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An Evaluation of Differential Positive Reinforcement without Extinction for Escape-Maintained Problem Behavior

A Thesis
By

Sabrina Rose Veilleux

Submitted to the Faculty of the Health Professions at Rollins College in Partial Fulfillment of the requirements for the Degree of

MASTER OF ARTS IN APPLIED BEHAVIOR ANALYSIS AND CLINICAL SCIENCE

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Abstract

Previous research has demonstrated the effectiveness of treatments with and without escape extinction to treat escape-maintained behavior. The aim of this study was to evaluate the use of differential positive reinforcement (DPR) without escape extinction (EE) for escape-maintained behavior in the home setting. Differential positive reinforcement is an effective function-based procedure known to produce reductions in problem behavior maintained by escape. Two subjects with autism spectrum disorder were included in this study. A functional analysis was conducted to confirm escape as the variable maintaining problem behavior for both subjects. Differential positive reinforcement without EE was evaluated using a reversal design. Results showed DPR without EE was effective in reducing problem behavior to near-zero levels for both subjects. This study demonstrated the use of an effective procedure to reduce problem behavior maintained by escape in the home setting without the use of EE.

Keywords: autism spectrum disorder, differential positive reinforcement, escape-maintained behavior, home setting

Introduction

The Centers for Disease Control and Prevention has identified the prevalence of autism spectrum disorder (ASD) and other intellectual disabilities in the United States as being one in 59 children (Baio et al., 2018). Autism is characterized by functional, social, academic, and behavioral challenges (Centers for Disease Control and Prevention, 2018). Many individuals with autism engage in problem behavior in the form of aggression, property destruction, self-injurious behavior (SIB), vocal outbursts, or tantrums. In some cases, problem behavior occurs at a frequency or intensity that is too high for caregivers or trained behavior analysts to allow (Slocum, 2016). In the past these cases have been treated using consequent-based procedures such as punishment, extinction, or restraints (physical or pharmaceutical; Linscheid, Iwata, Ricketts, Williams, & Griffin, 1990; Fisher, Piazza, Bowman, Hanley, & Adelinis, 1997; Singh & Millichamp, 1985).

Unfortunately, many of the treatment procedures used to treat problem behavior are often selected without first assessing which reinforcers maintain problem behavior. Additionally, some of them go against what is considered best practice (i.e., unethical). For example, implementing a punishment procedure might not be considered best practice if a procedure using reinforcement could be used instead. The Association for Behavior Analysis International has recommended the use of procedures such as punishment and restraints only if circumstances deem them necessary (Vollmer et al., 2011). Thus, such procedures should be used only if other less-restrictive treatment procedures have been ruled out.

The development of the functional analysis (FA) has allowed researchers to design and implement treatment procedures using the variables maintaining problem behavior (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994). The FA is considered the standard assessment for assessing and treating problem behavior (Payne & Dozier, 2013). Functional-analysis results

provide information about the relations between problem behavior and its maintaining consequences. These results then lead to the development of function-based treatments that target these relations (Slocum & Vollmer, 2015). For example, an antecedent-based procedure such as the delivery of noncontingent attention might be developed as a treatment to reduce problem behavior maintained by attention from adults. Function-based treatments have been developed to treat problem behavior maintained by a variety of variables, including those maintained by social and automatic reinforcers.

Of the various reinforcers maintaining problem behavior, one common reinforcer is escape from demands or other aversive events (Iwata et al., 1982/1994). Iwata, Pace, Kalsher, Cowdery, and Cataldo (1990) conducted FAs to determine the function of SIB in 7 individuals with developmental disabilities. Results showed higher rates of SIB in the escape condition across all subjects, suggesting SIB was maintained by escape from demands. In a subsequent article, Iwata et al. (1994) evaluated the use of the FA to determine the function of SIB in 152 individuals with developmental disabilities. Results showed escape from demands accounted for 38.1% of individuals' problem behavior (Iwata et al., 1994). The results from these studies suggest that escape from demands accounts for the function of a large portion of cases of problem behavior.

Review of the Literature

Escape Extinction

Escape extinction (EE) is a common function-based treatment for escape-maintained behavior (Iwata et al., 1990). EE involves the continuous delivery of a demand or another aversive event while problem behavior is put on extinction (i.e., "working through" the demand). The goal of EE is to not allow escape from the demand or aversive event. For example, Iwata et al. (1990) evaluated the use of EE to reduce SIB in 6 individuals with developmental disabilities.

Results showed a reduction in SIB for 5 out of 6 subjects to near-zero levels when EE was introduced. However, EE as a stand-alone procedure was not effective for one subject, who required an additional treatment component—response blocking—to reduce SIB to zero or near zero levels. These results suggest EE might not be effective as a stand-alone treatment for escape-maintained behavior.

EE can also be used as a component in a function-based treatment to make the procedure more effective. For example, Pace, Iwata, Cowdery, Andree, and McIntyre (1993) evaluated the use of a treatment package consisting of instructional fading (IF) plus EE to reduce escape-maintained SIB in 3 individuals with developmental disabilities. Demands were delivered in gradually increasing amounts throughout sessions contingent on low rates of SIB, which was put on extinction (i.e., "worked through"). Results showed an immediate reduction in SIB to near zero levels for all subjects. These results suggest EE, when added as a component to another treatment, might help to produce better treatment effects.

