:4, 23 (open access [here](#))

Abstract: This study explored 17 dyads of academically successful people with Autism Spectrum Disorder (ASD) and individuals who they identified as supportive. Qualitative methods, including in-depth interviews, participant observations, and document analysis, were used to study these supportive relationships. The purpose of the study was to develop a substantive grounded theory regarding supportive relationships within the lives of individuals with ASD. A dynamic model of supportive relationships emerged, with trust, unity, and support as the three core categories of these relationships. The data suggest that the quality of the relationship between an individual with ASD and the support provider can be a critical factor within effective support. These findings suggest that there is much yet to be learned about the social world of individuals with ASD.

Major Point: “. . . the quality of the relationship between an individual with ASD and the support provider can be a critical factor within effective support.”

Gernsbacher, M.A., Morson, E., & Grace, E. (2015), *Language Development in Autism, Neurobiology of Language*, 879-886 (open access [here](#))

Abstract: Abnormal language development used to define autism, but no longer does. Indeed, language development no longer even figures into contemporary diagnostic criteria, although early delays in language often lead to parents' concerns. In this chapter, we review recent empirical research on language development in autism. To paint a contemporary picture, we restrict our review to studies published in the 21st century. We conclude that language development in autism is often delayed, but not deviant; that a delay in language development is not unique to autism; and that language development in autism is remarkably heterogeneous.

Major Point: Reviews empirical research on language development in autism, concludes that language delay is not a necessary feature of autism, and supports the idea that speech delay is not the same thing as language delay

Tierney, C., Mayes, S., Lohs, S.R., Black, A., Gisin, E., & Veglia, M. (2015), *How Valid Is the Checklist for Autism Spectrum Disorder When a Child Has Apraxia of Speech?* Journal of Developmental & Behavioral Pediatrics, 36:8, 569-74 (paywall access [here](#))

Abstract: Our objective was to determine if the Checklist for Autism Spectrum Disorder (CASD) was inadvertently overemphasizing autism symptoms in a population of children without autism. Children noted with communication delays were referred to both a developmental pediatrician and a speech and language pathologist for an apraxia and autism evaluation. All children who underwent both autism and apraxia evaluations and met rule-in or rule-out criteria for both diagnoses were included in the study, resulting in a sample size of 30. Our results show that 63.6% of children initially diagnosed with autism also had apraxia, 36.8% of children initially diagnosed with apraxia also had autism, 23.3% had neither, and 23.3% had both. Overall diagnostic accuracy for the CASD was 96.7%. Overall accuracy for the CASD for children without apraxia was 100% and accuracy for children with apraxia was 94.7%. Specificity for the CASD was 100%, while sensitivity was 90.9%. The PPV was 100% and the NPV was 95.0%. This study demonstrates that the CASD does not overemphasize autism symptoms in a population of children without autism. It also shows that autism and apraxia are highly comorbid. Thus, it is important to monitor all children diagnosed with apraxia for signs of autism and all children diagnosed with autism for signs of apraxia. This will help identify children as early as possible and allow them access to services appropriate to their needs.

Major Point: Finds that autism and apraxia are highly co-morbid: 64% of children diagnosed with autism also have apraxia

Courchesne, V., Meilleur, A.-A.S., Poulin-Lord, M.-P., Dawson, M., & Soulières, I. (2015), *Autistic children at risk of being underestimated: school-based pilot study of a strength-informed assessment*, Molecular Autism, 6:12 (open access [here](#))

Abstract: An important minority of school-aged autistic children, often characterized as 'nonverbal' or 'minimally verbal,' displays little or no spoken language. These children are at risk of being judged 'low-functioning' or 'untestable' via conventional cognitive testing practices. One neglected avenue for assessing autistic children so situated is to engage current knowledge of autistic cognitive strengths. Our aim was thus to pilot a strength-informed assessment of autistic children whose poor performance on conventional instruments suggests their cognitive potential is very limited. Thirty autistic children (6 to 12 years) with little or no spoken language, attending specialized schools for autistic children with the highest levels of impairment, were assessed using Wechsler

Intelligence Scale for Children (WISC-IV), Raven's Colored Progressive Matrices board form (RCPM), Children's Embedded Figures Test (CEFT), and a visual search task. An age-matched control group of 27 typical children was also assessed. None of the autistic children could complete WISC-IV; only six completed any subtest. In contrast, 26 autistic children could complete RCPM, with 17 scoring between the 5th and 90th percentile. Twenty-seven autistic children completed the visual search task, while 26 completed CEFT, on which autistic children were faster than RCPM-matched typical children. Autistic performance on RCPM, CEFT, and visual search were correlated. These results indicate that 'minimally verbal' or 'nonverbal' school-aged autistic children may be at risk of being underestimated: they may be wrongly regarded as having little cognitive potential. Our findings support the usefulness of strength-informed approaches to autism and have important implications for the assessment and education of autistic children.

Major Point: Important study showing that non-speaking autistics cannot be assumed to be intellectually disabled

Torres, E.B., & Donnellan, A.M., eds., *Autism: The Movement Perspective (2013-2015)*, *Frontiers in Integrative Neuroscience* (open access [here](#))

Major Point: A compilation of 38 peer-reviewed articles published by 91 authors between 2013 and 2015 that support the idea that movement and sensory differences are core features of autism.

London, E.B. (2014), *Categorical diagnosis: a fatal flaw for autism research?* *Trends in Neurosciences*, 37:683-686 (paywall access [here](#))

Abstract: The use of autism as a diagnostic category guiding translational research is fraught with so many problems that the validity of research conclusions is suspect. Neuroscientists would benefit from attending to nosological difficulties to formulate meaningful research bridging basic biological systems and human disease. I propose a diagnostic schema that could translate more efficiently between the clinical and the neuroscience perspective as a step to improve the effectiveness of this type of research.

Chang, Y.S., Owen, J. P., Desai, S.S., Hill, S.S., Arnett, A.B., Harris, J., Marco, E.J., & Mukherjee, P. (2014), *Autism and sensory processing disorders: shared white matter disruption in sensory pathways but divergent connectivity in social-emotional pathways*, *PLoS One*, 9:7, e103038 (open access [here](#))

Abstract: Over 90% of children with Autism Spectrum Disorders (ASD) demonstrate atypical sensory behaviors. In fact, hyper- or hyporeactivity to sensory input or unusual interest in sensory aspects of the environment is now included in the DSM-5 diagnostic criteria. However, there are children with sensory processing differences who do not

meet an ASD diagnosis but do show atypical sensory behaviors to the same or greater degree as ASD children. We previously demonstrated that children with Sensory Processing Disorders (SPD) have impaired white matter microstructure, and that this white matter microstructural pathology correlates with atypical sensory behavior. In this study, we use diffusion tensor imaging (DTI) fiber tractography to evaluate the structural connectivity of specific white matter tracts in boys with ASD (n=15) and boys with SPD (n=16), relative to typically developing children (n=23). We define white matter tracts using probabilistic streamline tractography and assess the strength of tract connectivity using mean fractional anisotropy. Both the SPD and ASD cohorts demonstrate decreased connectivity relative to controls in parieto-occipital tracts involved in sensory perception and multisensory integration. However, the ASD group alone shows impaired connectivity, relative to controls, in temporal tracts thought to subserve social-emotional processing. In addition to these group difference analyses, we take a dimensional approach to assessing the relationship between white matter connectivity and participant function. These correlational analyses reveal significant associations of white matter connectivity with auditory processing, working memory, social skills, and inattention across our three study groups. These findings help elucidate the roles of specific neural circuits in neurodevelopmental disorders, and begin to explore the dimensional relationship between critical cognitive functions and structural connectivity across affected and unaffected children.

Libertus, K., Sheperd, K.A., Ross, S.W., & Landa, R.J. (2014), *Limited Fine Motor and Grasping Skills in Six-month-old Infants at High Risk for Autism*, *Child Development*, 85:6, 2218-2231 (open access [here](#))

Abstract: Atypical motor behaviors are common among children with Autism Spectrum Disorders (ASD). However, little is known about onset and functional implications of differences in early motor development among infants later diagnosed with ASD. Two prospective experiments were conducted to investigate motor skills among six-month-olds at increased risk (high-risk) for ASD (N1 = 129; N2 = 46). Infants were assessed using the Mullen Scales of Early Learning (MSEL) and during toy play. Across both experiments, high-risk infants exhibited less mature object manipulation in a highly structured (MSEL) context and reduced grasping activity in an unstructured (free play) context than infants with no family history of ASD. Longitudinal assessments suggest that between six and ten months, grasping activity increases in high-risk infants.

Major Point: Study systematically comparing fine motor skills of six-month-olds at high versus low risk of a later ASD diagnosis and finding those at higher risk experienced more delays in fine motor skills; provides further evidence that ASD has a motor component

Trevarthen, C., & Delafield-Butt, J.T. (2013), *Autism as a developmental disorder in intentional movement and affective engagement*, *Frontiers in Integrative Neuroscience*, 7:49 (open access [here](#))

Abstract: We review evidence that autistic spectrum disorders have their origin in early prenatal failure of development in systems that program timing, serial coordination and prospective control of movements, and that regulate affective evaluations of experiences. There are effects in early infancy, before medical diagnosis, especially in motor sequencing, selective or exploratory attention, affective expression and intersubjective engagement with parents. These are followed by retardation of cognitive development and language learning in the second or third year, which lead to a diagnosis of ASD. The early signs relate to abnormalities that have been found in brain stem systems and cerebellum in the embryo or early fetal stage, before the cerebral neocortex is functional, and they have clear consequences in infancy when neocortical systems are intensively elaborated. We propose, with evidence of the disturbances of posture, locomotion and prospective motor control in children with autism, as well as of their facial expression of interest and affect, and attention to other persons' expressions, that examination of the psychobiology of motor affective disorders, rather than later developing cognitive or linguistic ones, may facilitate early diagnosis. Research in this area may also explain how intense interaction, imitation or "expressive art" therapies, which respond intimately with motor activities, are effective at later stages. Exceptional talents of some autistic people may be acquired compensations for basic problems with expectant self-regulations of movement, attention and emotion.

