Influencing Gaze Behavior and Expression Recognition

M. Eckhardt[1] and M. S. Goodwin[2],

(1)Massachusetts Institute of Technology, The Media Laboratory, Cambridge, MA,
(2)Northeastern University, Boston, MA

Background:

Autism Spectrum Disorder (ASD) is a complex and heterogeneous condition characterized in part by difficulty with social and emotional cue recognition and expression. These social-emotional processing differences make recognizing subtle social-emotional cues difficult for persons with ASD. Persons with ASD typically perform worse than age-sex matched neurotypical individuals in recognizing facial expressions, especially when recognition is dependent solely on information surrounding the eyes. This may be due, in part, to an aversion to eye contact and/or atypical scanning behavior of the face by those with ASD. However, eyes provide a valuable source of social-emotional information during social and communicative interaction. Therefore, it is important that we develop methods and tools to help people with ASD better recognize and understand social-emotional cues from the face and eyes.

Objectives:

To demonstrate through undirected play with a tangible-digital puzzle game, Frame It, that we can influence social gaze behavior and expression recognition in children with ASD. Frame It required players to attend to details of the human eyes region on a computer in order to correctly construct, match, and then assign expression labels to corresponding physical puzzle pieces of eyes.

Methods:

The Frame It intervention was conducted over a five-week period at a school for children and adolescents with ASD. Pre- and post-intervention measures of gaze behavior and expression recognition were used to analyze within subject change. All phases of the study were carried out in the children's school to maximize their comfort and ability. The intervention was conducted with 10 children (two female) aged seven to eighteen years old (mean = 12yrs) during school hours. Each child in the study was seen two to four times per week for up to 15 minutes per session. In total, 11 sessions per child were analyzed. Gaze behavior was measured using a Tobi eye tracking system. Basic expression recognition performance was measured by correct multiple-choice responses to an expression image set presented on a computer.

Results:

Results indicated statistically significant changes in both gaze behavior, with more looking at the face, and improvement in recognizing fear, sadness, and surprise in post-intervention tests.

Conclusions:

The changes observed in this study are encouraging given the relative brevity of the intervention, 11 sessions over 5 weeks. We feel the engagement and fun of playing a physical-digital game had a significant influence on facilitating positive gains. Although this work resulted in measurable benefits and accomplished its initial goals, it also revealed further questions and considerations. Future studies will assess whether gains persist over time and across settings. We are also interested in replicating findings in an independent sample, and thus are working on scaling up the intervention so a larger group of users can access it.