

Visual Attention to a Dynamic Video Game Stimulus in Individuals with and without Autism Spectrum Disorder

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Abstract: Individuals with autism spectrum disorder (ASD) experience social deficits that affect functioning across their lives. One area that is particularly affected is the ability to make and maintain friendships. Video game play may be an appropriate context for bringing children together to increase positive interactions and the potential for establishment of friends. Prior to implementation of this type of intervention, patterns of game play for children with and without ASD need to be better understood. This study examines the allocation of visual attention to video game features by children with and without ASD to identify similarities and differences.

Autism spectrum disorder is characterized by a core deficit in social communication (APA, 2013). As a result, many individuals with ASD experience social isolation that negatively influences all aspects of development as well as long-term outcomes (Muller, Schuler, & Yates, 2008). In particular, limitations in social skills can restrict an individual's ability to make and maintain friendships, obtain and maintain employment, live independently and fully participate in society at large (White, Keonig, & Scahill, 2007). Friendship is one of the most fundamental aspects of quality of life, and its benefits are well documented. Many children with disabilities, including children with ASD, experience substantial difficulty in making and maintaining friends (Petrina, Carter, & Stephenson, 2014).

Interventions to increase quality and rate of social interactions of children with ASD have primarily sought to teach specific social skills, such as appropriate ways of entering a social group or asking partner-centered questions. Acquisition of these specific skills has largely not translated to increases in the number and/or quality of friendships for children with ASD. We propose these efforts have failed to generate lasting friendships because they are missing one or more of three key elements: (a) presence of mutually motivating activities, (b) repeated opportunities for interaction, and (c) creation/maintenance of equal status between children (cf. Kampert & Goreczny, 2007). It seems necessary to reframe the effort to promote friendships by grounding the approach in the naturally occurring social environments.

One ubiquitous form of leisure in which the vast majority of adolescents engage with their friends is video game play. In addition to being popular, video games have the unique advantage of containing all three of the critical elements for promoting friendship. There is no doubt they are highly motivating and offer repeated opportunities for interaction; Lenhart et al. (2008) reported that 99% of boys and 94% of girls under the age of 18 years old play some form of video-based games on a regular basis. Children with ASD have an interest in video games that is comparable (Hickerson, Finke, & Choi, 2014) to typically developing children. Finally, unlike most other forms of game play, many video games allow players to play cooperatively and as equals at whatever skill level they possess (i.e., games with "subjective difficulty" - such as *Super Mario Galaxy* and *Sonic Generations*). This allows players of varying ability levels to play together to accomplish a task as each player performs an important job for team success.

Objectives

It is not known if children with and without ASD play video games similarly. It is critical to examine how children with ASD look at and interact with characters in a video game. Unusual visual attention patterns are central to ASD, so children with ASD might engage with video game characters differently than their peers. If there is a difference, it might affect the way individuals with ASD play the game and how they play with a partner. If we fail to understand such possible alterations in visual attention, we risk overlooking a barrier to the success of a video game-based intervention for promoting friendships. This project examines the allocation of visual attention of individuals with ASD compared to same-age and gender peers while watching a video game stimulus with LOW and HIGH social demands. The dependent measure is the duration of fixations on the main elements of interest, relative to their size and time on screen. The animate elements (i.e., the characters) should attract the majority of attention.

Approach

Fifteen neurotypical individuals and 15 individuals with ASD of the same chronological age and gender were recruited. Participants watched two 60-second clips of a video game that contained various levels of social de-

mand (i.e., *LEGO Marvel Super Heroes*). In a cutscene clip, the characters in the game interact with one another, providing narrative structure for the game (high social demand). In a game play clip, the characters are not interacting with each other directly (low social demand). Data were collected via a 17-inch Tobii T60 eye-tracking monitor connected to a specially adapted PC laptop equipped with the Tobii Studio stimulus presentation and data acquisition software. The T60 monitor contains a projection strip built into the top of the monitor, by which infrared light is projected onto the participant's pupils and corneas; the Studio software provides a record of point-of-gaze based on the reflected light. Visual attention will be coded by hand using a coding scheme already developed by the research group, and reliability of coding will be analyzed on at least 20% of the data.

Data Analysis

Data have been collected for the study, and we are currently in the analysis phase. The live feed from the eye tracker is coded by hand using a coding scheme that has been developed and successfully piloted. This process evaluates the number, chronology, and duration of fixation to three areas of interest: (1) the main characters, (2) the facial features of the characters, and (3) the main non-animate elements of interest. Preliminary visual observation of the data indicates that children with and without ASD have similar visual attention patterns (see Figure 1).

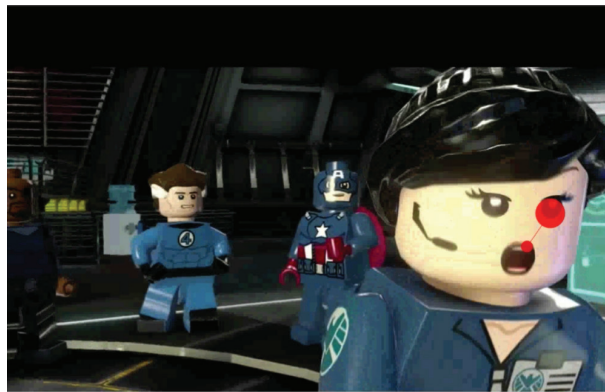


Figure 1: Gaze pattern for Nonverbal ASD participant

References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Hickerson, B., Finke, E., & Choi, Y. (2014). Enduring leisure involvement and children with autism spectrum disorder: Validation of a parent-reported involvement scale. *Therapeutic Recreation Journal, 48*(1), 31-45.
- Kampert, A. L., & Goreczny, A. J. (2007). Community involvement and socialization among individuals with mental retardation. *Research in Autism Spectrum Disorders, 3*, 278-286.
- Lenhart, A., Kahne, J., Middaugh, E., Macgill, A. R., Evans, C., & Vitak, J. (2008). Teens, video games, and civics. *Pew Internet & American Life Project*.
- Muller, E., Schuler, A., & Yates, G. B. (2007). Social challenges and supports from the perspective of individuals with Asperger syndrome and other autism spectrum disabilities. *Autism, 12*, 173-190.
- Petrina, N., Carter, M., & Stephenson, J. (2014). The nature of friendship in children with autism spectrum disorders: A systematic review. *Research in Autism Spectrum Disorders, 8*, 111-126.
- White, S. W., Keonig, K., & Scahill, L. (2007). Social skill development in children with autism spectrum disorders: A review of the intervention research. *Journal of Autism and Developmental Disorders, 37*, 1858-1868.