Designing a social skills serious game for individuals with autism

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Abstract: Individuals with autism often have difficulties understanding eye gaze cues. We propose that serious game technology might be especially useful for helping adolescents with autism learn about and develop social skills. To this end, we developed a detective-themed serious game to scaffold learning of social skills for adolescents with autism. The educational goals include learning to use eye gaze information to solve problems in social contexts. Seven adolescents with autism participated in the initial usability testing. Results from the usability testing suggest that this game is feasible and enjoyable for the individuals with autism.

Introduction

Autism is a neurodevelopmental disorder characterized by impairments in social and communicative behaviors. A core symptom for individuals is a deficit in nonverbal communication, such as the use of eye gaze cues. Research suggests that individuals with autism spend less time looking at the eye region of faces than their typically developing peers, from early childhood thru adulthood (Papagiannopoulou et al., 2014; Klin et al., 2002). In addition, children and adolescents with autism have more difficulty using eye gaze direction cues to predict the actions and intentions of others (Ribby et al., 2013). Thus, understanding of eye gaze cues is an important target for social skills interventions.

The current study has designed a serious game to teach sensitivity to eye gaze cues for individuals with autism. While computer-based interventions are increasingly being investigated as potential tools for teaching individuals with autism (Tanaka et al., 2010; Wainer & Ingersol, 2011), very few of these previous computer-based interventions have been designed with the principles of serious games in mind (Whyte, Smyth, & Scherf, 2014). The serious game principles utilized by the current serious game include: a detective-themed storyline, long-term goals (players solve various crimes), increasing levels of difficulty, and rewards for success (successful identification of social cues lead to capturing a criminal, signaling completion of a level). Success in completion of the maze requires interpreting nonverbal social cues, including: pointing, head-turns, and increasingly subtle eye gaze (see Figure 1). The current study completed usability testing of the autism social skills game during early prototype development to examine the feasibility and enjoyment of a narrative-driven serious game for individuals with autism.

Figure 1: Sample eye gaze cue from the tunnel maze.

Methods

Participants

Seven children and adolescents (ages 9 to 18 years) diagnosed with an autism spectrum disorder (6 male, 1 female) participated in the usability testing. Parents provided written consent and participants provided assent prior to participation.

Procedures

Participants completed the first four levels of the ‘proof of concept’ detective themed game over the course of an hour lab usability session. In this detective-themed game, participants play a detective and are instructed to find

criminals who have escaped into the tunnel system under the city. To navigate the maze, participants must ask bystanders for clues to prevent running into dead ends. Each maze level ends when the participant successfully catches the criminal. After playing the maze levels, participants completed the revised User Engagement Scale (UES; Wiebe, Lamb, Hardy, & Sharek, 2014), designed for assessing the usability of video games. Participants also answered other usability questions, such as: “were the controls for moving in the game (keys and mouse) difficult to use,” and “what changes would you suggest we make?”

Results

Most adolescents with autism had high accuracy in identifying the social cues in the first four levels of the game during usability sessions. Mean scores for each level ranged from 98% (for easier levels) to 87% (for more difficult levels).

The mean total score on the UES was 3.7 out of 5 points. This suggests that the game was enjoyable and had moderately high usability in this early stage of game development. On the open-ended response questions, individuals with autism gave various suggestions. This included suggestions to add cut-scenes that show the criminals run away at the beginning of the maze, adjustments to the rewards at the end of mazes, and the addition of secondary goals that require picking up clues from the ground in the maze.

Conclusions

The current study evaluated the usability of a serious game designed to target sensitivity to eye gaze cues. The usability testing indicated that this game is feasible and enjoyable for the individuals with autism. Importantly, the individuals with autism were able to understand the narrative-driven goals, navigate the immersive environment, and utilize social cues for navigation of the mazes. Usability testing has led to changes and improvements in the design of the game. Future research will evaluate generalization of learning from the game to real-world social skills for adolescents with autism.

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