ABSTRACT

Several research studies have shown that children with autism spectrum disorders (ASD) often display impairments in their ability to engage in many social behaviors that are crucial for the development of social-emotional competence, empathy, and expressive language. Because most children with autism show strong preferences for nonsocial information such as objects and machines (Adamson, Deckner, & Bakeman, 2010; Tapus et al., 2012), researchers have explored using humanoid robots to help children with autism develop skills for social interaction (Tapus et al., 2012). In this study, we used data from 55 typically developing toddlers (M = 33 months of age) who were video-recorded during a 10-minute semi-structured play session with a humanoid robot, the NAO V4 (Aldebaran Robotics). The NAO robot was pre-programmed to advance through seven structured social interactions, such as Simon Says, I Spy, a tai chi routine, and a dance to "If You're Happy and You Know It." Using this data, we examined children's engagement with the robot, specifically their looking preferences during the interaction phases with the NAO.

BACKGROUND

Infants' and toddlers' ability to coordinate their attention with another person on an object of mutual interest (coordinated joint engagement) is a crucial milestone in the development of social behaviors, empathy, symbolic thought, and expressive language (Adamson, Bakeman, Suma, & Robins, 2017; Melzoff, Brooks, Shon, & Rao, 2010). A number of research studies have shown that children with autism spectrum disorders (ASD) often display impairments in their ability to engage in joint attention. For example, they make less eye contact (American Psychiatric Association, 2013) and engage less frequently in social interactions with others (Adamson, Bakeman, Suma, & Robins, 2017). Because most children with autism show strong preferences for nonsocial information such as objects and machines (Adamson, Deckner, & Bakeman, 2010), researchers have explored using humanoid robots to help children with autism develop skills for social interaction (Tapus et al., 2012). Pierro, Mari, Lusher, and Castello (2008) discovered that typically developing children exhibited facilitation effects while imitating a human model, but not while imitating a robot arm, while children with autism demonstrated the reverse - facilitation effects by the robotic arm but not the human model. This finding suggests that individuals with autism might benefit from interventions that utilize the robot's dances might help assess children's interest and ability to make eye contact, while I Spy might assess children's ability to engage in reciprocal interactions.

METHODS

Data on toddlers' social engagement was collected throughout 2016 and 2017 in Dr. Jed Elson's Lab in the Institute of Child Development at the University of Minnesota. We used the data from 55 typically developing toddlers (M = 33 months of age) who were video-recorded during a 10-minute semi-structured play session with a humanoid robot, the NAO V4 (Aldebaran Robotics). The NAO robot was pre-programmed to advance through seven structured social interactions, such as Simon Says, I Spy, a tai chi routine, and a dance to "If You're Happy and You Know It." Using this data, we examined children's engagement with the robot, specifically their looking preferences during the interaction phases with the NAO.

RESULTS

• Children showed more interest in the NAO robot than the social agents present.
• It is hard to know whether more variability in looking behaviors during test phases I Spy and I Spy2 demonstrates that children were less engaged during these test phases, or if children spent less time looking at the robot because it was giving them directions to search for other objects in the room.
• It is also possible that the children were more interested in passively observing the robot during a performance than engaging with the robot in reciprocal interactions.
• When examining looking behaviors of children with ASD in the future, the robot's dances might help assess children's interest and ability to make eye contact, while I Spy might assess children's ability to engage in reciprocal interactions.

CONCLUSIONS

• Establish a normative range of looking behaviors in a typically developing sample of toddlers.
• Assess the efficacy of the robot's programmed interactions for evaluating children’s social engagement, especially in regard to repeating this study with children with ASD.

REFERENCES

• NAO V4 (SoftBank Robotics, San Francisco, California).