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Differential reinforcement of low rate responding in social skills training

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ABSTRACT

Social skills are unique in that excessive rates of responding may be just as socially undesirable as deficient responding. Furthermore, most social skills training programs utilize group formats such that one intervention (e.g., differential reinforcement) is applied universally to children with varied behavioral repertoires. Following exposure to continuous schedules of reinforcement for pro-social behaviors, we observed excessive levels of peer-directed compliments and physical contact. Thus, we evaluated the effectiveness of a full-session differential reinforcement of low rate responding (DRL) schedule in maintaining socially appropriate levels of these interactions. We used descriptive observations of typically developing children to establish normative criteria for the DRL schedules. Results indicated full-session DRL schedules were effective in maintaining participants' responding at levels below criterion levels without wholly eliminating responding.

Individuals with autism spectrum disorders display marked difficulties related to social functioning. These difficulties are often sources of persistent distress in addition to being associated with long-term negative outcomes (Greene et al., 1999; Chamak & Bonniau, 2016). Indeed, the severity of social deficits associated with autism have been found to be one of the strongest predictors of long-term outcomes (Howlin, Moss, Savage, & Rutter, 2013). Fortunately, behavioral interventions have been highly effective in teaching a variety of pro-social skills to individuals with autism spectrum disorders (Koegel & Frea, 1993; Pickles et al., 2016). For example, Leaf et al. (2012) used modified behavioral skills training to teach individuals with autism to engage in social skills including: greeting others, offering assistance, giving compliments, and losing graciously.

Behavioral interventions often utilize ratio schedules to increase target responding across a variety of behavioral topographies including social interaction (Allen, Hart, Buell, Harris, & Wolf, 1964; Ferster & Skinner, 1957). However, social skills are unique in that they are often 1) highly contextual and excessive responding may be just as socially undesirable as deficient or absent responding and 2) taught in group settings wherein reinforcement contingencies are applied uniformly to students with idiosyncratic behavioral repertoires.

Interventions that promote indiscriminately high rates of responding may have unintended effects of increasing skill performance to socially unacceptable levels. For example, a child may emit sportsman-like comments too often or under the wrong conditions (e.g., saying "good job" after every pass in basketball). Furthermore, problem behavior may be reduced using differential reinforcement of alternative behavior (DRA) only to be replaced by another problem (e.g., excessive levels of the alternative response). For this reason, added schedule requirements may be necessary to facilitate socially appropriate skill development.

In the context of a group contingency, reinforcement schedules favoring performance of pro-social skills are typically applied to children who exhibit deficits in those areas as well as children whose responding is within normal limits. Such applications have repeatedly been shown to be effective (Stage & Quiroz, 1997; Theodore, Bray, & Kehle, 2004) and to minimize the effort required of

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interventionists (Cooper, Heron, & Heward, 2007; Davis & Blankenship, 1996). However, given individual differences in baseline responding and/or motivation, simple group contingencies such as DRA may be associated with unacceptably high rates of *pro-social* responding (e.g., appropriate touching) for some group members.

Differential reinforcement of low rate responding (DRL) represents an alternative to ratio schedules in that responding at or below a pre-specified rate is reinforced. As such, it is recommended as a strategy for target behaviors that are problematic only when they occur in excess but are not intended to be eliminated completely (Cooper et al., 2007; Martin & Pear, 2015). Multiple procedural variations of DRL have been used in applied settings, including spaced responding, interval, and full-session DRL.

Ferster and Skinner (1957) originally conceptualized the logic of DRL, and Deitz (1977) defined three methodologies for application: Spaced responding, interval, and full session DRL. According to spaced responding DRL, reinforcement only occurs if a minimum amount of time elapses between responses, and responses that occur prior to the end of the programmed interval are not reinforced (Catania, 2013). In applied studies, a minimum inter-response time (IRT) for reinforcer delivery has been associated with decreases in rapid eating (Wright & Vollmer, 2002) and stereotypy (Singh, Dawson, & Manning, 1981) among individuals with developmental disabilities as well as inappropriate question-asking among school children (Deitz, 1977).

Interval DRL is a variation on this approach in which a session is divided into intervals, and reinforcement is delivered at the conclusion of an interval only if the frequency of responding is below a pre-determined criterion during that interval. For example, Deitz (1977) and Deitz et al. (1978) successfully reduced the frequency of classroom disruption by having teachers 1) set a criterion for each interval and 2) deliver rewards to students who engaged in problem behaviors at levels below the specified criterion for a set number of intervals. Full-session DRL follows similar logic, but reinforcement is delivered following the conclusion of a session in which the total count of behavior was less than the pre-determined criterion. Hagopian, Kuhn, and Strother (2009) utilized such a procedure to reduce inappropriate touching, inappropriate comments, and social withdrawal in a child with developmental delays. Austin and Bevan (2011) also used full-session DRL to reduce children's requests for assistance from their teacher. These methods may be preferable to spaced-responding DRL schedules in applied settings (e.g., classrooms) where resources for tracking inter-response times are limited and/or data must be collected for multiple children simultaneously. In both of these studies, individual instances of behavior continued to produce some form of reinforcement or feedback. Thus, it is unclear whether feedback provided solely at the end of the session would be sufficient to maintain responding at targeted levels.

Recent research suggests that interval and full-session DRL schedules are likely to reduce responding below acceptable rates, often eliminating them altogether (Jessel & Borrero, 2014). Indeed, much of the research involving DRL schedules has involved behaviors that are not socially acceptable at any level, and the gradual elimination of the target response was programmed by systematically increasing the IRT requirement or decreasing the criterion for reinforcement in each interval/session. As such, these schedules may be better characterized as *alternative* DRO DRL schedules (Ferster & Skinner, 1957), given that reinforcement may be obtained by responding below criterion levels or abstaining altogether.

Clearly, variations between these methods may have significant clinical implications when addressing complex social behaviors. Spaced responding DRL is likely more effective in maintaining low rates of responding given that such responding is required to access reinforcement. Full session DRL may be associated with the greatest reduction (if not complete elimination) of responding given the absence of programmed reinforcement or feedback within sessions. However, it is unknown whether these procedures are differentially effective for social vs. arbitrary responses given that the former are more likely to come into contact with additional sources of social reinforcement (e.g., reciprocal social interaction with peers).

The uses of DRL schedules in applied settings clearly merit further investigation to identify interventions that will facilitate socially appropriate levels of responding. Thus, the purpose of this study was to evaluate the effectiveness of a full-session DRL procedure to maintain social behaviors at acceptable levels without eliminating these behaviors entirely.

1. Methods

1.1. Participants and setting

Participants included 5 children enrolled in a group treatment program designed to facilitate social skill development. Each group included 4–5 participants matched by age and functioning level and 3 trained therapists. Therapists provided prompting and feedback in the use of various social skills in the context of semi-structured recreational activities. All experimental procedures were approved by the university's Institutional Review Board, and informed consent forms were signed by each of the participants' parent or legal guardian.

Barry was a 14 year-old male with diagnoses of Attention Deficit-Hyperactivity Disorder, Autism, Post-traumatic Stress Disorder, and Oppositional-Defiant Disorder. Donny was a 12 year-old male diagnosed with Asperger's Syndrome and Attention Deficit/Hyperactivity Disorder. Joe was a 10 year-old male diagnosed with Social Communication Disorder. Bernard and Harry were both 13 year-old males diagnosed with Autism. All participants engaged in reciprocal communication using full sentences, and all exhibited socially acceptable behaviors (positive comments, appropriate physical contact) at rates parents and therapists deemed to be excessive relative to their peers. One participant (Donny) initially engaged in acceptable levels of the target behavior (appropriate physical contact) that became excessive with the introduction of an independent group differential reinforcement contingency. Although group members were discouraged from openly criticizing the behaviors of their peers, it is noteworthy, that therapists observed participants' peers making disapproving faces and/or questioning their excessive performance of the target responses.

Sessions took place on the clinic playground and at various recreational areas (e.g., football field, gymnasium, soccer field). The order and location of group activities was randomly selected.