Increasing Social Interactions Using Prompts and Rewards for Adolescents with ASD in an Ice Hockey Practice Context

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Abstract

We evaluated the effects of using prompts and reinforcement procedures to increase the social interaction of two children with autism (ASD). This study took place during the context of a hockey practice. Two adolescent participants were evaluated using an ABAB single subject reversal design. Baseline data were collected prior to and after the implementation of a treatment phase. During baseline, the social interactive behavior of participants was measured. The participants engaged in vey low levels of social interaction. During treatment, the instructor applied prompting and reinforcement with the participants and social interaction was measured. The results indicate that social interaction of our participants can be increased during the hockey practice through the use of prompting and reinforcement.

The prevalence of autism spectrum disorder (ASD) has continued to rise. It has been reported that 1 out of 68 children have been diagnosed with the disorder (Baio, 2012; Center for Disease Control and Prevention [CDC] 2014CDC). Though the cause of autism remains unknown, many factors have been speculated to have an impact (Kaufman & Silverman, 2010). Symptoms of autism include impairments in social communication and repetitive stereotyped patterns of behavior and thought (Diagnostic and Statistical Manual, 2013). Deficits in social communication are the essential feature of an autism diagnosis (Diagnostic and Statistical Manual, 2013). Communication delays often lead to socialization deficits; which is why early detection is

critical (Hattier & Matson, 2012). Lack of spontaneous verbalizations can result in problems developing typical social relationships (Koegel, 2000). These deficits contribute to difficulties for persons with ASD to engage in activities with their typically developing peers.

Wide array of interventions have been used to teach new skills to individuals diagnosed with ASD (Koegel, Matos-Freden, & Lang, 2012; Odom, Collet-Klingenberg, & Hatton, 2010). The use of consequences has received much attention in the peer-reviewed literature. For example, Thompson, McLaughlin, and Derby (2011) used differential reinforcement to decrease the inappropriate verbalizations of a child with autism. Also, the use of setting events or specific setting events has received wide attention. Prompting has also been suggested as an important strategy to teach students with ASD new skills. A wide arrange of prompts have been evaluated and these have ranged from hand over hand full physical guidance (Macduff, Krantz, &McClanahan, 1993) to direct verbal prompts (Odom & Strain, 1986).

Prompting has been the most widely implemented procedure to assist persons with autism (MacDuff, Krantz & McClanahan, 2001). McClanahan and Krantz (1999) defined prompts as, "instructions, gestures, demonstrations, touches, or other things that we arrange or do to increase the likelihood that children will make correct responses" (p.37). Teachers may employ verbal prompts to attempt to have the child point to his or her name when given the prompt "Where is your name?"

Tetreault and Lerman (2010) used video modeling and prompting to increase the social initiations of three kids with autism. Quirmbach, Lincoln, Feinberg-Gizzo, and Monica (2009) employed social stories used to teach appropriate behaviors to a classroom of students diagnosed with ASD while they played games. The use of prompting and reinforcement has also been shown to have an effect on

shaping behavior. (Buffington, Krantz, Poulson, & McClannahan, 1998; Newman, & Eyck, 2005; Strain, Kerr, &Ragland, 1979). Many of these studies were conducted in the context of one-on-one setting or a small group environment.

Team sporting events can serve as an excellent context to teach social skills (Sharpe, Brown, & Crider, 1995). Also, team sports have been shown to result in positive outcomes for persons with developmental disabilities (Weiss, Diamond, Demark, & Lovald, 2003). Skills that have been taught to individuals with autism through physical activity include tennis, physical exercise, and swimming (Pan, 2011; Sowa, & Meulenbroek, 2012; Yanardag, Birkan, Yilmaz, Konukman, Agbuga, & Lieberman, 2011). Alexander, Drummer, Smeltzer, and Denton (2011) demonstrated that teaching social skills within the context of a soccer practice lead to increased social behaviors by persons with developmental disabilities. Alexander et al. combined classroom instruction with soccer activities to increase the social skills of four Special Olympics Participants. One participant was diagnosed with Autism. Their intervention was carried out across six phases: introduction, baseline, classroom instruction, soccer practice, parent supplemental activities and party. The phases were implemented across a 14week program in which training sessions were conducted two times per week for 90 minutes. Utilizing a combination of interventions that included direct didactic instruction, engagement and structured physical activities (soccer) and programming for generalization through parent training, the participants demonstrated an increase in social skills Importantly, these skills generalized across settings outside of the soccer practice. Sowa and Meulenbroek (2012) demonstrated that other forms of physical exercise could lead to increased social skills by persons with ASD. In a meta-analysis across 16 investigations, these authors identified

