Teaching Observational Learning to Children with Autism: Pedagogical Advancements for the Scientist-Practitioner

Luke, N.[1], Singh, N.[2]
[1,2]Brock University, Canada

Corresponding Email: nl.behavioranalyst@gmail.com

ABSTRACT

Observational learning is an important skill for all children to acquire. Children with autism often do not demonstrate this skill nor do they learn it on their own. The present study, using a multiple baseline across participants, single case, research design, investigated the effects of using a peer-yoked contingency game with four male participants with autism, aged 4-7 years. Each participant was presented with a simple labeling task while his friend was seated beside him. Participants had the same partners throughout the treatment. Once the model response was emitted, the teacher presented the same task to the observing boy. Data were collected on correctly observed and emitted responses during the game. Pre- and post probes and tests were conducted for observational learning, generalized imitation, and learned reinforcement for peers. Results from this study provide support for the use of the peer-yoked contingency game as a method for increasing observational learning in children with autism. All four participants increased their correct responding to specific tasks and increased their demonstration of observational learning in a natural educational setting. Evidence of increased interest in peers was also observed. The present study provides support for the use of the peer-yoked contingency game to teach observational learning.

Keywords: Peer-yoked contingency game; social skills; observational learning; learned reinforcement; autism; peer-mediated interventions; teaching strategies

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INTRODUCTION

Observational learning

The ability to learn through the observation of others is one way that humans acquire knowledge of novel behaviours and the successful execution of such behaviours (Bandura &Walters, 1963). Catania (1998), defined observational learning as a change in one's behaviour that occurs due to observing the behaviour of others, while also observing the consequences of those behaviours. Observational learning is an important skill because when someone can learn by watching someone else, they can learn much faster and more efficiently (Bandura & Huston, 1961). It has been of interest to researchers in human behavior since at least the 1960s.

Observational learning and autism

Typically developing children acquire observational learning very early in life, demonstrating complex observational skills as early as four years of age (Bandura & Huston, 1961). Children diagnosed with autism can have difficulty acquiring the ability to learn through observation and some do not learn to observe without instructional intervention (Varni, Lovaas, Koegel, & Everett, 1979). Despite this, it is believed that the ability to learn from observation can be taught (Greer et al, 2006; MacDonald & Ahearn, 2015). Children with autism often have deficits in the skills that are associated with observational learning such as discrimination, imitation, attention to their surroundings, and initiation of social interactions with others (Garfinkle & Schwartz, 2002). In addition, children with autism typically have restricted interests (American Psychiatric Association, 2000). Their lack of interest in others may affect their attention to others (Greer & Ross, 2008). Despite these challenges it is essential for children with autism to acquire the ability to learn through observation to increase their chances of success when entering the education system (Plavnick & Hume, 2014), to increase their efficiency in learning without explicit instruction (Taylor & DeQuinzio, 2012), and to improve their ability to function independently in the community.

Observational learning as a dependent variable

Prior research appears to have focused on performance tasks and more recent research has focused on learning new operants; relatively few studies have investigated observational learning as a dependent variable rather than an independent one (Lawson & Walsh, 2007; Rothstein & Gautreaux, 2007; Taylor, DeQuinzio, & Stine, 2012; Plavnick & Hume, 2014; DeQuinzio & Taylor, 2015; MacDonald & Ahearn, 2015). Peer monitoring appeared to be an effective strategy for inducing observational learning. MacDonald and Ahearn (2015) taught six children with autism four skills (attending to a model, imitation of a task, delayed imitation, and consequence discrimination) and then tested them to determine if they demonstrated observational learning during other, general tasks. Five of the six participants demonstrated this after learning the four skills taught.

The peer-yoked contingency game

Another intervention called the "peer-yoked contingency game" was also effective in teaching observational learning in male, middle school students diagnosed with emotional and behavioral disorders (Rothstein & Gautreaux,

2007) and in teaching math skills to neurotypical second graders (Broto & Greer, 2014). The peer-yoked contingency game consisted of the target student monitoring his peer while the peer learned to label five new pictures (Rothstein & Gautreaux, 2007).The observing student and his model partner received reinforcement only if the observing student emitted the correct response. In this way, the reinforcement for responding for both learners was dependent on the observer's response (yoked) (Greer & Ross, 2008; Broto & Greer, 2014).This connection of the reinforcement contingency to the observer's response, along with the practice of general positive reinforcement and correction procedures, may be pivotal in developing a complete observational learning repertoire (Greer et al., 2006). Additionally, a review of research on intervention with children with autism suggests that peer-mediated interventions are an effective and efficient way to teach children with autism (Chan, Lang, Rispoli, O'Reilly, Sigafoos, & Cole, 2009) but there are gaps in the literature that need to be addressed. For example, most, if not all, of the research examined "peers" who were not, in fact, true peers. They were either typically developing children who were older or typically developing children of the same calendar age.