Limitations of Escape Extinction

EE has been shown to be an effective treatment for escape-maintained behavior, as described above. However, there are several limitations to the use of EE. First, EE can produce undesirable effects such as a temporary increase in problem behavior (i.e., extinction burst). EE can also increase other behaviors such as emotional responding and aggression, assuming aggression is not the target problem behavior (Lerman, Iwata, & Wallace, 1999). Second, EE can be difficult to implement when problem behavior is severe. For example, when an individual engages in severe SIB, it might be difficult to physically prompt the individual to complete a task (Slocum, 2016). Additionally, it might be too dangerous to implement the procedure. For example, when an individual engages in high-intensity aggression, it might result in damage to property (e.g., broken windows) or injury to the individual implementing the procedure. Third,

EE can be difficult to implement when the individual is large. For example, it might be difficult to implement EE if the individual is taller, stronger, or weighs more than the individual implementing EE. Finally, EE can produce escape if it is not implemented with integrity (Vollmer et al., 1999). Even a minor error in the implementation of EE can result in the reinforcement of problem behavior, which might be enough reinforcement to maintain problem behavior.

Escape Extinction as a Treatment Component

Despite these limitations, EE is still used as a treatment for escape-maintained behavior. Specifically, EE is often used in combination with another treatment, such as differential negative reinforcement (DNR). DNR involves the delivery of escape contingent on compliance with demands. Thus, the goal of DNR is to reduce the opportunities and motivation for individuals to engage in problem behavior to escape demands (Vollmer & Iwata, 1992). DNR has been shown to be an effective treatment for escape-maintained problem behavior both with and without the use of EE. However, studies have shown DNR to be more effective when used in combination with EE (Piazza et al., 1997; McCord, Thomson, & Iwata, 2001). Vollmer, Roane, Ringdahl, and Marcus (1999) evaluated the use of DNR with EE to reduce problem behavior in 3 individuals, 2 of which displayed problem behavior maintained by escape from demands. Results showed DNR with EE reduced problem behavior to near zero levels for all subjects.

Another treatment for escape-maintained problem behavior used in combination with EE is differential positive reinforcement (DPR). DPR involves the delivery of a positive reinforcer (e.g., preferred edible or tangible item) contingent on the presence of an alternative behavior (e.g., compliance). DPR has also been shown to be effective in reducing problem behavior both with and without the use of EE. For example, Lalli et al. (1999) compared DPR and DNR for compliance to treat escape-maintained behavior with and without the use of EE. During DPR

without EE, a small edible item was delivered contingent on compliance with demands and the occurrence of problem behavior resulted in a 30-s break. DPR plus EE sessions were similar to those of DPR without EE except problem behavior did not result in a 30-s break. Results showed DPR was successful in reducing problem behavior for all subjects. In addition, these results were obtained without the use of EE (Lalli et al., 1999). These results suggest DPR without the use of EE might be an effective treatment for escape-maintained behavior.

Similarly, Slocum and Vollmer (2015) compared DPR and DNR for compliance to treat escape-maintained behavior without the use of EE. As in Lalli et al. (1999), a small edible item was delivered contingent on compliance with demands during DPR sessions, and the occurrence of problem behavior resulted in a 30-s break. Results showed DPR without EE reduced problem behavior to near-zero levels. The results of these studies suggest DPR as a stand-alone treatment can produce positive treatment effects. It is possible that DPR is effective without the use of EE because it reduces the opportunities and motivation for individuals to engage in problem behavior to escape demands by making the antecedent stimuli that produce problem behavior (i.e., demands) less aversive (Payne & Dozier, 2013). Additionally, access to the positive reinforcer might compete with the motivation to engage in problem behavior (Parrish, Cataldo, Kolko, Neef, & Egel, 1986). Thus, it is unlikely for problem behavior to occur using DPR.

Statement of the Problem

Many studies have demonstrated the effectiveness of EE as a treatment for escape-maintained behavior. However, it might not always be feasible to use due to its limitations (e.g., production of undesirable side effects, difficulty of implementation, etc.). In addition, EE is an extinction procedure and is not always recommended as a first line of treatment for escape-maintained behavior or without a reinforcement component (Vollmer et al., 2011). Thus, other

treatments (e.g., reinforcement procedures) should be used first before EE is considered as a treatment.

Although previous research supports the use of EE as a treatment for escape-maintained behavior, many studies have demonstrated the effectiveness of treatments for escape-maintained behavior in the absence of EE (Zarcone et al., 1994; Lalli et al., 1999; Vollmer et al., 1999; Payne & Dozier, 2013; Slocum & Vollmer, 2015). These treatments typically involve the delivery of reinforcement for an alternative behavior (i.e., compliance) while problem behavior results in reinforcement in the form of a 30-s break. Thus, reinforcement for the alternative behavior might compete with reinforcement for problem behavior. As a result, the relationship between the alternative behavior and a positive reinforcer is strengthened.

Differential positive reinforcement has been shown to be an effective treatment for escape-maintained behavior with and without the use of EE. DPR without EE involves the delivery of a positive reinforcer (i.e., small edible item) for the presence of an alternative behavior (e.g. compliance), which should compete with the motivation to engage in problem behavior and thus increase the motivation to engage in the alternative behavior. Most of the previous research evaluating DPR has been conducted in clinics or institutions specializing in the evaluation of treatments for multiple functions and topographies of behavior (e.g., escape-maintained behavior). It is possible that controlling for extraneous variables in these settings is easier than it would be in the home setting. No prior research has evaluated the use of DPR in the home setting, where extraneous variables might be more difficult to control. Thus, the purpose of this study is to evaluate the use of DPR without EE for escape-maintained problem behavior in the home setting.

Method

Subjects, Setting, and Materials

Two subjects, Luke and Robby, were included in this study based on three criteria: a) referral for the assessment and treatment of problem behavior from subjects' caregivers and/or ABA therapy team, b) diagnosis of ASD or pervasive developmental disorder, not otherwise specified (PDD-NOS), and c) functional-analysis results demonstrating problem behavior maintained by escape. Subjects who did not demonstrate problem behavior maintained by escape were either referred for participation in other studies focusing on the function of the subjects' problem behavior or received a functionally relevant treatment to be implemented by subjects' ABA therapy teams. Subjects were recruited from an in-home behavior-analytic service provider in the central Florida area.

Sessions were conducted in the subjects' homes during regular therapy hours. Locations in the home in which sessions were conducted varied per subject and were dependent on the rooms in the house in which subjects were permitted. For example, if a subject was not permitted to go into a caregiver's bedroom, then sessions were not conducted in that room. Luke's sessions were primarily conducted in the living room. Additional locations included the kitchen, office, and family room. The office initially doubled as a play room until the family room was converted into a play room specifically for Luke, after which the play room became the primary location in which sessions were conducted. Robby's sessions were primarily conducted in the living room. Additional locations included the hallway and his caregivers' bedroom since he occasionally transitioned to those locations during breaks. Materials for both Luke and Robby included a camera and a timer as well as any materials necessary for individualized demands.

Response Measurement, Interobserver Agreement, and Experimental Design

Self-injurious behavior for Luke was defined as any instance of hitting his head, chin, or thighs with an open or closed fist with force or hitting his head against the wall or floor with force. All instances of SIB were scored as separate occurrences unless they occurred simultaneously with both fists. For example, if Luke hit his head with one fist followed by the other, two instances of SIB were scored. In addition, all attempts to engage in SIB were scored as separate instances.

Robby engaged in multiple topographies of problem behavior, each of which was separately defined. Vocal outbursts were defined as whining/crying or negative vocalizations (e.g., "No!) above conversation level with a 3-s offset. For example, if Robby whined/cried twice within 3 s, one instance of vocal outbursts was scored. Elopement was defined as leaving the instructional area (i.e., therapist or instructional materials) by 0.61 m or more. Flopping was defined as dropping limp to the floor or limp limbs. For example, if Robby's limbs went limp while sitting on the floor or in the therapist's lap, an instance of flopping was scored.

The dependent variable measured was rate (responses per minute; rpm) of problem behavior in each session. All sessions were videotaped, and problem behavior was scored from videos using the Countee data-collection system. Since sessions were conducted in subjects' homes, subjects were able to transition to other areas of the room or between rooms. If this occurred during any session, the individual videotaping the session followed the subject to the room or area of the room in which he transitioned to keep the subject within shot of the camera for data-collection purposes. Sessions were conducted using a reversal design to demonstrate experimental control.

A second observer independently collected data from videos during 31% of Luke's sessions and 30% of Robby's sessions. Sessions were broken into 10-s intervals and

interobserver agreement (IOA) was calculated by dividing the smaller number of occurrences of problem behavior scored by one observer by the larger number of occurrences of problem behavior scored by the other observer. If both observers scored zero instances of problem behavior, the agreement was 100% for the interval. The intervals were averaged and multiplied by 100 to obtain the percentage of agreement for each session. Average IOA was 97% for Luke's sessions and 96% for Robby's sessions.

Treatment integrity data were collected from videos by an independent observer for 30% of Luke's sessions and 31% of Robby's DPR sessions. Data were collected on problem behavior, the number of demands delivered by the therapist, the number of correct responses (i.e., compliance), whether the therapist delivered reinforcement contingent on compliance, and whether the therapist delivered 30-s break contingent on the occurrence problem behavior. The data were then analyzed to determine whether the therapist delivered demands with a 5-s intertrial interval (ITI) and delivered the correct consequence (e.g., edible for compliance and break for problem behavior). Average treatment integrity was 48% for Luke's sessions and 51% for Robby's sessions.