increases in social skills with other sports activities that included swimming and running. This, it appears that sports contexts may be a valuable tool for increasing the social communicative behavior of persons with development disabilities and/or ASD. However, the use of teaching new skills in the context of a team sports setting has not been widely investigated. Specifically, utilization of a hockey practice as a context for increased social interaction has not been widely investigated.

Alexander, Drummer, Smeltzer, and Denton (2011) demonstrated that teaching social skills through physical sports activity could be both fun and engaging for children with developmental disabilities and their families. Parental perception about their child with ASD engaging in physical activity has been found to be positive (Obrusnikova, & Miccinello, 2012). In our prior research, parents reported that satisfaction with a hockey program for individuals with developmental disabilities was high, and their children reported overall satisfaction with the experience (Mortensen, Derby & McLaughlin, 2015). Mortenson et al., (2015) completed a preliminary assessment that evaluated the feasibility and parental satisfaction of engaging persons with developmental disabilities and/or ASD in the game of hockey. Mortenson et al., demonstrated that parents perceived the activity as beneficial for their child and that the players would often talk about hockey outside of practice. However, Mortenson et al., did not directly manipulate the environment for the purpose of increasing the player's social skills.

The purpose of the current study was to determine if the social communication of two students with ASD would increase through the context of hockey practice with their peers when a treatment package consisting of prompts and reinforcement was used. An additional purpose was to add to the literature of the efficacy of teaching interaction skills to

students with ASD and providing an important replication of Mortenson et al.,

Method

Participants

The participants were two school-aged children diagnosed with autism spectrum disorder (ASD). Participants were selected because they were reported to demonstrate very low communication skills and almost no verbal communication with peers or adults. Both children attended a local self-contained school program for students with ASD. Both had previous experience with the prompting and reinforcement strategies employed in this study. Jane was an 18-year-old female previously diagnosed with ASD. Jane was verbal but rarely engaged in reciprocal social communication with others. Intellectually, Jane functioned at a severe to moderate level of developmental disability. Jane had several years of ice skating experience prior to the investigation. However, Jane was a first year hockey player. John was a sixteen-year-old male previously diagnosed with ASD. John was verbal and engaged in low levels of reciprocal social communication. However, his social communication was repetitive in nature (i.e., consistently asking about the end of the year pizza party or expressing ideas in a perseverative manner). Intellectually, John functioned at a severe to moderate level of developmental disability. John had no previous experience with ice-skating or playing hockey prior to the investigation.

Setting

The investigation took place at a local ice rink in the late afternoon. The surface of the ice itself was a standard sized rink. There was 3 feet of plexi-glass surrounding the rink surface. On one side of the ice, there were two areas approximately 20 feet long by 4 feet wide for players to sit. On the other side of the ice, there was an approximately 150-

foot section with bleachers for an audience to view the ice. The rink was equipped with 4 locker rooms that were approximately 10 feet by 15 feet. Both the baseline and treatment sessions took place in the context of regularly scheduled hockey practices. Practices took place one time per week and were 60 min in length. Eight to 14 players attended each practice. When possible, each player was assigned a one-to-one coach. Coaches consisted of parent volunteers and volunteers from the Gonzaga University Hockey Club. Practices were broken down into skills session types lasting 5 to 10 minutes. All practices ended with a scrimmage. The Gonzaga Exceptional Hockey Team is a member of the American Specialized Hockey Association.

