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Further evaluation of the competition between positive and negative reinforcement among individuals with escape maintained problem behavior

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**Further evaluation of the competition between positive and negative
reinforcement among individuals with escape maintained problem behavior**

A Thesis Presented

by

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The Department of Counseling and Applied Educational Psychology

In partial fulfillment of the requirements

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Submitted in partial fulfillment of the requirements for the degree of
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Abstract

Kodak, Lerman, Volkert and Trosclair (2007) found that participants who exhibited problem behavior maintained by escape selected an arbitrary reinforcer (an edible) over a maintaining reinforcer (escape), suggesting that an arbitrary reinforcer may be more effective than the maintaining reinforcer in decreasing problem behavior. However, because the tasks used may not have functioned as establishing operations for participants' problem behavior, it is unclear whether these findings would generalize to tasks that reliably evoke problem behavior. The purpose of this study was to replicate and extend procedures conducted by Kodak et al. by conducting both a task preference assessment (as used by Kodak et al.) and a task motivating-operation assessment as described by Roscoe, Rooker, Pence and Longworth (in press), prior to conducting the concurrent operant analysis between edible vs. break under increasing schedule requirements. A high-preference task, a low-preference task (according to the task preference assessment), and a low-probability task (according to the task preference assessment and the motivating operation assessment) were alternated in a multielement design. Results showed that one participant consistently selected the edible over the break regardless of the task condition or reinforcement schedule in effect, whereas the other participant consistently selected the break over the edible.

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Negative reinforcement involves the removal, postponement, or termination of a stimulus contingent upon a response, which leads to an increase in the future probability of that response (Cooper, Heron, & Heward, 2007). Behavior maintained by negative reinforcement terminates, or postpones the presentation of a stimulus that was present prior to the occurrence of a response (Cooper et al.). Negative reinforcement contingencies play an important role in shaping many behaviors for typically developing individuals and individuals with developmental disabilities. For example, when an alarm sounds in the morning, a button press to terminate the aversive noise leads to an increased probability that the same response or similar responses will occur in the future. In another example, a parent who provides their tantruming child with a candy bar may initially decrease that behavior but subsequently increase that behavior in the same setting in the future. In this example, the removal of the aversive tantruming contingent upon the delivery of the candy will increase the probability that the parent will deliver candy in the future.

Children with disabilities are particularly vulnerable to negative reinforcement contingencies. According to Iwata (1987),

aversive stimulation initially produces one or more of a variety of responses characteristic of both human and nonhuman subjects, including flinching, freezing, jumping, visual scanning, and related and diffuse motor activity and the eventual and more elaborate form of behavior is determined by the individual's previous history and prevailing contingency. (p. 364)

Often the presence of training materials, an instructor or a specific environmental arrangement can serve as discriminative stimuli for the presentation of an aversive event (Iwata). Severe behavior problems exhibited by individuals with disabilities such as tantrums, aggression, self-injurious behavior (SIB), environmental destruction and bolting can be shaped over time with continued exposure to negative reinforcement contingencies (Iwata). These behaviors can quickly terminate or postpone an aversive event due to the posed danger to the individual and/or caretakers.

Identification of the contingencies that maintain negatively-reinforced problem behavior has been widely researched over the past several decades. One of the earliest studies evaluating negative reinforcement contingencies in individuals with disabilities was conducted by Sailor, Guess, Rutherford and Baer (1968), who identified escape as the maintaining reinforcer for a participant's problem behavior. The authors exposed the participant to high-difficulty versus low-difficulty tasks to determine if task difficulty affected problem behavior. Results indicated that problem behavior was evoked by difficult tasks and that reducing task difficulty substantially decreased the participant's problem behavior. In another early study examining the role of escape contingencies, Carr, Newsom and Binkoff (1980) exposed two individuals with mental retardation to demand and no demand conditions. For both of the participants, aggressive behavior occurred at high rates during the demand condition and low-to-near zero rates during the no demand condition. A differential reinforcement intervention, involving the delivery of escape contingent on compliance, was found effective in decreasing participants' problem behavior.

Through careful observation, measurement of target behavior, and the manipulation of environmental events, Sailor et al. and Carr et al. were successful in isolating the environmental conditions that maintained participants' escape-maintained behavior. However, in both of these studies, the authors assessed only negative-reinforcement contingencies. In addition, only antecedent events that may function as motivating operations for escape-maintained behavior were manipulated. Therefore, it is possible that participants' behavior were sensitive to other environmental contingencies in addition to escape.

The first study that involved a comprehensive analysis to determine behavioral maintenance by a range of environmental contingencies was conducted by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994), who developed an experimental model to systematically test the effects of positive, negative and automatic reinforcement contingencies on self-injurious behavior (SIB). In this study, a series of test conditions, including demand, attention, and alone conditions, were alternated with a control condition. During the demand condition a therapist presented difficult tasks to the participant, and SIB resulted in 30s of escape. During the attention condition, the therapist diverted their attention from the participant and delivered brief attention contingent on SIB. During the control condition, the therapist delivered brief praise on a fixed-time 30-s schedule and toys were continuously available. During the alone condition, the therapist was not present, and no programmed consequences were delivered. For six of the nine participants, higher levels of problem behavior occurred during specific test conditions. Furthermore,

rates of self-injury varied considerably across subjects indicating that the functions of problem behavior were idiosyncratic.

Functional analysis procedures outlined by Iwata et al. (1982/1994) have successfully identified the environmental conditions that reinforce severe problem behavior. Iwata, Pace et al. (1994) summarized outcomes from 152 functional analyses and subsequently evaluated antecedent- or consequent-based interventions. Results showed that 38.1% of the 152 cases indicated behavioral maintenance by social negative reinforcement (escape from demands or other aversive events). This study indicated that escape-maintained SIB is prevalent among individuals with developmental disabilities and that appropriate interventions could be identified based on results of a functional analysis.

Numerous studies have shown that treatment procedures based on the results of a functional analysis are often effective (Baker, Hanley, & Mathews, 2006; Blake et al., 2004; Deaver, Miltenberger & Stricker, 2001; Wilder, Carelle, Harris, Reagan & Rasey, 2007). Interventions for escape-maintained problem behavior often take two forms, antecedent-based interventions and consequent-based interventions. Antecedent-based interventions involve manipulation of environmental events that may serve as discriminative stimuli or motivating operations (Laraway, Snyderski, Michael & Poling, 2003). Studies involving the manipulation of motivating operations involve the presentation of events that may abolish the reinforcing efficacy of escape. Some examples of antecedent interventions for escape-maintained behavior include instructional fading (Pace, Iwata, Cowdery, Andree & McIntyre, 1993) task alteration (Zarcone, Iwata, Mazaleski & Smith, 1994) and noncontingent escape

(Vollmer, Marcus & Ringdahl, 1995).

Instructional fading is an antecedent-based intervention that involves removing instructions and then gradually reintroducing them if participants' problem behavior remains low. Weeks and Gaylord-Ross (1981) evaluated the efficacy of instructional fading for three individuals with developmental disabilities. In this study, the authors hypothesized that the presentation of difficult demands evoked participants' problem behavior. During treatment, difficult tasks were removed from the instructional context and then slowly faded into the instructional context while errorless learning procedures were implemented. Results showed that the errorless learning procedures greatly reduced problem behavior. In addition, this procedure decreased errors in visual-discrimination tasks but not in perceptual-motor tasks.

Task interspersal is another antecedent-based intervention that involves presenting an individual with alternating easy and/or high-preference tasks with difficult and/or low-preference tasks. Ebanks and Fisher (2003) evaluated a task-interspersal procedure for a participant who exhibited problem behavior maintained by escape. During treatment, easy and difficult tasks were alternated in a 1:1 ratio during instructional sequences. In addition, prompts were provided for tasks that were previously performed incorrectly, and no corrective feedback was delivered following incorrect task completion. Results showed that this combination of treatment components was effective in reducing the participant's problem behavior.

Antecedent-based interventions that include an extinction component have also been examined. One antecedent-based treatment for escape-maintained problem behavior is noncontingent escape (NCE). NCE involves the delivery of escape from

tasks on a fixed-time schedule, independent of problem behavior. Vollmer et al. (1995) evaluated NCE plus extinction in two participants who exhibited escape-maintained problem behavior. Results showed that NCE effectively reduced participants' problem behavior and increased compliance with tasks. However, because NCE also involved an extinction component (i.e., problem behavior did not produce escape), it is unclear from these data whether NCE alone would have produced similar outcomes.

O'Callaghan et al. (2006) evaluated NCE plus extinction for 5 children who exhibited disruptive behavior during restorative dental treatments. During baseline, the dentist explained the steps of the procedure and then implemented dental treatments (i.e. examining the teeth, filing & crowning teeth etc.). If high intensity disruptive behaviors prohibited the dentist from completing a necessary treatment, physical restraints were used. During NCE, the dentist provided a 10-s break from dental treatments on a FT 15-s schedule that was signaled by an electronic timer. The time between breaks was gradually increased from an FT 15-s to a FT 1-min schedule, based upon rates of problem behavior. The NCE treatment proved effective in reducing rates of disruptive behavior for all participants. Furthermore, rates of physical restraints were substantially reduced for all participants. The study illustrates the effectiveness of an NCE procedure in reducing rates of problem behavior in a clinic setting with typically developing individuals. Similar to the Vollmer et al. (1995), NCE was implemented with extinction (i.e. escape from treatments were not delivered contingent upon problem behavior). Therefore, it is difficult to conclude

whether NCE without extinction may be an effective treatment for reducing escape-maintained problem behavior.

Pace, Iwata, Cowdery, Andree and McIntyre (1993) evaluated instructional-fading with escape extinction for 3 participants who exhibited escape-maintained problem behavior. Instructional fading included two components: (a) immediate removal of all instructions, followed by (b) the gradual reintroduction of the instructions. There was no specific criterion used to determine the rate of instruction reintroduction across sessions; however, instructions were gradually introduced when problem behavior showed a low and/or stable trend. Contingent on SIB, the therapist physically guided the participant to complete the task. The results of the study showed that instructional fading combined with escape extinction resulted in substantial reductions in participants' SIB. However, because fading was combined with extinction, it is unclear whether fading, extinction, or some combination accounted for treatment effects.

Although various antecedent-based interventions have been found effective, consequent-based interventions are often used for decreasing escape-maintained problem behavior. Examples of consequent-based intervention include escape extinction (Anderson & McMillan, 2001; Piazza, Patel, Gulotta, Sevin, & Layer, 2003; Repp, Felce & Barton, 1988) and the continued presentation of tasks demands contingent upon noncompliance (Ahearn, Kerwin, Eicher, Shantz & Swearingin, 1996), or the delivery of a reinforcer for an alternative response (Kodak et al., 2007; DeLeon, Neidert, Anders & Rodriguez-Catter, 2001).

Escape extinction involves the continued presentation of demands following problem behavior, thereby preventing escape or avoidance contingent on problem behavior (Zarcone et. al., 1993). Iwata, Pace, Kalsher, Cowdery & Cataldo (1990) evaluated the effects of escape extinction for seven participants who exhibited escape-maintained SIB. A multiple baseline across subjects design was used to evaluate the effects of escape extinction. During baseline, the therapist presented learning trials and delivered praise for correct responding. Contingent upon SIB, the therapist delivered 30-s break from instructional demands. Treatment sessions were identical to baseline sessions except that any attempt and/ or occurrence of SIB resulted in the therapist physically guiding the participant to complete the task. Results showed that escape extinction procedures were successful in reducing participants' SIB and in increasing task compliance.

Treatment of escape-maintained problem behavior with the implementation of escape extinction alone and/or combined with instructional fading was evaluated by Zarcone et al. (1993). Three individuals diagnosed with developmental disabilities who exhibited moderate-to-severe SIB participated. Results of a functional analysis showed that participants' problem behavior was maintained by negative reinforcement contingencies. A multiple baseline across subjects design was implemented in which two treatments were compared in a multielement format. Both conditions included an escape extinction component and one condition included an instructional fading component. During the escape extinction plus instructional fading condition, the frequency of instructional trials was initially reduced to zero. Instructional trials per session were increased by one if the subject's SIB was at-or-

below a set criteria until the instructional rates matched baseline rates. Results showed that both treatments were effective in reducing SIB; however, escape extinction alone reduced SIB to end-of-treatment criteria in fewer sessions than did escape extinction plus fading for all participants. It should be noted that extinction bursts (increased rates of SIB at the beginning of treatment) were observed for 2 of the 3 participants during the escape extinction alone condition but not during the escape extinction plus instructional fading condition.

Another consequent-based intervention that has been evaluated for escape-maintained problem behavior is differential reinforcement of alternative behavior (DRA). When the alternative behavior involves a communicative response, DRA has often been termed functional communication training (FCT). FCT involves two components: (a) the identification of the function of problem behavior, followed by (b) the subsequent teaching of a communicative response that results in the same consequence (i.e. teaching a child with escape-maintained problem behavior to appropriately request a break instead of engaging in problem behavior to escape from demands). FCT has been examined in numerous studies with and without extinction (Fisher et al., 1993; Lalli, Casey & Kates, 1995). Fisher et al. evaluated the efficacy of FCT alone and in combination with extinction and punishment components. Participants included in the study were diagnosed with severe mental retardation, communication deficits, and exhibited various topographies of problem behavior (e.g., aggression, SIB, environmental destructions). Functional analyses showed that problem behavior was maintained by escape for 2 participants and access to tangibles for 2 participants. Prior to the implementation of baseline sessions, participants were

trained to exhibit an appropriate communicative response (i.e., a sign) that resulted in access to a reinforcer (i.e., break, toy). Results showed that the FCT condition alone was successful in substantially reducing rates of destructive behavior for only one participant. The greatest reductions in problem behavior were obtained for all participants when FCT was combined with extinction and/or punishment procedures. It is important to note that the extinction and punishment procedures were less effective in reducing problem behavior when FCT was not included as a treatment component.

Piazza et al. (1997) examined the use of positive and negative reinforcement for compliance, both with and without extinction, for treating escape-maintained problem behavior. Results of a functional analysis suggested that participants' problem behavior was maintained by escape from demands and access to a tangible item (two participants) or by escape from demands, attention, and access to a tangible item (one participant). For all participants, treatment involved the delivery of three different consequences singly provided contingent upon compliance: DRA of compliance without extinction (praise/break), DRA of compliance without extinction (break/break) and DRA of compliance without extinction (tangible/break). In addition, two conditions were evaluated when problem behavior did not produce a break (escape extinction) for one participant (DRA of compliance with extinction (break/extinction) and DRA of compliance with extinction (tangible/extinction). For 2 participants, compliance increased and problem behavior decreased in the absence of extinction when compliance produced access to tangible items. For the other participant, compliance increased and problem behavior decreased only when

extinction was in effect. For all participants, the schedule of reinforcement for compliance was faded more rapidly when compliance produced multiple reinforcers (i.e., break & attention or break & tangible) and when extinction was in effect for problem behavior.

Steege et al. (1990) evaluated the effects of negative reinforcement for appropriate behavior with escape extinction for treating problem behavior. Participants were two individuals, diagnosed with profound mental retardation, who exhibited SIB. Functional analyses showed that their SIB was maintained by negative reinforcement. During baseline, continuous grooming tasks were presented to the participant, and SIB resulted in immediate manual guidance to complete the task. During treatment, participants were provided with a 10-s break when they activated a microswitch. Cooperation with an activity resulted in the therapist physically guiding the participant to touch the microswitch if they did not initiate the response independently, and this response was followed by a 10-s break. If the participant engaged in SIB during the task or the 10-s break, the therapist provided immediate manual guidance to complete the task. During the extinction only baseline, both participants exhibited high rates of SIB. During the treatment phase, when a negative reinforcement contingency for microswitch presses was added to the extinction component, SIB decreased to low levels.

When conducting differential reinforcement treatment, many studies have used a reinforcer that is matched to that maintaining participants' problem behavior as identified during a pre-treatment functional analysis. However, a number of studies have also examined differential reinforcement using a preferred item that is arbitrary

with respect to behavioral maintenance. That is, an item that was preferred, but did not function as a maintaining reinforcer for the problem behavior, was used (DeLeon, Neidert, Anders & Rodriguez-Catter, 2001; Kodak et. al, 2007). Lalli et al. (1999) compared the effects of maintaining versus arbitrary reinforcers for five participants who exhibited problem behavior maintained by negative reinforcement in the form of escape from tasks. During baseline, the therapist delivered demands using a three-step prompting procedure (verbal, gestural, physical) and each occurrence of problem behavior resulted in a 30-s break from demands. High rates of problem behavior were obtained for all participants during baseline sessions. During treatment sessions, demands were continuously presented, compliance was reinforced by a break or an edible, and problem behavior was reinforced by a break. Results showed higher levels of compliance and lower rates of problem behavior when an arbitrary item (an edible) was delivered contingent on compliance as compared with when escape was delivered. These findings were surprising for two reasons. First, an arbitrary reinforcer that did not maintain problem behavior was more effective than a maintaining reinforcer for increasing compliance and reducing problem behavior. Second, treatment gains were achieved without the use of extinction.

DeLeon et al. (2001) also conducted a study examining maintaining versus arbitrary reinforcers for treating escape-maintained problem behavior. During baseline, demands were continuously presented, and problem behavior resulted in a 30-s break. During the first treatment phase, two conditions were alternated, using a multielement design. During one treatment condition, the therapist delivered demands and compliance resulted in the delivery an edible. During the other treatment

condition, the therapist delivered demands and compliance resulted in the delivery of a 30-s break. During both conditions, problem behavior produced a 30-s break from demands. Results showed that rates of compliance were higher and rates of problem behavior were lower when the positive reinforcer was delivered. In a subsequent treatment phase, the participant was offered a choice between a 30-s break an edible contingent on task completion, and escape extinction was in effect for problem behavior. Work requirements were gradually increased across sessions, based upon low levels of problem behavior. Results showed that the participant consistently chose the positive reinforcer over the negative reinforcer when the task requirement was low (i.e., less than a fixed-ratio 10). However, when the work requirement was increased to an FR 10 schedule, the participant allocated their choice to the negative reinforcer contingent on task completion, and variable rates of problem behavior were obtained. Variable preferences for positive and negative reinforcers were obtained for the first two sessions when a schedule reversal was conducted and the reinforcement schedule was increased to an FR1. When the work requirement was reserved to an FR 10 schedule, variable preferences for the positive and negative reinforcer were obtained and variable rates of problem behavior occurred. These results indicate that increasing the work requirement for this participant altered the value of the break as a reinforcer.

Kodak et al. (2007) extended the studies conducted by Lalli et al. (1999) and DeLeon et al. (2001) by further evaluating how preference for a food item versus a break is influenced by schedule requirements, preference level of the task, and variations in the quality of the reinforcer. Five participants diagnosed with autism and

various other developmental disabilities participated in the study. Results of functional analyses that included a tangible condition showed that participants' problem behavior was maintained by escape and was not maintained by access to tangibles. A task preference assessment was conducted using the procedures described by Lattimore, Parsons and Reid (2002) to identify high-and low-preference tasks. During the choice analysis, tasks were presented by a therapist using a three-step prompting procedure (verbal, model, physical) and extinction was in effect for problem behavior. High-and low preference tasks were alternated across sessions in a multielement design. Across all phases of the choice analysis, contingent on task completion, participants were given a choice between a 30-s break and an edible. During phase 1, a high preference edible item was used, and the schedule required for task completion was successively thinned. Results showed that 4 of the 5 participants selected the food item over the break, irrespective of the task used or the reinforcement schedule in effect. During Phase 2, participants were provided with a choice between a high-preference edible and an enriched break (a break with toys and/or attention) contingent on task completion. Results showed that 4 of the 5 participants continued to select the edible over the break. In Phase 3, a low-preference edible was substituted for the high-preference edible, and 3 of the 4 participants shifted their choice to the break over the edible. All participants exhibited high levels of compliance throughout the study. Although problem behavior was low for all participants, one participant displayed elevated rates of problem behavior under thin reinforcement schedules, and three participants exhibited slightly elevated rates when less-preferred tasks were presented.

One potential concern with the Kodak et al. (2007) study was that a selection-based task preference assessment was used for identifying low- versus high-preference tasks. During this assessment, tasks were presented in pairs, and participants were asked to select one. Following a selection, the participant was prompted to complete the selected task. High-preference tasks were defined as those selected most often and low-preference tasks were defined as those selected least often. Although the procedure indicated a hierarchy of task preference, they did not evaluate the extent to which the tasks included in the array functioned as establishing operations. Therefore, it is possible that neither the high- nor the low-preference tasks identified functioned as establishing operations, limiting the generality of their findings to problem behavior maintained by escape.

An alternative method for identifying tasks that function as establishing operations for problem behavior was used by Roscoe, Rooker, Pence, & Longworth (in press), who singly presented tasks during 5-min sessions. Tasks were continuously presented using a 3-step prompting procedure (vocal, model, then physical), and problem behavior resulted in a 30-s break. Dependent variables measured included both compliance (completion of the task before the physical guidance prompt) and problem behavior. From this assessment, low-probability (low-p) demands (those associated with either low levels of compliance or high levels of problem behavior) and high-probability (high-p) demands (those associated with either high levels of compliance and low levels of problem behavior) were identified. A subsequent FA was conducted to evaluate the validity of this method in identifying demands that did and did not evoke problem behavior during a functional analysis. Results showed that

clearer functional analysis outcomes were obtained for 3 of the 4 participants when a low-p demand condition was included rather than a high-p demand condition. These findings illustrated the importance of conducting a demand assessment to empirically identify effective establishing operations for the demand condition. If demands included in the FA demand condition are not empirically identified, they may not function as establishing operations and, consequently, may result in a false-negative outcome for escape-maintained behavior.

Although a number of studies have evaluated the relative effects of positive versus negative reinforcement for treating negatively-reinforced problem behavior, further research is needed to determine if and when a maintaining reinforcer (escape) will be selected more often than an arbitrary reinforcer (an edible). Kodak et al. (2007) found that positive reinforcement often competed with negative reinforcement even when the schedule was thinned, suggesting that arbitrary reinforcers may be just as effective if not more effective than the maintaining reinforcer in decreasing problem behavior. However, because the tasks used may not have functioned as establishing operations for participants with problem behavior, it is unclear whether these findings would generalize to tasks that reliably evoke problem behavior. The purpose of this study was to extend research by Kodak et al. by utilizing two different types of assessments: a selection-based task preference assessment (as used by Kodak et al.) and a task assessment that empirically identified motivating operations as described by Roscoe et al. (in press). We evaluated whether including tasks that did and did not reliably evoke problem behavior among individuals with escape-maintained problem

behavior differentially affected their selection among the maintaining negative-reinforcer response option over the arbitrary positive-reinforcer response option.

Method

Participants and Setting

Two individuals, who exhibited problem behavior that interfered with their educational programming, were included in this study. Both participants were diagnosed with an autism spectrum disorder, attended a school for children with developmental disabilities, had visual discrimination skills, and could follow one-step directives. Noah was a 13-year-old boy who emitted aggression in the form of head butts, slaps and kicks. He communicated vocally and/or with picture exchange communication systems (PECS). Josh was a 9-year-old boy who emitted self-injury in the form of hand bites. He communicated vocally and/or with picture exchange communication systems (PECS) and electronic devices.

Sessions for Noah were conducted in his classroom. This room contained classroom materials, a table and two chairs. Sessions for Josh were conducted in two classrooms with limited distractions. Both rooms were approximately 1.5 m by 3.6 m and were equipped with a two-way mirror, a table, 2 chairs, a video camera, and relevant session materials. All sessions were videotaped. Sessions were conducted 2-3 times per week.

Response Measurement and Interobserver Agreement

Dependent variables were participants' selection of an edible (paired-stimulus preference assessment), participants' selection of a photo depicting a task (task-preference assessment), and participants' selection of a photo depicting a positive or a

negative reinforcer (choice analysis), task compliance (task-preference assessment, motivating operation assessment, and choice analysis), and problem behavior (functional analysis, task-preference assessment, motivating operation assessment, and choice analysis). For Noah, aggression was defined as any occurrence of a head butt, slap or kick. For Josh, hand biting was defined as any instance in which any part of his hand made contact with the mouth and pressure was applied to the hand with teeth. Reinforcer choice was defined as pointing to or touching one of two pictures, each associated with either a positive or negative reinforcer, after the delivery of a verbal prompt. Compliance was defined as completing a task within 5 s of the verbal or model prompt.

Dependent variables were scored using data collection software on computers. All sessions were videotaped and tapes were scored by trained observers for both primary and interobserver agreement (IOA) data. Interobserver agreement was calculated by dividing the total number of occurrence agreements across consecutive 10-s intervals by the total number of occurrence agreements plus disagreements and multiplying by 100%. Interobserver agreement was scored for at least 25% of all sessions. The criterion for acceptable agreement was 85%.

For Noah, IOA was scored for 25% of task preference assessment trials, 30% of motivating operation assessment sessions, 60% of the functional analysis sessions and 35% of the choice evaluation sessions. The average agreement for task preference assessment was 100% with all values at 100%. The average agreement for the motivating operation assessment was 98.8% with a range of 93.3% to 100%. The average agreement for the functional analysis was 99.4% with a range of 95% to

100%. The average agreement for the choice evaluation assessment was 98.5% with a range of 97% to 100%. For Josh, IOA was scored for 33 % of task preference assessment trials, 33% of motivating operation assessment sessions, 44% of the functional analysis sessions and 32% of the choice evaluation sessions. The average agreement for task preference assessment was 97.2% with a range of 91.7% to 100%. The average agreement for the motivating operation assessment was 99.6% with a range of 96.7% to 100%. The average agreement for the functional analysis was 100% with a range of 100% to 100%. The average agreement for the choice evaluation assessment was 95.2% with a range of 83.3% to 100%.

Assessments Prior to Experimentation

Edible Preference Assessment.

A paired-stimulus preference assessment, based on that described by Fisher et al. (1992), was conducted to identify a high-preference edible for use during the choice analysis. During this assessment, eight edible items were presented in pairs, and each item was presented with every other item, for a total of 56 trials. During each trial, two edibles were simultaneously presented, and the participant was asked to select one. If the participant did not select an edible within 5 s, the items were removed for 5 s and then represented. Observers collected data on participant selection, which was defined as picking up an edible and consuming it within 5 s. Results were summarized by dividing the number of trials each edible was selected by the total number of trials it was presented. High-preference was defined as selection on at least 80% of trials. A high-preference edible was included in the functional analysis tangible condition and in subsequent experimental conditions. For

Noah, pepperoni (selected on 100% of trials) was identified as the high-preference edible. For Josh, kit kat® chocolate bars (selected on 92% of trials) was identified as the high-preference edible.

Task Preference Assessment.

A task-preference assessment was conducted to identify high-preference and low-preference tasks based on procedures described by Lattimore et al. (2002). Prior to the assessment, 8-to-12 tasks were identified through staff interview and by review of participants' individualized education plans and core skills assessments (only tasks similar to those on the plan or core skills were used). Because certain task types or categories may be more likely to evoke problem behavior, tasks from a range of categories were identified, including academic tasks (e.g., sight words), daily living tasks (e.g., brushing teeth), and domestic tasks (e.g., throwing away a cup). In addition, staff were asked to indicate demands that could be completed by the participant but were often associated with noncompliance and/or problem behavior. Four-to-six of the tasks included involved physical movement (getting up from a chair and/or walking across the room), whereas the remainder of the tasks required minimal physical exertion (e.g., they were conducted at a table).

Prior to the assessment, the experimenter captured photos of the participant performing each task. The photos were subsequently placed in front of the participant, and the therapist manually guided the participant to touch the photo and subsequently complete the task depicted. This procedure was conducted a minimum of 10 times for each task to ensure that the participant had sufficient exposure to the contingency associated with touching each photo.

During the assessment, 8 to 12 photos depicting the participant performing each task were presented in pairs and each photo was paired with every other photo two times. The number of trials varied across participants based upon the number of tasks selected for inclusion. During the assessment, two different photos were simultaneously presented to the participant and the participant was instructed to “choose.” Following participant selection of one of the photos, the other photo was immediately removed from the table, and the therapist presented the task depicted in the photo. Each time a photo was selected, the therapist instructed the participant to complete the task (e.g., put 1 shape in a shape sorter box) using a three-step prompting procedure (gesture, model, then physical). This procedure was repeated three times during each trial so that the participant was required to complete the task three times before continuing on to the next trial (e.g., put 3 shapes in shape sorter box). If the participant did not select a task within 5 s, the photos were removed for 5 s and then represented. No consequences were provided for problem behavior. The participant was trained on these procedures a minimum of 2 times for each photo prior to the assessment. During this assessment, observers measured task selection, compliance and problem behavior. Results were summarized by dividing the number of trials each task was selected by the total number of trials it was presented. High-preference (high-p) tasks were those that were selected at least 70% of trials, whereas low-preference (low-p) tasks were defined as those selected on less than 40% of trials. One low-p and one high-p task was identified for each participant for inclusion in the subsequent choice analysis.

Motivating Operation Assessment.

A motivating operation assessment, based on procedures described by Roscoe et al. (in press), was conducted to identify tasks that did and did not evoke problem behavior. The same 8-to-12 tasks included in the participants' task preference assessment were used. During each 5-min session, a single task was continuously presented using a three-step prompting hierarchy (vocal, model, and then physical). Tasks were presented in a random order, two-to-three times each, using a multielement design. Sessions were identical to functional analysis demand sessions. The therapist was present in the room with appropriate task materials. If the participant completed the task before the physical prompt, brief praise was delivered. If the participant engaged in the target behavior, the task was removed for 15 s. During this assessment, observers measured problem behavior and compliance. Problem behavior was measured using frequency and was summarized by dividing the total number of responses by the total session time. Compliance was defined as completion of the demand before the physical prompt and was summarized as the percentage of occurrence by dividing the number of compliances by the number of demand presentations. Low-probability (low-p) demands were defined as those that evoked at least .6 responses of problem behavior per minute. High-probability (high-p) demands were defined as those that evoked less than .6 responses of problem behavior per minute. Two-to-three low-p demands were identified for each participant for inclusion in the subsequent FA. One low-p and one high-p demand was identified for each participant for inclusion in the subsequent choice analysis.

Functional Analysis.

Following the task preference and the motivating operation assessments, a functional analysis was conducted based on that described by Iwata et al. (1982/1994). Conditions included attention, demand, toy play, and alone or no interaction conditions. In addition, a tangible condition using the high-preference edible was included to ensure that this item was not a maintaining reinforcer for problem behavior. Tasks that were associated with problem behavior during the motivating operation assessment were included in the demand condition. For Noah, standing up and sitting on the floor, toe touches and hand writing were used. For Josh, zipping jacket and toe touches were used. Sessions were 5 min for Josh and 10 min for Noah, and were randomly alternated in a multielement design.

Discrimination Training.

After the completion of the functional analysis, the therapist taught participants to discriminate between two pictures, one depicting a break icon and the other depicting a photo of the preferred-edible item. During each session a demand was presented and the therapist manually guided the participant to touch one of the pictures after demand compliance. The therapist subsequently delivered the reinforcer (edible or 30-s break) depicted in the picture. After this discrimination procedure occurred 5 times for each picture (break icon and photo of edible), the therapist instructed the participant to complete the task. After the participant completed the task (after the verbal, model or physical prompt) the therapist placed the two photos in front of the participant and instructed them to “choose,” followed by the subsequent delivery of the reinforcer (food or break) depicted in the photo selected.

Discrimination training was complete when the participant completed all demands three times and independently selected a reinforcer after each demand completion.

To ensure that the participant could discriminate between the pictures and contacted the consequences associated with each of the pictures, booster discrimination training sessions were conducted periodically throughout the FR 2 and FR 5 schedules of reinforcement. A booster session consisted of the therapist delivering a demand (verbal, model, then physical), manually guiding the participant to select the break picture, followed by the delivery of the reinforcer (30s break).

Choice Analysis

During this analysis, three conditions were alternated using a multielement design. One condition was a high-preference task condition and included the task identified as high-preference according to the task-preference assessment and as high-p according to the motivating-operation assessment (HP- TP & MO). The second condition was a low-preference task condition and included the task identified as low-preference according to the task-preference assessment but not according to the motivating-operation assessment (LP- TP/ HP- MO). The third condition was a low-p task according to the motivating operation assessment and the task-preference assessment (LP- TP & MO).

During sessions, tasks were singly presented using a three-step prompting procedure (verbal, model, physical prompts). In addition, no programmed consequences were provided for problem behavior (i.e., problem behavior was exposed to extinction).

Two choice analyses were conducted. The purpose of the first reinforcer choice analysis was to evaluate preference for reinforcers under increasing schedule requirements with one high-preference task and two low-preference tasks. In this condition, the therapist presented a task using a three-step prompting procedure (verbal, model then physical). After the completion of the task requirement, the therapist presented the participant with two pictures and instructed the participant to “choose one.” If the participant selected the picture depicting the high-preference edible, the therapist delivered that item and immediately presented the next task. If the participant selected the picture depicting the break icon, the therapist provided the participant with a 30-s break from demands. Sessions ended when the participant had received 5 opportunities to choose between reinforcers. The FR 1 schedule of reinforcement for task completion was systematically faded to an FR 2 schedule when the reinforcer choice remained stable for at least 3 consecutive sessions. Choice stability was achieved when choice selection varied 20% or less from one session to the next. The FR1 schedule was thinned to an FR2 and then to an FR5 schedule. Three sessions of each demand were conducted for each schedule of reinforcement (FR1, FR2, and FR5). This choice analysis was conducted with Noah only.

The second reinforcer choice analysis was similar to the first with a few modifications. At the start of the session, both pictures (the picture depicting the edible and the picture depicting the break icon) were placed on the table in front of the participant. After selection of one of the two cards, both cards were removed, the relevant consequence was delivered, and the cards were represented after 30 s. When the participant chose the picture of the edible, the edible was delivered and the

therapist immediately presented a task using a three-step prompting procedure (verbal, model, then physical). After 30 s, the pictures were represented, and the participant had the opportunity to choose between reinforcers. If the participant chose the picture depicting the break icon, the task was immediately removed for 30 s and both pictures were also removed for 30 s. Following the break, the pictures were represented, and the therapist continued to present demands. The therapist did not prompt the participant to choose a reinforcer after the pictures were available during sessions. However, the participant received the reinforcer (break or edible) whenever they touched or pointed to a picture. For Noah, the reinforcer schedule was thinned to a fixed-interval 3-min schedule when reinforcer choice was stable for at least three consecutive sessions. Sessions were 10 min.

Results

The results of the Noah's task-preference assessment are depicted in the top panel of Figure 1. According to this assessment method, high-preference tasks were defined as those selected on at least 70% of trials, and low-preference tasks were defined as those selected on 40% or fewer trials. For Noah, four tasks, wipe tray (M selection = 86.3), cut paper (M selection = 72.7), sort shapes (M selection = 72.7), and sweep floor (M % selection 72.7) were identified as a high-preference task, and three tasks, touch toes (M % selection = 4.5%), standup and sit on the floor (M selection = 9%), and standup and sit on a chair (M selection = 22.7%) were identified as low-preference tasks. During the task-preference assessment, aggression occurred but was not consistently associated with a particular task.

The results of Noah's motivating-operation assessment are depicted in the bottom panel of Figure 1. According to this assessment method, high-preference tasks were defined as those associated with less than .5 RPM problem behavior, whereas low-preference tasks were defined as those associated with greater than .5 RPM problem behavior. Ten tasks, shape sorter (M aggression = 0.0 RPM, M compliance = 97.2%) sort utensils (M aggression = .067 RPM, M compliance = 96.6%), brush teeth (M aggression = .130 RPM, M compliance = 96.6%), type letter (M aggression = .467 RPM, M compliance = 94.0%), cut paper (M aggression = .067 RPM, M compliance = 91.1%), write name (M aggression = .4 RPM, M compliance = 88.9%), lace cards (M aggression = .4 RPM, M compliance = 85.1%), wipe tray (M aggression = .067 RPM, M compliance = 84.9%) sweep floor (M aggression = .0 RPM, M compliance = 91.1%) and standup and sit on chair (M aggression = .4 RPM, M compliance = 77.6%) were identified as high-p tasks. Two tasks, stand up and sit on floor (M aggression = 1.5 RPM; M compliance = 61%) and touch toes (M aggression = 1.1 RPM; M compliance = 76.8%), were identified as low-p demands.

The results of Josh's task-preference assessment are depicted in the top panel of Figure 2. For Josh, two tasks, tie shoes (M selection = 71.4%) and wash face (M selection = 71.4%), were identified as high-preference tasks, and three tasks, count out number (M selection = 28.5%), zip jacket (M selection = 21.4%), and touch toes (M selection = 7.1%) were identified as low-preference tasks. During the task-preference assessment, SIB occurred 13 times and was most often observed with the sit-up task.

The results of Josh's motivating-operation assessment are depicted in the bottom panel of Figure 2. For Josh, one task, touch toes (M SIB = 1.3 RPM; M compliance = 70.5%), was identified as a low-preference task. Seven tasks, zip jacket (M SIB= 0.4 RPM, M compliance = 76.9%) throw cup in trash (M SIB = 0.0 RPM, M compliance = 100%), wash face (M SIB = 0.0 RPM, M compliance = 98.4%), step on stool (M SIB = 0.0 RPM, M compliance = 94.2%), tie shoe (M SIB = 0.0 RPM, M compliance = 59.8%), count out number (M SIB = .5 RPM, M compliance = 50%), sit up (M SIB = 0.0 RPM, M compliance = 10.7%) were identified as high-p tasks. Although Josh exhibited problem behavior when zip jacket was presented, this task was not identified as low-preference task because it evoked less than .5RPM SIB. (M SIB = .4). Problem behavior did not occur when sit ups were presented as a demand however Josh was compliant for 10.7% of opportunities. Although rates of compliance were extremely low for this demand, his caregivers hypothesized that Josh enjoyed manual guidance during the activity.

Based on the results of these assessments, tasks were identified to be included in the three different choice analysis task conditions. For Noah, shape sorter was identified as the high-preference task according to both assessments (HP- TP & MO), stand up and sit on chair was selected as a low-preference task according to the task-preference assessment but not according to the motivating-operation assessment (LP – TP/HP - MO), and stand up and sit on floor was identified as a low-preference task according to both assessments (LP – TP & MO). For Josh, wash face was identified as the high-preference task according to both assessments (HP– TP & MO), count out numbers was selected as a low-preference task according to the task-preference

assessment but not according to the motivating-operation assessment (LP – TP/HP - MO), and touch toes was identified as a low-preference task according to both assessments (LP – TP & MO).