Procedures

Prior to the FA, a free-operant preference assessment (FOPA) was conducted to identify tangible items to include in the attention and tangible conditions (Roane, Vollmer, Ringdahl, & Marcus, 1998). Instructional demands to be targeted in the demand condition were identified based on reports from subjects' caregivers and/or ABA therapy team. A multiple-stimulus without replacement (MSWO) preference assessment was conducted to identify edible items to include in differential positive reinforcement (DPR) without EE treatment sessions (DeLeon & Iwata, 1996). All sessions were 5 min with a brief (1 to 2 min) break in between each session. If

problem behavior occurred prior to the start of the session, the therapist waited to start the session until problem behavior subsided for approximately 30 s.

Functional analysis. An assessment was conducted with each subject using procedures similar to those described by Iwata et al. (1982/1994) to identify escape as the variable maintaining problem behavior. Conditions for Luke included no interaction, attention, tangible, play, and demand, and sessions were conducted in that fixed order (Hammond, Iwata, Rooker, Fritz, & Bloom, 2013). Tangible sessions were included for Luke because he was observed to engage in SIB when tangible items were removed or manipulated by others. Robby was exposed to only a pairwise comparison of play and demand conditions because his behavior analyst indicated a hypothesized escape function. Thus, a pairwise design was used to test for an escape function for clinical purposes.

In the *no interaction* condition (Luke only), the subject and therapist started in a room with a table, at least two chairs, and any other materials already present in the room (i.e., couches, coffee table, bookshelf, etc.); no instructional or play materials were present. Instructional and play materials from each room were locked away in the caregiver's bedroom while any other items typically present each room remained. The therapist did not interact with the subject and problem behavior was ignored. In the *attention* condition (Luke only), the subject had continuous access to a moderately preferred tangible item (alphabet flashcards). The therapist began the session by stating, "I have some work to do so you can play with your toy," and contingent on an occurrence of problem behavior, the therapist provided brief attention in the form of a verbal reprimand (e.g., "Don't do that" or "That's not nice"). Prior to the start of the *tangible* condition (Luke only), the subject was given access to a highly preferred tangible item (iPad) for 30 s. At the start of the session, the item was removed from the subject and was returned for 30 s contingent on the occurrence of problem behavior. In the *play* condition, the

subject was given continuous access to highly and moderately preferred tangible items (multicolored stackable ice cream scoops, alphabet flashcards, and iPad for Luke; bubbles and multicolored peg pieces in a tub for Robby) as well as continuous attention from the therapist. Zero demands were presented and problem behavior was ignored in this condition.

Finally, in the *demand* condition, the therapist delivered instructional demands using a three-step, least-to-most prompting procedure. Demands for Luke included one-step instructions (e.g., "Touch blue" or "Look"), match-to sample, and motor imitation. For Robby, demands included completing two-piece freeform puzzles, tracing, and placing a colored peg inside a puzzle by matching. Demands were delivered with a 5-s ITI, and prompts were delivered based on an incorrect response or 5 s of no response. To start the session, the therapist delivered a demand. If the subject did not respond within 5 s or responded incorrectly, the therapist delivered a vocal prompt and modeled the correct response. Following correct responding independently or after the model prompt, the therapist delivered praise. However, if the subject responded incorrectly or did not respond within 5 s following the model prompt, the therapist delivered an additional vocal prompt and physically guided the subject to respond. Thirty seconds of escape were delivered contingent on the occurrence of problem behavior at any point during instruction. Problem behavior that occurred during the 30-s escape period was ignored.

Baseline. The demand sessions from the FA were used as an initial baseline for both subjects. Three additional baseline sessions were conducted for Luke using procedures identical to the demand condition. These additional sessions were conducted for reasons unrelated to the current study.

Differential positive reinforcement without escape extinction (DPR). DPR sessions were conducted using procedures similar to baseline. The therapist delivered identical instructional demands using a 5-s ITI and provided prompting using a least-to-most prompting

hierarchy. However, unlike in baseline, a small piece of an edible item (Mott's fruit snacks, Sour Cream & Onion Pringles, Pirate's Booty puffs, or mini Oreos for Luke and hazelnut crème-filled wafers, mini Ritz cheese crackers, or mini Oreos for Robby) was delivered contingent on responding to the initial instruction or model prompt. Edible items used during DPR sessions were determined based on availability or subject preference. Prior to the start of most DPR sessions, subjects were shown and offered a sample of the edible items available to determine preference and motivation for edible items. In addition, 30 s of escape was delivered contingent on the occurrence of problem behavior.

Results

Functional analysis results for Luke are displayed in Figure 1. High rates of SIB occurred during the demand and tangible conditions, suggesting SIB was maintained by escape from demands and access to tangible items. For the purpose of the current study, only escape-maintained SIB was targeted during treatment. Thus, all attempts to access tangible items during sessions were not blocked. For example, if Luke attempted to grab an item in the room in which sessions were being conducted, he was able to engage with that item throughout the session. A full series of the FA was not always conducted for Luke. For example, the attention condition was not conducted during the third series because SIB was not observed during the first and second series. In addition, data from the no interaction condition were not included because it was difficult to control for the delivery of attention from other family members. Finally, during second and third sessions of the play condition, Luke engaged in moderate levels of SIB. It was hypothesized that the proximity of the therapist during these sessions served as a discriminative stimulus for the removal of the iPad since the play condition followed the tangible condition. Thus, the therapist sat further away from Luke during the last three play sessions and a

decreasing trend in SIB was observed. Figure 1 also displays FA results for Robby. Based on these results, Robby's problem behaviors were maintained by escape from demands.