Torres, E.B., Brincker, M., Isenhower, R.W., Yanovich, P., Stigler, K.A., Nurnberger, J.I., Metaxas, D.N., & José, J.V. (2013), *Autism: the micro-movement perspective*, *Frontiers in Integrative Neuroscience*, 7:32 (open access [here](#))

Abstract: The current assessment of behaviors in the inventories to diagnose autism spectrum disorders (ASD) focus on observation and discrete categorizations. Behaviors require movements, yet measurements of physical movements are seldom included. Their inclusion however, could provide an objective characterization of behavior to help unveil interactions between the peripheral and the central nervous systems (CNSs). Such interactions are critical for the development and maintenance of spontaneous autonomy, self-regulation, and voluntary control. At present, current approaches cannot deal with the heterogeneous, dynamic and stochastic nature of development. Accordingly, they leave no avenues for real time or longitudinal assessments of *change* in a coping system continuously adapting and developing compensatory mechanisms. We offer a new unifying statistical framework to reveal re-afferent kinesthetic features of the *individual* with ASD. The new methodology is based on the non-stationary stochastic patterns of minute fluctuations (micro-movements) inherent to our natural actions. Such patterns of behavioral variability provide re-entrant sensory feedback contributing to the

autonomous regulation and coordination of the motor output. From an early age, this feedback supports centrally driven volitional control and fluid, flexible transitions between intentional and spontaneous behaviors. We show that in ASD there is a disruption in the maturation of this form of proprioception. Despite this disturbance, each individual has unique adaptive compensatory capabilities that we can unveil and exploit to evoke faster and more accurate decisions. Measuring the kinesthetic re-afference in tandem with stimuli variations we can detect changes in their micro-movements indicative of a more predictive and reliable kinesthetic percept. Our methods address the heterogeneity of ASD with a personalized approach grounded in the inherent sensory-motor abilities that the individual has already developed.

Major Point: Provides further evidence of sensory-motor differences among autistic individuals

Belmonte, M.K., Saxena-Chandhok, T., Cherian, R., Muneer, R., George, L., & Karanth, P. (2013), *Oral motor deficits in speech-impaired children with autism*, *Frontiers in Integrative Neuroscience*, 7:47 (open access [here](#))

Abstract: Absence of communicative speech in autism has been presumed to reflect a fundamental deficit in the use of language, but at least in a subpopulation may instead stem from motor and oral motor issues. Clinical reports of disparity between receptive vs. expressive speech/language abilities reinforce this hypothesis. Our early-intervention clinic develops skills prerequisite to learning and communication, including sitting, attending, and pointing or reference, in children below 6 years of age. In a cohort of 31 children, gross and fine motor skills and activities of daily living as well as receptive and expressive speech were assessed at intake and after 6 and 10 months of intervention. Oral motor skills were evaluated separately within the first 5 months of the child's enrolment in the intervention programme and again at 10 months of intervention. Assessment used a clinician-rated structured report, normed against samples of 360 (for motor and speech skills) and 90 (for oral motor skills) typically developing children matched for age, cultural environment and socio-economic status. In the full sample, oral and other motor skills correlated with receptive and expressive language both in terms of pre-intervention measures and in terms of learning rates during the intervention. A motor-impaired group comprising a third of the sample was discriminated by an uneven profile of skills with oral motor and expressive language deficits out of proportion to the receptive language deficit. This group learnt language more slowly, and ended intervention lagging in oral motor skills. In individuals incapable of the degree of motor sequencing and timing necessary for speech movements, receptive language may outstrip expressive speech. Our data suggest that autistic motor difficulties could range from more basic skills such as pointing to more refined skills such as articulation, and need to be assessed and addressed across this entire range in each individual.

McCleery, J., Elliott, N., Sampanis, D., & Stefanidou, C. (2013), *Motor development and motor resonance difficulties in autism: relevance to early intervention for language and communication skills*, *Frontiers in Integrative Neuroscience*, 7:1-20 (open access [here](#))

Abstract: Research suggests that a sub-set of children with autism experience notable difficulties and delays in motor skills development, and that a large percentage of children with autism experience deficits in motor resonance. These motor-related deficiencies, which evidence suggests are present from a very early age, are likely to negatively affect social-communicative and language development in this population. Here, we review evidence for delayed, impaired, and atypical motor development in infants and children with autism. We then carefully review and examine the current language and communication-based intervention research that is relevant to motor and motor resonance (i.e., neural “mirroring” mechanisms activated when we observe the actions of others) deficits in children with autism. Finally, we describe research needs and future directions and developments for early interventions aimed at addressing the speech/language and social-communication development difficulties in autism from a motor-related perspective.

Major Point: Reviews the evidence of delayed, impaired, and atypical motor development in autism

Tager-Flusberg, H., & Kasari, C. (2013), *Minimally Verbal School-Aged Children with Autism Spectrum Disorder: The Neglected End of the Spectrum*, *Autism Research: Official Journal of the International Society for Autism Research*, 6:6 (open access [here](#))

Abstract: It is currently estimated that about 30% of children with autism spectrum disorder remain minimally verbal, even after receiving years of interventions and a range of educational opportunities. Very little is known about the individuals at this end of the autism spectrum; in part because this is a highly variable population with no single set of defining characteristics or patterns of skills or deficits, and in part because it is extremely challenging to provide reliable or valid assessments of their developmental functioning. In this paper we summarize current knowledge based on research including minimally verbal children. We review promising new novel methods for assessing the verbal and nonverbal abilities of minimally verbal school-aged children, including eye-tracking and brain imaging methods that do not require overt responses. We then review what is known about interventions that may be effective in improving language and communication skills, including discussion of both non-augmentative and augmentative methods. In the final section of the paper we discuss the gaps in the literature and needs for future research.

Major Point: Finds that even though approximately one-third of autistic children are minimally verbal, even after receiving years of interventions and a range of educational

opportunities, almost all research focuses on *verbal* children; suggests autism research therefore cannot necessarily be assumed to apply to the minimally verbal. Observes that the non-verbal/minimally-verbal autistic population is itself highly heterogeneous, and the causes of and solutions for the inability to speak cannot be generalized. Finds almost no evidence for effective AAC or language interventions in the minimally verbal ASD population; notes no data exists to support the use of PECS or iPad-based AAC applications beyond a requesting function. Provides suggestions for further research.

Emerson, A., & Dearden, J. (2013), *Accommodating to Motor Difficulties and Communication Impairments in People with Autism: the MORE Intervention Model*, *Frontiers in Integrative Neuroscience*, 7:45 (open access [here](#))

Abstract: Motor impairment in individuals with autism potentially impacts on their development in all spheres. This paper is particularly concerned with people with severe communication impairments suggesting that recognition of the impact of motor impairments on their lives could lead to more effective interventions being developed. One such intervention is the MORE (Means, Opportunities, Reasons, and Expectations) model, founded on the “least dangerous assumption,” that is assuming competence until otherwise established through long-term observation and assessment. Components of the model include recognizing the importance of having high expectations and linking this to the way people are spoken to; timing within an intervention and over long periods; the importance of eye-hand coordination and teaching independent pointing skills. It is suggested that literacy should be offered as an early step which could significantly enhance communication. There is increasingly widespread recognition of the relevance of motor impairments to the lives of people with autism (Boucher, 2003; Ming et al., 2007; Hilton et al., 2012; Liu, 2012). These impairments are thought to be present from birth and potentially the earliest diagnostic markers of autism (Mitchell et al., 2006; Iverson and Wozniak, 2007). It is also suggested that motor impairment may be a core deficit in autism (Dziuk et al., 2007). Researchers have begun to consider the link between ability, as measured by I.Q., and the presence, to varying degrees, of motor impairments (Mari et al., 2003) as well as the link between sensory-motor difficulties and the development of communication (Iverson and Wozniak, 2007). Motor impairments have so far mostly been considered in terms of their recognition and diagnosis but are also of considerable relevance to intervention, at all stages of development. This paper suggests a model to aid understanding of people with autism and severe communication impairments, in the light of possible motor difficulties, and offers suggestions for interventions. The term “motor” is used to suggest a wide range of skills and actions, with “movement” denoting a specific function comprising a range of motor skills.

Savarese, R.J. (2013), *Moving the field: the sensorimotor perspective on autism* (Commentary on “Rethinking autism: implications of sensory and motor differences,” an article by Anne Donnellan, David Hill, and Martha Leary), *Frontiers in Integrative Neuroscience*, 7:6 (open access [here](#))

Abstract: Since the article’s initial publication in *Disability Studies Quarterly*, the sensorimotor hypothesis has garnered even more support (Donnellan et al., 2010). For example, a meta-analysis from 2010 concluded, “ASD is associated with significant and widespread alterations in motor performance” (Fournier et al., 2010). The article went so far as to propose that motor differences constitute a “core element” of autism and that “interventions aimed at improving ... motor coordination (i.e., gait and balance, arm functions, and movement planning)” should be considered. A study from 2011 found that gross and fine motor differences in autistic children increased significantly with “each 6-month period of chronological age” (Lloyd et al., 2011). It recommended “addressing motor development in early intervention treatments.” And a study from 2012 reported that “motor skills were substantially impaired among ASD-affected children and highly correlated with autistic severity and IQ” (Hilton et al., 2012). By looking at the siblings of autistic children and finding in them no equivalent impairment, the study was able to directly link sensorimotor disturbances with ASD. It, too, contended that motor impairment is a “core characteristic” of autism and that treatment should reflect this fact. The tide has clearly shifted with respect to the sensorimotor hypothesis; what was once dismissed out of hand by an earlier generation of autism researchers is now increasingly being taken up for its superior explanatory power.

Major Point: Responds in support of Donnellan et al.’s call for “rethinking autism” and argues that sensorimotor differences are core components of autism experiences

Donnellan, A.M., Hill, D.A., & Leary, M.R. (2013), *Rethinking autism: implications of sensory and movement differences for understanding and support*, *Frontiers in Integrative Neuroscience*, 6:124 (open access [here](#))

Abstract: For decades autism has been defined as a triad of deficits in social interaction, communication, and imaginative play. Though there is now broad acknowledgment of the neurological basis of autism, there is little attention paid to the contribution of such neurological differences to a person’s development and functioning. Communication, relationship, and participation require neurological systems to coordinate and synchronize the organization and regulation of sensory information and movement. Developmental differences in these abilities are likely to result in differences in the way a person behaves and expresses intention and meaning. The present paper shares our emerging awareness that people may struggle with difficulties that are not immediately evident to an outsider. This paper explores the symptoms of sensory and movement differences and the possible implications for autistic people. It provides a review of the history and literature that describes the neurological basis for many of the so-called

behavioral differences that people experience. The paper emphasizes the importance of our acknowledgment that a social interpretation of differences in behavior, relationship, and communication can lead us far away from the lived experience of individuals with the autism label and those who support them. We suggest alternative ways to address the challenges faced by people with autism.

Major Point: Explores sensory-motor differences in autism; makes case for a revised understanding of autism that focuses on the perspectives of autistic individuals

Blanche, E.I., Reinoso, G., Chang, M.C., & Bodison, S. (2012), *Proprioceptive processing difficulties among children with autism spectrum disorders and developmental disabilities* The American Journal of Occupational Therapy, 66:5, 621-624 (open access [here](#))

Abstract: Sensory processing difficulties among children with autism spectrum disorders (ASD) have been extensively documented. However, less is known about this population's ability to process proprioceptive information. We used the Comprehensive Observations of Proprioception (COP; Blanche, Bodison, Chang, & Reinoso, in press) to describe the proprioceptive difficulties experienced by children with ASD. A sample of 32 children with ASD, 26 children with developmental disabilities excluding ASD, and 28 typically developing control children were studied using the COP. Children with ASD present with proprioceptive processing difficulties that are different from those of children with developmental disabilities and their typically developing counterparts. Specific data, potential clinical applications, and directions for future research are described. Results suggest that the COP has useful clinical research applications. Further assessment of psychometric properties, clinical utility, and meaningful differences among diverse clinical populations are needed.