Response Definition for Social Interaction.

Social interaction served as the dependent variable for this investigation. The use of prompting and reinforcement was also measured. Social interaction for both participants was defined as both (1) receptive communication in the form of attending (i.e., looking at and following an instruction) to the coach's direction and standing in close proximity to coaches or peers (i.e., participants could not be alone, or skating independently away from the instructor and (2) any expressive communication in the form of speaking or gestural response to peers, or coaches; to include communication unrelated to task at hand, standing in or skating in a 10 foot radius of peers or instructor while attending to task, and carrying out the direction of the instructor. Specifically, for a behavior was scored as a receptive communication response the player was required to be turned toward the coach with his/ her face looking at the coach. Similarly, player expressive communicative was recorded for the player is he/she interacted with a coach/peer via physically directing a hockey skill (i.e., passing the puck) or via verbally expression toward another individual.

Measurement and Reliability

Following each 5-min session video clips were scored using a 6-second interval system designed for the study to record social interaction and the use of prompting/ reinforcement. The data system utilized pencil and paper recording for both player and coach behavior. Inter-observer agreement was gathered by having a trained volunteer view the 5-minute video sessions simultaneously but separately from the primary data collector. An agreement was defined as having a six second box with the same marks on the primary and secondary data collectors sheets, while disagreements were defined as any time a corresponding box on the data collectors' sheets did not match. Agreements between the two data collectors were then divided by the number of agreements plus disagreements for the two data collectors, and then multiplied by 100. Interobserver reliability for Jane was collected for 50% of the sessions with a mean agreement of 96% with a range of 57% to 100% agreement over all observed sessions. For John, inter-observer agreement was conducted during 42% of sessions with a mean agreement of 95% with a range of 83% to 100%.

Experimental Design and Conditions

For this investigation, a single case ABAB reversal design (Kazdin, 2011) was employed with both participants to evaluate the effectiveness of prompting and reinforcement on social interaction. An initial baseline was conducted with both participants to document pre-treatment levels of socialization during hockey practices. Treatment, consisting of prompting and reinforcement while participants worked one-on-one with a coach was then implemented. A return to baseline conditions occurred after a trend of increased socialization was observed during the treatment condition. When a consistent trend of decreased social interaction

occurred during the second baseline phase, treatment was reinstituted.

Baseline

The baseline sessions took place over several days during different portions of the regularly scheduled hockey practice. The coaches did not prompt any social interactions during baseline. Baseline consisted of simply observing the participants social interactions through the context of a hockey practice. Skill sessions were initiated by a specific prompt to begin practicing a skill. For example, prior to a stick handling session the players were presented with a nonspecific verbal prompt such as "Okay everyone, let's begin stickhandling." Following the prompt, players were verbally encouraged to engage in the activity and no tangible reinforcement was delivered

Treatment

All treatment sessions took place during the regularly scheduled hockey practice on the same sheet of ice with the same coaches and peers involved in the special needs hockey program present in baseline. The coach prompted the participants using the same hockey drills as the other players in practice. The drills included: Skating to a line on the ice and back; Forwards and backward skating; Playing tag with the coach, where both the participant, and the coach traded off being who was "it"; Skating with the puck to a line and back; Skating down the length of the ice and passing the puck back and forth with the coach; Standing in a stationary position and passing the puck back and forth with the coach. For example, for skating the coach would provide a verbal prompt or gestural request to perform a task to initiate a social interaction. That is, the coach verbally prompted, "John, skate to the blue line and back." Or, "Jane, get the puck and pass it to me." If the player engaged in the activity

verbal praise was presented following each response. Tangible reinforcement was provided on an intermittent schedule. The intermittent schedule consisted of the delivery of a tangible reinforce following 2 to 3 appropriate responses. Tangible reinforcement for each player was in the form of an edible reinforcer. For John, Mike and Ike's candy were used, and for Jane, Cool Ranch flavored Doritos were used. These items were selected based on a parent report of player preferences.

