Title: Using Eye Tracking to Examine the Receptive Vocabulary of Young Children on the Autism Spectrum

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Introduction: Children with Autism Spectrum Disorder (ASD) may have a greater impairment in receptive language than expressive language (Hudry et al., 2010), and the early receptive language skills of children with ASD have been found to predict later symptom outcomes (Charman et al., 2005). However, standardized tests of receptive language ability impose additional demands (e.g., social interaction, motor responding, memory) that may adversely impact the performance of children with ASD (Goodwin et al., 2012; Venker et al., 2013). We have developed a passive-viewing receptive vocabulary (PVRV) task for use on an infrared eyetracker that was based on the Looking While Listening (LWL) paradigm developed by Fernald and colleagues (2008). The PVRV task has previously been used to measure effects of sertraline treatment on language in children with fragile X Syndrome (FXS) (Yoo et al., 2017). The present study explored the use of the PVRV task as a measure of receptive language in young children with ASD.

Method: Thirty-eight children (9 female, MAge = 49.45 months, SDage = 11.48) with a clinical diagnosis of ASD provided data used in this study, which is part of an ongoing clinical trial evaluating the efficacy of low-dose sertraline in children with ASD. In the PVRV task, the children were simultaneously presented with two images (e.g., a book and a window) at opposite ends of a screen. An auditory cue (e.g., “Where is the book?”) was then presented. Children’s eye movements were recorded using an infrared eye tracker and used to calculate a visual preference score representing total fixation to the target image divided by total fixation to either image.1 Parents completed a questionnaire indicating whether their children understood each of the words presented in the LWL eye-tracking task, and receptive language was measured using standardized assessments: the Mullen Scales of Early Learning (MSEL) (Mullen, 1995) and the Preschool Language Scales (PLS) (Zimmerman et al., 2011).

Results: Overall, visual preference scores (M = 0.56, SD = 0.12) indicate that participants with ASD visually preferred the target objects above chance levels, t(37) = 2.89, p = .006. These visual preference scores did not differ based on whether parents reported that words were known (M = 0.55, SD = 0.17) or unknown (M = 0.55, SD = 0.14) to their child, t(20) = -0.26, p = .80.2 Visual preference scores were significantly and positively correlated with mental age on the PLS auditory comprehension subscale, r(22) = .49, p = .01, and with MSEL receptive language subscores, r(31) = .52, p = .001.

Discussion: Though data collection on this study is ongoing, these results suggest that the PVRV task can be used to investigate receptive vocabulary in children with ASD. Visual preference scores were moderately correlated with standardized measures of receptive vocabulary, but can be collected in a much more passive manner. Interestingly, visual preference was not lower when parents reported that words were unknown to their children, which might indicate that the PVRV paradigm can be sensitive to verbal comprehension that children with ASD do not display to their parents through their behavior.

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1 Five participants were excluded due to looking at the areas of interest <25% of the time in >20% of the trials; their details are not included in the participant demographics presented earlier. The remaining participants had an average of 22.25 retained trials out of a total of 30.

2 Degrees of freedom differ because some children were reported to know / not know all words. Furthermore, parents had the option of indicating uncertainty, so the means for known and unknown words cannot be averaged to produce the grand mean.
References/Citations:


