

THE EFFECTS OF REINFORCEMENT MAGNITUDE ON
FUNCTIONAL ANALYSIS OUTCOMES

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ABSTRACT

The functional analysis methodology developed by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994) has been successfully used to identify the variables that maintain the problem behavior of individuals with developmental disabilities. However, in some cases, the results of functional analysis may be inconclusive. Altering parameters of reinforcement, such as the schedule, the quality, or magnitude of the reinforcer, may increase the likelihood of obtaining clear functional analysis results. Few studies have evaluated the effects of reinforcement magnitude on problem behavior even though basic findings indicate that this parameter may alter functional analysis outcomes. In fact, reinforcement magnitude has varied widely and appeared to be selected arbitrarily in most studies on functional analysis. In the current study, seven children with autism and/or developmental disabilities who engaged in severe problem behavior were exposed to three separate functional analyses: One with a small (3-s) reinforcement magnitude, one with a medium (20-s) reinforcement magnitude, and one with a large (120-s) reinforcement magnitude. Results of the three functional analyses were compared to determine if a particular reinforcement magnitude should be used to obtain the clearest outcomes. Overall, the same conclusion about the function (s) of each participant's problem behavior was drawn regardless of the reinforcement magnitude. However, the medium reinforcement magnitude is recommended for use during functional analysis.

INTRODUCTION

Assessment and Treatment of Problem Behavior

Problem behavior typically is defined as behavioral excess that is socially significant and warrants complaint by some person. Problem behavior may occur so frequently or intensely in some individuals that lives are endangered or educational progress is hindered. Many individuals with developmental disabilities exhibit some type of problem behavior. For instance, Johnson and Day (1992) reported that 14 % to 59% of individuals with profound or severe levels of mental retardation display self-injurious behavior (SIB).

Despite some evidence supporting the possibility that the problem behavior displayed by individuals with developmental disabilities has a biological determinant, the outcomes of basic and applied studies suggest that most problem behavior is learned (Iwata, Vollmer, & Zarcone, 1990). Problem behavior may be maintained by social-positive reinforcement, social-negative reinforcement, or automatic reinforcement. For example, caregivers often attempt to reduce problem behavior by providing attention (e.g., reprimands or consoling statements) or tangible items (e.g., toys or food) following its occurrence (social-positive reinforcement). In other instances, caregivers will terminate the delivery of instructions or activities following problem behavior (social-negative reinforcement). However, providing an individual with attention, a tangible item, or a break contingent on problem behavior may not decrease the occurrence of the behavior over the long run. Instead, one or more of these consequences may be responsible for maintaining the problem behavior. Finally, some problem behavior is not maintained by social reinforcement but occurs independent of environmental

consequences (automatic reinforcement). The problem behavior may produce some kind of internal sensory stimulation.

Skinner (1953) first used the term functional analysis to describe empirical demonstrations of cause-and-effect relationships between the environment and behavior. Several studies included systematic, empirical examinations of the relationship between an environmental consequence (e.g., attention or escape from demands) and problem behavior (e.g., Carr, Newman, & Binkoff, 1976,1980; Lovaas, Freitag, Gold, & Kassorla, 1965; Lovaas & Simmons, 1969; Pinkston, Reese, LeBlanc, & Baer, 1973; Sailor, Guess, Rutherford, & Baer, 1968; Thomas, Becker, & Armstrong, 1968). However, all of the aforementioned studies only assessed one response-reinforcer relation. The first comprehensive functional analysis of problem behavior, which examined the sensitivity of SIB to positive, negative, and automatic reinforcement concurrently, was developed by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994). The Iwata et al. study included nine children with developmental disabilities who engaged in some topography of SIB. Attention, demand, alone, and control conditions were rapidly alternated in a multielement design. The relevant antecedents (i.e., establishing operations [EOs] and discriminative stimuli [S^D s]) and consequences were manipulated in each condition.

During the attention condition, a therapist was present in the room but pretended to be busy, and the child was provided with low to moderately preferred toys. The therapist withheld attention unless the child engaged in SIB. When SIB occurred, the therapist delivered brief verbal reprimands (e.g., “Stop that, you are going to hurt yourself.”). This condition served as a test for SIB maintained by social-positive reinforcement. During the demand condition, the therapist delivered instructions to the

child using a progressively more intrusive prompting strategy (least-to-most prompting). Demands were continued until the child exhibited SIB, at which point the task materials were removed, and the child was given a brief break. This condition was designed as a test for SIB maintained by social-negative reinforcement.

In the alone condition, the child was left alone in the therapy room without any materials. This condition was a test for SIB maintained by automatic reinforcement, or independent of social consequences. The control condition excluded the antecedents and consequences that were evaluated in the other conditions. The child had access to highly preferred toys and noncontingent attention, and no demands were delivered. In addition, no consequences were provided contingent upon SIB. For six of the nine participants, consistent patterns of responding were demonstrated in which SIB was higher in a particular condition (Iwata et al., 1990). In other words, a functional relationship between a consequence and problem behavior was identified.

The functional analysis methodology developed by Iwata et al. (1982/1994) has been applied to the assessment of SIB, aggression, property destruction, pica, motor disruptions, vocal tics, bizarre vocalizations, elopement, stereotypy, tantrums, mouthing, breath holding, noncompliance, and drug ingestion (Hanley, Iwata, & McCord, 2003; Iwata et al., 1990). Hundreds of replications and extensions of functional analysis have been reported in 34 journals (Hanley et al.). Of the 277 studies reviewed by Hanley et al., 86%, 89%, and 60% of the participants' problem behavior was maintained by social-positive reinforcement, social-negative reinforcement, and automatic reinforcement, respectively.

The functional analysis methodology introduced by Iwata et al. (1982/1994) has allowed clinicians to develop individualized function-based treatments based on reinforcement and extinction, decreasing the need for punishment. A review by Pelios, Tesch, and Axelrod (1999), which examined intervention selection between 1967 and 1997, showed an overall increase in the use of reinforcement-based procedures relative to punishment-based procedures for the treatment of SIB and aggression beginning in the late 1980s. The authors also found that reinforcement-based and punishment-based treatments were equally likely to be selected when a functional analysis was not conducted before treatment. However, when a functional analysis was conducted prior to treatment, researchers and clinicians clearly selected reinforcement-based treatments over punishment.

Nevertheless, the function of problem behavior is not always identified (e.g., Conners, Iwata, Kahng, Hanley, Worsdell, & Thompson, 2000; Hanley et al., 2003; Iwata, Pace, Dorsey, Zarcone, Vollmer, & Smith, 1994; Vollmer, Marcus, Ringdahl, & Roane, 1995). For example, levels of problem behavior may be undifferentiated across conditions if the relevant antecedents and consequences are not manipulated during the functional analysis. Responding also may be undifferentiated due to carryover effects associated with the commonly used multielement design. Finally, uncontrolled variables (e.g., unknown medication changes) may contribute to unclear functional analysis outcomes.

Procedural Variations and Refinements to Functional Analysis

A number of procedural variations and refinements have been made to the functional analysis methodology described by Iwata et al. (1982/1994). Many of the

modifications were made in response to undifferentiated functional analysis results or to information obtained about potential idiosyncratic variables related to problem behavior. Generally, modifications have been made to either the experimental design or to the types of antecedents and consequences evaluated.

Experimental Design Modifications. A reversal design (ABAB) was employed successfully when carryover effects were obtained with the multielement functional analysis (Vollmer, Iwata, Duncan, & Lerman, 1993). Another design, called the “pairwise design,” combined features of both the reversal and multielement designs (Iwata, Duncan, Zarcone, Lerman, and Shore, 1994). In this design, a test condition and a control condition were alternated, similar to the multielement design, but the test conditions were conducted sequentially, as in the reversal design. This design was intended to reduce carryover effects like the reversal design, but it was developed to be less time consuming. For two participants, clear results were obtained with the pairwise method after the multielement method yielded undifferentiated results. Vollmer et al. (1995) developed a four-phase functional analysis that progressed from a brief multielement functional analysis, to an extended multielement functional analysis, to an exclusive alone/ignore condition, and finally to functional analysis utilizing a reversal design. If the assessment method in a phase did not clearly identify the function of problem behavior, the participant advanced to the next phase. The function of problem behavior was identified for 85% of the participants.

Idiosyncratic Variables. The functional analysis developed by Iwata et al. (1982/1994) also has been modified to include other types of antecedents and consequences. Information about these putative functional relations typically was

obtained via parental descriptions or direct observations. For example, Mace, Page, Ivancic, and O'Brien (1986) developed the divided attention condition, which was a variation of the attention condition. During the divided attention condition, the therapist interacted with another individual instead of pretending to work on a task. If the participant engaged in problem behavior, the therapist would then direct attention to the participant for a brief amount of time. Taylor, Sisson, McKelvey, and Trefelner (1993) conducted functional analyses with the typical attention condition and the divided attention condition. Zero or near-zero rates of problem behavior occurred in the attention condition, but high rates of problem behavior occurred in the divided attention condition for one participant.

Day, Rea, Schussler, Larsen, and Johnson (1988) developed another condition to test for social-positive reinforcement. In this condition, tangible items identified as preferred by the participant were offered to the participant's peers at the beginning of the session. Contingent upon problem behavior, the participant was allowed access to the tangible items for 20 s to 30 s. For three participants, the tangible condition was alternated with demand and alone conditions similar to those described by Iwata et al. in a multielement design. The SIB for two participants was identified to be maintained by access to tangible items.