Research Questions

The present study was designed to address the following questions:

1. Can children with autism be taught observational learning?
2. Can observational learning be taught through the manipulation of reinforcement contingencies alone?
3. Can peer-mediated interventions be effective in teaching observational learning?

Can children with autism acquire observational learning through discrete trial instruction with a peer of a similar skill level?

METHODS

Participants

Alex, Mathew, Alan, and Bobby were all boys who were enrolled in a full time Early Intensive Behaviour Intervention (EIBI) program where they had all attended for at least five months at the time of the study. Alex, Mathew, Alan, and Bobby were aged 5, 7, 4, and 6 years, respectively. Alex and Mathew were the first participant pair and Alan and Bobby were the second participant pair.

All four participants were diagnosed with Autism Spectrum Disorder (ASD) using the DSM-IV manual (American Psychiatric Association, 2000). None of the participants had a history of aggressive behaviour nor did any have a history of other developmental, physical, or biological diagnoses. During their time in the EIBI program, the participants were assessed using the Assessment of Basic Language and Learning Skills--Revised (ABLLS-R) (Partington, 2006) and the participants' parents completed the Vineland Adaptive Behavior Scale--Second Edition (VABS-II) (Sparrow, Cicchetti, & Balla, 2005). Alex's Adaptive Behavior Composite (ABC) standard score was 70, Mathew's ABC was 63, Alan's ABC was 59, and Bobby's ABC was 54. The research ethics board approved the research proposal and written consent was obtained from each family prior to inclusion of the participants in the research study.

Setting

Probes were conducted during the instructional day at the treatment centre, while participants were engaged in their regular routines. The participants were observed during individual instruction, group instruction, free time, lunch and snack times, and in a variety of settings—the classroom, the hallway, the playground, and the gym. All teaching and testing sessions were conducted in a small classroom in the treatment centre. The room contained a single, rectangular table and chairs for each participant and the teacher. The students were directed to sit next to each other and to sit across the table from the teacher. The room was cleared of any other distractions and was absent other children or teachers. Teaching and testing sessions lasted from seven to 15 minutes and the participants returned to their regular treatment day after completing an experimental session. No more than two sessions took place in the same day. The participants remained in the same pairs throughout the study.

Observational Learning

Pre and post probes. Pre and post probe data were collected using the event recording method (Cooper, Heron, & Heward, 2007). The first five opportunities that occurred in a day were recorded. Data were recorded separately for each participant as “yes” or “no” responses and converted to +/- for graphing. Probe data were collected before and after the intervention.

Pre and post tests. Pre and post tests of correct responses to observed presentations of novel trials were conducted with each participant. Sets of five novel stimuli were reserved for the pre and post test; these stimuli were ones that were different than the sets used for the peer-yoked contingency game. The pictures used for pre and post tests were: set 1) flute, trombone, tambourine, harp, saxophone, and set 2) garlic, radish, cauliflower, squash, asparagus. Only one session of the baseline test was completed to avoid influencing the dependent variable with repeated exposure to the test. Data were recorded as “plus” or “minus” responses for each trial and graphed as a percentage.

The Peer-Yoked Contingency Game

During the intervention phase, participants were paired together in a team and asked to play a game with the teacher. The assigned teams remained the same throughout the treatment. The game took place in an observation room inside the EIBI clinic. Both participants were seated side-by-side on one side of a table facing the teacher, with the game board in reach, allowing the participants to move their own piece. A themed game board, game pieces, pictures of unknown items, a data sheet and pen for data collection, a choice board (Legos, DVDs, blocks, books, puzzles, gym time), and a variety of preferred, tangible reinforcers were available during the game sessions. All available choices on the choice board had been selected using a daily informal preference assessment and frequent formal preference assessments (Cooper, Heron, & Heward, 2007) with the participants prior to playing the game. The game pieces were toy vehicles because all the participants had demonstrated, prior to playing the game, that vehicles were a preferred toy. The pictures of unknown items were arranged in sets, one participant in the team assigned to one set: set #1) veterinarian, plumber, judge, pilot, librarian, and set #2) tennis, archery, snowboarding, volleyball, canoeing. The game board was designed with two paths of 20 spaces each. At the beginning of the game, the teacher explained to the participants that they would be playing a game with the teacher and that they could choose a game piece and a reinforcer before they began the game.