Key Quotation: "Proprioception, defined as the sum of neuronal inputs from the joint capsules, ligaments, muscles, tendons, and skin, is a multifaceted system that affects motor control and is hypothesized to have an impact on behavior and motor control."

Robledo, J., Donnellan, A.M., & Strandt-Conroy, K. (2012), *An exploration of sensory and movement differences from the perspective of individuals with autism*, Frontiers in Integrative Neuroscience, 6:107 (open access [here](#))

Abstract: Parents, teachers, and people who themselves experience sensory and movement differences have consistently reported disturbances of sensation and movement associated with autism. Our review of the literature has revealed both historical and recent references to and research about sensory and movement difference characteristics and symptoms for individuals with autism. What is notably infrequent in this literature, however, is research that highlights the perspective of the

individual with autism. If we wish to truly understand the experience of sensory and movement differences for individuals with autism, we must explore their experiences and perspectives. This study presents a qualitative analysis of more than 40 h in-depth inquiry into the lives of five individuals with the autism label. Data were sorted into six categories: perception, action, posture, emotion, communication, and cognition. The insights into sensory and movement differences and autism offered by these individuals was illuminating. We found that the data strongly supported the presence of disruption of organization and regulation of sensory and movement differences in the lived experience of these participants with autism. The present data suggests that in autism this disruption of organization and regulation is amplified in terms of quantity, quality, intensity, and may affect everyday life. These data contribute to a more expansive view of autism that incorporates the possibility that autism is a disorder that affects motor planning, behavior, communication, the sensory motor system, and the dynamic interaction of all of these.

Major Point: Supports the existence of differences in sensory perception and movement in autistic individuals in study involving in-depth interviews and interactions with five autistic individuals

MacNeil, L.K., & Mostofsky, S.H. (2012), *Specificity of dyspraxia in children with autism*, *Neuropsychology*, 26:2, 165-171 (open access [here](#))

Abstract: Objective: To explore the specificity of impaired praxis and postural knowledge to autism by examining three samples of children, including those with autism spectrum disorder (ASD), attention-deficit hyperactivity disorder (ADHD), and typically developing (TD) children. Method: Twenty-four children with ASD, 24 children with ADHD, and 24 TD children, ages 8–13, completed measures assessing basic motor control (the Physical and Neurological Exam for Subtle Signs; PANESS), praxis (performance of skilled gestures to command, with imitation, and tool use) and the ability to recognize correct hand postures necessary to perform these skilled gestures (the Postural Knowledge Test; PKT). Results: Children with ASD performed significantly worse than TD children on all three assessments. In contrast, children with ADHD performed significantly worse than TD controls on PANESS but not on the praxis examination or PKT. Furthermore, children with ASD performed significantly worse than children with ADHD on both the praxis examination and PKT, but not on the PANESS. Conclusions: Whereas both children with ADHD and children with ASD show impairments in basic motor control, impairments in performance and recognition of skilled motor gestures, consistent with dyspraxia, appear to be specific to autism. The findings suggest that impaired formation of perceptual-motor action models necessary to development of skilled gestures and other goal directed behavior is specific to autism; whereas, impaired basic motor control may be a more generalized finding.

Marco, E.J., Hinkley, L.B., Hill, S.S., & Nagarajan, S.S. (2011), *Sensory processing in autism: a review of neurophysiologic findings*, *Pediatric Research*, 69(5 Pt 2): 48R–54R (open access [here](#))

Abstract: Atypical sensory-based behaviors are a ubiquitous feature of autism spectrum disorders (ASDs). In this article, we review the neural underpinnings of sensory processing in autism by reviewing the literature on neurophysiological responses to auditory, tactile, and visual stimuli in autistic individuals. We review studies of unimodal sensory processing and multisensory integration that use a variety of neuroimaging techniques, including electroencephalography (EEG), magnetoencephalography (MEG), and functional MRI. We then explore the impact of covert and overt attention on sensory processing. With additional characterization, neurophysiologic profiles of sensory processing in ASD may serve as valuable biomarkers for diagnosis and monitoring of therapeutic interventions for autism and reveal potential strategies and target brain regions for therapeutic interventions.

Key Quotations: “What does appear to be common to individuals across the spectrum are atypical behavioral responses to sensory information. More than 96% of children with ASD report hyper- and hyposensitivities in multiple domains.” “Sensory processing concerns have been a key feature of ASD clinical descriptions from the original independent seminal reports by Asperger and Kanner to first person accounts. The distress caused by particular sensory stimuli can cause self-injurious and aggressive behavior in those who are unable to communicate their duress. Although sensory hyper- and hyposensitiveness are not unique to ASD, they appear to be more prevalent in this population than in other developmental disabilities.” “Many of the atypical perceptual experiences reported in those with ASD are believed to be due to an inability to properly filter or process simultaneous channels of visual, auditory, and tactile inputs.”

Donnellan, A.M., Hill, D., & Leary, M.R. (2010), *Rethinking Autism: Implications of Sensory and Movement Differences*, *Disability Studies Quarterly*, 30:1 (open access [here](#))

Abstract: Descriptions of autism in the Diagnostic and Statistical Manuals of the APA and throughout much of the history of autism emphasize difficulties in social interaction, communication and imaginative play. Recent reports by self-advocates, neuroscientists and other researchers suggest that sensory and movement differences may play a significant part in the lives of those who live with autism. Sensory and movement differences may include difficulties in starting, stopping, continuing, combining and switching motor action, speech, thought, memory and emotion. A review of these reports, the experience of those with other movement differences, and implications for understanding individuals with autism are presented. Suggestions are included on how knowledge of sensory and movement differences may offer guidance in rethinking

assumptions about autism characteristics, social interactions, communication and other supports.

Major Point: Emphasizes sensory and movement differences in autism

Fournier, K.A., Hass, C.J., Naik, S.K., Lodha, N., & Cauraugh, J.H. (2010), *Motor coordination in autism spectrum disorders: a synthesis and meta-analysis*, Journal of Autism and Developmental Disorders, 40: 1227-1240 (paywall access [here](#))

Abstract: Are motor coordination deficits an underlying cardinal feature of Autism Spectrum Disorders (ASD)? Database searches identified 83 ASD studies focused on motor coordination, arm movements, gait, or postural stability deficits. Data extraction involved between-group comparisons for ASD and typically developing controls (N = 51). Rigorous meta-analysis techniques including random effects models, forest and funnel plots, I (2), publication bias, fail-safe analysis, and moderator variable analyses determined a significant standardized mean difference effect equal to 1.20 (SE = 0.144; $p < 0.0001$; $Z = 10.49$). This large effect indicated substantial motor coordination deficits in the ASD groups across a wide range of behaviors. The current overall findings portray motor coordination deficits as pervasive across diagnoses, thus, a cardinal feature of ASD.

Major Point: Meta-analysis of 83 studies demonstrating overwhelming evidence for existence of motor coordination difficulties in autistic individuals

Green, D., Charman, T., Pickles, A., Chandler, S., Loucas, T., Simonoff, E., & Baird, G. (2009), *Impairment in movement skills of children with autistic spectrum disorders*, Developmental Medicine & Child Neurology, 51:311-316 (open access [here](#))

Abstract: We undertook this study to explore the degree of impairment in movement skills in children with autistic spectrum disorders (ASD) and a wide IQ range. Movement skills were measured using the Movement Assessment Battery for Children (M-ABC) in a large, well defined, population-derived group of children (n=101: 89 males, 12 females; mean age 11y 4mo, SD 10mo; range 10y-14y 3mo) with childhood autism and broader ASD and a wide range of IQ scores. Additionally, we tested whether a parent-completed questionnaire, the Developmental Coordination Disorder Questionnaire (DCDQ), was useful in identifying children who met criteria for movement impairments after assessment (n=97 with complete M-ABCs and DCDQs). Of the children with ASD, 79% had definite movement impairments on the M-ABC; a further 10% had borderline problems. Children with childhood autism were more impaired than children with broader ASD, and children with an IQ less than 70 were more impaired than those with IQ more than 70. This is consistent with the view that movement impairments may arise from a more severe neurological impairment that also contributes to intellectual disability and

more severe autism. Movement impairment was not associated with everyday adaptive behaviour once the effect of IQ was controlled for. The DCDQ performed moderately well as a screen for possible motor difficulties. Movement impairments are common in children with ASD. Systematic assessment of movement abilities should be considered a routine investigation.

Dowell, L.R., Mahone, E.M., & Mostofsky, S.H. (2009), *Associations of postural knowledge and basic motor skill with dyspraxia in autism – implications for abnormalities in distributed connectivity and motor learning*, *Neuropsychology*, 23:5, 563-570 (open access [here](#))

Abstract: Children with autism often have difficulty performing skilled movements. Praxis performance requires basic motor skill, knowledge of representations of the movement (mediated by parietal regions), and transcoding of these representations into movement plans (mediated by premotor circuits). The goals of this study were (a) to determine whether dyspraxia in autism is associated with impaired representational ("postural") knowledge and (b) to examine the contributions of postural knowledge and basic motor skill to dyspraxia in autism. Thirty-seven children with autism spectrum disorder (ASD) and 50 typically developing (TD) children, ages 8-13, completed (a) an examination of basic motor skills, (b) a postural knowledge test assessing praxis discrimination, and (c) a praxis examination. Children with ASD showed worse basic motor skill and postural knowledge than did controls. The ASD group continued to show significantly poorer praxis than did controls after accounting for age, IQ, basic motor skill, and postural knowledge. Dyspraxia in autism appears to be associated with impaired formation of spatial representations, as well as transcoding and execution. Distributed abnormality across parietal, premotor, and motor circuitry, as well as anomalous connectivity, may be implicated.

