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First theme choice: Clinical/Behavioral/Intervention

Multisensory Perceptual Training in Youth with Autism: A Randomized Controlled Trial

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Introduction: Differences in sensory functioning - and audiovisual multisensory integration in particular - are commonly observed in individuals with autism. Difficulty integrating auditory and visual speech signals, in particular the temporal processing of these audiovisual cues, is commonly observed in this clinical population. The extent literature suggests that temporal binding of audiovisual speech can be trained (i.e., temporal binding windows [TBWs] can be narrowed) in typically developed adults. The purpose of this study was to evaluate a computer-based perceptual training in youth with autism to determine whether the perceptual training results in (a) narrower TBWs on trained stimuli or (b) narrower TBWs on untrained speech stimuli and/or speakers. We also assessed whether treatment outcomes varied according to individual characteristics (i.e., chronological age, language ability, non-verbal cognitive ability).

Methods: Thirty youth with autism matched on the group level on chronological age, sex, gender, and pre-training temporal binding windows were randomly assigned to a perceptual training group (n = 15) or a control group (n = 15). Participants in the perceptual training group completed eight days of the training. At post-test, groups were compared on TBWs for trained and untrained stimuli and perception of the McGurk illusion. Language and nonverbal cognition were assessed prior to the onset of the study using standardized assessments. Data were analyzed using multiple regression models.

Results: The brief computer-based perceptual training for temporal binding of audiovisual speech resulted in small but non-significant changes in the TBW for the perceptual training group on average compared to the control group on trained stimuli (Hedge's g = 0.47, p = 0.19) and untrained stimuli utilizing both a novel syllable (Hedge's g = 0.47, p = 0.19) and a novel speaker (Hedge's g = 0.22, p = 0.54). However, these effects of the training program on TBW outcomes varied according to participant profiles (p values for interaction term in the multiple regression models < 0.05). Follow-up Johnson-Neyman tests utilized to derive precise cut points along the continuous moderator indicated that there were significant effects in favor of the training for participants with at least above-average nonverbal IQs and at least average language abilities. However, participants with below-average nonverbal IQs were likely to experience counter-therapeutic effects.

Discussion: Future studies should evaluate (a) whether factors such as neural processing of audiovisual speech and/or attention to regions of the face during audiovisual speech mediate outcomes of the perceptual training, (b) whether perceptual trainings can improve more distal outcomes in children with autism with higher cognitive and language ability, and (c) novel approaches to improving audiovisual speech perception in children with autism with lower cognitive and language ability.

Keywords:
Autism spectrum disorders, Multisensory integration, Perceptual training