Further studies have looked at idiosyncratic antecedents associated with tangible reinforcement. Fisher, Adelinis, Thompson, Worsdell, and Zarcone (1998) conducted an analogue functional analysis similar to that described by Iwata et al. (1982/1994), but with the addition of a tangible condition for two participants. However, problem behavior was at zero or near zero levels in all conditions. The authors then developed an

“activity” condition based on descriptive data collected in the natural environment. The therapist allowed the participant to engage in a preferred activity prior to the beginning of the session. When the session began, the therapist interrupted the activity with “don’t” or “do” requests. Physical guidance was used if the participant did not comply with the requests. The participant was allowed to resume the activity contingent upon problem behavior. Problem behavior was high for both participants when the termination of “don’t” and symmetrical “do” requests resulted in access to the preferred activity. For one participant, problem behavior was low when the termination of “do” requests did not result in access to a preferred activity. Thus, the authors concluded that both participants’ problem behavior was maintained by positive reinforcement (i.e., termination of the requests resulted in access to activities).

Finally, Bowman, Fisher, Thompson, and Piazza (1997) developed a new condition called the “mand condition” after the function of two participants’ problem behavior was not identified using the conditions described by Iwata et al. (1982/1994). Prior to the mand session, the therapist complied with all of the participant’s requests (e.g., one participant instructed the therapist to sing a song while walking around in circles or to use only even-numbered cards to play a game). Once the session began, the therapist deviated from the requests (e.g., walked in a circle, but did not sing a song) until the participant engaged in problem behavior. When the mand condition was alternated with a control condition (i.e., the therapist complied with all mands), it was clear that both participants’ problem behavior was maintained by therapist compliance to mands.

Parameters of Reinforcement

In addition to modifying the types of antecedents and consequences manipulated in the functional analysis, altering other parameters of reinforcement, such as the schedule, the quality, or magnitude of the reinforcer, also may increase the likelihood of obtaining clear functional analysis results. However, little research has been conducted on the effects of these parameters on problem behavior.

Schedule. A continuous reinforcement schedule, or fixed ratio (FR 1) schedule, typically is used when testing putative reinforcement contingencies during functional analysis. Only one study has examined the effects of schedule on problem behavior. Lovaas et al. (1965) compared the effects of an FR 1 schedule of attention versus an intermittent schedule of attention [variable-ratio (VR) 5] on SIB. Higher rates of SIB occurred under the intermittent schedule. This finding appears to suggest that an intermittent schedule should be used during functional analysis to increase the likelihood of obtaining clear results. However, the higher rates of problem behavior that are associated with intermittent schedules of reinforcement may be unnecessary or unsafe, and intermittent schedules may make problem behavior more resistant to extinction during treatment (Iwata et al., 1990).

Quality. A number of studies have focused on the type or quality of attention provided for problem behavior. For example, problem behavior was demonstrated to be maintained by attention from peers but not by attention from adults in several studies (e.g., Broussard & Northup, 1997; Lewis & Sugai, 1996; Northup, Broussard, Jones, George, Vollmer, & Herring, 1995). Fisher, Ninness, Piazza, and Owen-DeSchryver (1996) conducted a functional analysis as described by Iwata et al. (1982/1994) and then

compared the effects of two attention conditions (one in which the therapist delivered verbal reprimands for problem behavior, and one in which the therapist delivered random statements) on one participant's problem behavior. The results indicated that the participant's problem behavior was more sensitive to attention in the form of verbal reprimands than to random statements. These results also suggest that if the correct form of attention is not used during functional analysis, the reinforcer may appear to be irrelevant to the behavior.

Magnitude. The duration or magnitude of the reinforcer also may be an important parameter. However, only one study has investigated the extent to which this variable can influence the results of functional analysis. Fisher, Piazza, and Chiang (1996) compared the results of two separate functional analyses. In one functional analysis, unequal reinforcement durations were used (i.e., attention was delivered for 5 s and all other potential reinforcers were delivered for 30 s). In the other functional analysis, equal durations of reinforcement were used (i.e., all potential reinforcers were delivered for 30 s). Results of the functional analysis with unequal reinforcement duration suggested that the participant's problem behavior was maintained by attention only. However, rates of problem behavior were similar across all test conditions with equal reinforcement duration. The authors hypothesized that levels of problem behavior were much higher in the attention condition when reinforcer duration was unequal (i.e., when attention was delivered for only 5 s) because the EO was present more often, and not because attention was more potent than the other tested consequences.

The duration of reinforcement used in functional analyses has varied widely and appeared to be selected arbitrarily in most studies. For example, a brief reinforcement

duration (i.e., 5 s) was used during the attention condition in Iwata et al. (1982/1994), whereas 20 s or 30 s of attention has been used in other studies (e.g., Hoch, McComas, Thompson, & Paone, 2002). Day et al. (1988) varied the reinforcement duration during the tangible condition from 10 s to 30 s. In Connors et al. (2000), the duration of escape in the demand condition varied across participants. For some participants, demands were delivered continuously until a target behavior occurred, at which time a 30-s break was provided. For other participants, demand trials were initiated on a fixed-time (FT) 30-s schedule regardless of problem behavior. That is, problem behavior terminated a demand trial but did not influence the scheduled delivery of the next demand trial. This resulted in various reinforcement durations depending on when the target behavior occurred during the demand trial. For example, if a target behavior occurred 15 s after a new demand was issued, the duration of reinforcement was 15 s. If it occurred 20 s following a new demand, the duration of reinforcement was 10 s. Lengthier reinforcement durations also have been used during functional analyses. For example, Piazza, Hanley, Bowman, Ruyter, Lindauer, and Saiontz (1997) provided 40-s access to reinforcement during all test conditions of a functional analysis of elopement. In a functional analysis of behavior during transitions, McCord and Thomson (2001) sometimes provided the potential reinforcers for up to 2 min.

Brief reinforcement durations typically have been used so that the behavior can contact the consequence repeatedly in a relatively short session. However, it is possible that the functions of problem behavior have not been identified in some cases because the reinforcement magnitudes used during functional analyses were not sufficient to maintain problem behavior. On the other hand, large magnitudes may result in low rates of

behavior due to satiation. Rates of problem behavior must be noticeably and consistently higher in a test condition relative to the control condition to identify a functional relation. Thus, it may be very important to evaluate the effects of reinforcement magnitude on responding. Although few applied studies have been conducted in this area, a large number of basic studies have examined the effects of reinforcement magnitude on rate of responding.

Results of basic research indicate that reinforcement magnitude does influence responding. However, the results have been inconsistent. Some studies found that the rate of responding increased as reinforcement magnitude increased (e.g., Hutt, 1954; Jenkins & Clayton, 1949; Reed, 1991; Reed & Wright, 1988; Stebbins, Mead, & Martin, 1959). For example, in Jenkins and Clayton, pigeons received food contingent on key pecking. Each pigeon was exposed to two reinforcement magnitudes (i.e., a 2-s eating time and a 5-s eating time). For four of five pigeons, key pecking was consistently higher when followed by the 5-s magnitude. Stebbins et al. varied the concentration of a sucrose solution (5%, 12.7%, 32%, and 50 %) as reinforcement for bar presses under a fixed interval (FI) 2-min schedule. For both participants, bar pressing increased as a function of the increase in the concentration of sucrose solution (most noticeably, from 32% to 50%).

Other studies found that rate of responding decreased as reinforcement magnitude was increased (e.g., Belke, 1997; Lowe, Davey, & Harzem, 1974; Premack, Schaeffer, & Hundt, 1964; Reed, 1991; Staddon, 1970). For example, Staddon exposed pigeons to five durations of food access (i.e., 1.3 s, 2.4 s, 3.5 s, 5.7 s, and 9 s) using an FI 60-s schedule for key pecking. For all participants, responding decreased as food duration increased.

Belke provided rats with time to run on a wheel contingent upon lever presses. Each participant was exposed to three different durations of reinforcement (i.e., 30 s, 60 s, and 120 s of wheel running). Results indicated that lever pressing decreased as reinforcement duration increased. Belke suggested that the observed changes in lever pressing could have been the result of satiation.

It is difficult to reconcile these conflicting findings because different procedures and different forms of reinforcement were used. One possibility is that reinforcement magnitude has a nonmonotonic relationship with behavior. That is, if reinforcement is too small, it may not be potent enough to maintain sufficient levels of responding. If too much reinforcement is provided in a short amount of time, satiation effects may occur rapidly. The relationship between reinforcement magnitude and response rate may also depend on the type of reinforcement used. In basic studies, reinforcers were very different than those typically evaluated during functional analysis (i.e., food versus attention or escape). Thus, further applied research is needed.

PURPOSE

The effects of altering some parameters of reinforcement (e.g., schedule or type/quality) during functional analysis have been evaluated. However, few studies have focused on magnitude of reinforcement even though basic findings indicate that this parameter may be very important to consider when designing functional analysis procedures. The duration of reinforcement has varied from 5 s to 120 s within and across studies on functional analysis and appeared to be selected arbitrarily. It is possible that the functions of problem behavior have not been identified in some cases because responding either (a) rapidly extinguished due to insufficient magnitudes of reinforcement or (b) rapidly decreased due to satiation effects associated with large magnitudes of reinforcement. Rates of problem behavior must be noticeably and consistently higher in a test condition relative to the control condition to identify a functional relation. Thus, it may be very important to evaluate the effects of reinforcement magnitude on responding. Further research on the effects of this parameter may help advance the current technology of functional analysis.

The purpose of the current investigation was to examine the impact of reinforcement magnitude on the results of functional analyses. In doing so, the possible role of satiation and extinction during functional analyses was examined. Would a very small reinforcement magnitude fail to maintain behavior (i.e., produce extinction)? Would a large reinforcement magnitude result in decreased rates of problem behavior (i.e., satiation)?

For each participant, three functional analyses were conducted: One with a small reinforcement magnitude (i.e., 3-s access to the potential reinforcers), one with a medium

reinforcement magnitude (i.e., 20-s access to the potential reinforcers), and one with a large reinforcement magnitude (120-s access to the potential reinforcers).

Results of the current study should indicate whether reinforcement magnitude can affect the outcomes of functional analyses. If magnitude does appear to influence functional analysis outcomes, and the nature of this relationship is consistent across participants (qualitatively and quantitatively), results may reveal the ideal reinforcement magnitudes for use during each condition of the functional analysis. However, if the results are relatively idiosyncratic across participants (i.e., the form or the relationship is not consistent for the value used), this finding would suggest that the magnitude of reinforcement should be increased or decreased on an individual basis when clear functional analysis results are not obtained.

On the other hand, results of the current study may indicate that reinforcement magnitude does not influence the results of functional analyses. This finding also would be important because it would indicate that any magnitude is acceptable to use. Thus, this parameter can be selected on the basis of other considerations (e.g., ease, efficiency). Research that identifies variables that do and do not influence assessment outcomes is important to the field. When the effects of a variable on assessment outcomes are known, time and energy can be spent investigating the effects of other factors.

METHOD

Participants and Settings

Seven children diagnosed with autism and/or moderate to severe developmental disabilities participated in the study. These were the first seven children referred to the Louisiana State University School Psychology Program for the assessment and treatment of self-injurious, aggressive, or disruptive behavior after the inception of the study. No other children participated. Six of the seven children were blind or diagnosed with visual impairment (Tyler had normal vision), five of whom attended a special school for the visually impaired. The remaining two children attended self-contained classrooms for students with developmental disabilities in regular public schools. Meadow was a 7-year-old girl who exhibited aggression (hitting, grabbing, and scratching). Nick was a 6-year-old boy who exhibited disruption, aggression (biting), and SIB (head hitting). Tony was a 4-year-old boy who exhibited SIB (head hitting and head banging). Mathew was a 3-year-old boy who engaged in aggression (hitting, grabbing, pinching, and biting). Max was a 7-year-old boy who engaged in SIB (head hitting, head banging, and face or body scratching) and aggression (hitting, grabbing, scratching, and kicking). Adel was a 9-year-old girl who engaged in SIB (hand biting) and whining. Rose was a 9-year-old girl who exhibited aggression (grabbing, hitting, kicking, and biting). Adel spoke in full sentences and answer simple questions. Nick and Rose mainly used one- to two word utterances to communicate and engaged in delayed echolalia. Tyler communicated by pulling people towards objects or pointing. Meadow, Tony, and Max did not have any expressive language skills. All of the participants except Meadow and Tony followed one-step instructions. All participants had limited self-help skills.

A doctoral student collected initial information about possible functions of each child's behavior by interviewing parents/teachers and observing the child in the classroom. Doctoral students served as therapists during all functional analysis conditions. The functional analyses were conducted at each participant's school but in a room other than the classroom (a student lounge at the school for the visually impaired and the cafeteria or small storage room at the public school). The lounge contained a dining room table, chairs, a game table, a desk, and two couches. Sessions were typically conducted toward the center of the room using only two chairs or at the table. The cafeteria contained several long tables and chairs. Two or three of the tables were pushed against the wall to block off a square-shaped area. Two chairs were placed within this area. The storage room contained a classroom desk and chairs. Sessions were conducted four to five days a week and three to four sessions were conducted per day.

Response Measurement, Reliability, and Procedural Integrity

Hitting (Meadow, Tyler, Max, and Rose) was defined as forceful contact of an open or closed hand with another person's body. *Grabbing* (Meadow, Tyler, Max, and Rose) was defined as wrapping the fingers tightly around another person's body part or clothing. *Scratching* (Meadow and Max) was defined as scraping the fingernails across another person's skin. *Disruption* (Nick) was defined as throwing objects. *Biting* (Nick, Tyler, and Rose) was defined as closure of the teeth against another person's body. *Head hitting* (Nick, Tony, and Max) was defined as forceful contact between an open or closed hand and the head. *Head banging* (Tony and Max) was defined as forceful contact between the head and hard surfaces. *Pinching* (Tyler) was defined as tightly squeezing another person's skin between two fingers. *Face/body scratching* (Max) was defined as

scraping of the fingernails across the skin on the face or body. *Kicking* (Max and Rose) was defined as striking another person with the foot. *Hand biting* (Adel) was defined as the teeth closing against the skin on the hand or wrist. *Whining* (Adel) was defined as louder than normal conversational level grunts, high-pitched screams, or saying “no.”

Previously trained graduate or undergraduate students served as observers. The frequency of each participant’s target behavior was recorded on laptop computers. Data on the target behavior were converted to a rate measure for each session by dividing the number of responses that occurred during the session by the number of minutes in the session. Reinforcer access time was not removed from the total session time prior to data calculation (see further discussion below).

Interobserver agreement was assessed by having a second data collector score behavior simultaneously but independently during a mean of 53% of the sessions (range, 32% to 76%) for each child. Interobserver agreement was determined by dividing each session into consecutive 10-s intervals and comparing the data of the two observers. Agreements were defined as the same number of responses scored within a 10-s interval. Agreement coefficients were calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. Across participants, mean interobserver agreement of problem behavior was 94% (range, 85% to 100%).

Data also were collected on therapist behavior using frequency and duration recording in order to evaluate the extent to which the potential reinforcers were delivered with integrity during each functional analysis. During the demand condition, *escape* was defined as the period of time in which the therapist removed the demands materials, no longer delivered instructions, and turned away from the participant. During the attention

condition, *attention delivery* was defined as the period of time in which the therapist directed verbal and physical interaction (e.g., reprimands and other statements of concern) toward the participant. During the tangible condition, *tangible delivery* was defined as the period of time in which the therapist provided the participant with preferred items. For each session, the length of each reinforcement interval was examined to determine the degree of agreement between the interval length specified by the condition and the actual length arranged by the therapist. For an agreement to be scored, the length of the reinforcement interval had to fall within a specific range depending on the reinforcement magnitude. During the small magnitude functional analysis, an agreement was scored if the potential reinforcer was delivered between 1 s and 8 s. During the medium magnitude functional analysis, an agreement was scored if the potential reinforcer was delivered between 15 s and 25 s. During the large magnitude functional analysis, an agreement was scored if the potential reinforcer was delivered between 110 s and 130 s. For each session, integrity of the relevant consequence was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. Across participants, mean integrity of reinforcer delivery was 90% (range, 80 % to 96%).

Procedures

Each participant was exposed to functional analyses with conditions that incorporated small magnitudes, medium magnitudes, and large magnitudes of reinforcement. Thus, each participant was exposed to three separate functional analyses. The most commonly used duration of reinforcement was selected as the medium value (i.e., 20 s) so that it could be compared to smaller and larger values. The smallest,

practically possible value (3 s) was chosen for the small value. This value was approximately six times smaller than the medium value. Thus, a proportionally larger value (120 s) was chosen for the large magnitude.

Prior to conducting the functional analyses, preference assessments were conducted for each participant to identify highly preferred toys (and edibles for Tyler) for the toy play and tangible conditions and low to moderately preferred toys for the attention condition. For Meadow, Tony, Tyler, and Adel, a paired-choice preference assessment was conducted using procedures similar to those described by Fisher et al., (1992). For the children who were blind, the therapist briefly placed their hands on each toy and then on the table between the two items before delivering the instruction, “Pick one” (Paclawskyj & Vollmer, 1995). For Nick, Max, and Rose, a preference assessment similar to that described by Deleon, Iwata, Conners, and Wallace (1999) was used because these three participants did not choose between two items presented to them. Each potential reinforcer was presented one at a time for 2 min. The duration of item interaction and frequency of problem behavior were scored. The items associated with the longest durations of interaction and the lowest amounts of problem behavior were considered the most preferred.

Attention, demand, no interaction, and toy play conditions were alternated in a multielement design for each functional analysis. A tangible condition was included if direct observation in the classroom or teacher or caregiver report indicated that the removal or restriction of tangible items and access to these items may have been related to the child’s problem behavior. A no interaction condition was not included if the

participant's only problem behavior was aggression. The procedures in each functional analysis condition were similar to those described by Iwata et al. (1982/1994).

All sessions were 10 min. As such, the proportion of the session in which the reinforcer was present (e.g., the therapist was delivering attention to the participant; no demands were delivered) varied across the different magnitudes. Because problem behavior may be less likely to occur while the functional reinforcer is being delivered, overall levels of problem behavior may necessarily be lower under large reinforcement magnitudes than under smaller magnitudes for this reason alone (Fisher, Piazza, & Chiang, 1996; Roane, Lerman, Kelley, & Van Camp, 1999). However, this is one important factor that may influence functional analysis outcomes and, thus, should be evaluated when studying the effects of reinforcement magnitude. Furthermore, in most studies on functional analysis, total session time included reinforcer access time when implementing the procedures and when analyzing the data. Thus, it made sense to conduct the functional analyses in this manner rather than to exclude the reinforcement intervals from the session time.

During the initial functional analysis phase (when the first reinforcement magnitude was evaluated), sessions continued until clear results were obtained or until results were undifferentiated across 10 sessions in each condition, whichever came first. The length of the remaining functional analyses were matched to the initial functional analysis unless clear results were obtained in fewer sessions and no trends were apparent.

Small Reinforcement Magnitude (3 s). During the attention condition, the therapist provided the participant with moderately preferred toys and then engaged in an activity (e.g., read a magazine). Contingent upon the occurrence of a target behavior, the

therapist delivered verbal reprimands for 3 s (e.g., “Don’t do that, you are going to hurt yourself.”). All other behavior displayed by the participant was ignored.

Prior to the tangible condition, the participant was provided with 1 min to 2 min of access to a preferred item. At the beginning of the session, the therapist restricted access to that preferred item. Contingent upon the occurrence of a target behavior, the participant received 3-s access to the preferred item after which the item was removed until another target behavior occurred. All other behavior displayed by the participant was ignored. The tangible condition was included in the functional analyses for Nick, Tony, Tyler, Max, and Rose. A koosh ball and a massager were used for Tony; goldfish were used for Tyler; a keyboard and a radio were used for Max; and a comb and hair tie were used for Rose during these sessions. For Nick, an informal preference assessment was conducted every few days, because his preferences appeared to change frequently. Several items were presented to Nick one at a time for a brief period, and the items that he held and did not throw were considered preferred. Thus, a variety of toys were rotated (e.g., slinky, feather boa, massager, beads, koosh ball) throughout the tangible condition but the same items were used across all functional analyses.

During the demand condition, instructions were presented to the participant using a graduated prompting sequence (i.e., verbal, gestural, and physical prompts). Contingent upon compliance, the participant received brief verbal praise (e.g., “good job”). If at any point the participant engaged in a target behavior, the participant was provided with a 3-s break. That is, the task materials were removed and the therapist turned away from the participant for 3 s. All of the participant’s behavior was ignored during the reinforcement interval.

During the no interaction condition, no materials were available, and only the observers were present in the room. The observers did not interact with the participant.

During the toy play condition, the participant was provided with continuous, noncontingent attention and highly preferred items throughout the session. In addition, no demands were placed on the participant. There were no programmed consequences for the target behavior.

Medium Reinforcement Magnitude (20 s). All of the conditions were identical to those described above except that the participant received 20-s access to the potential reinforcers.

Large Reinforcement Magnitude (120 s). All of the conditions were identical to those described above except that the participant received 120-s access to the potential reinforcers.

Experimental Design

For each functional analysis, the conditions were alternated within a multielement design. The first reinforcement magnitude evaluated was varied across participants to identify possible sequence effects. Two participants were first exposed to the small reinforcement magnitude, three participants were first exposed to the medium reinforcement magnitude, and two participants were first exposed to the large reinforcement magnitude. The order in which the participants were exposed to the two remaining reinforcement magnitudes also was varied across participants. The magnitudes were presented in ascending order (small/medium/large) for two participants (Tyler and Adel) and in descending order (large/medium/small) for two participants (Max and Rose). For the three remaining participants, the medium magnitude was either

followed by the small magnitude and then the large magnitude (Nick and Tony) or vice versa (Meadow).

RESULTS

Results of the functional analyses are shown in the table and in Figures 1 through 6. The mean rate of problem behavior in each condition under each reinforcement magnitude is displayed in the table for all participants. Session-by-session data are displayed in Figures 1 through 6. Overall, reinforcement magnitude did not influence the outcomes of the functional analyses. In other words, the same conclusion about the function(s) of each participant's problem behavior was drawn regardless of the reinforcement magnitude.

For Meadow (Figure 1, top panel), the highest rates of aggression occurred in the attention condition of each functional analysis. In fact, the rates during the attention condition were similarly high and variable across each magnitude (see table 1). These results indicated that Meadow's aggression was maintained by social positive reinforcement in the form of attention. In addition, the effects of contingent attention appeared to carry over into the no interaction condition during the large magnitude functional analysis, but not during the medium and small functional analyses (as reflected by the differential levels of aggression during the no interaction sessions). However, this potential interaction between magnitude and carry over effects was not further examined by replicating one or more of the functional analyses.

Results for Nick are shown in the bottom panel of Figure 1 and in the table. Levels of problem behavior were highest in the demand condition across all three reinforcement magnitudes, indicating that disruption, aggression, and SIB were maintained by social negative reinforcement in the form of escape from demands. In

Table 1
Mean Rate of Problem Behavior Per Condition for Each Reinforcement Magnitude

Participant and Magnitude	Functional Analysis Conditions				
	Toy Play	Demand	Attention	Tangible	No Interaction
Meadow					
3-s	2.5	.7	17.3	n/a	4.1
20-s	2.7	.7	20.8	n/a	5.4
2-min	1.8	1.2	21.1	n/a	13.2
Nick					
3-s	.27	7.58	.14	0	0
20-s	.04	1.47	.08	.02	0
2-min	.02	.5	.18	0	0
Tony					
3-s	0	5.92	.54	4.9	.7
20-s	0	3.26	0	1.28	.05
2-min	0	1.57	.45	1.2	.07
Tyler					
3-s	.06	.13	.05	.78	n/a
20-s	.19	.43	.11	1.19	n/a
2-min	.22	.33	.10	.48	n/a
Max					
3-s	0	1.3	.06	.33	.18
20-s	0	1.53	0	.03	.03
2-min	0	.75	.03	.05	.08
Adel					
3-s	.03	4.83	0	n/a	0
20-s	0	1.88	0	n/a	0
2-min	0	.5	0	n/a	0
Rose					
3-s	0	0	.03	.03	n/a
20-s	0	0	0	0	n/a
2-min	0	.04	0	.18	n/a

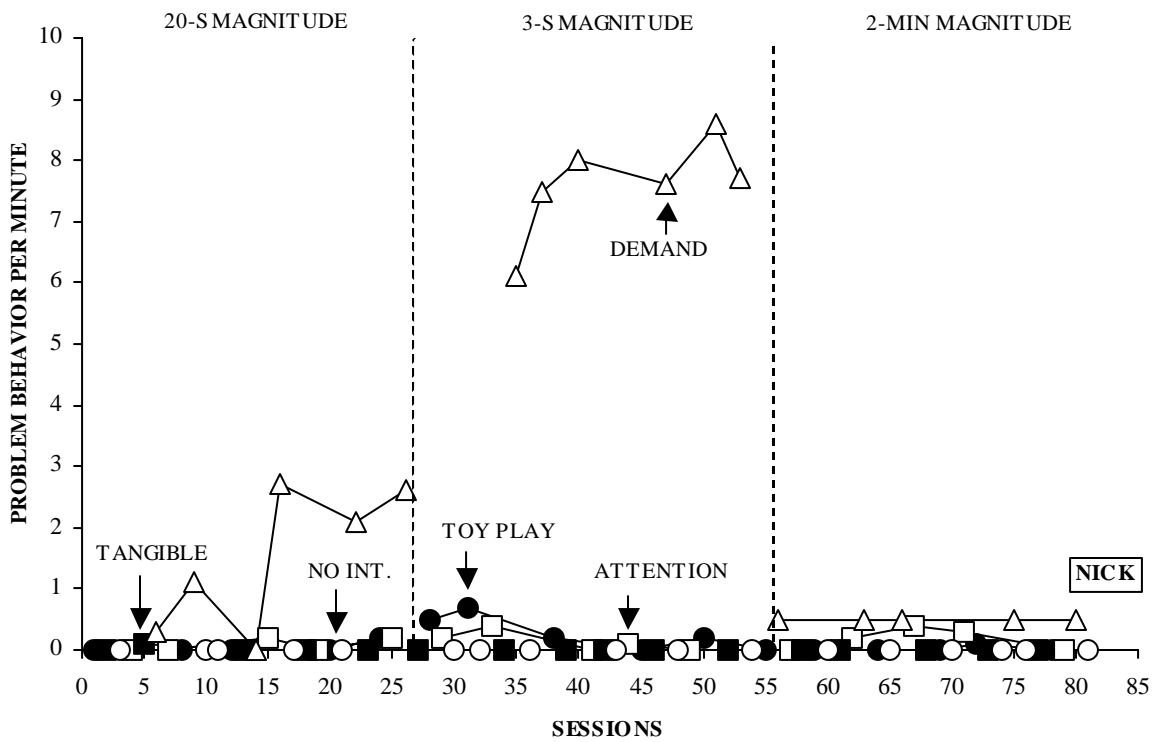
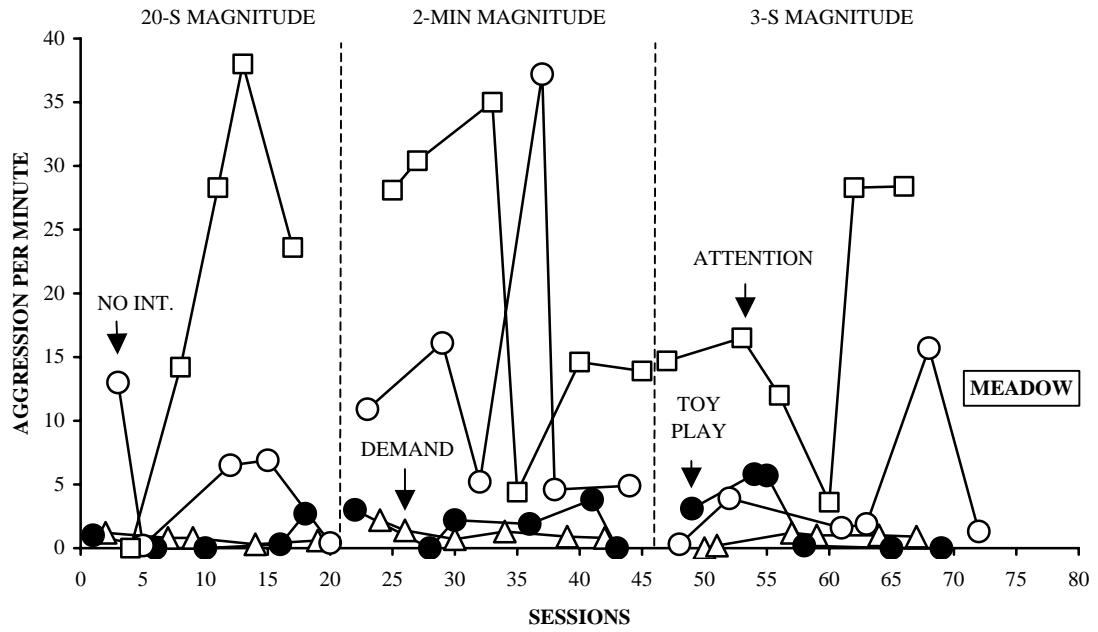


Figure 1. Aggression per minute for Meadow (top panel) and problem behavior per minute for Nick (bottom panel) during all magnitude functional analyses.

addition, rates of problem behavior in the demand condition were substantially higher during the small magnitude functional analysis ($M = 7.6$) than during the medium and large magnitude analyses ($M = 1.5$ and $M = .5$, respectively), as shown in the table. This may have occurred because a larger proportion of the session contained the relevant EO for escape-maintained behavior during the small magnitude sessions (i.e., demands were presently more frequently).

As shown in the top panel of Figure 2 and in the table, rates of SIB for Tony were highest in the tangible condition and the demand condition, regardless of the reinforcement magnitude. However, responding during the large magnitude analysis seemed less differentiated across conditions. This may have been an artifact of the data display, because overall response rates were lower in the large magnitude functional analysis than in the other functional analyses (i.e., the data appeared to be compressed by the y-axis scale used). Thus, results for only the large magnitude functional analysis are presented in the bottom panel of the figure with the y-axis scale adjusted to accommodate the lower response rates. As shown in the bottom panel, rates of SIB were highest in the demand and tangible conditions. These results indicated that his behavior was maintained by social positive reinforcement in the form of access to tangibles and by negative reinforcement in the form of escape from instructions. Interestingly, the highest and most variable rates of SIB occurred during the small magnitude functional analysis, a pattern that is consistent with extinction effects. It is possible that responding would have extinguished if this functional analysis had continued.

Results for Tyler are shown in Figure 3 and in the table. Data from the large magnitude functional analysis also are presented in the bottom panel of the figure with

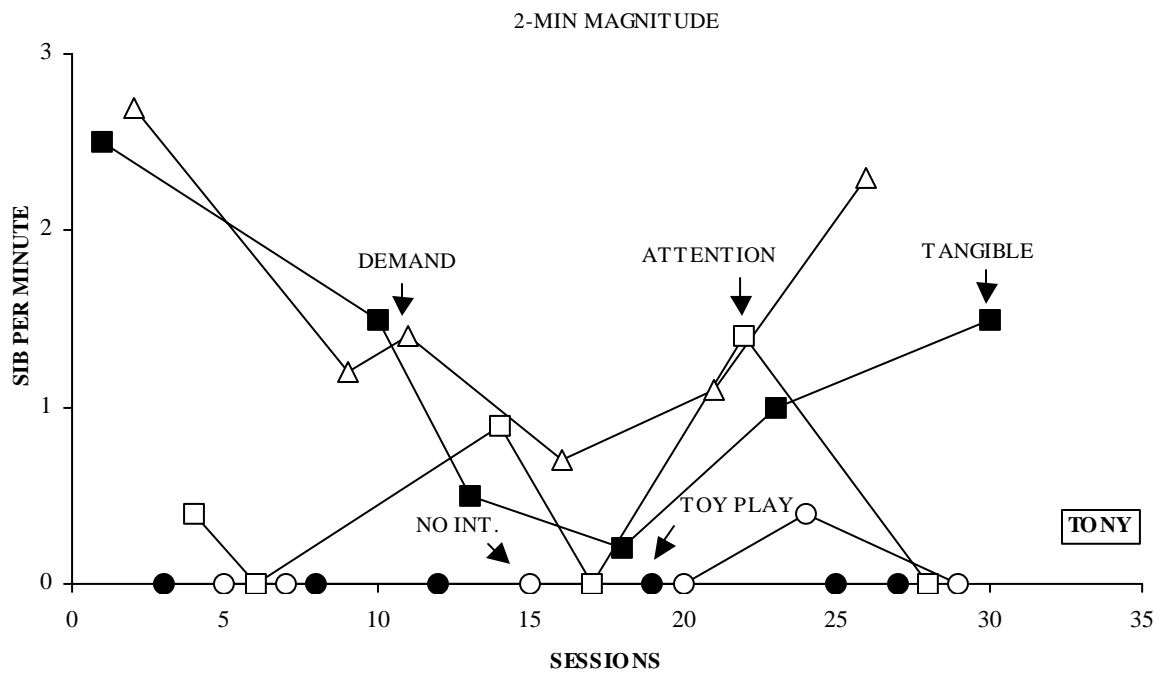
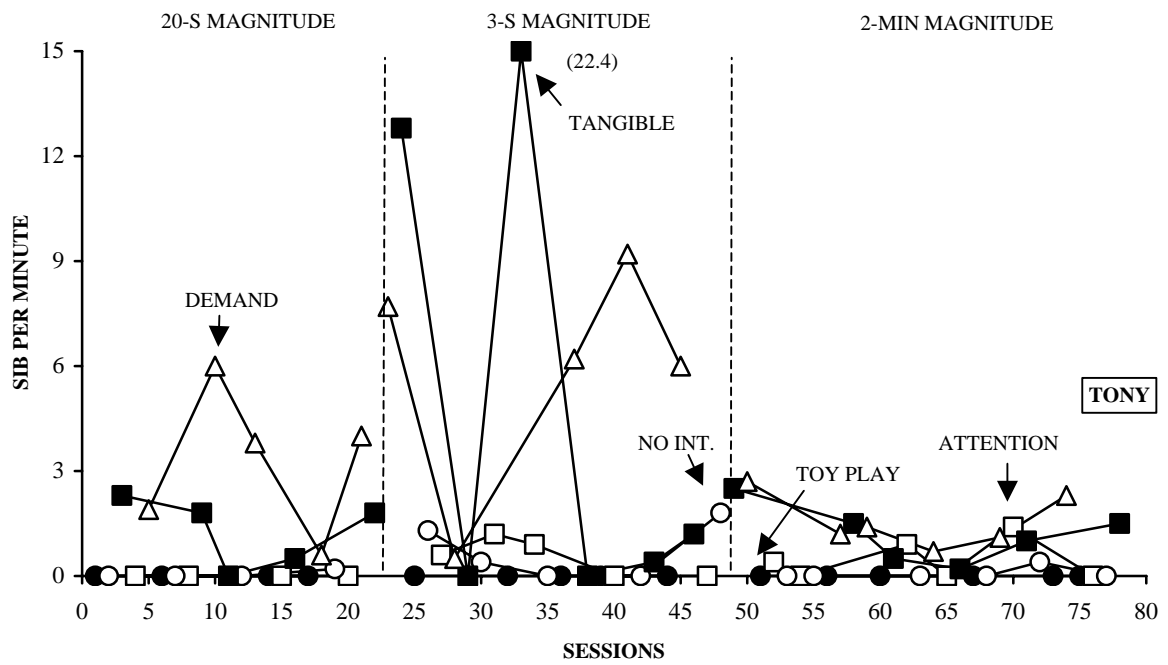


Figure 2. SIB per minute for Tony during all magnitude functional analyses (top panel) and during the large magnitude functional analysis (bottom panel).

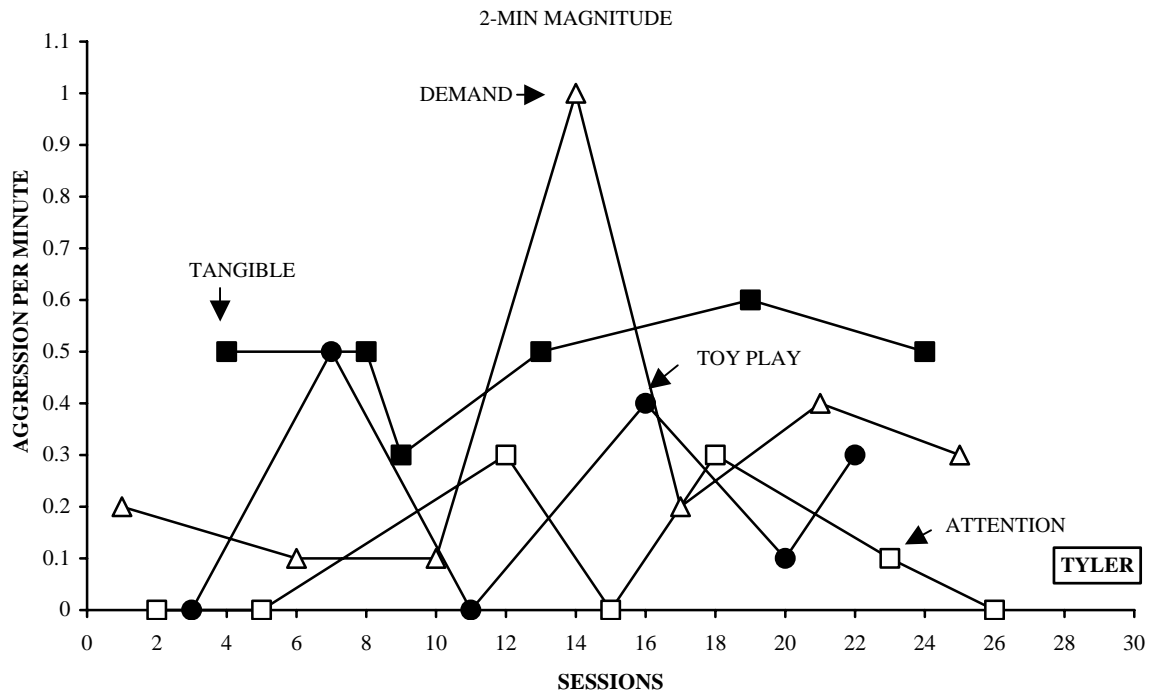
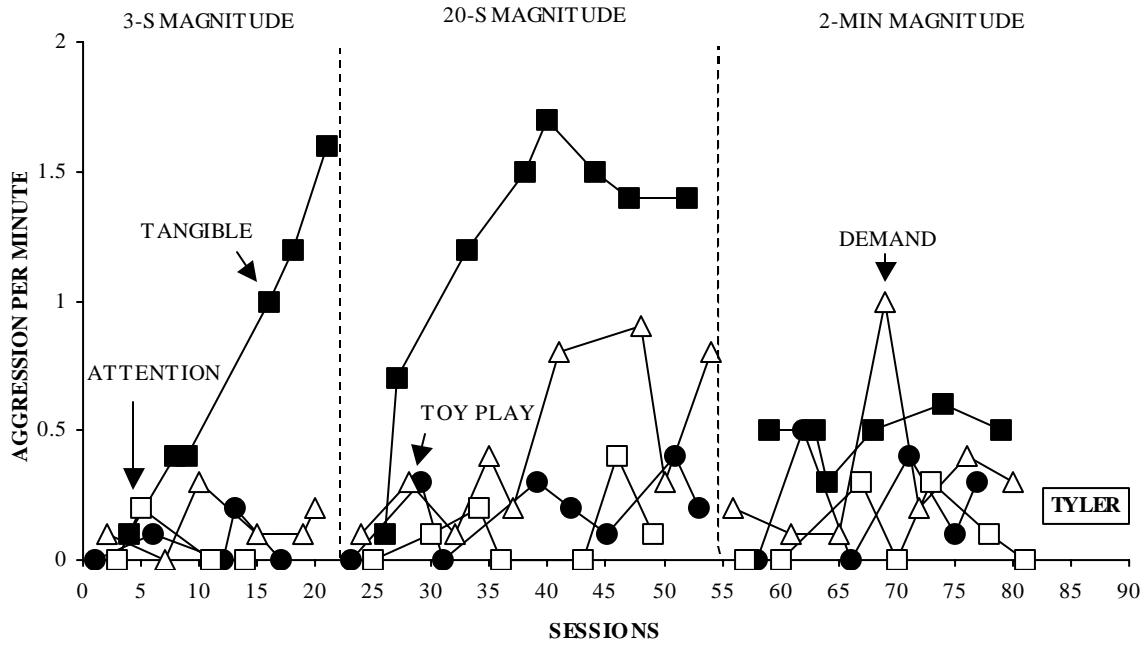


Figure 3. Aggression per minute for Tyler during all magnitude functional analyses (top panel) and during the large magnitude functional analysis (bottom panel).

the y-axis scale adjusted to accommodate the lower rates of responding associated with this magnitude. Overall rates of aggression were highest during the tangible condition of each functional analysis, suggesting that his behavior was maintained by social-positive reinforcement in the form of access to food. Levels of aggression in the tangible condition were more clearly differentiated from those in the other conditions when the small and medium magnitudes were used. An increasing trend in the level of aggression was observed during the demand condition of the medium magnitude functional analysis, so sessions were continued beyond the length of the first functional analysis (with the small magnitude). Levels of aggression in the demand condition were most clearly differentiated from those in the toy play and attention conditions during the medium magnitude functional analysis when compared to those in the small and large magnitude functional analyses. Thus, although results of the medium magnitude functional analysis indicated that aggression was also maintained by escape from demands, this additional function was less evident in the small and large magnitude functional analyses.

Results for Max are shown in Figure 4 and in the table. Rates of SIB and aggression were highest during the demand condition, regardless of the reinforcement magnitude. This finding indicates that his problem behavior was maintained by escape from demands. Rates of problem behavior were most variable during the small magnitude functional analysis. It should be noted that the small reinforcement magnitude functional analysis was restarted following a month-long absence from school (due to illness). Prior to his absences, rates of problem behavior in the demand condition of the small magnitude functional analysis (data not shown) were much higher than those in the demand condition of the restarted analysis.

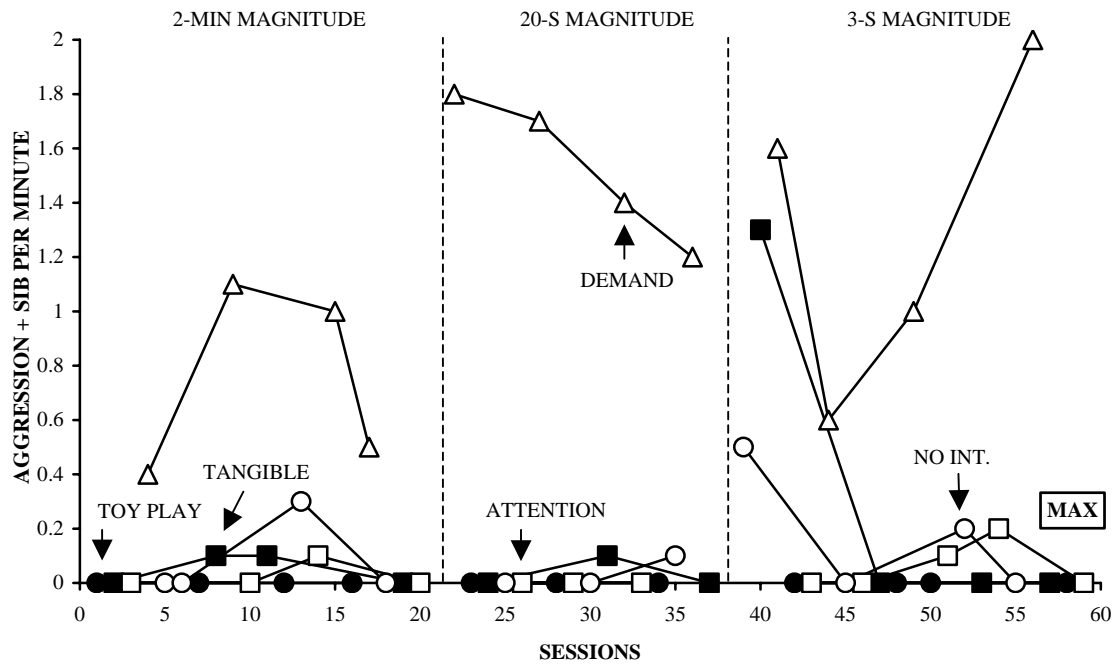


Figure 4. Aggression and SIB per minute for Max during all magnitude functional analyses.

Results for Adel are shown in Figure 5 and in the table. Across all functional analyses, the rates of Adel’s problem behavior were highest in the demand condition, indicating that SIB and whining were maintained by escape from demands (see top panel of the figure). Responding in this condition was substantially higher during the small magnitude functional analysis relative to the medium and large functional analyses (see table). Interestingly, as shown in the bottom panel of the figure, SIB only occurred during the small magnitude functional analysis.

As shown in Figure 6 and in the table, results for Rose were inconclusive across all functional analyses. Aggression initially occurred in the demand and tangible conditions of the first functional analysis (large magnitude) but rapidly decreased to zero. Aggression remained at or near zero levels throughout the medium and small magnitude functional analyses.

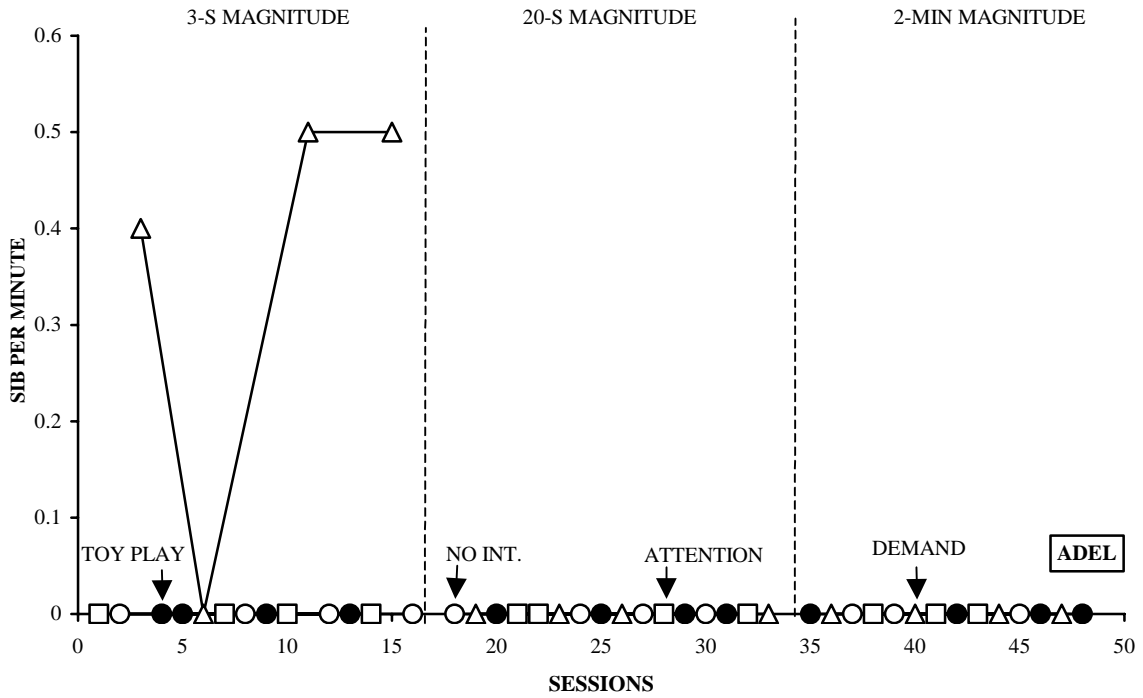
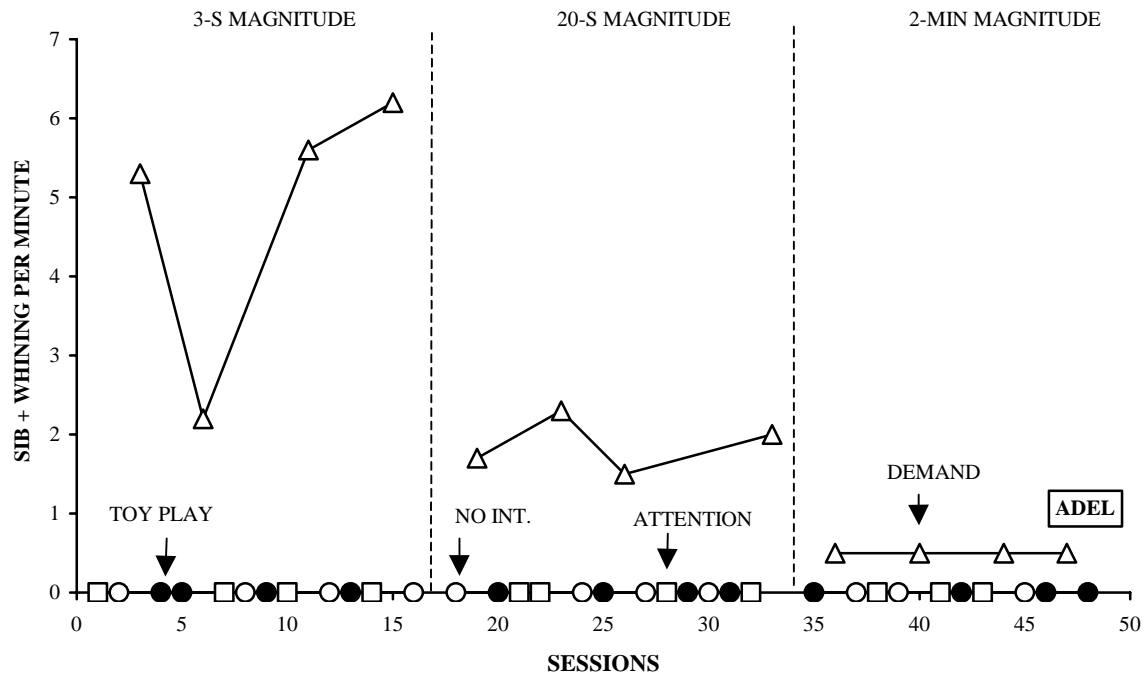


Figure 5. SIB and whining per minute for Adel during all magnitude functional analyses (top panel) and SIB per minute for Adel during all magnitude functional analyses (bottom panel).

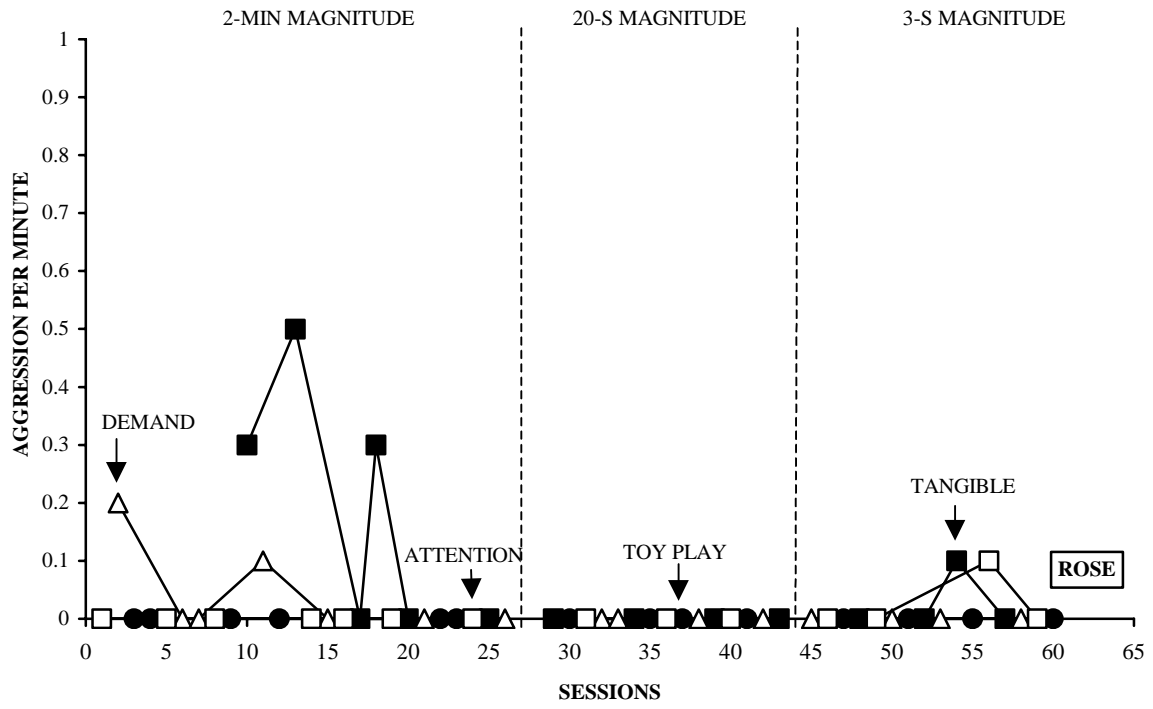


Figure 6. Aggression per minute for Rose during all magnitude functional analyses.

DISCUSSION

Summary of Findings

With the exception of one participant (Tyler), the same maintaining variables were identified across all reinforcement magnitudes for each participant's problem behavior. For one participant (Rose), the results of all magnitude functional analyses were inconclusive. Social functions (i.e., escape, access to tangibles in the form of food and toys, and access to attention) were identified in every case in which functional analysis outcomes were conclusive, and the most predominant function was escape from demands. Clear results were obtained fairly rapidly for these participants. Thus, each functional analysis was relatively brief (between 14 and 32 sessions).

Although results of basic research indicated that reinforcement magnitude may be an important variable to consider during functional analyses, these results suggested that reinforcement magnitude was not a direct determinant of functional analysis outcomes. This finding suggests that it is acceptable for clinicians and researchers to use a wide range of reinforcement magnitudes when conducting functional analyses. Thus, the specific magnitudes can be selected based on other concerns (e.g., ease, efficiency).

Patterns of behavior that would have indicated extinction effects -- initial high rates of responding followed by a gradual decline in rates of responding -- did not emerge under the smaller reinforcement magnitudes (3 s and 20 s). However, the functional analyses were relatively brief, and responding may have been in the process of extinguishing. If so, within-session patterns might reveal extinction effects that were obscured by examining overall response rates in each session. For example, responding may have been initially high at the start of each session (and perhaps even elevated due to

an extinction burst) and then decreased as the session progressed. This type of response pattern would provide tentative evidence that extinction was taking place.

Thus, minute-by-minute data on problem behavior across sessions of each functional analysis condition were examined for the participants. No obvious or consistent within-session patterns of extinction were found for any participant. For Adel, however, SIB only occurred during the small magnitude functional analysis (see bottom panel of Figure 5), and within-sessions patterns were consistent with extinction effects. When these sessions began, Adel engaged in whining only; however, her behavior often would escalate to SIB as the sessions progressed. Anecdotally, the intensity of whining and SIB appeared to increase within session, which is characteristic of an extinction burst. This possibility could have been evaluated further by extending the length of the small magnitude analysis to determine if responding would have eventually decreased, or by replicating the small magnitude functional analysis following the medium and large magnitude analyses.

It should be noted that the rapid decrease in Rose's problem behavior across sessions of the large magnitude functional analysis also was consistent with extinction effects. A functional analysis with an even larger reinforcement magnitude (e.g., 5 min) could have been implemented to evaluate the possible role of extinction in this case.

Within-session patterns of responding that would have indicated satiation effects - a gradual decline in responding across each session -- also were examined for the large reinforcement magnitude functional analyses. No obvious within-session patterns of satiation were observed for any participant. It is possible that satiation effects did not influence overall responding for most participants because the session lengths were brief.

Although satiation effects may have occurred with Rose during the large magnitude analysis (her first functional analysis), aggression never reemerged during the smaller magnitude analyses. Furthermore, it seems unlikely that satiation effects would carry over from one test session to the next (see further discussion of Rose's results below).

Thus, both extinction and satiation effects may not have been observed because the length of the sessions and overall functional analyses were fairly brief. The functional analyses were kept relatively short because clear results were obtained quickly for these participants. In addition, brief sessions typically are used to assess high-rate problem behavior. In Wallace and Iwata (1999), the outcomes of functional analyses with 5-min, 10-min, and 15-min sessions were compared. The same conclusions about the function of each participant's problem behavior were drawn regardless of session length. This finding indicates that efficient functional analyses would be preferable, especially when problem behavior is assessed in clinical settings, such as schools.