The teacher also explained that the game was a race; that one path on the game board was for the participants' team and the second path was for the teacher. The goal of the game was to see who could get to the end of the path first, the teacher alone or the participants together.

The teacher showed the model participant a picture, asked, "What is it?" and waited up to five seconds for the model participant to answer. If the model participant did not provide a verbal response the teacher then said what was seen in the picture (i.e., "It's a librarian") and waited for the model participant to repeat what she said. If the model participant answered correctly, independently, the teacher provided reinforcement in the form of verbal praise, "Good job," without repeating the label. If the model participant provided an incorrect answer, the teacher would make a correction statement such as "It's a librarian," and require the model participant to repeat the statement.

Immediately after the response of the model participant and the consequence that followed, the observing participant was then asked for their response to the same stimuli. The teacher turned to face the observing participant, showed them the same picture and said, "What is it?" If the observing participant answered correctly, reinforcement was given to both participants in the form of verbal praise (i.e., "Way to go," "Nice working together!") and the observing participant and his model partner could move their team's game piece one space forward on the game board. If the observing participant answered incorrectly or did not provide a response within five seconds, the teacher said, "It's my turn to move forward," and moved her/his game piece forward on the board. The teacher used the same correction procedure as with the model participant; made a correction statement such as, "It's a librarian" and required the observing participant to repeat the statement. The process was repeated until 20 trials had been completed—ten for each participant in each of the two roles—model and observer.

Responses were recorded for both the model participant and the observing participant. If the model participant emitted an incorrect response and the observing participant copied that incorrect response, the children were told, "That was incorrect; I get to move my game piece forward." The teacher scored the participants' responses with either a plus (+) for correct responses or a minus (-) for incorrect responses. Data were tallied at the end of each session and graphed on a line graph for visual analysis. Once a participant had participated as a model for ten trials; he switched roles and became the observing participant. This way each participant served both as a model and as an observer, and served in each role for ten trials. If the teacher reached the end of the game board before the participant team, she/he celebrated and briefly engaged in a preferred activity while the participant team observed. If the participant team reached the end of the game board before the teacher, the teacher celebrated and allowed the team to access the preferred activity that they had selected from the choice board before beginning the game. This concluded a single intervention session.

Interobserver Agreement and Treatment Fidelity

Interobserver agreement (IOA) recording was completed by an independent observer during the probe, test, and intervention sessions. IOA was calculated as the smaller count divided by the larger count, then multiplied by 100 (Cooper, Heron, & Heward, 2007). IOA was collected for 100% of pre- and post probes and pre- and post tests. IOA for pre- and post probes ranged from 75–100%, averaging 92%. IOA for pre- and post tests ranged from 70–100%, averaging 93%. IOA was collected for 100% of intervention sessions. IOA for intervention sessions ranged from 86–100%, averaging 98%. Treatment fidelity was collected and calculated using a Teacher Performance Rate Accuracy (TPRA) form (Albers & Greer, 1991) and was collected for 23% of the treatment sessions. Treatment fidelity ranged from 90–100%, averaging 99%.

RESULT

Using a multiple baseline across participants, single case, research design (Tawney & Gast, 1984) the results of this study demonstrated a functional relationship between the peer-yoked contingency game and increased evidence of observational learning for all four participants.

Pre and post probes

Alex emitted one correct observing response in the pre probe and six correct observing responses in the post probe; his performance increased by 500% from baseline. Mathew emitted one correct observing response in the pre probe and five correct observing responses in the post probe; his performance increased by 400% from baseline. Alan emitted zero correct observing responses in the pre probe and four correct observing responses in the post probe. His performance increased by 400% from baseline. Bobby emitted three correct observing responses in the pre probe and five correct observing responses in the post probe; his performance increased by 66% from baseline.