Mostofsky, S.H., Powell, S.K., Simmonds, D.J., Goldberg, M.C., Caffo, B., & Pekar, J.J. (2009), *Decreased connectivity and cerebellar activity in autism during motor task performance*, *Brain: A Journal of Neurology*, 132(Pt 9): 2413-25 (open access [here](#))

Abstract: Although motor deficits are common in autism, the neural correlates underlying the disruption of even basic motor execution are unknown. Motor deficits may be some of the earliest identifiable signs of abnormal development and increased understanding of their neural underpinnings may provide insight into autism-associated differences in parallel systems critical for control of more complex behaviour necessary for social and communicative development. Functional magnetic resonance imaging was used to examine neural activation and connectivity during sequential, appositional finger tapping in 13 children, ages 8–12 years, with high-functioning autism (HFA) and 13 typically developing (TD), age- and sex-matched peers. Both groups showed expected primary activations in cortical and subcortical regions associated with motor execution

[contralateral primary sensorimotor cortex, contralateral thalamus, ipsilateral cerebellum, supplementary motor area (SMA)]; however, the TD group showed greater activation in the ipsilateral anterior cerebellum, while the HFA group showed greater activation in the SMA. Although activation differences were limited to a subset of regions, children with HFA demonstrated diffusely decreased connectivity across the motor execution network relative to control children. The between-group dissociation of cerebral and cerebellar motor activation represents the first neuroimaging data of motor dysfunction in children with autism, providing insight into potentially abnormal circuits impacting development. Decreased cerebellar activation in the HFA group may reflect difficulty shifting motor execution from cortical regions associated with effortful control to regions associated with habitual execution. Additionally, diffusely decreased connectivity may reflect poor coordination within the circuit necessary for automating patterned motor behaviour. The findings might explain impairments in motor development in autism, as well as abnormal and delayed acquisition of gestures important for socialization and communication.

Broderick, A., & Ne’eman, A. (2008), *Autism as metaphor: Narrative and counternarrative*, International Journal of Inclusive Education, 12:5-6, 459-476 (paywall access [here](#))

Abstract: In this paper we explore the significance of metaphor and dominant cultural narratives in current autism discourse. We briefly explore the history of metaphor in autism discourse, and outline the contemporary struggle between the culturally dominant metaphor of autism as disease and the emergent counter-narrative of autism within neurodiversity. We argue that metaphor serves very specific purposes in autism discourse, including (1) to create a commonsensical narrative congruence between common understandings of autism and currently dominant notions about its aetiology(ies) or causes(s), and (2) to create a commonsensical narrative congruence between common understandings of autism and currently dominant notions about appropriate responses to or interventions for autism. We argue that the bulk of the support for metaphorically framing autism within a disease model comes from within the non-autistic ('neurotypical' or 'NT') community, whereas the bulk of the support for metaphorically framing autism within a neurodiversity model comes from within the autistic community (and is inclusive of some non-autistic allies as well). In exploring these competing cultural narratives, we argue for the crucial import that counter-narrative can play in the process of cultural critique and resistance to ideological hegemony.

Major Point: Argues that the dominant discourse of autism as metaphor for disease creates misunderstandings about the causes of and best interventions for autism

Shoener, R.F., Kinnealey, M., & Koenig, K.P. (2008), *You can know me now if you listen: Sensory, motor, and communication issues in a nonverbal person with autism*, American Journal of Occupational Therapy, 62: 547-553 (open access [here](#))

Abstract: This case report describes an intensive approach to treating autism and provides an intersection between a first-person narrative paired with intervention and outcomes. In-depth conversations between a person with autism and an occupational therapist provide insight into understanding differences and difficulties in sensory processing and regulation, praxis, and communication. Individuals with autism may be intellectually and emotionally intact but hampered by deficits that interfere with the ability to move the body efficiently. These sensorimotor deficits underlie the ability to communicate with others and to develop relationships. This article illustrates the benefits of an intensive therapeutic program designed to address sensory and motor differences underlying communication, as well as the vital role the occupational therapist plays in addressing these underlying differences to improve functional communication and social participation.

Key Quote: “Professionals have an ethical obligation to seek methods for communicating with people with ASD that will access their intelligence and free their voices.”

Dawson, M., Soulières, I., Gernsbacher, M.A., & Mottron, L. (2007), *The Level and Nature of Autistic Intelligence*, Psychological Science, 18:8, 657-662 (open access [here](#))

Abstract: Autistics are presumed to be characterized by cognitive impairment, and their cognitive strengths (e.g., in Block Design performance) are frequently interpreted as low-level by-products of high-level deficits, not as direct manifestations of intelligence. Recent attempts to identify the neuroanatomical and neurofunctional signature of autism have been positioned on this universal, but untested, assumption. We therefore assessed a broad sample of 38 autistic children on the preeminent test of fluid intelligence, Raven’s Progressive Matrices. Their scores were, on average, 30 percentile points, and in some cases more than 70 percentile points, higher than their scores on the Wechsler scales of intelligence. Typically developing control children showed no such discrepancy, and a similar contrast was observed when a sample of autistic adults was compared with a sample of nonautistic adults. We conclude that intelligence has been underestimated in autistics.

Major Point: Finds that autistic participants tended to score much higher on the Raven’s than the Wechsler (see also Courchesne et al., 2015)

Dziuk, M.A., Gidley Larson, J.C., Apostu, A., Mahone, E.M., Denckla, M.B., & Mostofsky, S.H. (2007), *Dyspraxia in autism: association with motor, social, and communicative deficits*, *Developmental Medicine & Child Neurology*, 49:10, 734-739 (open access [here](#))

Abstract: Impaired performance of skilled gestures, referred to as dyspraxia, is consistently reported in children with autism; however, its neurological basis is not well understood. Basic motor skill deficits are also observed in children with autism and it is unclear whether dyspraxia observed in children with autism can be accounted for by problems with motor skills. Forty-seven high-functioning children with an autism spectrum disorder (ASD), autism, or Asperger syndrome (43 males, four females; mean age 10y 7m [SD 1y 10m], mean Full-scale IQ (FSIQ) 99.4 [SD 15.9]), and 47 typically developing (TD) controls (41 males, six females; mean age 10y 6m [SD 1y 5m], mean FSIQ 113.8 [SD 12.3], age range 8-4y) completed: (1) the Physical and Neurological Assessment of Subtle Signs, an examination of basic motor skills standardized for children, and (2) a praxis examination that included gestures to command, to imitation, and with tool-use. Hierarchical regression was used to examine the association between basic motor skill performance (i.e. times to complete repetitive limb movements) and praxis performance (total praxis errors). After controlling for age and IQ, basic motor skill was a significant predictor of performance on praxis examination. Nevertheless, the ASD group continued to show significantly poorer praxis than controls after accounting for basic motor skill. Furthermore, praxis performance was a strong predictor of the defining features of autism, measured using the Autism Diagnostic Observation Schedule, and this correlation remained significant after accounting for basic motor skill. Results indicate that dyspraxia in autism cannot be entirely accounted for by impairments in basic motor skills, suggesting the presence of additional contributory factors. Furthermore, praxis in children with autism is strongly correlated with the social, communicative, and behavioral impairments that define the disorder, suggesting that dyspraxia may be a core feature of autism or a marker of the neurological abnormalities underlying the disorder.

Edelson, M.G. (2006), *Are the majority of children with autism mentally retarded?: A systematic evaluation of the data. Focus on Autism and Other Developmental Disabilities*, 21: 66-83 (paywall access [here](#))

Abstract: There are frequent claims in the literature that a majority of children with autism are mentally retarded (MR). The present study examined the evidence used as the basis for these claims, reviewing 215 articles published between 1937 and 2003. Results indicated 74% of the claims came from nonempirical sources, 53% of which never traced back to empirical data. Most empirical evidence for the claims was published 25 to 45 years ago and was often obtained utilizing developmental or adaptive scales rather than measures of intelligence. Furthermore, significantly higher prevalence rates of MR were reported when these measures were used. Overall, the findings indicate that more

empirical evidence is needed before conclusions can be made about the percentages of children with autism who are mentally retarded.

Bara, B.G., Bucciarelli, M., & Colle, L. (2001), *Communicative abilities in autism: Evidence for attentional deficits*, *Brain and Language*, 77: 216-240 (paywall access [here](#))

Abstract: Although there are many theories about autism, something all of them agree upon is that autistics are impaired in the ability to communicate. The explanation is either their incapacity to attribute mental states to others or the interference of irrelevant stimuli with the access and processing of the communication (low). Our study on mute autistic children aims to investigate their communicative ability in order to bring some new evidence on the debate. We used an experimental technique that allows autistic children to access and process the communicative acts in a familiar context for as long as needed. The experimental results show that our sample of autistic children performs as well as the control group of normal children in dealing with directs, indirects, ironies, deceits, and recoveries of failure. Independent of their respective difficulty, the felicitous outcome of any of these acts requires the capacity to attribute an adequate communicative intention to the actor. Moreover, our results show that, contrary to the established findings in the literature, autistics' performance in the standard false belief task, a task that requires one to understand the mental states of other people, is equivalent to the performance of normal subjects. We argue that an attentional deficit affects the communicative performance of autistics in experiments where classic methodologies are used; with the proper methodology, we can access the unexplored world where mute autistic children also communicate. As far as we know, this is the first systematic experiment on pragmatic abilities in mute autistic children. Indeed, our work shows that tests and methodologies which help to focus on the communicative task improve the autistics' performance with respect to those used in the literature. We conclude that the autistic communicative deficit is at the performance level and that it has an attentional nature.

Major Point: Given the right supports and environment, non-speaking autistics are able to communicate as effectively as non-autistics; attentional deficits contribute to communication impairments in autistics

Teitelbaum, P., Teitelbaum, O., Nye, J., Fryman, J., & Maurer R. (1998), *Movement analysis in infancy may be useful for early diagnosis of autism*, *Proceedings of the National Academy of Sciences*, 95:23, 13982-13987 (open access [here](#))

Abstract: All of the 17 autistic children studied in the present paper showed disturbances of movement that with our methods could be detected clearly at the age of 4–6 months, and sometimes even at birth. We used the Eshkol–Wachman Movement Analysis System in combination with still-frame videodisc analysis to study videos obtained from

parents of children who had been diagnosed as autistic by conventional methods, usually around 3 years old. The videos showed their behaviors when they were infants, long before they had been diagnosed as autistic. The movement disorders varied from child to child. Disturbances were revealed in the shape of the mouth and in some or all of the milestones of development, including, lying, righting, sitting, crawling, and walking. Our findings support the view that movement disturbances play an intrinsic part in the phenomenon of autism, that they are present at birth, and that they can be used to diagnose the presence of autism in the first few months of life. They indicate the need for the development of methods of therapy to be applied from the first few months of life in autism.

Bristol, M.M., Cohen, D.J., Costello, E.J., Denckla, M., Eckberg, T.J., Kallen R., Kraemer, H.C., Lord, C., Maurer, R., McIlvane, W.J., Minshew, N., Sigman, M., & Spence, M.A. (1996), *State of the science in autism: Report to the National Institutes of Health*, Journal of Autism and Developmental Disorders, 26:2, 121-154 (paywall access [here](#))

Abstract: (none)

Major Point: Many individuals with autism lack speech and have limitations in gestural communication and in the use of augmentative communication systems. These problem areas may be caused or complicated by specific sensory difficulties and/or general motor or more specific motor/speech impairment.