Implications for Research and Practice

Overall, the functional analysis outcomes seemed clearest when the small or medium reinforcement magnitudes were used. For four participants (Meadow, Nick, Tony and Tyler), functional analysis outcomes were the least clear under the large reinforcement magnitude. However, results of the small magnitude analysis also were somewhat less clear than those obtained under the medium reinforcement magnitude for Tony. Together, these findings suggest that a medium reinforcement magnitude may increase the likelihood of obtaining clear functional analysis results. Nevertheless, the functions of problem behavior were still evident under all reinforcement magnitude phases for these participants, with the exception of Tyler.

It was surprising to find that a 3-s reinforcement magnitude was adequate to maintain problem behavior, especially when the reinforcer was escape from demands or access to tangibles (toys). For example, the size of the small break was not much lengthier than a break that might naturally occur between instructional trials of a teaching session. In fact, sometimes the highest levels of responding occurred during the relevant condition of the small reinforcement magnitude analysis. The antecedent-only functional analysis model developed by Carr and Durand (1985), in which social consequences are not provided for problem behavior, has successfully identified the variables related to problem behavior in a number of cases (e.g., DePaepe, Shores, Jack, & Denny, 1996; Dunlap, Kern-Dunlap, Clarke, & Robbins, 1991; Kennedy, 1994; Lee, Sugai, & Horner, 1999; Weeks & Gaylord-Ross, 1981). Hanley et al. (2003) suggested that problem behavior persists during antecedent-only functional analyses because rates of behavior are in the early stages of extinction and these functional analyses are typically brief. This also may explain the relatively high rates of problem behavior during the small magnitude functional analyses in this study.

In addition, the small magnitude may actually ensure high levels of responding, and thus, a more easily identified function because the EO is present more often during the session. However, a higher level of responding may be more dangerous to the participant or therapist, especially if SIB or aggression is the target behavior. For instance, Nick's problem behavior reached nearly 10 responses per minute during the small magnitude reinforcement analysis, but never exceeded 3 responses per minute under the medium reinforcement magnitude. Thus, when conducting a brief functional

analysis or when using short-duration sessions, a small reinforcement magnitude may be beneficial unless contraindicated due to the severity of problem behavior.

With the large reinforcement magnitude, the presence of the reinforcer occupies a large proportion of the session time. Problem behavior is less likely to occur while the participant is consuming the reinforcer (Roane et al., 1999). Thus, the function of problem behavior may be more difficult to identify, as was the case for Nick, Tony, and Tyler. On the other hand, lower rates of problem behavior during the functional analysis may be desirable when the individual engages in severe problem behavior. It should be noted, however, that levels of problem behavior were similar across all reinforcement magnitudes for Meadow and Max. With all things considered, the safest choice may be the medium reinforcement magnitude.

Limitations

In some cases, replications of a particular functional analysis may have been beneficial for drawing conclusions about the effects of magnitude on responding. For example, replicating the large magnitude conditions with Meadow would have been useful for determining whether magnitude influenced interaction effects across the attention and no interaction conditions. A replication of the results of the medium magnitude functional analysis with Tyler would have established that the demand function was related to the 20-s reinforcement duration. Finally, replicating the results of the small magnitude analysis with Adel would have been useful for determining if SIB would only occur under the 3-s reinforcement duration. Participants were not exposed to additional functional analysis sessions due to the extensive nature of the first three

assessment phases. The research was conducted within the context of providing behavioral services in school settings, where further treatment delays were undesirable.

The study also was limited to putative reinforcers that are commonly evaluated in functional analyses of problem behavior. Thus, the results may not generalize to other types of reinforcers, such as termination of “don’t/do” requests or therapist compliance to mands (Bowman et al., 1997; Fisher et al., 1998). Another limitation, as noted above, was that some of the functional analyses were only 14 to 16 sessions. If the analyses had been carried out longer, extinction or satiation effects may have been observed under certain reinforcement magnitudes. In addition, all of the children were diagnosed with moderate to severe developmental disabilities and all but one of the children were diagnosed with visual impairment. It is not clear whether the results of the study would have extended, for instance, to individuals with ADHD or those without a formal diagnosis. For a typically developing child, 3-s access to a reinforcer may not be adequate to maintain problem behavior during functional analysis.

As with any study that utilizes a multielement design, carryover or interaction effects may have been a factor. The order in which the child was exposed to the magnitudes also may have influenced the outcomes. For example, different results may have been obtained for children who were first exposed to the 3-s magnitude versus children who were exposed to the 3-s magnitude last (e.g., problem behavior may have been more likely to extinguish if the small magnitude was implemented first; problem behavior may have been more resistant to extinction after exposure to the large magnitude), although results did not appear to indicate the presence of sequence effects.

Finally, the function of one participant's problem behavior was not identified. In the epidemiological study conducted by Iwata et al. (1994), the function of 4.6% of the participants' SIB was not identified. Hanley et al. (2003) reported that 4.1% of studies utilizing functional analysis obtained undifferentiated results. Hanley et al. suggested that the results of these functional analyses may have been undifferentiated because the appropriate antecedents and consequences for problem behavior were not manipulated or because the participants could not discriminate between the conditions (i.e., carryover effects related to the experimental design). It is possible that the relevant antecedent and consequences for Rose's aggression were not manipulated during the functional analysis. After the conclusion of the study, additional strategies were taken to clarify the variables related to Rose's aggression. Individuals who worked with Rose daily or at least once a week were interviewed (e.g., teachers, speech therapist, school psychologist). In addition, observations of Rose in the classroom and dormitory at the school she attends are ongoing.

Directions for Future Research

Future investigations should replicate the effects of reinforcement magnitude on the outcomes of functional analyses with test conditions/reinforcers that differ from those used in the current study. Future studies should more closely examine extinction and satiation effects across small, medium, and large reinforcement magnitudes during functional analysis. If within-session patterns of extinction are observed or different topographies of problem behavior emerge when a particular magnitude is used, sessions could be continued to determine how quickly problem behavior would extinguish. Also, the reinforcement magnitude could be increased to determine if problem behavior would

maintain. If within-session patterns of satiation are observed with a certain magnitude, the functional analysis could also be extended beyond identification of a function to determine if responding would eventually decrease across sessions. Future investigations should also be directed toward extending the current findings to other populations (e.g., more typically developing individuals) and should include replications of phases when differences in responding are observed under different reinforcement magnitudes. Future studies also could determine whether using a small reinforcement magnitude (e.g., 3 s) during brief functional analyses would be beneficial. Because a small magnitude may be associated with higher rates of problem behavior than a large magnitude, the function of the behavior may be easier to identify when limited time is available for assessment (e.g., in outpatient clinic settings).

Future studies could further evaluate different parameters of reinforcement during functional analysis. The effects of schedule on problem behavior have been evaluated in just one study (Lovaas et al., 1967). For example, the schedule of reinforcement that maintains problem behavior in the natural environment could be compared to a continuous schedule of reinforcement. The use of a more naturalistic schedule of reinforcement may increase the likelihood of obtaining a clear function. Future research could focus more on the quality or type of reinforcement used during functional analysis. For example, preference assessment could be conducted prior to functional analysis to identify which form of attention a participant prefers. Although an attention function may not be identified if the relevant form of attention is not used during functional analysis, it is not common practice to conduct a preference assessment of attention beforehand (Fisher et al., 1996).

Future research could examine whether problem behavior responds to treatment any differently following functional analyses utilizing different reinforcement magnitudes. For instance, if extinction is going to be used as part of treatment, problem behavior may decrease more rapidly following a small magnitude of reinforcement than following a large magnitude or vice versa.

The findings of this study indicated that reinforcement magnitude did not influence functional analysis outcomes. Therefore, reinforcement magnitude can be selected for reasons related to ease or efficiency. However, these findings did indicate that using small or medium reinforcement magnitudes may increase the likelihood of obtaining clear outcomes during functional analysis. If these results are replicated, time and energy can be devoted to investigating the effects of other variables.

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VITA

Valerie Volkert received a Bachelor of Science degree at the University of Florida (UF) in 1999. Her undergraduate experience was a liberal arts education with an emphasis in psychology. During her four years at UF, Valerie received various awards and honors (e.g., President's Honor Role). In her final year at UF, she enrolled in two psychology classes with Dr. Brian Iwata that focused on applied behavior analysis. Through these classes, Valerie discovered an interest in behavior analysis and wished to gain clinical research experience. Immediately after graduating from UF, Valerie began working full-time at the Marcus Institute in Atlanta, a replication site of the Kennedy Krieger Institute, in an entry-level position (Behavior Data Specialist). She was trained by Dr. Wayne Fisher and Dr. Cathleen Piazza to provide clinical services to children with autism and mental retardation who displayed severe destructive behavior or feeding disorders, while simultaneously conducting behavior analytic research. Within 2 years, Valerie was promoted from the Behavior Data Specialist position to the Clinical Specialist III position. At the Marcus Institute, her research experience included functional analysis methodology and the development of function-based treatments for children with destructive behavior (e.g., aggression and disruption). She also gained experience creating research protocols (e.g. differential reinforcement, extinction, and stimulus fading) to increase oral consumption for children with pediatric feeding disorders. Through her experiences at the Marcus Institute, Valerie discovered she would like to dedicate a lifetime to the study of behavior. Thus, she is currently pursuing her doctoral degree in school psychology at the Louisiana State University.