

*FUNCTIONAL ANALYSIS AND TREATMENT  
OF ELOPEMENT*

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Elopement is a dangerous behavior because children who run away may encounter life-threatening situations (e.g., traffic). We conducted functional analyses of the elopement of 3 children who had been diagnosed with developmental disabilities. The results identified a maintaining reinforcer for the elopement of 1 child, but the data were difficult to interpret for 2 of the children. Subsequent reinforcer assessments were used to help to clarify the reinforcers for elopement for these 2 children. Results of the functional analyses and reinforcer assessments then were used to develop successful treatments to reduce elopement. The findings are discussed in terms of (a) the application of functional analysis methodology to elopement, (b) the use of reinforcer assessments to identify potential reinforcers when standard functional analyses are undifferentiated, and (c) the utility of assessment-based treatments for elopement.

DESCRIPTORS: elopement, developmental disabilities, functional analysis, reinforcer assessments, concurrent operants

Elopement is typically defined as repeated attempts to leave designated areas without permission or supervision (Bodfish, 1992). Elopement may interfere with instructional activities and hinder skill acquisition in classroom settings (Chambers, Sanok, & Striefel, 1980), as well as expose an individual to dangerous situations (e.g., traffic). According to Garner (1991), individuals who elope often are placed in more restrictive settings to maintain their safety.

Jacobson (1982) estimated the prevalence of elopement to be 4.9% in a population of over 30,000 individuals receiving developmental disabilities services. Despite this relatively high prevalence of elopement among persons with developmental disabilities, there is a paucity of research on the assess-

ment and treatment of this behavior problem. In most studies on elopement, individuals were treated with multiple interventions such as reinforcement for the absence of elopement, time-out for elopement, and graduated levels systems in which the individual gained access to less restrictive environments and greater access to reinforcers contingent upon the absence of elopement (Chambers et al., 1980; Garner, 1991).

Garner (1991) treated the elopement of 1 child with profound mental retardation who resided in a group home. The treatment program involved increased amounts of freedom of movement within the group home (i.e., from restricting him to rooms without exits in the home to allowing him unrestricted access to all areas in the home) contingent on the absence of elopement, and included response interruption (teaching the participant to respond to the command "stop" when he began to run away), time-out following episodes of elopement, and reinforcement for appropriate communication to leave the group home. A similar program

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was described by Chambers *et al.* (1980) for an individual who was described as "ungovernable." Treatment was implemented within a self-contained classroom and consisted of time-out contingent upon elopement and a levels program in which the participant gained increasing access to classroom activities and movement within the classroom contingent upon the absence of elopement. These studies are limited in that functional control of the treatment was not demonstrated, and each study involved only 1 participant.

The standard of practice for reducing destructive behavior is to prescribe treatments based on the results of behavioral assessments. For example, Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994) showed that the consequences that maintain self-injurious behavior (SIB) could be identified using functional analysis. Vollmer, Iwata, Zarcone, Smith, and Mazaleski (1993) showed that the results of functional analyses could be used to prescribe treatments to reduce SIB. The functional analysis methodology was developed originally for the assessment of SIB but has been modified to assess and treat a variety of behavior problems such as aggression (Fisher *et al.*, 1993; Piazza *et al.*, 1997), pica (Piazza, Hanley, & Fisher, 1996), tantrums (Carr & Newsom, 1985), and psychotic speech (Fisher, Piazza, & Page, 1989; Mace & Lalli, 1991). In cases in which results of a functional analysis are equivocal or suggest that behavior is maintained independent of the social environment (*i.e.*, maintained by automatic reinforcement), results of reinforcer assessments have been used to prescribe treatments (Fisher *et al.*, 1994; Steege, Wacker, Berg, Cigrand, & Cooper, 1989). These same strategies could be applied to the assessment and treatment of elopement.

In the current investigation, we modified the functional analysis method to assess the elopement of 3 children with developmental

disabilities. Subsequent reinforcer assessments were used to identify reinforcers for 2 of the children. The results of the functional analyses and reinforcer assessments then were used to develop treatments to reduce elopement. The treatments were altered (*e.g.*, schedules of reinforcement were thinned) to make them more practical for caregivers and were extended from analogue conditions to more natural settings (*e.g.*, the community).

### GENERAL METHOD

This is a three-experiment study with data for each participant presented individually in each experiment. First, a functional analysis of elopement was conducted with each participant. If the results of the functional analysis were unclear, reinforcer assessments were conducted. The results of these behavioral assessments then were integrated into treatment packages.