Leary, M.R., & Hill, D. (1996), *Moving on: autism and movement disturbance*, Mental Retardation, 34: 39-53 (open access [here](#))

Abstract: Many authors have reported on the presence of movement disturbance symptoms in some individuals with autism. Typically, these symptoms have been seen as peripheral to autism or as belonging to a co-occurring syndrome. Some have dismissed these symptoms as having no apparent impact on the presence of behaviors defined as the core characteristics of autism. In this article we considered the relation between symptoms of movement disturbance and symptoms of autism and included our speculative and exploratory analyses of shared symptoms. The analyses point out the difficulties posed by current definitions of autism. We proposed that symptoms of movement disturbance can affect a person's experience of life and how he or she may be perceived by others.

Major Point: Early study arguing for reframing autism from a movement perspective

V. Literature on Presuming Competence: Qualitative Studies on Experience

**Bacon, J., Orsati, F.T., Floyd, S., & Khater, H. (2017), “Friends give meaning to life”:
Reframing friendship for individuals with autism who type to communicate, Review of
Disability Studies Journal, 13:3, 1-19 (paywall access [here](#))**

Abstract: We, two able-bodied authors and two authors with autism, use a disability studies framework to understand our experiences of friendship. Taken from a series of recorded conversations over the course of a year, this project describes the development, maintenance, and complications related to our experiences with friendship, including: reframing of friendships, respect for communication, facilitator roles and support, interdependence and reciprocity, and permanency in relationships.

Major Point: Study describing friendships between individuals who communicate differently and require different levels of communication support

Harrison, A.H., & Connolly, J.F. (2013), *Finding a way in: A review and practical evaluation of fMRI and EEG for detection and assessment in disorders of consciousness*, Neuroscience and Biobehavioral Reviews, 37:8, 1403-1419 (open access [here](#))

Abstract: Diagnoses and assessments of cognitive function in disorders of consciousness (DOC) are notoriously prone to error due to their reliance on behavioural measures. As a result, researchers have turned to functional neuroimaging and electrophysiological techniques with the goal of developing more effective methods of detecting awareness and assessing cognition in these patients. This article reviews functional magnetic resonance imaging (fMRI) and electroencephalography (EEG)-based studies of cognition and consciousness in DOC, including assessment of basic sensory, perceptual, language, and emotional processing; studies for detection of conscious awareness; paradigms for the establishment of communication in the absence of behaviour; and functional connectivity studies. The advantages and limitations of fMRI and EEG-based measures are examined as research and clinical tools in this population and an explanation offered for the rediscovery of the unique advantages of EEG in the study of DOC.

Major Point: Finds that assessment tools that rely on behavioral output do not tell us anything about the cognitive ability of individuals who cannot speak or move reliably

Ashby, C.E., & Causton-Theoharis, J. (2012), “Moving quietly through the door of opportunity”: Perspectives of college students who type to communicate, Equity & Excellence in Education, 45:2, 261-282 (paywall access [here](#))

Abstract: Colleges and universities across the United States are becoming increasingly diverse. That increased diversity includes students who do not use speech as their primary means of expression. This qualitative study focuses on the experiences and challenges of higher education for individuals with autism who type to communicate using a method known as facilitated communication. This article focuses on the perspectives of these individuals as they make sense of their inclusion in and, at times, exclusion from higher education, particularly their academic and social access. In addition, the findings of this research indicate that while there are structural and classroom supports that are helpful for individuals who type to communicate, their participation and meaningful inclusion is also incumbent on attitudinal factors and how receptive faculty and staff are to the students’ method of communication. While there is still much work to be done in the area of higher education for individuals with more complex needs, this study highlights the promise of higher education for this new population of students.

Major Point: Documents perspectives and experiences of college students who type to communicate

Ashby, C. (2011), Whose “voice” is it anyway? Giving voice and qualitative research involving individuals that type to communicate, Disability Studies Quarterly, 31:4 (open access [here](#))

Abstract: One of the critical questions facing Disability Studies is how to make central the voices of individuals with disabilities in research? In this paper, I interrogate the idea of "voice" in critical, qualitative research and its application to research involving individuals who do not use speech as their primary mode of expression. How do critical, qualitative research and theories of voice position participants whose means of expression challenge traditional notions of normative participation? I first problematize the premise of giving voice generally and then present four key issues, which include a) the question of competence for individuals who do not use speech, b) hearing silence, c) agency and voice, and d) broadening the conceptualization of voice beyond speech. I conclude with implications for qualitative researchers and others interested in facilitating voice for individuals using alternative forms of expression.

Major Point: Examines the process and importance of conducting qualitative research with individuals who use AAC

Ashby, C. (2010), *The trouble with normal: The struggle for meaningful access for middle school students with developmental disabilities*, *Disability & Society*, 25:3, 345-358 (paywall access [here](#))

Abstract: This critical, qualitative study considers issues of access to the academic and social experiences of middle school for five students with labels of intellectual disability and autism through a lens of ableism and enforced 'normalcy'. Starting from the position that schools are sites where ableist norms of performance leave many marginalized, this study privileges the perspective of individuals whose inclusion in school is most tenuous. Challenging the notion that mere access to general education classrooms and instruction is enough, this study interrogates questions of efficiency and meaningful engagement within the context of middle school. This paper first illustrates the ways that ableism pervades middle school settings and then outlines a typology of particular ways of being and performing that are privileged and an illusion of normalcy maintained. Finally, this article explores the implications of ableism and enforced normalcy on the engagement and participation of students considered to have developmental disabilities.

Major Point: Explores the ways that speech and other ableist norms of performance are privileged in schools, contributing to the marginalization of those who use AAC

Savarese, D.J. (2010), *Cultural Commentary: Communicate with Me*, *Disability Studies Quarterly*, 30:1 (open access [here](#))

Abstract: Last year Dr. Sanjay Gupta of CNN wanted to talk to me so much that he flew me to New York and got me a room at the fanciest hotel in the city, but ironically at my school, most kids choose not to talk to me at all. Why is that?

Major Point: Self-advocate DJ Savarese answers questions about his communication preferences, including recommending that communication partners speak directly to him, disregard certain physical cues, maintain an open mind, and provide choices or wait time

Jorgensen, C.M., McSheehan, M., & Sonnenmeier, R.M. (2009), *Presumed competence reflected in the educational programs of students with IDD before and after the Beyond Access professional development intervention*, *Journal of Intellectual & Developmental Disability*, 32:4, 248-262 (open access [here](#))

Abstract: Judgements about students' competence influence the goals of their individualised education programs (IEPs), the location of service delivery, and their placement in general education (GE) as opposed to special education (SE) classes. The purpose of this study was to describe how presumed competence to learn the GE curriculum was reflected in the IEPs of students with intellectual and developmental

disabilities (IDD), and in the reported percentage of time that these students spent in GE classes prior to and following the Beyond Access professional development intervention.

Five educational teams of students with IDD participated in a professional development intervention that emphasised students' presumed competence to learn grade-level GE curriculum. Students' pre- and post-intervention IEPs were qualitatively analysed and team member reports of percentage time spent in GE classes were averaged. Five categories of presumed competence were identified. Following intervention, emphasis on learning the GE curriculum, a shift in location of service delivery from outside to within the GE classroom, and increased time spent in GE classes were reported. The Beyond Access intervention shows promise for enhancing views of the competence of students with IDD to learn the GE curriculum and for increasing their inclusion in GE classrooms.

Major Point: Research study examining effectiveness of the Beyond Access professional development intervention, which operationalizes the elements of presumption of competence

Rossetti, Z., Ashby, C., Arndt, K., Chadwick, M., & Kasahara, M. (2008), “I like others to not try to fix me”: Agency, independence, and autism, *Intellectual and Developmental Disabilities*, 46: 364-375 (paywall access [here](#))

Abstract: This article is based on an interpretivist, qualitative research project conducted with individuals labeled with *autism* who type to communicate. Researchers engaged in participant observation and conducted open-ended interviews with 9 participants who were working to develop independent typing skills. Three findings emerged from this research. First, participants shaped a notion of independence that included dependence on various supports. Second, researchers recognized the concept of agency in the interactions between participants and their communication facilitators. Third, participants exercised control of their lives through these expressions of agency.

Major Point: Challenges limited constructions of “independence” and highlights the ways individuals who type to communicate exert agency in their interactions

Biklen, D., & Burke, J. (2006), *Presuming competence, Equity & Excellence in Education*, 39:2, 166-175 (open access [here](#))

Abstract: At least since the early 1990s, educators in inclusive schooling as well as scholars in Disability Studies have critiqued prevailing notions of intellectual ability and have suggested the importance of interpretive communities for constructing student competence. This work follows in the tradition of education-as-dialogue, which some have argued is a sine qua non for conceptualizing education with individuals who have been traditionally marginalized. The core of this article is a conversation between a

university educator and a high school student with autism who types to communicate. Out of this essay, the authors find a series of principles for inclusive schooling, the most central of which is the idea of presuming competence of students.

Major Point: Details the concept of “presuming competence” for individuals with intellectual disability labels, arguing that difficulties with “performance” not be taken as evidence of intellectual ability; includes a dialogue between Biklen and Burke (the authors) that highlight recommendations for inclusive schooling including ideas for physical space, the sensory environment, teacher attitudes and practices, and redefining “normal”

Biklen, D., & Kliever, C. (2006), *Constructing competence: Autism, voice and the “disordered” body*, International Journal of Inclusive Education, 10:2-3, 169-188 (paywall access [here](#))

Abstract: Definitions of intelligence have traditionally been rooted in literacy competence. In this article, the authors examine two historical examples where societal prejudices and institutional forces worked to limit and regulate access to literacy. The first example illustrates how racism and denial of competence were so profoundly linked and established in 18th century America that author and poet Phyllis Wheatley was forced to go before a tribunal to demonstrate her faculties. The second example concerns Helen Keller. She too was, on more than one occasion, presumed a fraud and had her literacy interrogated. The authors then identify contemporary instances of societal monitoring of who may be literate, drawing especially on experiences of individuals classified as autistic. Based upon these examples, the authors examine the connection between perceptions of communicative competence and understandings of intelligence and mental retardation.

Major Point: Traces historical roots of dominant understandings of intelligence as connected to literacy competence, noting that restricted access to literacy effectively decided who was “allowed” to be intelligent and who was not, then drawing parallels to contemporary understandings of individuals with autism (particularly those with complex communication needs that manifest in difficulties with verbal speech) as “not intelligent”

Broderick, A.A., & Kasa-Hendrickson, C. (2006), *“I am thinking that speech is asinine”:* Narrating complexities and rethinking the notion of “independence” in communication, Equity & Excellence in Education, 39: 176-186 (paywall access [here](#))

Abstract: This article presents a narrative accounting of a critical interpretivist research study that sought to document the emergence of useful speech in participants who had previously been described as largely nonverbal. The purpose of this piece is to narrate this inquiry process through examination not only of our participants’ own accounts of

their experiences but also through critical examination of the ways in which we as researchers solicit and respond to those accounts. Our analytic gaze, therefore, focuses on the dialectic process through which we interactively co-construct concepts related to disability in our participants' experiences, alternating between narrating our own experience of this process as researchers and narrating our participants' accounts of their own experiences with this interpretive process. Discussion focuses on critique of the cultural value accorded to the notions of "independence" and "normalcy," and on the participants' demonstration of their own agency in the complex, fluid, and constant process of managing and constructing, in concert with those around them, and often in the face of significant resistance to the process, their own positive and valued identities as competent communicators.