Baseline and treatment data for Luke are displayed in Figure 2. As stated previously, demand sessions from Luke's FA were used as an initial baseline and an additional three sessions were conducted for reasons unrelated to the current study. The rate of SIB during baseline for Luke was high and variable, with a mean of 4.9 rpm. Following the introduction of DPR, Luke displayed a 40% reduction in the rate of SIB. Once the rate of SIB decreased to near-zero levels and remained low, a reversal to baseline was conducted to demonstrate experimental control. During the reversal to baseline, the rate of SIB was high and variable, with a mean of 3.8 rpm. Following the reintroduction of DPR, the rate of SIB once again decreased to near-zero levels and remained at near-zero levels in all but one session.

Figure 3 displays baseline and treatment data for Robby. Compliance data are also displayed because the rate of problem behavior during treatment was similar to baseline and demonstrated and increasing trend. Similar to Luke, baseline sessions were comprised of the demand sessions from Robby's FA. The rate of problem behavior during baseline ranged from 1.2 rpm to 3.8 rpm, with a mean of 1.8 rpm. Following the introduction of DPR, Robby displayed a 33% reduction in the rate of problem behavior. However, the rate of problem behavior remained variable across DPR sessions and increased to a rate of 3 rpm, which was consistent with the rate of problem in baseline. In addition, it was observed that Robby was no longer motivated for the edible items (hazelnut crème-filled wafers and mini Ritz cheese crackers) selected from the MSWO. Thus, a new edible item (mini Oreos) was introduced. Following the introduction of a new edible item, the rate of problem behavior decreased to near-zero levels and remained low. A reversal to baseline was then conducted to demonstrate experimental control. During the reversal to baseline, the rate of problem behavior increased to

baseline levels, with a mean of 2.33 rpm. DPR was then reintroduced and the rate of problem behavior once again decreased to near-zero levels in all but one session.

Discussion

The current study evaluated the use of a function-based treatment for escape-maintained behavior without the use of EE in the home setting. Overall, DPR was effective in reducing the rate of problem behavior to near-zero levels for both subjects. When DPR was removed, the rate of problem behavior increased to baseline levels for both subjects, with some sessions achieving a rate higher than was observed in baseline. Finally, following the reintroduction of DPR, the rate of problem behavior decreased to near-zero levels and remained low for both subjects.

Previous research evaluating the use of DPR as a treatment for escape-maintained behavior has been conducted in clinics or institutions, in which it might be easier to control for extraneous variables. Prior to the current study, DPR had not been evaluated in the home setting, in which controlling for extraneous variables might be difficult. Based on the results of the current study, extraneous variables were difficult to control for in the home setting. For example, it was difficult to control for the delivery of attention during the no interaction sessions of Luke's FA. Thus, these sessions were removed from the analysis of Luke's FA results and are not displayed in Figure 1. It was also difficult to control for the delivery of attention or demands from the caregivers of both subjects during 30-s breaks from demands across baseline and treatment sessions. On more than one occasion Robby's mother provided attention (e.g., "Robby, come back!" or "Robby, stop!") following an instance of elopement while on a 30-s break from demands. When this occurred, the therapist politely reminded the caregivers that no demands should be placed during the 30-s breaks from demands.

Although a standard FA was conducted in the current study, future research should consider using an alternative methodology of the FA, such as a latency- or trial-based FA, when

conducting FAs in the home setting to account for the control of various extraneous variables that might arise. In a latency-based FA, the latency to the first occurrence of problem behavior is measured (Thomasson-Sassi, Iwata, Neidert, & Roscoe, 2013). Thus, sessions are terminated following the first response. A latency-based FA might minimize the amount of time in each session spent allowing problem behavior to occur since the session would be terminated following the first occurrence of problem behavior. Conversely, in a trial-based FA, sessions are conducted under naturalistic conditions, such as during regularly occurring activities (Bloom, Iwata, Fritz, Roscoe, & Carreau, 2011). For example, play conditions are conducted during playtime and demand conditions are conducted during work periods. Thus, a trial-based FA might be more feasible for conducting FAs in the home setting where the resources to conduct standard FAs are not always available and controlling for extraneous variables are more difficult.

There were several other limitations to the current study that are worth discussion. First, since subjects were able to transition between rooms, it was difficult to maintain a 5-s ITI in between demands during both demand sessions of the FA and treatment sessions. When a subject transitioned between rooms between instructions, the therapist brought whatever instructional materials were necessary for the next demand to the new location; however, those transitions might have required longer than 5 s. It is possible that this served as limitation of the current study because access to tangible items was not blocked for Luke. Thus, Luke had access to tangible items that were easily accessible in each room, which provided opportunities for him to transition to other areas of the room and between rooms to engage with those items. Future research evaluating the use of DPR without the use of EE in the home setting should consider using a longer ITI to account for these transitions.

