Communication Interventions for Minimally Verbal Children With Autism: A Sequential Multiple Assignment Randomized Trial

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Objective: This study tested the effect of beginning treatment with a speech-generating device (SGD) in the context of a blended, adaptive treatment design for improving spontaneous, communicative utterances in school-aged, minimally verbal children with autism. **Method:** A total of 61 minimally verbal children with autism, aged 5 to 8 years, were randomized to a blended developmental/behavioral intervention (JASP+EMT) with or without the augmentation of a SGD for 6 months with a 3-month follow-up. The intervention consisted of 2 stages. In stage 1, all children received 2 sessions per week for 3 months. Stage 2 intervention was adapted (by increased sessions or adding the SGD) based on the child's early response. The primary outcome was the total number of spontaneous communicative utterances; secondary measures were the total number of novel words and total comments from a natural language sample. **Results:** Primary aim results found improvements in spontaneous communicative utterances, novel words, and comments that all favored the blended behavioral intervention that began by including an SGD (JASP+EMT+SGD) as opposed to spoken words alone (JASP+EMT). Secondary aim results suggest that the adaptive intervention beginning with JASP+EMT+SGD and intensifying JASP+EMT+SGD for children who were slow responders led to better posttreatment outcomes. **Conclusion:** Minimally verbal school-aged children can make significant and rapid gains in spoken spontaneous language with a novel, blended intervention that focuses on joint engagement and play skills and incorporates an SGD. Future studies should further explore the tailoring design used in this study to better understand children's response to treatment. Clinical trial registration information—Developmental and Augmented Intervention for Facilitating Expressive Language (CCNIA); http://clinicaltrials.gov/; NCT01013545. J. Am. Acad. Child Adolesc. Psychiatry, 2014;53(6):635–646. **Key Words:** autism spectrum disorders, minimally verbal, school-aged, communication intervention, SMART design

Communication impairment is a core deficit in children diagnosed with autism spectrum disorders (ASD). Although the majority of children learn to communicate with spoken language, approximately 25% to 30% of children with ASD remain minimally verbal, even after years of intervention.[1,2] Exact numbers are unknown, largely because research studies often exclude children because of limited verbal abilities.[1] Failure to develop spoken language by age 5 years increases the likelihood of a poor long-term prognosis for social and adaptive functioning.[2,3]

This article is discussed in an editorial by Dr. Helen Tager-Flusberg on page 612.

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Some children can learn spoken language after the age of 5 years, but the window of opportunity may be small.[4] A recent review of studies of language acquisition in individuals with ASD reported on 167 individuals who started speaking after age 5 years.[5] The majority of individuals who acquired spoken language did so between 5 and 7 years of age and had nonverbal IQs of >50. These individuals often received behavioral interventions targeting production of sounds and words and learned to produce single words to request needs and wants. Only one-third who began to use spoken language progressed to phrase speech. Because participant and outcome descriptors were often limited, the extent to which word production was communicative (i.e., socially directed to others) is unknown.

One approach to providing minimally verbal children a means to communicate is to use augmentative or alternative communication (AAC) approaches, most often a picture symbol system or speech-generating device (SGD). Although AAC intervention studies demonstrate improvements in communication, few have demonstrated changes in spoken language. For example, the Picture Exchange Communication System (PECS) is a visually based, augmentative communication system in which children exchange pictures to communicate with others. One study randomized 84 children to PECS or control conditions and found that children with PECS training initiated communicative requests at a higher rate.[6] Vocalizations also improved, especially for children who had some spoken language at baseline.[7] Language test scores, however, did not improve.[6]

Another AAC intervention approach involves an SGD. SGDs display symbols that produce voice output communication when selected. A review of 23 studies that used an SGD included a total of 51 children with ASD between the ages of 3 and 16 years.[8] All studies were single-subject designs, and most focused on teaching, requesting, or responding to questions using the SGD. Few studies assessed maintenance and generalization. While using an SGD appears to increase communication, particularly requesting in individual children with ASD,[8] no rigorous group designs have replicated these findings, and few studies have demonstrated varied communicative functions beyond requesting (e.g., commenting) or an increase in spoken language. Because of the importance of increasing social use of spoken language, in the current study our primary outcome measure was total spontaneous, communicative utterances (SCU) coded from a standardized natural language sample (NLS). SCUs are unprompted, generative (nonscripted) communicative utterances that are directed to a partner for the purpose of sharing information (comments), requests, and questions.

Given the lack of spoken language progress for some children with ASD who have had access to early intervention services, we considered novel approaches to intervention in this study. We blended 2 communication-focused and evidence-based early interventions for preschool children—JASPER (Joint Attention Symbolic Play Engagement and Regulation)[9,10] and EMT (Enhanced Milieu Teaching)[11,12] hereafter referred to JASP+EMT. JASPER is a naturalistic behavioral intervention focused on the development of prelinguistic gestures (joint attention, requesting) and play skills within the context of play-based interactions as a means to increase joint engagement between an adult and child with ASD.[9,10] EMT is a naturalistic behavioral intervention that uses responsive interaction and systematic modeling and prompting to promote spontaneous, functional spoken language.[11,12] Both JASPER and EMT have shown efficacy in preschool-aged, minimally verbal children with ASD.[10,12-13]

Furthermore, given the promising but limited data on the effectiveness of SGDs for children with ASD, we sought to understand the role of SGDs as a treatment component in the context of JASP+EMT. Because not all children were expected to benefit equally from these components, we used adaptive intervention designs.[14] In an adaptive intervention, treatment may be adapted (e.g., by intensifying the dosage or augmenting the spoken intervention with SGD) to address the specific needs of the child (e.g., if the child is making slow progress in spoken communication).

The overarching aim of this study was to construct an adaptive intervention that used JASP+EMT and varied the addition of an SGD with minimally verbal school-aged children. Three adaptive interventions were considered in the context of a sequential multiple assignment randomized trial (SMART), as follows[15-19]: a first adaptive intervention that began with JASP+EMT and intensified JASP+EMT for children who were slow responders; (b) a second adaptive intervention that began with JASP+EMT and augmented JASP+EMT with SGD for children who were slow responders; and (c) and a third adaptive intervention that began with JASP+EMT+SGD and intensified JASP+EMT+SGD for children who were slow responders. The SMART design addressed 2 aims. The primary aim was to examine the effect of the adaptive intervention beginning with JASP+EMT+SGD versus those beginning with JASP+EMT alone. A secondary aim was to compare outcomes across the aforementioned 3 adaptive interventions.

METHOD

Study Design

This study was a longitudinal (repeated outcome measures at baseline and weeks 12, 24, and 36), 3-site SMART design. This SMART included 2 stages of treatment (Figure 1). Each stage of treatment was