Major Point: Provides narratives of FC users, including how they negotiate their identities and their use of typing and speech

Hehir, T. (2002), *Eliminating ableism in education*, Harvard Educational Review, 72:1, 1-33 (paywall access [here](#))

Abstract: In this article, the author defines ableism as "the devaluation of disability" that "results in societal attitudes that uncritically assert that it is better for a child to walk than roll, speak than sign, read print than read Braille, spell independently than use a spell-check, and hang out with nondisabled kids as opposed to other disabled kids." The author highlights ableist practices through a discussion of the history of and research pertaining to the education of deaf students, students who are blind or visually impaired, and students with learning disabilities, particularly dyslexia. He asserts that "the pervasiveness of...ableist assumptions in the education of children with disabilities not only reinforces prevailing prejudices against disability but may very well contribute to low levels of educational attainment and employment." In conclusion, the author offers six detailed proposals for beginning to address and overturn ableist practices. Throughout this article, Hehir draws on his personal experiences as former director of the U.S. Department of Education's Office of Special Education Programs, Associate Superintendent for the Chicago Public Schools, and Director of Special Education in the Boston Public Schools.

Broderick, A.A., & Kasa-Hendrickson, C. (2001), "*Say just one word at first*": *The emergence of reliable speech in a student labeled with autism*, The Journal of the Association for People with Severe Handicaps, 26:1, 13-24 (paywall access [here](#))

Abstract: This article presents a qualitative, interpretivist research study that documents the emergence, in the context of typed expression, of increasingly useful and reliable speech for a young person labeled with autism. The authors construct a descriptive narrative of the process of this young man's emergent speech development and

organize the data around four components of this complex, dynamic, and nonlinear process: (a) echolalia or “unreliable” speech, (b) reading out loud, (c) using reliable speech, and (d) integrating speaking and typing. Additionally, the authors identify three categories of supports that this young man and his family experienced and interpreted as being supportive of his emergent speech. These categories include (a) the importance of taking risks, (b) the importance of seeing and hearing words together, and (c) the importance of an inclusive academic education including rich literacy experiences. Throughout, this inductive analysis constructs an understanding of how this young man and his family have experienced and interpreted his emergence as a reliable speaker.

Major Point: Examines evidence of speech before and during typing

Rubin, S., Biklen, D., Kasa-Hendrickson, C., Kluth, P., Cardinal, D.N., & Broderick, A. (2001), *Independence, participation, and the meaning of intellectual ability*, *Disability and Society*, 16: 415-429 (paywall access [here](#))

Abstract: This article presents a non-speaking person’s perspectives on independence and the implications of newfound communication abilities for her participation in the world and upon the meaning of intellectual ability. The person with the communication disability also has autism and, early in her life, was classified by school officials as 'severely retarded'. The narrative focuses especially on the concepts of independence, participation, and intellectual competence or intellectual performance, and their relationship to the concepts of democracy, freedom, and identity, all from a non-essentialist perspective. In addition, the article addresses practical questions about how, from her perspective, the non-speaking person developed the ability to communicate without physical support.

Major Point: Highlights experiences and perspectives of a non-speaking person who learned to type to communicate, including the implications of the shifts in how her competence was regarded over time

Borthwick, C., & Crossley, R. (1999), *Language and retardation*, *Psychology*, 10:38, 1 (paywall access [here](#))

Abstract: The diagnostic link between lack of speech (in the absence of deafness or obvious structural impairment) and mental retardation depends on the premise that behaviour is in general an accurate reflection of internal mental processes, and that nothing is inhibiting the overt production of communication and "masking" more sophisticated language. This premise is not always valid, and the methods for determining whether it is valid may not be the ones now practised in the field of mental retardation psychology. This article reviews several cases in which people with

deafness, physical handicap, and learning disabilities were reclassified out of the category of mental retardation. The recent debate over “facilitated communication” suggests that the burden of proof may lie with those who hold that the actual expressive communication of people diagnosed as mentally retarded does adequately represent their internal language.

Major Point: Without access to a communication method to enable a person to represent their thoughts to others, it is difficult if not impossible to accurately measure that person’s intelligence.

Biklen, D., & Duchan, J. (1994), “*I am intelligent*”: *The social construction of mental retardation*, *Journal of the Association for Persons with Severe Handicaps*, 19:3, 173-184 (paywall access [here](#))

Abstract: Argues that there are two opposing views of mental retardation, normative and competence, and two comparable research approaches in the literature. Mental retardation is viewed as a social construction that accounts for events, behaviors, and phenomena. The experimental and phenomenological approaches to research are contrasted. The controversy about facilitated communication (FC) is seen as a disagreement about objectivist reports of controlled experiments and interpretivist reports of experiences with and systematic observations of FC. Questions about FC are discussed in the context of the competence view of retardation and the experiencing approach to research.

Major Point: Highlights the tensions the FC controversy calls forth about research methodologies; discusses the concept of social construction

VI. General Communication Literature

Finkl, T., Hahne, A., Friederici, A.D., Gerber, J., Mürbe, D., & Anwander, A. (2020), *Language Without Speech: Segregating Distinct Circuits in the Human Brain, Cerebral Cortex*, 30(2): 812-823 (open access [here](#))

Abstract: Language is a fundamental part of human cognition. The question of whether language is processed independently of speech, however, is still heavily discussed. The absence of speech in deaf signers offers the opportunity to disentangle language from speech in the human brain. Using probabilistic tractography, we compared brain structural connectivity of adult deaf signers who had learned sign language early in life to that of matched hearing controls. Quantitative comparison of the connectivity profiles revealed that the core language tracts did not differ between signers and controls, confirming that language is independent of speech. In contrast, pathways involved in the production and perception of speech displayed lower connectivity in deaf signers compared to hearing controls. These differences were located in tracts towards the left pre-supplementary motor area and the thalamus when seeding in Broca's area, and in ipsilateral parietal areas and the precuneus with seeds in left posterior temporal regions. Furthermore, the interhemispheric connectivity between the auditory cortices was lower in the deaf than in the hearing group, underlining the importance of the transcallosal connection for early auditory processes. The present results provide evidence for a functional segregation of the neural pathways for language and speech.

Key Quotation: "The core language network seems to mature as long as either auditory or visual language input is provided in early childhood. In contrast, the pathways necessary for speech processing explicitly need auditory input and active speaking in order to mature to their full extent. Taken together, our findings demonstrate the modality-independence of the language network and provide structural evidence for the segregation of the core language system and speech processing circuits."

Wood, R. (2018), *The wrong kind of noise: understanding and valuing the communication of autistic children in schools*, Educational Review (open access [here](#))

Abstract: As a result of the association of autism with speech and language difficulties, autistic school children can be subject to interventions ostensibly intended to remedy these problems. However, my study, based in five mainstream primary schools in England, which incorporated the views and experiences of school staff (n = 36), autistic children (n = 10), their parents (n = 10) and a sample of autistic adults (n = 10), suggests that these inputs do not always provide the children with the help they require. Indeed, notwithstanding some examples of effective assistance, the more evident

communication of the autistic children, in its various manifestations, might be ignored and their wishes denied, if deemed not to correspond with the expectations or intentions of the supporting adult. Furthermore, their communication was also found to intersect with the issue of noise in schools, a complex phenomenon which can be an exclusionary factor for autistic children. Indeed, if some forms of noise were tolerated in school, the sounds emanating from autistic children might be disdained, while the communicative value of their silence was not evidently recognised either. Therefore, whether speaking, making noises or remaining silent, autistic children can be deemed to be making the wrong kind of noise. Elucidated via empirical examples from my study, the implications for research and practice are discussed, providing alternative perspectives on how to support the communication of autistic children, leading to greater agency, well-being and educational inclusion on their part.

Major Point: “. . . whether speaking, making noises or remaining silent, autistic children can be deemed to be making the wrong kind of noise.”

Zadbood, A., Chen, J., Leong, Y.C., Norman, K.A., & Hasson, U. (2017), *How We Transmit Memories to Other Brains: Constructing Shared Neural Representations Via Communication, Cerebral Cortex*, 27:10, 4988-5000 (open access [here](#))

Abstract: Humans are able to mentally construct an episode when listening to another person's recollection, even though they themselves did not experience the events. However, it is unknown how strongly the neural patterns elicited by mental construction resemble those found in the brain of the individual who experienced the original events. Using fMRI and a verbal communication task, we traced how neural patterns associated with viewing specific scenes in a movie are encoded, recalled, and then transferred to a group of naïve listeners. By comparing neural patterns across the 3 conditions, we report, for the first time, that event-specific neural patterns observed in the default mode network are shared across the encoding, recall, and construction of the same real-life episode. This study uncovers the intimate correspondences between memory encoding and event construction, and highlights the essential role our common language plays in the process of transmitting one's memories to other brains.

Yeshurun, Y., Swanson, S., Simony, E., Chen, J., Lazaridi, C., Honey, C.J., & Hasson, U. (2017), *Same Story, Different Story*, *Psychological Science*, 28:3, 307-319 (open access [here](#))

Abstract: Differences in people's beliefs can substantially impact their interpretation of a series of events. In this functional MRI study, we manipulated subjects' beliefs, leading two groups of subjects to interpret the same narrative in different ways. We found that responses in higher-order brain areas—including the default-mode network, language areas, and subsets of the mirror neuron system—tended to be similar among people

who shared the same interpretation, but different from those of people with an opposing interpretation. Furthermore, the difference in neural responses between the two groups at each moment was correlated with the magnitude of the difference in the interpretation of the narrative. This study demonstrates that brain responses to the same event tend to cluster together among people who share the same views.

Hasson, U., & Frith, C.D. (2016), *Mirroring and beyond: coupled dynamics as a generalized framework for modelling social interactions*, Philosophical Transactions of the Royal Society of London, Series B, Biological Sciences, 371:1693, 20150366 (open access [here](#))

Abstract: When people observe one another, behavioural alignment can be detected at many levels, from the physical to the mental. Likewise, when people process the same highly complex stimulus sequences, such as films and stories, alignment is detected in the elicited brain activity. In early sensory areas, shared neural patterns are coupled to the low-level properties of the stimulus (shape, motion, volume, etc.), while in high-order brain areas, shared neural patterns are coupled to high-levels aspects of the stimulus, such as meaning. Successful social interactions require such alignments (both behavioural and neural), as communication cannot occur without shared understanding. However, we need to go beyond simple, symmetric (mirror) alignment once we start interacting. Interactions are dynamic processes, which involve continuous mutual adaptation, development of complementary behaviour and division of labour such as leader–follower roles. Here, we argue that interacting individuals are dynamically coupled rather than simply aligned. This broader framework for understanding interactions can encompass both processes by which behaviour and brain activity mirror each other (neural alignment), and situations in which behaviour and brain activity in one participant are coupled (but not mirrored) to the dynamics in the other participant. To apply these more sophisticated accounts of social interactions to the study of the underlying neural processes we need to develop new experimental paradigms and novel methods of data analysis.

Dikker, S., Silbert, L.J., Hasson, U., & Zevin, J.D. (2014), *On the same wavelength: predictable language enhances speaker-listener brain-to-brain synchrony in posterior superior temporal gyrus*, The Journal of Neuroscience, 34:18, 6267-72 (open access [here](#))

Abstract: Recent research has shown that the degree to which speakers and listeners exhibit similar brain activity patterns during human linguistic interaction is correlated with communicative success. Here, we used an intersubject correlation approach in fMRI to test the hypothesis that a listener's ability to predict a speaker's utterance increases such neural coupling between speakers and listeners. Nine subjects listened to recordings of a speaker describing visual scenes that varied in the degree to which they permitted specific linguistic predictions. In line with our hypothesis, the temporal profile

of listeners' brain activity was significantly more synchronous with the speaker's brain activity for highly predictive contexts in left posterior superior temporal gyrus (pSTG), an area previously associated with predictive auditory language processing. In this region, predictability differentially affected the temporal profiles of brain responses in the speaker and listeners respectively, in turn affecting correlated activity between the two: whereas pSTG activation increased with predictability in the speaker, listeners' pSTG activity instead decreased for more predictable sentences. Listeners additionally showed stronger BOLD responses for predictive images before sentence onset, suggesting that highly predictable contexts lead comprehenders to preactivate predicted words.

Cress, C.J., Grabast, J., & Jerke, K.B. (2011), *Contingent interactions between parents and young children with severe expressive communication impairments*, *Communication Disorders Quarterly*, 34:2, 81-96 (paywall access [here](#))

Abstract: Parents and their children with severe expressive impairments may have limited successful communicative exchanges due to each partner's difficulty in recognizing and responding to communicative behaviors of the other. This study examined the communicative functions and modes of communication that received contingent responses in 20 dyads of parents and young children with severe expressive impairments. Parents responded more often to children's nonvocal behaviors and adult-directed behaviors than vocal behaviors and non-adult-directed behaviors (i.e., child gestures or vocal behaviors that were not conveyed toward the direction of the adult). The children responded more often to parent communication about goal-directed than non-goal-directed tasks. Implications of these results for communication intervention are discussed.

Major Point: "Parents and their children with severe expressive impairments may have limited successful communicative exchanges due to each partner's difficulty in recognizing and responding to communicative behaviors of the other."

Stephens, G.J., Silbert, L.J., & Hasson, U. (2010), *Speaker-listener neural coupling underlies successful communication*, *Proceedings of the National Academy of Sciences*, 107:32, 14425-14430 (open access [here](#))

Abstract: Verbal communication is a joint activity; however, speech production and comprehension have primarily been analyzed as independent processes within the boundaries of individual brains. Here, we applied fMRI to record brain activity from both speakers and listeners during natural verbal communication. We used the speaker's spatiotemporal brain activity to model listeners' brain activity and found that the speaker's activity is spatially and temporally coupled with the listener's activity. This coupling vanishes when participants fail to communicate. Moreover, though on average the listener's brain activity mirrors the speaker's activity with a delay, we also find areas

that exhibit predictive anticipatory responses. We connected the extent of neural coupling to a quantitative measure of story comprehension and find that the greater the anticipatory speaker-listener coupling, the greater the understanding. We argue that the observed alignment of production- and comprehension-based processes serves as a mechanism by which brains convey information.

Major Point: “We used the speaker’s spatiotemporal brain activity to model listeners’ brain activity and found that the speaker’s activity is spatially and temporally coupled with the listener’s activity. This coupling vanishes when participants fail to communicate.”

Cress, C.J., Arens, K.B., & Zajicek, A.K. (2007), *Comparison of engagement patterns of young children with developmental disabilities between structured and free play*, Education and Training in Developmental Disabilities, 42:2, 152-164 (paywall access [here](#))

Abstract: Children with developmental disabilities are slower to develop skills at intentional and symbolic communication than typically developing children, and may rely on atypical patterns of preintentional behaviors to support more complex communication development. The present study compared complex gaze engagement behaviors elicited by 25 preintentional children with developmental disabilities during two interactive contexts: structured object-based play with an examiner and free play with parents that included social play. Children with developmental disabilities demonstrated more onlooking and complex engagement behaviors (i.e., coordinated joint and combined joint), and less unengagement in structured play than in free play. The degree of change in engagement behaviors between play settings was not significantly associated with children’s receptive language, motor, or overall developmental scores. Clinical implications for adapting play and partner behaviors to support more complex engagement behaviors in this population are discussed.

Major Point: This study used guided strategies to help adults elicit child communication behaviors during play. When adults successfully elicited, responded to, and repeatedly encouraged the child’s preintentional communication, the young children with complex communication needs learned to actively engage in their environment. These extended periods of more complex engagement increased the number of opportunities adults had to promote communication development.

Dennis, R. (2002), *Nonverbal narratives: Listening to people with severe intellectual disability*, Research and Practice for Persons with Severe Disabilities, 27:4, 239-249 (paywall access [here](#))

Abstract: This article describes an exploratory study that examined the perspectives of practitioners who spend much of their working day listening to and in some ways

“interpreting” for people with severe intellectual disabilities. On the basis of focus group interviews with 23 professional disability-sector workers, including speech therapists, psychologists, and human service workers, the article reports on the importance of a practitioner’s values and experience in successful interactions with individuals who rely on self-developed nonsymbolic communication repertoires. The article includes a discussion of the likelihood of including individuals with severe intellectual disabilities in narrative research.

Major Point: Finds personal values strongly influence listening practices; highlights need for practitioners to be aware of environmental, personal, or behavioral factors impacting successful AAC intervention with individuals who are communicating via preintentional and intentional behaviors

Yoder, P., McCathren, R.B., Warren, S.F., & Watson, A. (2001), *Important distinction in measuring maternal responses to communication in prelinguistic children with disabilities*, *Communication Disorders Quarterly*, 22:3, 135-147 (paywall access [here](#))

Abstract: Two research hypotheses were tested in the research reported here: The first was that non linguistic maternal responses to intentional child communication, but not to preintentional communication, will predict later intentional communication but not later language development. The second hypothesis was that linguistic mapping of intentional communication, but not of preintentional communication, will predict later language development but not later intentional communication. Study participants were 58 children with disabilities or developmental delays and their primary caretakers. Receptive language, prelinguistic communication, and maternal responses were measured at Time 1 (entry into study) and Time 2 (6 months later). Vocabulary level was measured at Time 2. Expressive and receptive language were measured at Time 3 (12 months after entry into study). After controlling for initial measures of child communication or language, number of maternal nonlinguistic responses to intentional communication were positively related to Time 2 rate of intentional communication and to Time 3 expressive and receptive language scores. After controlling for initial child language, number of linguistic mapping responses to intentional communication was positively related to Time 3 expressive and receptive language scores. The results of this study showed no relationship between responsiveness to preintentional communication and later language or communication, thus emphasizing the importance of responding differentially to preintentional and intentional communications.

Major Point: Supports the need to attribute meaning to child communication acts, and provides guidance for focusing the response based on the child’s communication intent

McCathren, R.B. (2000), *Teacher implemented prelinguistic communication intervention, Focus on Autism and Other Developmental Disabilities, 15: 21-29* (paywall access [here](#))

Abstract: The purpose of this case study was to explore the efficacy of a prelinguistic intervention implemented by a classroom teacher in the ongoing daily activities of one special education preschool classroom. The project used a multiple baseline across behavior design for both child and teacher. The participants were a 3-year-old boy with severe communication and cognitive delays and his special education classroom teacher. The teacher implemented a prelinguistic intervention designed to increase the child's frequency and clarity of communication. The strategies used by the teacher were environmental arrangement, following the child's lead, imitation of vocalizations and gestures, modeling of vocalizations and gestures, and prompting for communication. The results indicated that the teacher was able to implement the intervention and showed increases in all the intervention strategies. The child increased his rate of intentional communication, eye contact, vocalizations with consonants, and conventional gestures. Two unanticipated results occurred. First, the child increased his use of symbolic communication, primarily of signs. He also developed symbolic play skills that were not targeted in the intervention. Although the results should be viewed with caution, they warrant further investigation of the use of prelinguistic intervention with young children with communication delays and disorders.

Major Point: Finds that prompting, modeling, and attributing meaning to one 3-year-old boy increased his rate of intentional communication and symbolic play

Yoder, P.J., & Warren, S.F. (1999), *Maternal responsivity mediates the relationship between prelinguistic intentional communication and later language, Journal of Early Intervention, 22:2, 126-136* (paywall access [here](#))

Abstract: Intentional communication may be related to later language development, in part, because intentional communication is a relatively clear communicative cue, which may elicit language-facilitating maternal responses. As a first step in testing this model, this study was conducted to determine whether the relationship between early intentional communication and later language is in part due to covariation with maternal responsivity. The participants were 58 children with developmental disabilities in the prelinguistic period of development and their mothers. Children's intentional prelinguistic communication, mothers' responses, and children's language were measured at entry into the study, 6 months later, and 12 months later, respectively. The results support the model that the relationship between intentional communication and later language was, in part, due to the covarying relationship with maternal responsivity. Implications for future research are discussed.

Major Point: Finds that maternal responsiveness impacts children's use of intentional prelinguistic communication and is related to later language levels

Yoder, P., & Warren, S.F. (1998), *Maternal responsivity predicts the prelinguistic communication intervention that facilitates generalized intentional communication*, Journal of Speech Language Hearing Research, 41: 1207-1219 (open access [here](#))

Abstract: Family systems theory posits that the relative effectiveness of early interventions will vary depending on various aspects of the family. This study tested whether maternal responsivity would predict the extent to which Prelinguistic Milieu Teaching (PMT) facilitated generalized intentional communication better than a contrast treatment that was conducted in a small group by a responsive adult (i.e., Responsive Small Group, RSG). Fifty-eight children with developmental disabilities in the prelinguistic communication period of development were randomly assigned to one of the two staff-implemented treatment groups. Thirty were assigned to RSG; 28 were assigned to PMT. Mothers were kept naive to the intervention methods, hypotheses, and measures. In families with mothers who responded to a high percentage of the children's communication acts at the pretreatment period, the children in the PMT group used more frequent intentional communication in post-treatment generalization sessions with a trainer and mothers than did children in the RSG group. In the families with mothers who responded to fewer than 39% of their children's communication acts, children in the RSG intervention used more frequent intentional communication in posttreatment generalization sessions with the mothers than did children in the PMT intervention. Other family variables and no child variables that we measured could account for these findings.