#### *Participants*

Three individuals were admitted to an inpatient unit specializing in the assessment and treatment of destructive behavior. All 3 participants were admitted primarily for the assessment and treatment of elopement, and they also engaged in aggressive and disruptive behaviors. Owen was a 10-year-old boy who had been diagnosed with moderate mental retardation, autism, attention deficit hyperactivity disorder (ADHD), and a seizure disorder. Owen could follow one-step instructions and communicated through gestures. Owen's caregivers reported that he would commonly elope from rooms and then engage in dangerous behaviors such as touching electrical cords and climbing on furniture and windowsills.

Ray was an 11-year-old boy who had been diagnosed with severe mental retardation, autism, bipolar disorder, and ADHD. Ray was independent with his daily living skills,

and had good receptive language skills (e.g., he could follow two-step instructions) but limited expressive language skills (e.g., he used a few rote expressions in a variety of contexts). Ray's caregiver reported that he frequently ran away when out in the community.

Ty was a 4-year-old boy who had been diagnosed with cerebral palsy, a seizure disorder, and learning and speech delays (his cognitive level had not been evaluated successfully in the past because of his destructive behavior). Ty followed complex instructions (e.g., "Go to your room and get your football"), initiated conversation, and spoke in complete sentences. All 3 participants required constant supervision because of the severity and dangerous nature of their elopement.

The functional analyses for elopement were based on procedures described by Iwata et al. (1982/1994). Sessions were 10 min in length and were modified as follows. First, we attempted to simulate the setting in which the participant typically engaged in elopement in the natural environment. Second, because elopement is a dangerous behavior, the participants could not be allowed to run away without eventually retrieving them (i.e., the behavior could not be ignored), and all families reported going after their children when they ran away. Retrieving the child also permitted multiple opportunities to observe the behavior and for the child to experience the consequences of elopement that were prescribed in the functional analysis. Therefore, across all conditions, when the participant eloped, he was retrieved by the therapist on a fixed-time schedule as described below. No differential consequence occurred for the participants' other destructive behavior (e.g., aggression) across all conditions. The inclusion or exclusion of some functional analysis conditions was based on caregiver report regarding the

situations in which the participants ran away.

Demand sessions were conducted to determine whether the participants engaged in elopement to escape tasks. Attention sessions were conducted to determine whether the participants engaged in elopement to gain access to adult attention. Tangible sessions were conducted to evaluate whether the participants engaged in elopement to gain access to tangible items. Ignore sessions were conducted to determine whether the participants engaged in elopement in the absence of social consequences. Toy play or control sessions were conducted to evaluate the rates of elopement in a condition in which the absence of elopement resulted in differential reinforcement.

#### *Target Behaviors, Data Collection, and Interrater Agreement*

*Elopement* was defined as any part of the participant's body passing through the doorway (Owen and Ray) and moving or attempting to move 3 m (or more) away from the therapist (for Ty during all assessments and for Ray during treatment extension only) during the functional analyses and treatment assessments. During the treatment analyses for Ty, attempts to elope were scored as elopement. During the reinforcer assessments, *card touches* were defined as any part of the participant's hand touching a card. For Owen, the cards were a green rectangle (7 cm by 18 cm), a yellow triangle (13 cm by 13 cm by 13 cm), and a red square (13 cm by 13 cm). For Ty, blue, orange, and white index cards (7 cm by 13 cm) were used. The duration of appropriate walking, defined as the participant remaining within 3 m (or less) of the therapist, was recorded during Ty's treatment analyses. Trained observers used laptop computers to record each occurrence of elopement and card touches and duration of appropriate walking (Ty only). The percentage of the session with ap-

appropriate walking then was calculated by dividing the total duration of appropriate walking by the total session time.

Two observers simultaneously but independently scored target responses during 44%, 40%, and 42% of the functional analysis sessions and 40%, 59%, and 38% of the elopement treatment sessions for Owen, Ray, and Ty, respectively. Interrater agreement was assessed during 35% and 56% of the reinforcer assessment sessions for Owen and Ty, respectively. Interrater agreement was assessed during the schedule thinning for Ray and Ty and during the extension of treatment to different settings and caregivers for Owen and Ray during 60%, 36%, and 50% of sessions for Owen, Ray, and Ty, respectively. Agreement coefficients for elopement, card touches, and appropriate walking were calculated by partitioning each session into 10-s intervals and dividing the number of exact agreements by the sum of agreements plus disagreements and multiplying by 100%.