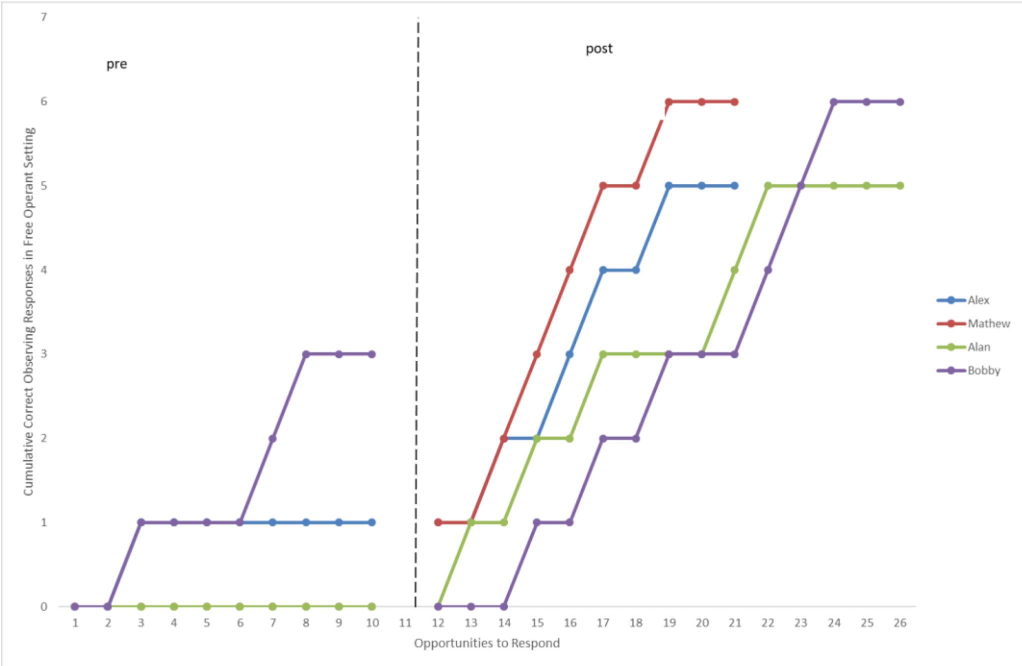

Figure 1. Cumulative graph of pre- and post- probes of observational learning in the natural setting.

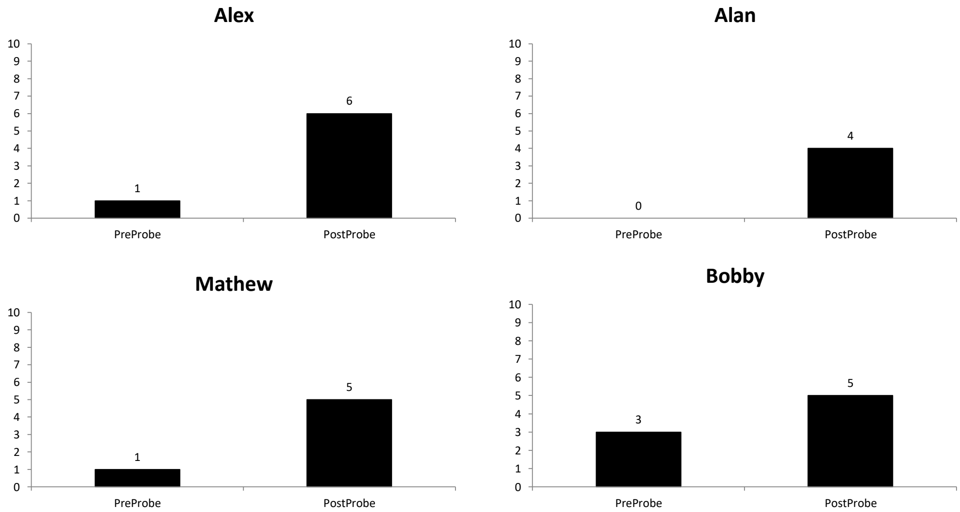

Figure 2. Bar graph of pre and post probes of observational learning in the classroom setting.

Pre and post tests

Alex emitted eight correct responses in the pre test and ten correct responses in the post test; his performance increased by 25% from baseline. Mathew emitted five correct responses in the pre test and ten correct responses in the post test; his performance increased by 100% from baseline. Alan emitted five correct responses in the pre test and seven correct responses in the post test; his performance increased by 40% from baseline. Bobby emitted three correct responses in the pre test and seven correct responses in the post test; his performance increased by 130% from baseline (see Figure 3).