Results of participants' functional analyses are depicted in Figure 3 and Figure 4. For Noah aggression was only observed during the demand condition, suggesting his behavior was maintained by negative reinforcement in the form of escape from tasks. For Josh, SIB initially was differentially higher during the demand condition. However, after the first few series, SIB became undifferentiated and was observed during demand, attention, and alone conditions. In order to enhance discrimination across conditions, demand and alone conditions were alternated in a subsequent pairwise phase. During this phase, SIB occurred during both conditions for the first 10 sessions. However, when session length was extended from 5 min to 10 min, differentially higher rates of problem behavior occurred in the demand condition, suggesting that Josh's SIB was maintained by negative reinforcement in the form of escape from tasks.

Results of Noah's first choice analysis are depicted in Figure 5. Noah consistently selected the picture depicting the edible over the picture depicting the break icon across HP – TP & MO, LP – TP / HP - MO, and LP – TP & MO conditions and across FR 1, FR 2, and FR 5 phases. The one exception was a trial during the FR 1 phase when the LP – TP / HP – MO condition was presented. During the FR 1 phase, high levels of compliance and no problem behavior were observed across HP – TP & MO (M = 93.3%), LP – TP / HP – MO (M = 100%), and LP – TP & MO (M = 80%) conditions. During the FR 2 phase, high levels of compliance were

observed across HP – TP & MO (M =100%) and LP – TP /HP – MO (M = 96.7%) conditions, but not during the LP – TP & MO (M = 60%) condition. During the FR2 phase, no problem behavior occurred across the HP – TP & MO (M aggression= 0.0 RPM) and LP – TP / HP – MO (M aggression = 0.0 RPM) conditions but high levels occurred in the LP – TP & MO (M aggression= .55 RPM) condition. During the FR 5 phase high levels of compliance were observed across HP – TP & MO (M =94.7%) and LP – TP / HP – MO conditions (M = 99.7%), but not during the LP – TP & MO condition (M = 64%). During the FR5 phase no problem behavior occurred across the HP – TP & MO (M aggression= 0.0 RPM) and LP – TP / HP – MO (M aggression = 0.0 RPM) conditions but occurred in the LP – TP & MO (M aggression = .28 RPM) condition. Furthermore, when the schedule increased to FR10, the session met criteria for termination due to the danger it posed to the therapist because of the intensity of the aggressions. For these reasons, we did not further thin the schedule with Noah and did not implement this procedure with Josh. Instead, we initiated a second choice analysis that was similar to the first analysis with some minor modifications.

Results from Noah's second choice analysis are depicted in Figure 7. Similar to the results of the first choice analysis, Noah consistently selected the picture depicting the high-preference edible over the picture depicting the break icon across all three task conditions. When the reinforcers were available every 30s, high levels of compliance were observed across HP – TP & MO (M = 96.2%), LP – TP / HP – MO (M = 93.5%) conditions and low level of compliance were observed in the LP – TP & MO (M = 61.3%) condition. Low levels of problem behavior occurred across HP – TP & MO (M aggression = 0.0 RPM), LP – TP / HP – MO (M aggression = .2

RPM) and the LP – TP & MO (M aggression= .1 RPM) conditions. These results were replicated when response effort was increased during the fixed-interval 3-min schedule. When the reinforcers were available every 3 min high levels of compliance were observed across HP – TP & MO (M = 95.7%), LP – TP / HP – MO (M = 83.7%) conditions and low level of compliance were observed in the LP – TP & MO (M = 31.3%) condition. Low levels of problem behavior occurred across HP – TP & MO (M aggression = .06 RPM), LP – TP / HP – MO (M aggression = 0.0 RPM) and the LP – TP & MO (M aggression= .2 RPM) conditions.

Results from Josh's choice analysis are depicted in Figure 8. Josh selected the picture depicting the break icon over the picture depicting the high preference edible for the majority of sessions across two task conditions. Josh consistently selected the break icon over the high-preference edible in the LP – TP & MO condition (M = 90.25%). During the first session in which the LP – TP / HP – MO condition was presented, Josh preferred the high-preference edible over the break (M = 93%), however Josh consistently chose the break for remaining 3 session (M = 95%). During the first two sessions in which the HP – TP & MO condition was presented Josh consistently preferred the edible over the break (M = 95.5%) however during the final two sessions, Josh consistently chose the break over the edible (M = 100%). Low levels of compliance were observed across HP – TP & MO (M =50 %), LP – TP/ HP – MO (M = 30%) and the LP – TP & MO (M = 39%) conditions. Low levels of problem behavior occurred across the HP – TP & MO (M SIB = .1 RPM), LP – TP/ HP– MO (M SIB= 0.0 RPM) conditions and high levels of problem behavior occurred in the LP – TP & MO (M SIB=.33 RPM) condition.

Discussion

In the present study, we further evaluated the competition between positive and negative reinforcement for two individuals with escape-maintained problem behavior. We extended previous research by Kodak et al. (2007) by conducting a motivating-operation assessment in addition to a task-preference assessment for identifying low-preference tasks for use during the choice analysis. The motivating operation assessment allowed for the identification of tasks that reliably evoked problem behavior. By including low-preference tasks that functioned as establishing operations for escape-maintained problem behavior, we increased the likelihood that participants would choose the maintaining reinforcer (escape) response option over the arbitrary (edible) response option. A strength of this study was that we systematically evaluated whether preferred tasks identified in the task-preference assessment matched outcomes in the motivating-operation assessment (i.e., whether they did not evoke problem behavior). More importantly, we evaluated whether low-preferred tasks identified in the task-preference assessment matched outcomes obtained during the motivating operation assessment. Tasks were identified for both participants that were low-p according to the task preference assessment and high-p according to the motivating operation assessment. For both participants, high and low preference tasks matched for both assessments with the exception of one task. For Noah, standup and sit on the chair was identified as a low-p task according to the task-preference assessment (M selection = 22.7%) but not according to the motivating operation assessment. For Josh, count out number was identified as a low-p task according to the task-preference assessment (M selection = 28.5%) but not according

to the motivating operation assessment. These findings suggest that the tasks identified as low-preference in the Kodak et al. study may not have functioned as establishing operations for escape-maintained problem behavior. Therefore, one explanation for why participants consistently selected the arbitrary reinforcer (edible) over the maintaining reinforcer (break) may have been because the low-preference tasks presented did not function as sufficient establishing operations. To test this possibility, we included two different low-p task conditions, one that was indicated as low-preference according to the task-preference assessment but not according to the motivating operation assessment, and one that was low-preference according to both assessments. If participants selected the maintaining reinforcer (break) during the task that was low-preference according to both assessments, but selected the edible during the task that was low-preference according to only the task-preference assessment, this would provide support that identifying a low-preference task based on whether or not it functioned as an establishing operation was an important variable.

Noah consistently selected the positive reinforcer (edible) over the negative reinforcer (break) regardless of the schedule of reinforcement or the task used. These findings are consistent with previous research conducted by Kodak et al. (2007) who found that 4 out of 5 participants with escape-maintained problem behavior consistently selected the positive reinforcer over the negative reinforcer under all schedules of reinforcement, across all demands. A surprising outcome was that different outcomes were not obtained across task condition. That is, Noah consistently selected the same response option (edible response option) whether the task was a low-preference task based on just the task-preference assessment or a low-

preference task according to both the task preference and motivating operation assessments. Problem behavior only occurred when the LP – TP & MO condition was presented during the first choice analysis (M aggression=.28 RPM) and rates of compliance were low during both choice analyses. These results are informative for two main reasons. First, these results suggest that the motivating operation assessment more effectively identified establishing operations for problem behavior over the task preference assessment alone. Second, despite that overall rates of problem behavior were highest and rates of compliance were lowest during the LP – TP & MO condition, there was no differentiation between reinforcer choice when all conditions were presented. Therefore, if the motivating-operation assessment more effectively identified establishing operations for problem behavior, presentation of the low-preference task identified from this assessment did not have a differential effect on participant's response allocation towards for the positive or negative reinforcer response option.

Josh predominantly chose the negative reinforcer (break) over the positive reinforcer (edible) with some response differentiation occurring for three sessions. Josh selected the break icon over the high-preference edible in the LP – TP & MO condition in all sessions. While Josh chose the edible reinforcer in the first two sessions of the HP – TP & MO and the first session of the LP – TP/ HP – MO condition, choices were consistently allocated to the break reinforcer for the remainder of all sessions. Although there was not a significant difference in levels of compliance across all conditions, higher levels of problem behavior occurred during the LP – TP & MO (M SIB= .33 RPM) condition but not during the HP- TL & MO

(M SIB = 0.0 RPM) and LP – TP/ HP – MO (M SIB=.1 RPM) conditions. These results indicate that the use of a motivating operation assessment in addition to a task-operation assessment was necessary in identifying establishing operations for problem behavior. However, despite the fact that the motivating-operation assessment more effectively identified establishing operations for problem behavior, presentation of the low-preference task identified from this assessment did not have a significant differential effect on participant's response allocation towards for the positive or negative reinforcer response option.

Results from Josh's choice analysis are not consistent with previous research evaluating choice between positive and negative reinforcers for individuals with escape-maintained problem behavior (Kodak et al., 2007). It is unclear why Josh preferred the break over the edible for the majority of sessions. One possible explanation is that the high-preference edible identified via an edible preference assessment (Fisher et al., 1992) did not effectively compete with the break reinforcer. These results suggest that increased rates of problem behavior may occur during work sessions if Josh is not provided with the reinforcer options (i.e., break, edible).

Although the results of Noah's choice analyses are consistent with previous research evaluating choice between positive and negative reinforcers for individuals with escape-maintained problem behavior (Kodak et al., 2007), there are some methodological details of the current study that may limit the generality of our results. First, the first choice analysis was conducted with only one participant. Second, the reinforcement schedule was faded from an FR1 to an FR2 to an FR5 schedule but sessions had to be terminated before we could thin the reinforcement schedule to an

FR10. Lalli et al. (1999) found that choices for positive and negative reinforcers were inconsistent when the reinforcement schedule was thinned to an FR10 schedule. It remains unknown whether or not preferences would have shifted if the reinforcement schedule were thinned to a leaner schedule, as was the case in Lalli et al.'s investigation.

