Enhancing Joint Attention Skills in Autistic Children via a Robot

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1   INTRODUCTION

Autism spectrum disorder (ASD) is described by the DSM-5 as a range of disorders characterized by social deficits and communication difficulties, stereotyped or repetitive behaviors and interests, sensory issues, and in some cases, delayed cognitive development (American Psychiatric Association, 2013). There is currently no cure for ASD, but providing therapy early can greatly reduce symptoms and increase abilities. One area of focus in therapy is language and communication social skills. In this paper the specific skill of joint attention will be addressed. Joint attention is the sharing of attention between a person (child), another person, and an object or event. The current experiment was conducted to expand upon the research done by Kajopoulos, et al. (2015) where in a robot named "CuDDler" (A*Star) served to enhance the joint attention skills of Autistic children.

2   MATERIALS AND METHODS

2.1   Participants

7 children (Mean age: 5.3, SD = 0.5), age range: 5 to 6 years, all male) all diagnosed with moderate ASD took part in the experiment. Parents were recruited via the early intervention center THK EIPIC Centre (Singapore)

2.2   Stimuli, Apparatus, Procedure, Data Analysis

The experiment consisted of three phases: Phase 1, was a pre-test to measure the children's joint attention skills via the ESCS (Mundy et al., 2003). Phase 2, was the robot training. Phase 3, was the administration of the ESCS as a post-test.
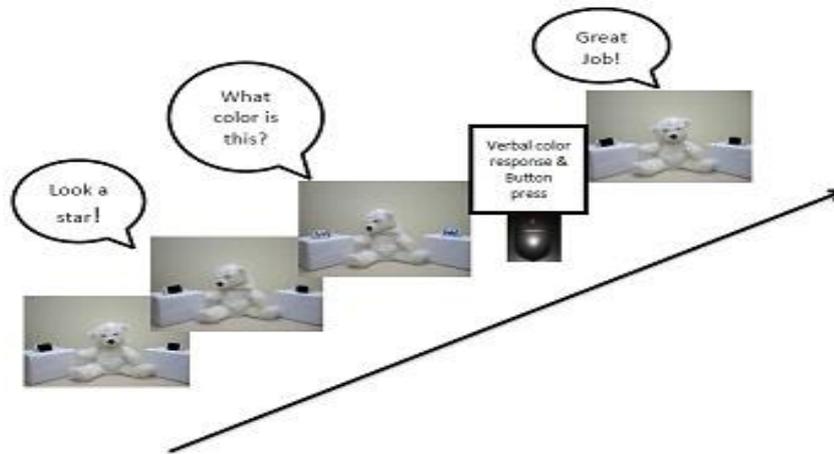
Fig. 1. Trial Sequence Example: 1. Robot looks straight ahead 2. Turns head and says, "Look a star!" 3. Two stars appear 4. Robot asks, "What color is this?" 5. Child gives verbal response naming the color (correct here = red) and presses the mouse button (correct = left). 6. Robot looks at child while saying "Good job" and moving its arms and head around 7. Return to starting position. Image credit to: Kajopoulos, et al. (2015).

3 RESULTS

It has been suggested that there are two separate mechanisms for joint attention. One mechanism functions to initiate joint attention (**IJA**); e.g., showing an object to others; the other mechanism functions to respond to joint attention (**RJA**); e.g., turning one's head to look in the direction that another person is pointing and looking (Mundy & Crowson, 1997). **Scores for IJA and RJA were analyzed separately** based on the guidelines of the ESCS (Mundy et al., 2003). No children were excluded from data analysis. A t-test comparing pre- and post-test scores of RJA was not statistically significant. While a t-test comparing pre- and post-test scores of IJA was significant: $t(6) = -2.85$, $p = 0.029$. Pre-test scores had a mean of 6.0 (SD = 5.2) and post-test sores had a mean of 12.9 (SD = 6.0).

4 DISCUSSION

These results show that the children's ability to initiate joint attention (**IJA**) improved after robot training; while their ability to respond to joint attention (**RJA**) did not improve. The results seen here show a similar pattern to Kajopoulos, et al. (2015), but on IJA scores rather than on RJA scores. This may be due to the difference in the severity of Autism between the two samples. Some of the challenges faced during this experiment were due to the fact that the robot is operated via a computer interface, making it challenging for the experimenter to select the correct responses for the robot

and keep the child on task at the same time. One solution for this would be to implement the computer interface needed for controlling the robot on a tablet, so that the experimenter can move with ease and be in closer proximity to the child when necessary. Another solution would be to increasing the team, meaning that a teacher or parent would keep the child on task while the experimenter controls the robot. Another simple solution is to take many breaks and engage in another task, such as bubble blowing.

5 REFERENCES

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