Results

The results for this investigation are displayed in Figures 1, and 2. Both participants demonstrated very low levels of social interaction during the initial baseline sessions (Jane *M* = 1%; John *M*= 11%). During Baseline sessions, both participants preferred to be by themselves while other hockey players were participating with coaches and their peers on the ice. John would often drop to hands and knees and make piles of ice shavings on the surface of the ice, while Jane would skate uninterrupted down the length of the ice for most of the practice, not interacting with any of her peers or coaches.

During Phase 1 of treatment, social interaction increased for both participants (Jane M=80%; range: 48%-96%; John M= 93% range: 80%-98%).

The use of prompting and reinforcement were also tracked during treatment sessions. Prompting occurred for a mean of 16% of all intervals for Jane and a mean of 24% of all intervals for John. Reinforcement occurred for a mean of 14% of all intervals for Jane and a mean of 12% of all intervals for John. Baseline conditions were reapplied for the next 3 sessions. During the reintroduction of baseline, social interaction decreased to near zero levels for both participants

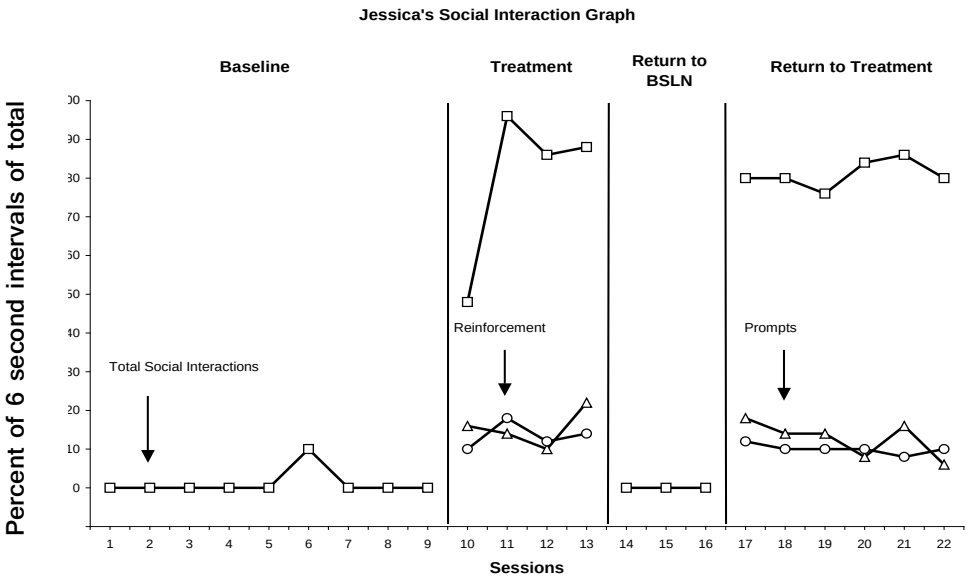

Figure 1. **The percent of intervals for Jane with social interaction (open squares) and prompts (open circle) and the amount of reinforcement (open triangles) for baseline and treatment. Social interaction (□), Reinforcement (Δ), Prompt (◯).**