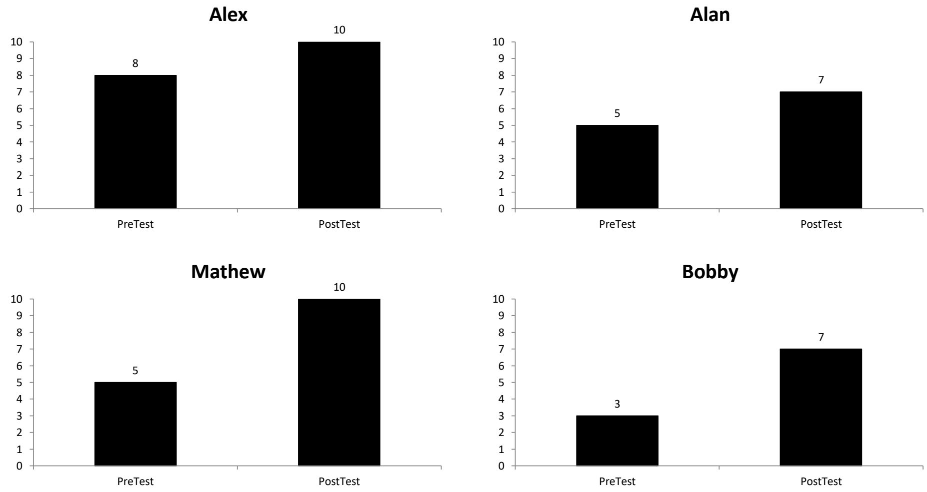

Figure 3. Pre and post tests of correct responses to novel trials.

Peer-yoked contingency game

During intervention, Alex and Mathew each required five teaching sessions to reach mastery criterion of 90% correct responding in two consecutive sessions. Alan and Bobby each required 17 teaching sessions to reach mastery criterion (see Figure 4).

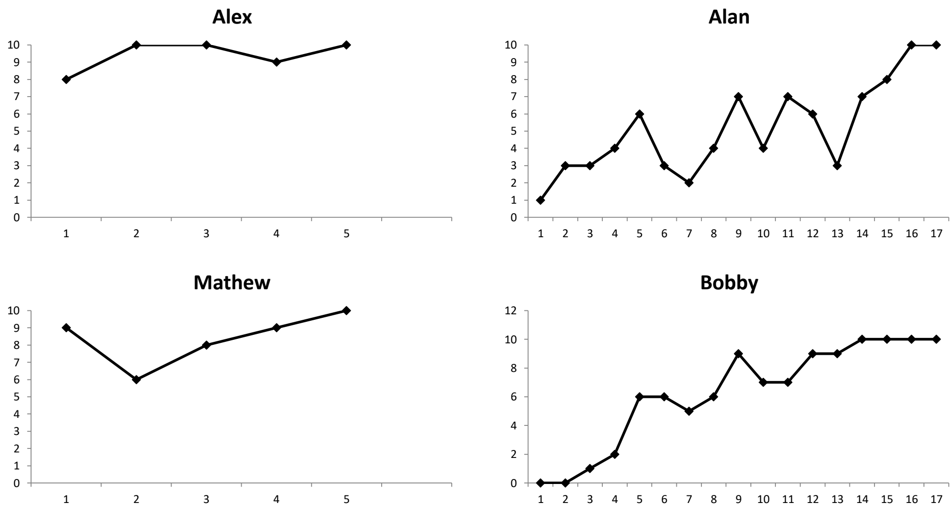

Figure 4. Correct responses to instructional learn units during the peer-yoked contingency game.

Standardized assessment results

Vineland (VABS-II) scores were collected before and after this research study for Mathew and Alan. Prior to the study, Mathew scored an age equivalent of six months in the Expressive subdomain of Communication. After the study, Mathew's scores jumped to an age equivalent of two years 10 months in Expressive Communication. This represented an increase of 28 months in just a six-month period. Prior to the study, Alan scored an age equivalent of four months in the Interpersonal Relationships subdomain of Socialization. After the study, Alan's scores in this subdomain jumped to an age equivalent of one year three months. This represented an increase of 11 months in a six-month period. Because all participants were also in the EIBI treatment program, these gains cannot be attributed to our intervention alone but future research should investigate in more detail the relationship between the acquisition of observational learning and performance on standardized measures (Ledford, Gast, Luscre, & Ayres, 2008).