Second, it was difficult to train multiple therapists to implement procedures due to insufficient staff. The company with which each subject received behavioral services had limited

staff, and each subject's therapy team consisted of one to two therapists who rotated therapy sessions. Third, the time between sessions was not consistent due to scheduling (e.g., cancellations due to sickness or vacation) and the availability of an individual to record sessions. For example, Luke was sick multiple times midway through the study, which resulted in multiple cancellations. Thus, on more than one occasion there were one- to three-week gaps between Luke's sessions. Future research should consider training multiple therapists to implement procedures. This might help maintain the consistency of time between sessions as well as promote generalization to other therapists.

Another limitation of the current study was maintaining buy-in from Luke's mother during the reversal to baseline. Luke's mother expressed concern about the increasing rate of Luke's SIB during these sessions, which made it difficult to conduct baseline sessions, especially when she was the only individual available to video record sessions. In addition, higher rates of SIB were observed for Luke when attempts to engage in SIB were blocked. Most blocked attempts occurred when Luke attempted to hit his head against the floor, which was usually observed when Luke was on a 30-s break from demands. It is possible that SIB observed during 30-s breaks from demands were due to carryover from the previous demand. Future research should consider using an alternative experimental design, such as a multiple baseline design, to demonstrate experimental control. Unlike the reversal design, a multiple baseline design demonstrates experimental control without the withdrawal of the treatment, which might eliminate the need to maintain buy-in from caregivers.

Finally, Robby required the introduction of a new edible item during intervention after he was observed to no longer be motivated for the edible items selected from the MSWO. It is possible that these edible items were actually moderately preferred edible items and the new edible item, which was not included in the MSWO, was a high-preferred edible item. Future

research should evaluate the effectiveness of DPR without EE using moderately and highly preferred edible items to determine if moderately preferred edible items could be as effective as high-preferred edible items.

Previous research using DPR with and without EE included procedures to thin the schedule of reinforcement for compliance following low rates of problem behavior on an FR 1 schedule of reinforcement. For example, Lalli et al. (1999) successfully thinned the schedule of reinforcement for compliance from a fixed-ratio (FR) 1 to FR 10 with two subjects and to FR 20 with a third subject. Similarly, Slocum and Vollmer (2015) successfully thinned the schedule of reinforcement for compliance from FR 1 to a variable-ratio (VR) 10 for one subject. Due to time constraints, procedures to thin the schedule of reinforcement for compliance were not included in the current study. Future research should replicate the current study and include procedures to thin the schedule of reinforcement for compliance.

Although the current study did not use EE, the data do not indicate that EE should be abandoned as a treatment for escape-maintained behavior. Escape extinction might be useful for treating several escape-maintained behaviors, such as escape from medical routines and procedures, as well as loud sounds (e.g., fire alarm). Specifically, EE might be beneficial for treating behaviors that individuals might not be able to escape for health and safety reasons. For example, individuals who engage in problem behavior to escape taking medication or attending doctors' visits might be at risk if they continue to access escape from these aversive events. Escape extinction might also be useful for increasing behavior, such as food consumption. For example, by holding a bite of food in front of an individual and not removing it until the bite is consumed can increase the amount of food consumed over time. This might be beneficial for individuals with food selectivity or who are at risk of malnutrition, such as those with eating disorders. Finally, EE might be a necessary treatment component under certain circumstances,

such as when positive treatment effects are needed but there is limited time to obtain them. For example, EE might be necessary to decrease escape-maintained problem behavior that puts others at risk, such a caregivers, teachers, or peers. Escape extinction often produces a rapid decrease in behavior, which might eliminate the risk to others.

The current study adds to the existing literature on effective treatments for escape-maintained behavior by being the first to evaluate the use of DPR without EE for escape-maintained behavior in the home setting. The findings of the current study demonstrate how procedures might produce different results in the home setting than in a clinic setting. This is important for practitioners who might want to use procedures similar to those described in the current study but are hesitant to implement them in the home setting, which is often difficult to control. Future research is needed to validate the findings of the current study and to evaluate the use of other effective treatments for escape-maintained behavior in the home setting.