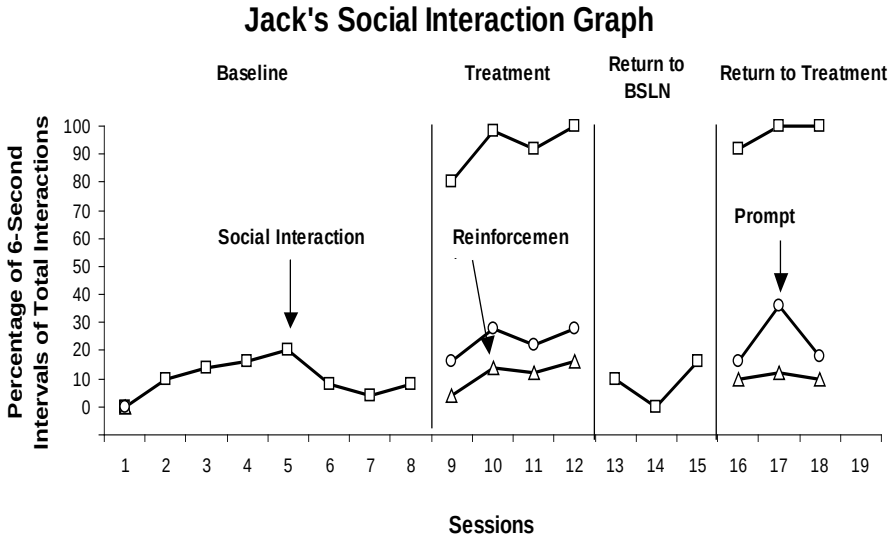

Figure 2. **The percent of intervals for John with social interaction (open squares) and prompts (open circle) and the amount of reinforcement (open triangles) for baseline and treatment. Social interaction (☐), Reinforcement (Δ), Prompt (◯).**

(Jane *M* = 0%; John *M* = 9%). Treatment was reintroduced for the next 6 sessions for Jane and 3 sessions for John; resulting in increased social interactions in both participants. (Jane *M* = 81%; John *M* = 97%). The prompts and reinforcement were tracked during these sessions. Prompting was used during *M* = 14% and *M* = 23% of the intervals for Jane and John, respectively. Reinforcement was delivered during *M* = 10% for Jane and *M* = 11% for John.

Discussion

The results provide preliminary evidence of the effectiveness of using prompting and reinforcement to increase the social interaction of two individuals with ASD in the context of a hockey practice. The reversal design demonstrates that the increasing social interaction was linked to the treatment. In addition, the results provide evidence that interaction with the coach during a hockey practice setting is a positive context that gives opportunities for social interaction with two individuals that had limited social behavior. However, because prompting and reinforcement was delivered in the same sessions together, there is no way to differentiate if the behavior changes were due to the prompt, the reinforcement, or a combination of both. Nevertheless, the investigation expands upon previous investigations that demonstrated the team sports such as soccer provide a positive context in which to incorporate interventions designed to increase social communication (Alexander, Drummer, Smeltzer & Denton, 2011).

The results replicated previous findings that prompting and reinforcement can have positive effects on behavior for persons with ASD (Biederman, Fairhall, & Raven, 1998). Increased social interaction within the hockey practice context was the direct result of prompting and reinforcement delivered by the coach. However, it is unclear if change in social interaction can be attributed to the

prompting or delivery of reinforcement alone. Future research could include the application these two components in isolation. For example, presentation of verbal and gestural prompts without the delivery reinforcement could be evaluated. Similarly, non-contingent or contingent delivery of tangible reinforcement could be applied without the delivery of verbal or gestural prompts. Specifically, contingent delivery reinforcement could be provided when self initiated social communication occurs.

Some limitations to this study should be noted. First, our participants were highly dependent upon the therapist delivery of prompts for social interaction to occur. There was no fading strategy in place to fade the prompts upon conclusion of the investigation. Because a typical hockey practice requires a coach delivering instruction, future research should focus on a progression of fading the prompt delivery from a therapist, to a coach, and then to a peer. This fading schedule will result in a prompt system that closely models the typical delivery of prompting during hockey practice. Second, we did not measure the generalized effects across activities or time. Lastly, we did not separate the effects across the coaches and players. Additional research should evaluate social outcomes in future practices to measure generalization across time and persons within the environment (i.e., other players and coaches).

The current investigation supports previous research (Weiss et al., 2003) that the use of prompts and rewards can increase behavioral outcomes for individuals with developmental disabilities. The use of prompting and rewards had not previously been investigated in the context of a hockey practice to increase social interaction with students with ASD. In fact, there is limited literature supporting the use of behavioral intervention in the context of extracurricular group activities for individuals with ASD. As demonstrated via the meta-analysis completed by Sowa, &

Meulenbroek (2012) a majority of investigations of the effects of sports contexts have been conducted within individual sports activities (i.e., running and swimming). The results of the current investigation are promising and provide a platform for additional research on behavioral treatments in the context of hockey and other group sports.

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