Anecdotal results

There were significant qualitative changes noted in the participants' behavior both during and after this project. All four participants began the intervention phase with a primary focus and attention on the teacher. By the end of the intervention phase, all four participants were attending to their partner and clearly looking at them and listening to them when they played the game. Mathew sang and talked to himself when he began intervention but after several sessions he stopped singing and began to look at his partner and engage in the game. This attention to their partners transferred to the natural instructional setting. Mathew was observed to look at other children frequently during group instruction and during free time in the classroom and gym and was even observed following them around and saying their names. Prior to this intervention, this behaviour had not been observed. This was a change from baseline measures but was not captured by experimental probes because he did not follow looking at his peers with an imitation of his peers' actions. Alex spontaneously began clapping his hands in excitement when the participants' game piece got moved up on the game board. In addition, during the post test for Mathew and Alex, the use of 1-2 minutes of tangible reinforcement was not required to keep them alert and engaged in the activity, unlike during the pre-test. The teacher placed a bin of toys, puzzles, and books on the table in between trials exactly like the schedule of reinforcement delivered during the pre-test; however, neither Mathew nor Alex used the available reinforcement. Rather, the participants stated that they wanted to continue "looking at pictures." Clearly, once the boys learned the game it was a preferred activity. Alan did not look at his partner when he began the game but by the end of the intervention he not only looked at his partner but began to make statements like, "We're gonna win!" and was observed to put his arm around Bobby and whisper the answers in Bobby's ear. Bobby was initially observed to emit high rates of vocal stereotypy in the natural classroom setting and during testing and training sessions. He did not attend to his peers and often failed to follow group routines. During the time that he played the game with Alan, he began to look at Alan when it was Alan's turn to answer and was often observed to repeat his own answers, leaning toward Alan, until Alan answered. Bobby's vocal stereotypy reduced and he was seen watching his peers and following group routines during the day, participating in activities such as circle time. Significant qualitative evidence accrued to suggest that the peer-yoked contingency game may have functioned to teach social reinforcement for observing peers and in this way, by teaching the necessary reinforcer, may have elicited learning by observation.

DISCUSSION

This study investigated observational learning as a dependent variable. A peer-yoked contingency game was played with four young participants, all with autism and all with a demonstrated lack of observational learning. Because of playing this game, all four made modest to significant gains in their evidenced ability to learn through observation. The results of our study suggest that children with autism can be taught observational learning. Our findings also suggest that observational learning can be taught through the manipulation of reinforcement contingencies as they exist in a discrete trial learning opportunity arranged in a cooperative/competitive game format. This peer-mediated intervention appeared to have been an effective way to teach observational learning and these participants successfully played with peers who were similar in both developmental age and skill level.

Limitations and future directions

This study was limited by its small sample size of only four participants. This study was also limited by its sample of only participants with autism. Future research should seek to replicate these findings with additional participants, both with autism and with other developmental delays, while using this strategy of the peer-yoked contingency game in order to add to the evidence of its efficacy as a way to improve social relationships with adults and peers. This study contributed to the evidentiary support for the use of the peer-yoked contingency game as an evidence-based strategy in a treatment setting. Collection of additional evidence through future research is recommended. The peer-yoked contingency game is a promising strategy which produced changes in social behaviour as a by-product of a discrete-trial teaching format designed to change the participant's repertoire of reinforcers. Using peer-mediated interventions to produce changes in observational learning is a current gap in the literature (Chan, et al, 2009) and would be an excellent area for further research. In addition, the fact that our participants also served as their own peers will, hopefully, encourage others to consider ways to expand how we define a "peer" in research.

Further work is necessary to experimentally identify the natural fractures in the observational learning phenomenon. For example, while this game appears to have had a significant impact on peers as reinforcers and, subsequently, on the attention these participants paid to their friends in the classroom, we did not separately investigate the competition element of the game. What role did the competitive nature of the game play in the development of observational learning? What role did the partnering of the two participants in a competitive game---creating a cooperative element---contribute to the learning of a social reinforcer?

Additionally, the targets selected for teaching in this study were unknown by all the participants. Future research might look at the effect of using teaching targets that are known by the model participant. Is it necessary for learners to observe corrections for incorrect responses to discriminate between reinforced and nonreinforced responses (Taylor & DeQuinzio, 2015)? Is discrimination of consequences a critical component of observational learning (MacDonald, &

Ahearn, 2015)? How does this observation of consequences influence the learning process?

These researchers were pleased to see the changes in the participants' social interactions as a result of participating in this pilot project and we are hopeful that continued work in this area will further our understanding of how children with autism can learn to be social, improving their access to the reinforcement communities in which they live, work, and play.

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DECLARATION OF CONFLICTING INTERESTS

The authors declare that they have no conflict of interest.

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