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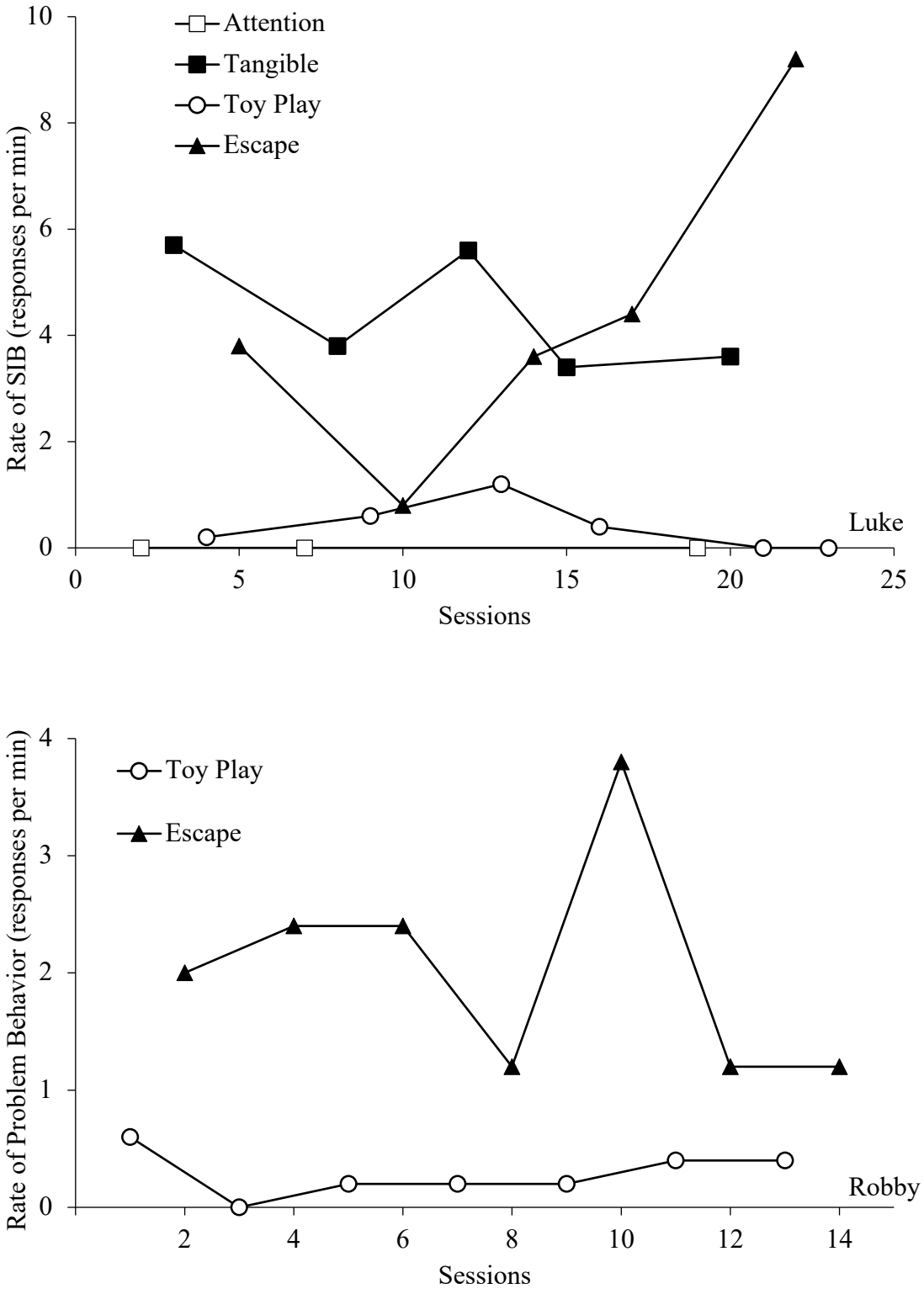

Figure 1. Functional analysis results for Luke (top panel) and Robby (bottom panel).