During the first choice analysis, escape extinction could not be implemented under thin reinforcement schedules. This differs from Kodak et al. and Lalli et al., who noted that escape extinction was successfully implemented across reinforcement schedules with all participants. In the present study, the severity of the problem behavior made it unsafe for the therapist to conduct sessions. These findings are consistent with the literature that outlines the drawbacks associated with escape extinction procedures such as extinction bursts, poor procedural integrity and safety concerns (Iwata et al., 1990; Pace, Ivancic, & Jefferson, 1994; Piazza, Moes, & Fisher, 1996).

One limitation of this study was that there were only two participants. Future research should attempt to evaluate these interventions with more participants. Another limitation of the study was that the first choice evaluation condition was not completed due to problems associated with escape extinction implementation. The first choice evaluation condition should be implemented with other participants whose behavior is appropriate for therapists to implement escape extinction procedures.

The present findings have a number of implications for future research. DRA for task compliance could be evaluated using a multielement design, where task compliance results in escape in one condition & results in an edible in the other

condition; while problem behavior continues to produce a break. This design could be evaluated when different task conditions are in effect to see how tasks alter problem behavior and compliance during DRA without extinction. Further work could be conducted to evaluate the conditions under which a negative reinforcer may compete with a positive reinforcer. In the current study, fixed-ratio schedules of reinforcement were examined. Future research could evaluate manipulating the quality of the negative and positive reinforcers. For example, it is possible that individuals may select a break over an edible if a lengthy break is offered as opposed to a 30-s break. Future research might explore the effect of VR or VI schedules of reinforcement on preference for positive versus negative reinforcers. In addition, the effects of reinforcement delay could be manipulated to determine whether the delay to each reinforcer may alter participants' preference.

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Figure Captions

Figure 1. Task-preference assessment and Motivating operation results for Noah

Figure 2. Task-preference assessment and Motivating operation results for Josh

Figure 3. Functional analysis results for Noah

Figure 4. Functional analysis results for Josh

Figure 5. Reinforcer choice condition I results for Noah

Figure 6. Compliance and aggression data for Noah's reinforcer choice condition I

Figure 7. Reinforcer choice condition II results for Noah

Figure 8. Reinforcer choice condition II results for Josh

Figure 1:

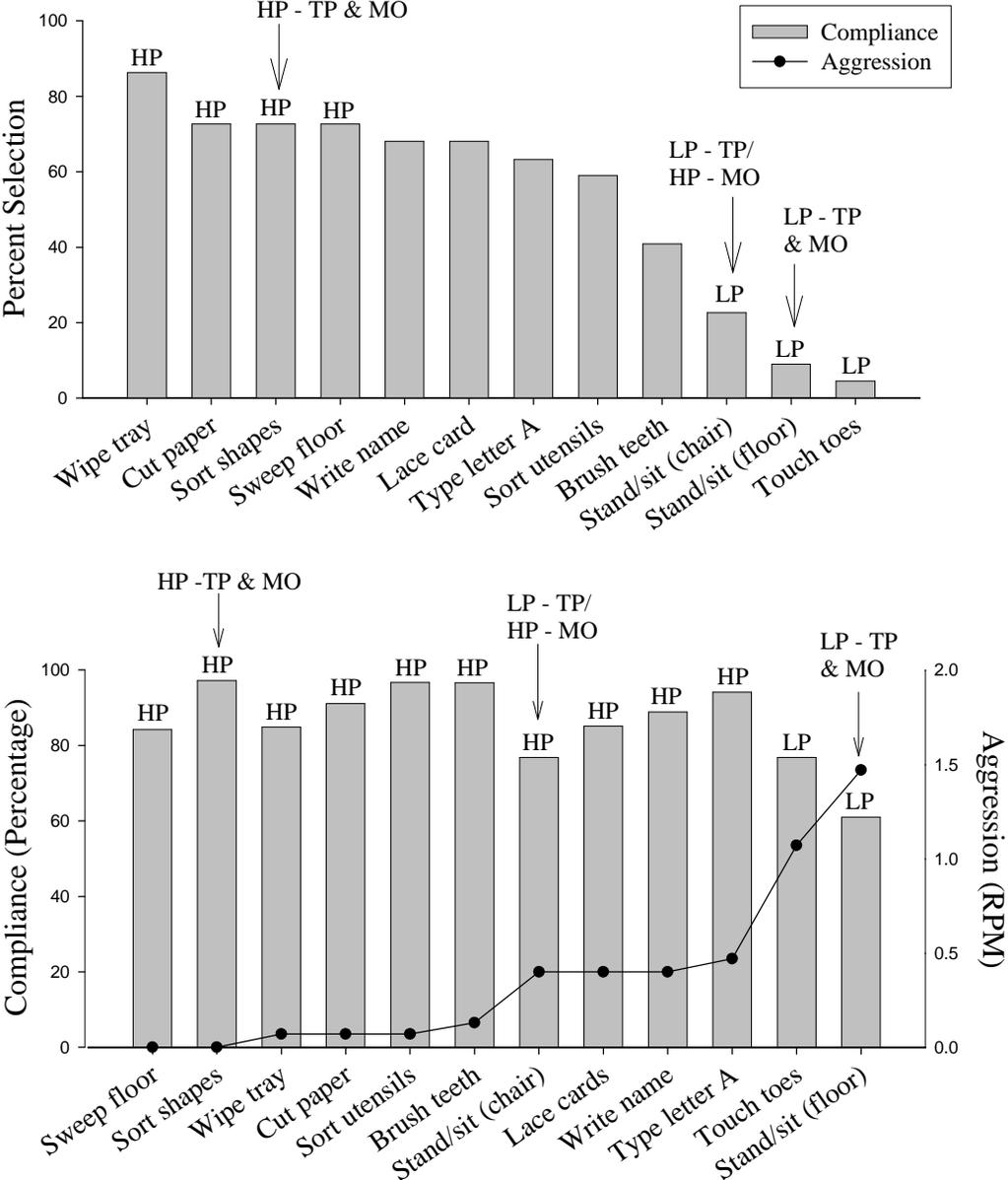


Figure 2:

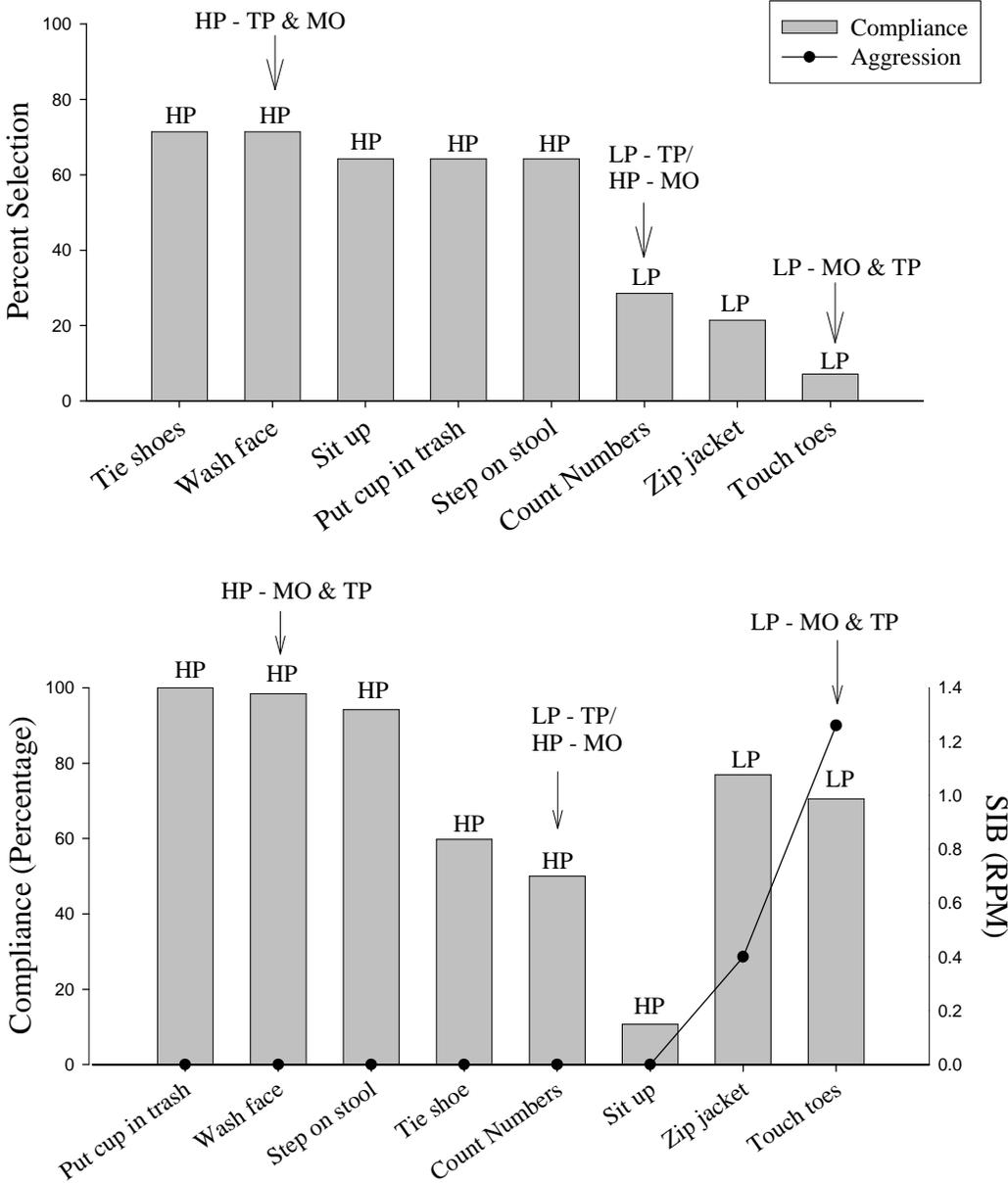
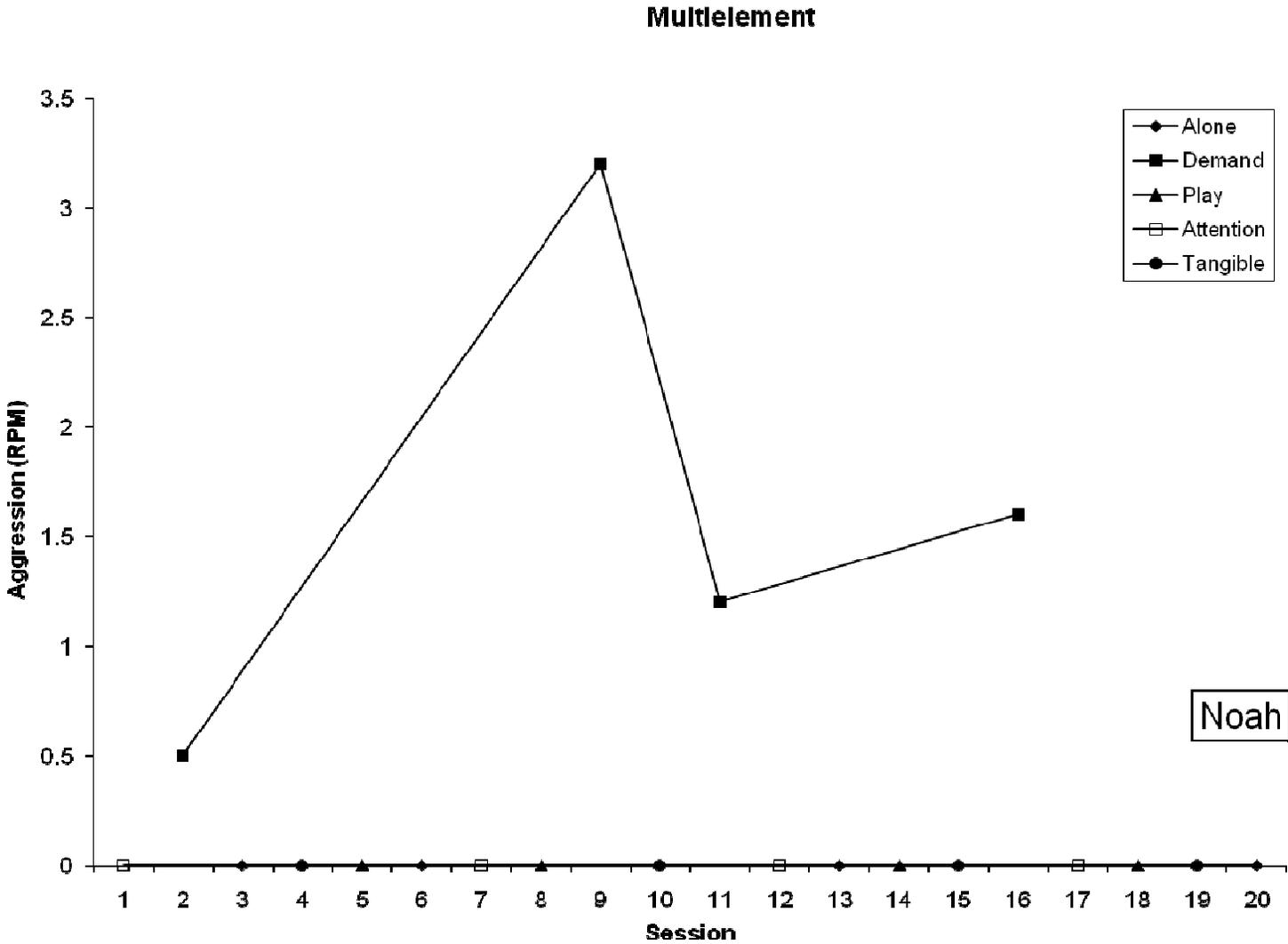


Figure 3:



Noah

Figure 4:

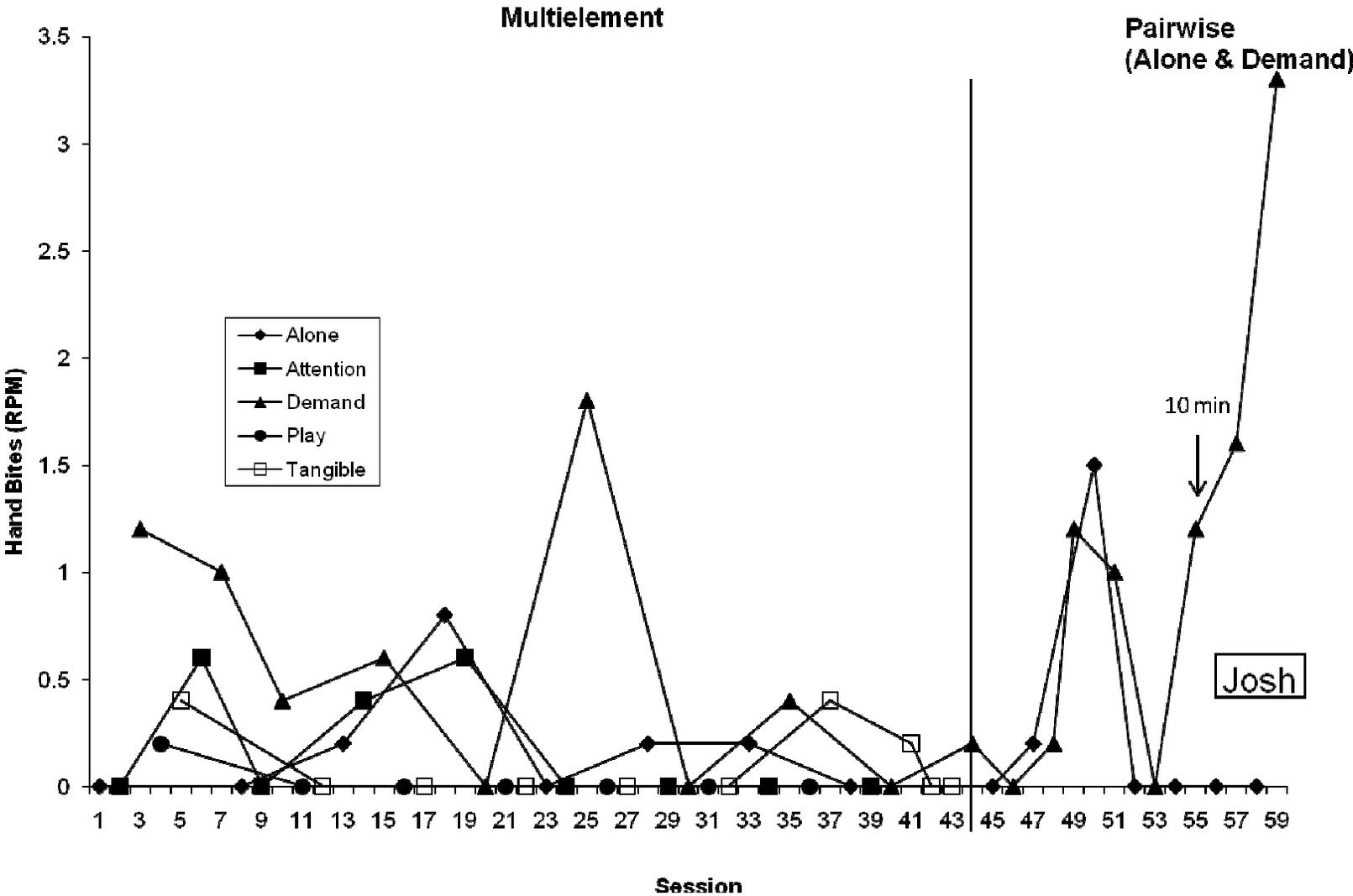


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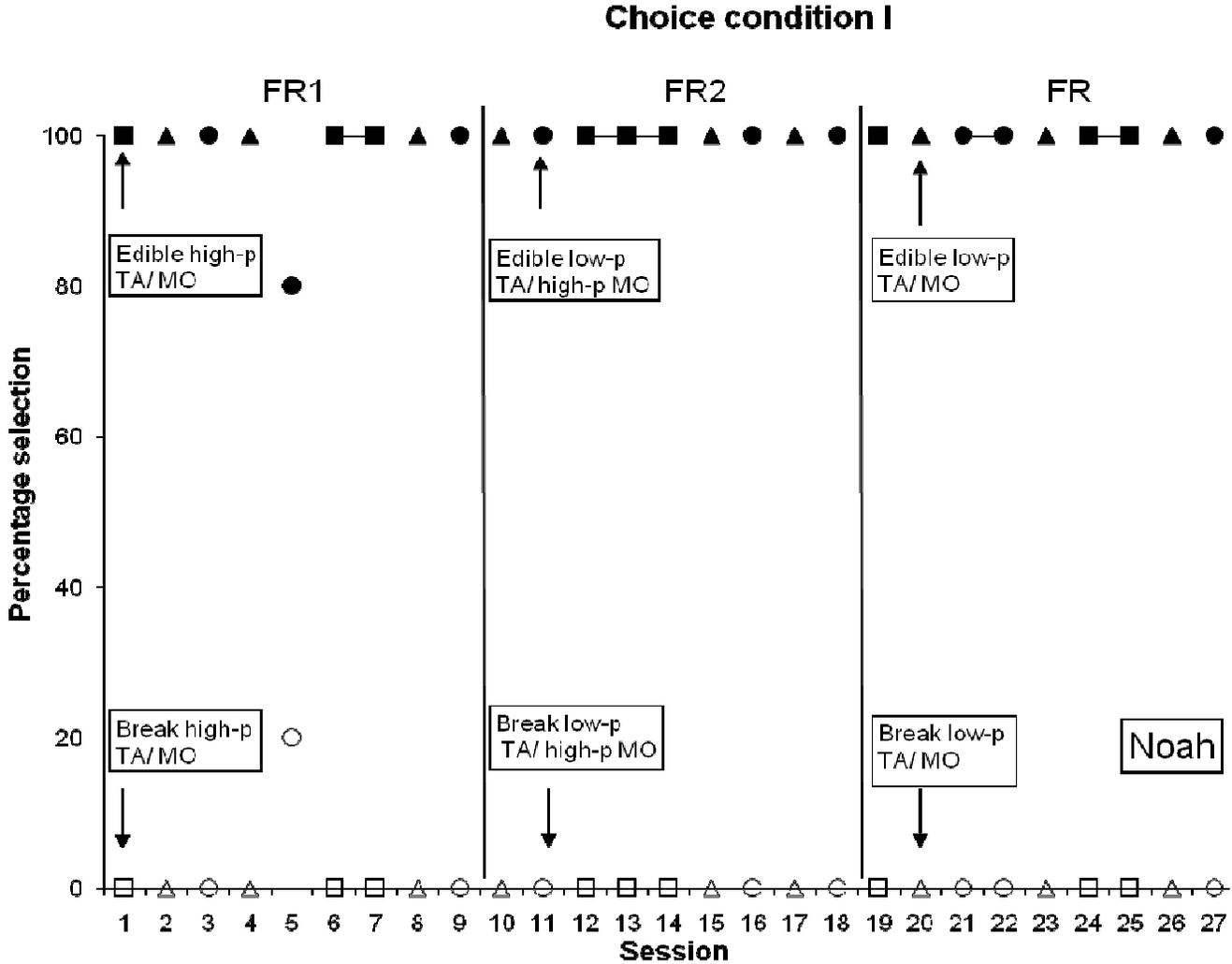


Figure 6.

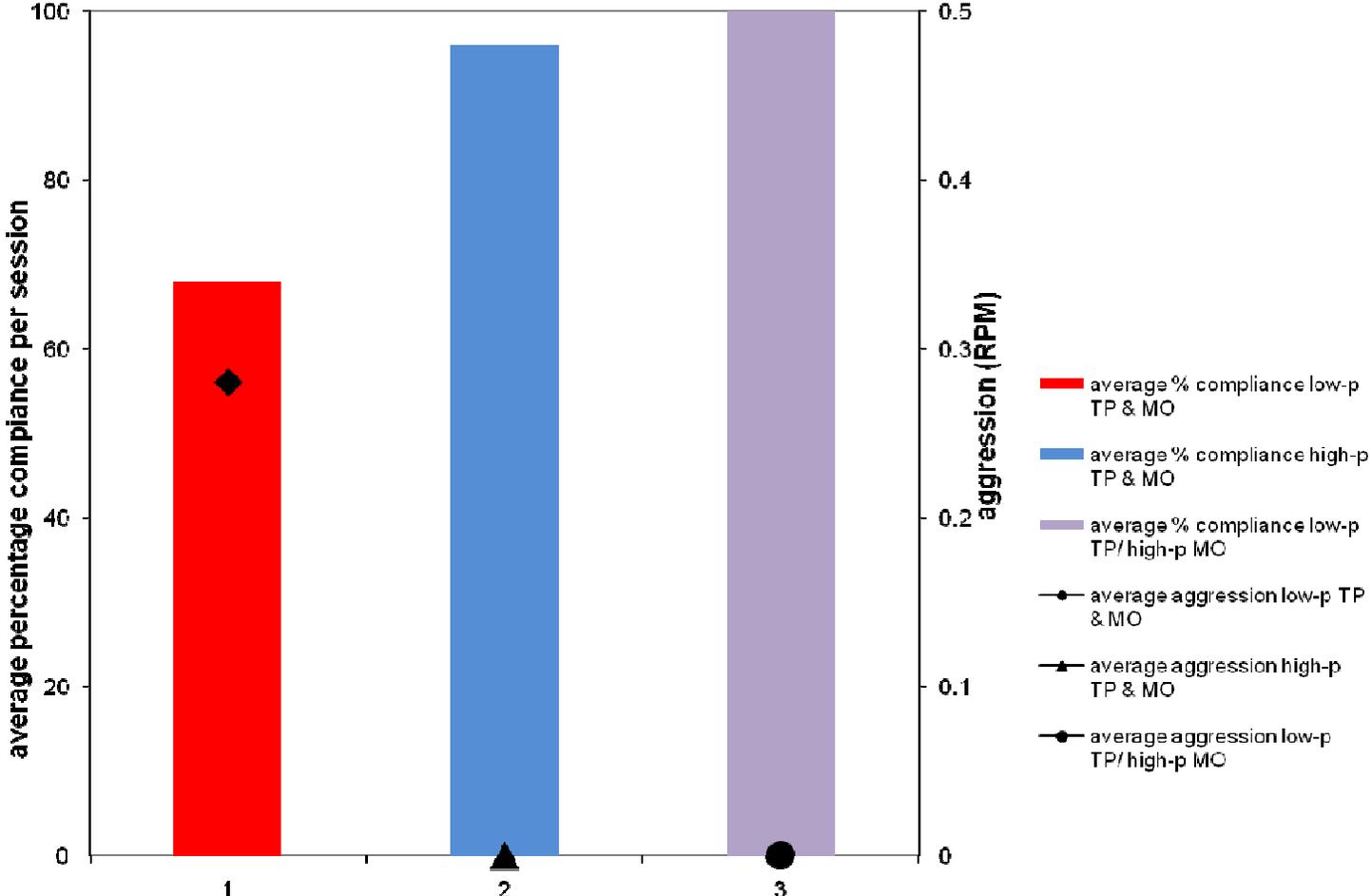


Figure 7:

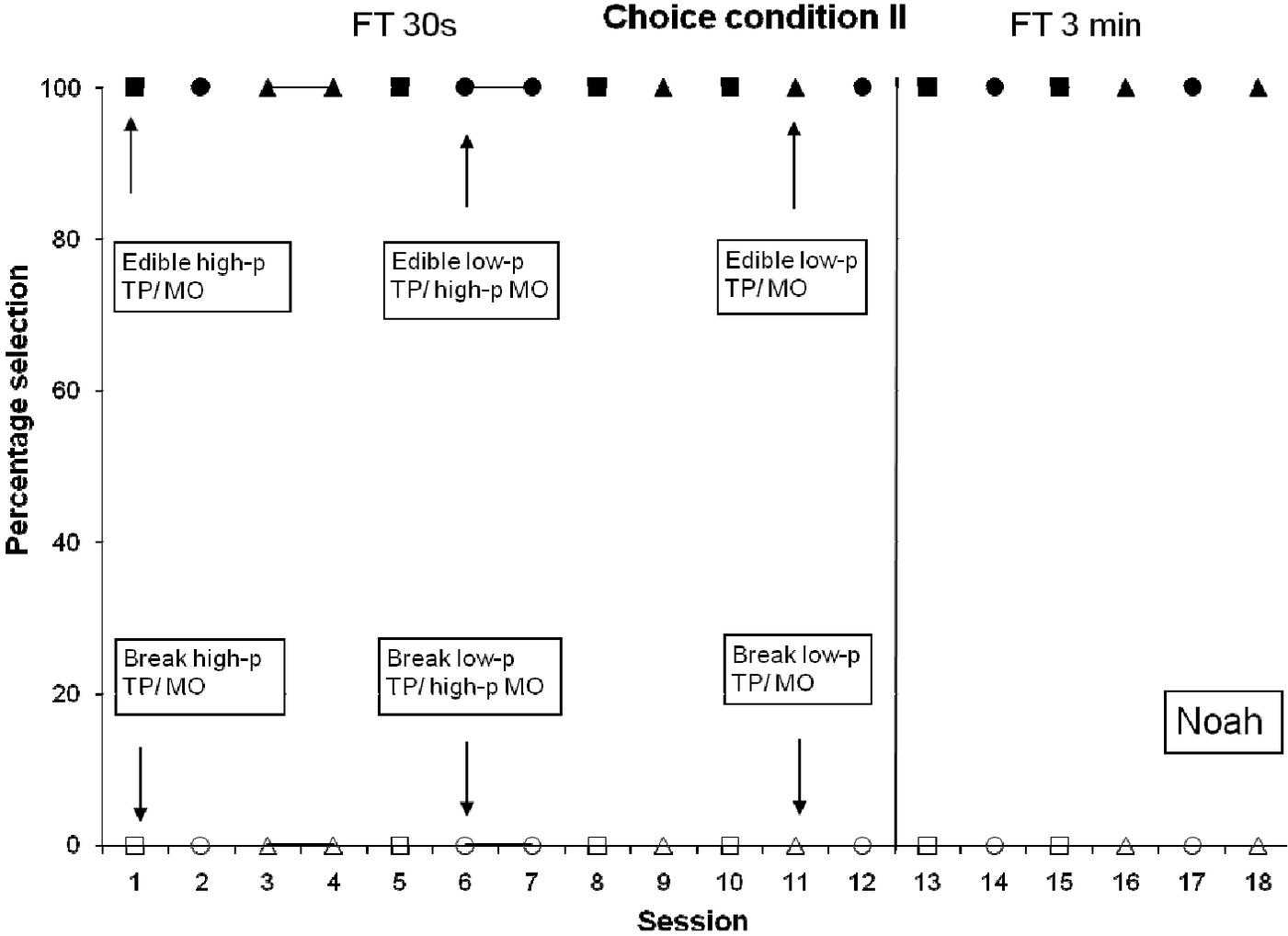


Figure 8:

