Title: Evaluating the Efficacy of a Remote Microphone System for Improving Receptive Language Performance in Preschool Children with Autism

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Introduction: It is well established that language disorder commonly co-occurs with autism spectrum disorder (ASD). Both receptive language and expressive language can be impaired in children with ASD. Receptive language is a foundational skill that greatly impacts expressive language, including conversational language and literacy, as well as later life outcomes such as employment (Howlin, Mawhood, & Rutter, 2000). While much research has been done on expressive language in ASD, little is established in the way of assessing and treating receptive language in children with ASD, especially for those with severe language disorder (Tager-Flusberg et al., 2009). One intervention that is beginning to be studied in ASD is Remote Microphone (RM) technology. RM systems improve the signal-to-noise ratio (SNR), or how salient a speakers’ voice is in the presence of background noise. This is important given that previous studies have demonstrated that children with ASD require improved SNR, compared to typically developing peers, to decipher speech in the presence of background noise (Schafer et al., 2014; Schafer et al., 2016; Rance et al., 2014; Rance, Chisari, Saunders, & Rault, 2017). Given that many children with ASD have both impaired receptive language performance and difficulty understanding speech in background noise, we sought to determine if improving the SNR could improve receptive language performance in preschool children with ASD and language disorder.

Method: In this study, 10 children with ASD and language disorder, ranging in age from 3-4 years, participated. All children were enrolled in a preschool for children with autism at Vanderbilt University Medical Center. The effect of the RM system on receptive language performance was evaluated using an alternating treatments design that compared the RM-on condition to a baseline RM-off condition in the preschool classroom setting. Sessions in the RM-on condition were conducted using a soundfield RM system, which wirelessly broadcasts the therapist’s voice to a speaker mounted on the classroom wall. Because most standardized measures of receptive language are not feasible for many children with ASD who have severe language impairments, we developed a novel observational measure of receptive language performance (the Observational Measure of Receptive Language [ORLA]). The ORLA measures receptive language performance via two metrics: 1) prompt level needed to successfully respond to receptive language presses and 2) latency (in seconds) of response to receptive language presses.

Results: The ORLA was found to be feasible for this population (could be completed by all children, administration time approximately five minutes), reliable (r = .986), and stable over time (r=.86, p<.01). Using the ORLA as the outcome measure, 70 percent of the children in the sample met an a priori criterion for positive response (>50% improvement relative to baseline) in receptive language performance during the RM-on condition. Subgroup analyses indicated that minimally verbal children tended to show improvement in prompt level, whereas children with phrase speech tended to show improvement in response latency.

Discussion: The results suggest that although the RM system was not beneficial for all participants, the RM system did have a significant impact on the receptive language performance of some children in the sample. The effects observed were modest in magnitude and were not sufficient to indicate that RM systems are an effective tool for all; however, they provide preliminary evidence that RM systems may be an effective approach for improving indices of receptive language performance for preschoolers with ASD, and support future research in this area with larger samples that can also isolate profiles of children most likely to show a positive response.

Selected References:


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