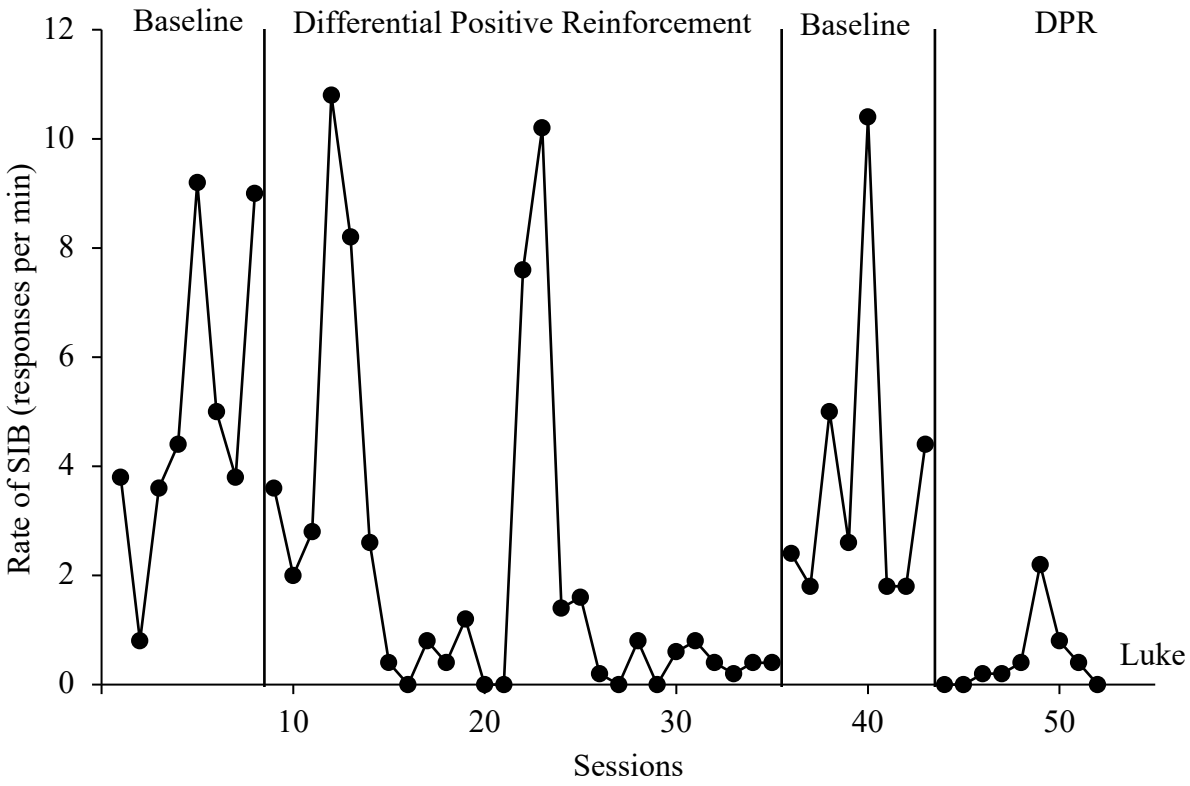

Figure 3. Baseline and treatment data for Luke.

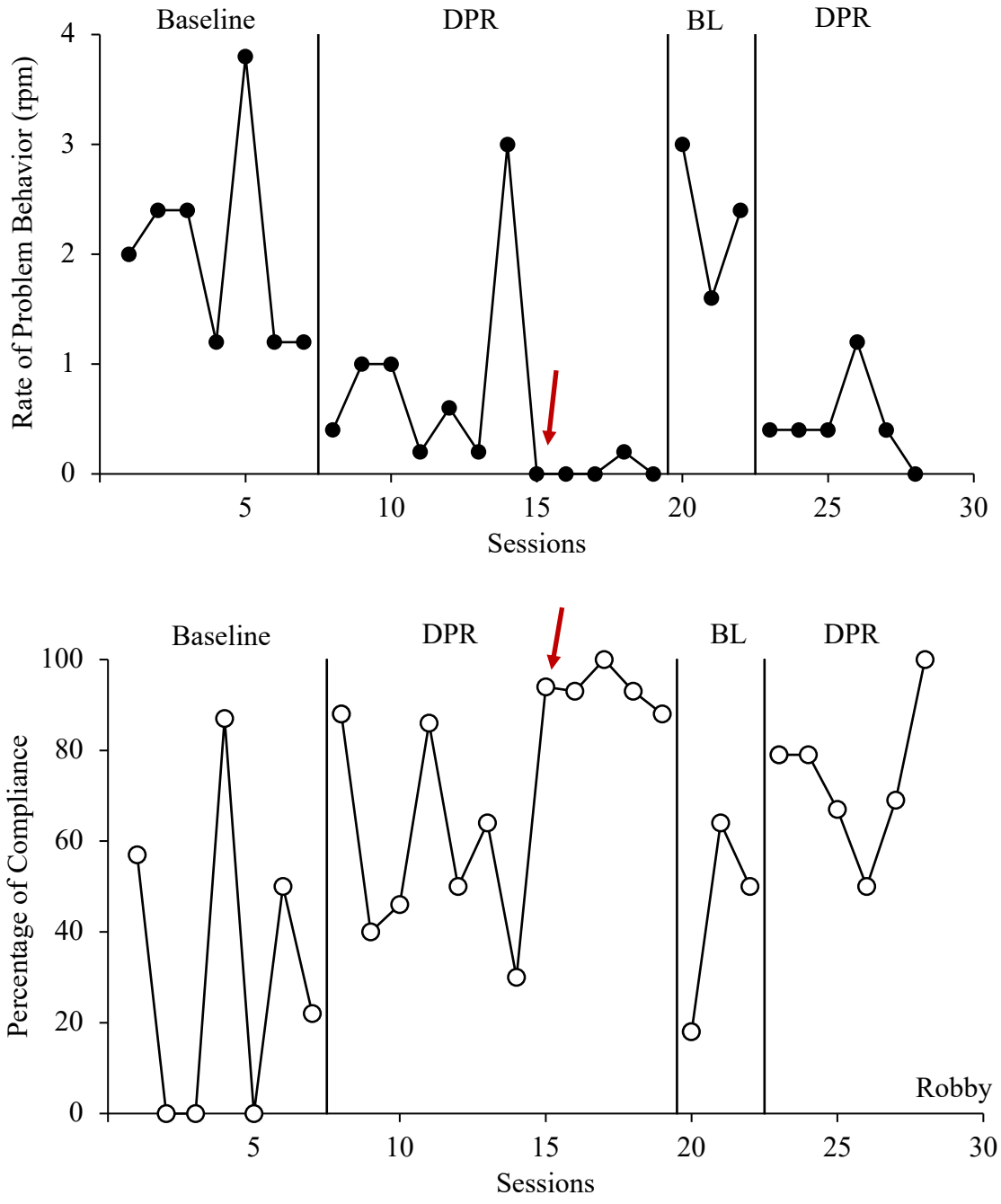

Figure 3. Baseline and treatment data for Robby. Top panel represents the rate of problem behavior and the bottom panel represents the percentage of compliance across sessions. The red arrows correspond to the introduction of a new edible item.