Major Point: Finds that attributing meaning to children's communicative attempts helps facilitate positive communication development

Yoder, P.J., Warren, S.F., Kim, K., & Gazdag, G.E. (1994), *Facilitating prelinguistic communication skills in young children with developmental delays II: Systematic replication and extension*, Journal of Speech and Hearing Research, 37: 841-851 (open access [here](#))

Abstract: Four children with mental retardation were studied in the context of a multiple baseline across subjects design. Staff members used a modified version of the milieu teaching method to facilitate intentional requesting. The results replicated the finding that a modified version of milieu teaching was effective in facilitating the use of intentional requesting by children with developmental delays in an intervention context (Warren, Yoder, Gazdag, Kim, & Jones, 1993). This study also extended the Warren et al. (1993) work by (a) documenting that increased intentional requesting generalized to sessions with the children's mothers, (b) demonstrating that mothers who were naive to the

purposes of the study were more likely to linguistically map their children's prelinguistic communication after the intervention than before the treatment, and (c) that mothers and teachers who were naive to the purposes of the study linguistically mapped the children's intentional communication more than the children's preintentional communication. We discuss implications of these results for early intervention, the transactional theory of development, and the importance of the distinction between intentional versus preintentional communication.

Major Point: Finds that attributing meaning to children's communicative attempts helps facilitate positive communication development

Warren, S.F., Yoder, P.J., Gazdag, G., Kim, K., & Jones, H. (1993), *Facilitating prelinguistic communication skills in young children with developmental delay*, *Journal of Speech and Hearing Research*, 36: 83-97 (paywall access [here](#))

Abstract: Very little research has focused on the development and evaluation of intervention strategies designed to facilitate the acquisition of prelinguistic communication skills. We conducted two experiments to determine the effects of a milieu teaching approach on the acquisition and generalization of specific prelinguistic communication skills. In the first experiment, we utilized this intervention approach within a multiple baseline design to teach prelinguistic requesting, commenting, and vocal imitation to a single subject with Down syndrome and language delay. The results indicated that the intervention approach was effective at facilitating the child's use of these skills within the treatment setting. Therefore, in the second experiment we conducted a more comprehensive analysis of this approach with 4 subjects with mental retardation. Three of these subjects were taught to request, and 1 subject was taught both to request and to comment. The effects were experimentally evaluated with multiple baseline across subjects design. The results indicated that the intervention was effective in eliciting the intervention targets within the training setting for all 4 subjects. All 4 subjects showed evidence of generalization across stimulus materials, setting, teachers, and interaction style. There was also evidence of reciprocal effects on how classroom teachers in the generalization setting interacted with the subjects as a result of changes in the child's communication behavior.

Major Point: Finds that attributing meaning to children's communicative attempts helps facilitate positive communication development

Mirenda, P., Iacono, T., & Williams, R. (1990), *Communication Options for Persons with Severe and Profound Disabilities: State of the Art and Future Directions*, Journal of the Association for Persons with Severe Handicaps, 15:1, 3-21 (paywall access [here](#))

Abstract: This article reviews the literature related to issues of communication augmentation for individuals with severe and profound intellectual disabilities within the framework of the “Participation Model” (Rosenberg & Beukelman, 1987). This model consists of a communication opportunity strand and a communication access strand. The opportunity strand is discussed briefly in terms of the knowledge and attitudinal barriers that may limit communication, with suggestions for remediation of these problems. The access strand is discussed in detail, beginning with a review of current methods of assessing capability in relevant domains. The relevant literature related to the learning characteristics of both unaided and aided communication techniques is reviewed next, followed by a discussion of potential external constraints that may affect the range of options for consideration. This information facilitates the next step of selecting communication options with a view to the current and future needs and capabilities of the individual. Following this, a review is presented of vocabulary selection and effective instructional techniques in augmentative communication interventions. Finally, evaluation issues are discussed in relation to level of disability.

Key Quotations: “Undoubtedly, the most important constraints that must be considered are those related to user and partner preferences (Norris & Belair, 1988). Such constraints may include system portability, durability, and cosmetics; the time and skills required to learn the system (this may be particularly relevant for manual sign and “high tech” approaches); the quality and intelligibility of synthetic speech output; the “naturalness” of the communication exchange achieved through the system, and so forth. For example, some users and partners may choose to use less sophisticated methods of communication (e.g., gestures, yes/no responding) because such natural techniques allow greater social closeness and are less cumbersome than books, boards, or machines.” “First and foremost, we must understand that the greatest handicaps still faced by persons with severe disabilities are the negative attitudes and limiting assumptions of others. Much work remains to be done to tear down the attitudinal, public policy, and other barriers that prevent communication opportunity. Second, professionals and others must have the skills and knowledge base necessary to provide efficient and effective communication access to all individuals with severe intellectual disabilities.”

Näätänen, R. (1990), *The role of attention in auditory information processing as revealed by event-related potentials and other brain measures of cognitive function*, Behavioral and Brain Sciences, 13:2, 201-233 (paywall access [here](#))

Abstract: This article examines the role of attention and automaticity in auditory processing as revealed by event-related potential (ERP) research. An ERP component

called the mismatch negativity, generated by the brain's automatic response to changes in repetitive auditory input, reveals that physical features of auditory stimuli are fully processed whether or not they are attended. It also suggests that there exist precise neuronal representations of the physical features of recent auditory stimuli, perhaps the traces underlying acoustic sensory ("echoic") memory. A mechanism of passive attention switching in response to changes in repetitive input is also implicated. Conscious perception of discrete acoustic stimuli might be mediated by some of the mechanisms underlying another ERP component (NI), one sensitive to stimulus onset and offset. Frequent passive attentional shifts might account for the effect cognitive psychologists describe as "the breakthrough of the unattended" (Broadbent 1982), that is, that even unattended stimuli may be semantically processed, without assuming automatic semantic processing or late selection in selective attention. The processing negativity supports the early-selection theory and may arise from a mechanism for selectively attending to stimuli defined by certain features. This stimulus selection occurs in the form of a matching process in which each input is compared with the "attentional trace," a voluntarily maintained representation of the task-relevant features of the stimulus to be attended. The attentional mechanism described might underlie the stimulus-set mode of attention proposed by Broadbent. Finally, a model of automatic and attentional processing in audition is proposed that is based mainly on the aforementioned ERP components and some other physiological measures.

VII. Evidence and Research-Related Literature (Generally)

Powers, L.E. (2017), *Contributing Meaning to Research in Developmental Disabilities: Integrating Participatory Action and Methodological Rigor*, Research and Practice for Persons with Severe Disabilities, 42: 42-52 (paywall access [here](#))

Abstract: Action research approaches reflecting power sharing by academic and community researchers, full engagement of community partners across all study phases, and ongoing commitment to partnership and capacity building have been increasingly embraced, particularly in research affecting marginalized populations. Findings suggest action research approaches have value in promoting the relevance, effectiveness, and translation of research, including experimental and other rigorous quantitative study. A relatively small proportion of action research has focused on individuals with developmental disabilities, and most studies have been qualitative. Strategies to address four major challenges in quantitatively focused action research in developmental disabilities are discussed: establishing connections between academic and community researchers, building understanding and trust, involving community researchers in technical aspects of research, and providing accommodations for community researchers and research participants. Implications and future research needs are discussed.

Dindar, K., Lindblom, A., & Kärnä, E. (2017), *The construction of communicative (in)competence in autism: a focus on methodological decisions*, Disability & Society, 32:6, 868-891 (paywall access [here](#))

Abstract: Research on people diagnosed with autism spectrum disorder (henceforth autism) is often based upon biomedical understanding. Such understanding tends to view the characteristics related to autism diagnosis, such as the lack of or atypical use of speech, as a sign of incompetence that can be reduced as an underlying pathology of an individual. However, little research has explicitly investigated how methodological decisions in research might influence the perception of these characteristics. This paper draws on two separate research cases involving minimally verbal children with autism to examine how methodological decisions in research design, data collection, data analysis, and data interpretation influence the construction of communicative (in)competence in these children. The paper encourages researchers to carefully consider and reflect on the methodological decisions they make throughout the research process.

Major Point: Encourages reflection of how researchers' methodological decisions influence how a child with autism is portrayed; exposes gap between deficit perspective and a strengths-based understanding of autism

Bouffard, M., & Reid, G. (2012), *The good, the bad, and the ugly of evidence-based practice*, *Adapted Physical Activity Quarterly*, 29:1, 1-24 (open access [here](#))

Abstract: The evidence-based practice (EBP) movement has been extremely influential over the last 20 years. Fields like medicine, physiotherapy, occupational therapy, nursing, psychology, and education have adopted the idea that policy makers and practitioners should use interventions that have demonstrated efficiency and effectiveness. This apparently straightforward idea is beginning to affect adapted physical activity; however, researchers and practitioners in our field often appear to be unaware of fundamental questions related to them. The major purpose of this paper is to outline and discuss 10 of these fundamental questions. This analysis leads us to conclude that EBP is a good direction to pursue in adapted physical activity if we develop a type of EBP congruent with the main tenets of our field.

Major Point: Argues that EBP needs to be congruent with the main tenets of the particular field of study.

Green, L.W. (2008), *Making research relevant: If it is an evidence-based practice, where's the practice-based evidence?*, *Family Practice*, 25:1, 20-24 (open access [here](#))

Abstract: The usual search for explanations and solutions for the research-practice gap tends to analyze ways to communicate evidence-based practice guidelines to practitioners more efficiently and effectively from the end of a scientific pipeline. This examination of the pipeline looks upstream for ways in which the research itself is rendered increasingly irrelevant to the circumstances of practice by the process of vetting the research before it can qualify for inclusion in systematic reviews and the practice guidelines derived from them. It suggests a 'fallacy of the pipeline' implicit in one-way conceptualizations of translation, dissemination and delivery of research to practitioners. Secondly, it identifies a 'fallacy of the empty vessel' implicit in the assumptions underlying common characterizations of the practitioner as a recipient of evidence-based guidelines. Remedies are proposed that put emphasis on participatory approaches and more practice-based production of the research and more attention to external validity in the peer review, funding, publication and systematic reviews of research in producing evidence-based guidelines.

Major Point: Emphasizes "participatory approaches and more practice-based production of the research and more attention to external validity in the peer review, funding, publication and systematic reviews of research in producing evidence-based guidelines"