

Aim

This presentation will present data from eye-tracking research technology concerning social attention patterns: gaze fixations on human figures either interacting or not interacting with each other in photographs. The data were obtained from school-aged children and adolescents with autism and typical development. Our specific aim was to evaluate the allocation of visual attention to photographs in which human figures are either interacting or not interacting with each other. The main purpose of the study was to help inform the design of visual scene displays, by determining whether interacting human figures in photographs attract visual attention in the same way as non-interacting human figures. A secondary outcome of the study was to add further information to the growing literature on patterns of visual attention to human figures in individuals with autism, which has yielded mixed results about whether gaze to human figures in static photographs is atypical.

Method

Data collection related to the present study is complete with 33 individuals with autism and 13 chronological age- and -gender-matched typically developing individuals, between the ages of 8 and 20 years. All participants with autism exhibited moderate to profound delays in vocabulary as evaluated by the Peabody Picture Vocabulary Test, 4th Edition (PPVT-4¹). A language-measure was used for selection, because the current study aims to inform materials that would be used to support communication functioning.² Participants without disabilities were all performing at grade level according to parental reports.

Participants freely viewed 5 photographs containing interacting humans and 5 containing non-interacting humans. The study acquired data via the Tobii T60 eye-tracking system, a set of technologies designed for research purposes. The T60 monitor contained a built-in projection strip, by which infrared light was projected onto the participants' pupils and corneas. The light reflected off the eyes was captured by three built-in cameras. Point of gaze was recorded by the Studio software at a rate of 6 samples per second. A fixation was defined as a series of consecutive samples in which the gaze remained within a 35 pixel area for greater than 100 milliseconds. Patterns of fixation on photographs were evaluated for each participant. The dependent variable was the amount of time spent on viewing interacting versus non-interacting human figures, and non-human elements (ball, flower, Christmas present, etc.).

Results

Both groups spent more time on humans than non-human elements, fixating on average on interacting-humans for 45.3% of the total picture-viewing time for participants with autism, and 57.5% for the typically developing controls, and fixating on non-interacting humans for 38.4% of the total picture-viewing time for those with autism, and 44.7% for the controls. The ratio of fixation duration to the interacting humans was 1.29 times for those with autism, and 1.63 times for those with typical development; the ratio of fixation duration to non-interacting humans was 4.25 times for those with autism, and 5.4 times for the controls. It demonstrated that given the sizes of human figures, both groups spent approximately 3.3 times more on viewing the non-interacting humans than on viewing the interacting humans. Two possibilities may explain the viewing pattern: first, irrespective of the clinical profiles, all participants needed more time to inspect the

human figures because the sizes of non-interacting humans were generally smaller than those of the interacting humans; second, in contrast to the controls, social-interaction events did provoke more avoidance than non-social interaction events for the autistic group.

To rule out the first possibility, a second study is underway in which human figures of comparable sizes across stimuli are used. Stimuli sets are larger than the ones in the preliminary study: 32 target photos (containing interacting or non-interacting human figures) and 16 fillers. Additionally, considering the possibility that atypical fixations on human figures were not specific to autism,² the current study also involved language-matched participants with Down syndrome. Data collected using the new stimuli set showed that individuals with Down syndrome fixated on average on interacting-humans for 58.5% of the total picture-viewing, whereas typically developing controls fixated for 56.7%; individuals with Down syndrome fixated on average on non-interacting humans for 51.7% of the total picture-viewing time, whereas the typically developing controls fixated for 60.1%. This indicates that individuals with Down syndrome attended to interacting humans more than non-interacting humans whereas opposite pattern was observed in typically developing controls. Additional data for the new stimuli sets will be collected within the month to bring more participants with autism, Down syndrome, and typical development for pair-wise comparisons (e.g., autism vs. Down syndrome).

Conclusion

This research has implications for our understanding of gaze patterns across etiology categories, and in turn, informs the design of augmentative and alternative communication (AAC) materials. Research with individuals with autism yielded mixed results as to whether there is avoidance of gaze to images containing humans. Some reports suggest the presence of gaze avoidance,^{3,4,5} while other research does not.^{2,6} The level of social demands in stimuli may account for the discrepancies.⁷ Many studies used one-person photographs, reporting no significant between-group differences in viewing patterns. In contrast, when viewing sets of stimuli in which two or more persons were present, individuals with autism spent significantly less time viewing the faces than the typically developing controls.⁴ Therefore, the current study is of value as it aims to evaluate whether the degrees of social demands would influence gaze patterns in participants with autism.

All participants spent more time viewing the human figures than non-human elements. From the perspective of AAC displays, the results strongly indicate that in static images of the sort we used, human figures were generally attractive to participants with autism. However, the presence of social-interaction events in photographs may influence viewing patterns differently from that of non-social interaction events. If additional data collected suggest atypical gaze behaviors toward interacting humans, clinicians and manufacturers creating photograph-based AAC displays should consider the degree of social demands in photographs based on the concerns about gaze avoidance. This presentation will illustrate the method, findings, and results of this study.

References

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Program Planner/Instructional Personnel’s Name: Jiali Liang, Krista Wilkinson

Course Title: Gaze toward Social Interactions in Photographs by Individuals with Autism: Implications for AAC design

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