During the functional analyses, mean agreement for elopement was 99% (range, 97% to 100%), 99% (range, 93% to 100%), and 89% (range, 82% to 98%) for Owen, Ray, and Ty, respectively. Mean agreement for card touches was 97% (range, 84% to 100%) and 99% (range, 85% to 100%) for Owen and Ty, respectively. During the treatment assessments, mean agreement for elopement was 99% (range, 97% to 100%), 100%, and 95% (range, 67% to 100%) for Owen, Ray, and Ty, respectively. During the treatment analyses for Ty, mean agreement for appropriate walking was 85% (range, 41% to 100%). During the schedule thinning and treatment extension, mean agreement for elopement was 100%, 99% (range, 96% to 99%), and 98% (range, 93% to 100%), for Owen, Ray, and Ty, respectively, and mean agreement for appropriate walking was 96% (range, 93% to 100%) for Ty.

## EXPERIMENT 1:

### RAY

#### METHOD

##### *Functional Analysis*

The initial functional analysis was conducted within a multielement design in which four conditions (tangible, ignore, attention, and toy play) were alternated according to a random schedule. Because the rates of elopement were variable during the ignore and attention sessions of the multielement analysis for Ray, a sequential pairwise analysis was conducted in which the attention and ignore conditions were each compared to the toy play condition in separate phases (Iwata, Duncan, Zarcone, Lerman, & Shore, 1994) to further evaluate the effects of attention and low stimulation.

Ray's mother reported that he typically ran away to obtain food (e.g., chips) and that she often gave him food following elopement to "calm him down." She also reported that Ray did not run away during instructional activities (i.e., school work or tasks). Therefore, attention, tangible, ignore, and toy play conditions were assessed with Ray, but no demand sessions were conducted.

Ray's sessions were conducted in an experimental area consisting of two rooms (4 m by 5 m) connected by a single doorway. Each session began with Ray situated in Room A. Room A contained two chairs and a table, and Room B contained a table.

A tone was sounded every 40 s in all conditions as a signal to the therapist to physically guide Ray to sit in a chair in Room A. If he then eloped to Room B, he was guided back to Room A to sit in a chair. If Ray was already seated in a chair in Room A or had returned to Room A independently, he was physically guided to sit in a different chair in Room A. Ray was guided to sit in a chair so that physical interaction would occur independent of elopement in an attempt to

control for physical interaction as a differential consequence. That is, we wanted to isolate escape, attention, and access to tangible items that were the programmed consequences for elopement during the functional analysis. The tone was also used as a prompt to the therapist to initiate or discontinue contingencies specific to each functional analysis condition, as described below.

During attention sessions, Ray was given toys and was asked to play quietly. If he engaged in elopement, the therapist followed him into Room B and provided mild verbal reprimands (e.g., "don't run away") until the 40-s interval elapsed (i.e., when the tone sounded) or until the child returned to Room A. All other responses were ignored.

During toy play sessions, the therapist and child were in Room A, and preferred toys and food were available. The therapist interacted with Ray (e.g., threw a ball back and forth) and provided praise or food every 40 s contingent upon the first 5-s period in which elopement did not occur. Otherwise, no differential consequence was provided for elopement or other destructive behavior.

During tangible sessions, a bag of chips was placed in Room B. Ray was allowed to eat chips in Room B for 1 min prior to the start of the session. When the session began, the therapist guided Ray into Room A. Contingent on elopement, Ray was allowed to eat chips in Room B for the remainder of the 40-s interval. Small amounts of chips were given to Ray by the therapist to prevent him from consuming large quantities of chips in a short period of time and to prevent him from bringing chips back into Room A.

During the ignore condition, the therapist and Ray were in Room A. No other materials were present. No differential consequence occurred for elopement. The therapist observed Ray from the doorway of Room A when he eloped.

#### *Treatment Assessment*

The effects of treatment were evaluated using an ABAB design. The baseline (A phase) was followed by implementation of treatment (B phase) followed by a return to baseline (A) and a return to treatment (B).

Sessions were 10 min in length and were conducted in the same rooms (A and B) used in the functional analysis. Across all conditions, a tone signaled the therapist to physically guide Ray to sit in a chair in Room A every 40 s. If Ray was already seated in a chair in Room A or had returned to Room A independently, he was physically guided to sit in a different chair in Room A. Prior to each session, Ray was given access to attention and chips for 1 min.

The baseline condition was similar to the tangible and attention conditions of the functional analysis (i.e., contingent on elopement, he was given access to chips and attention in Room B). We combined the contingencies of tangible and attention during baseline because the results of the functional analysis indicated that Ray's elopement was maintained by both sources of reinforcement. The treatment condition was similar to the baseline condition in that the tangible items were located in Room B. During treatment, access to 20 s of attention or to 5 s of chips was delivered every 50 s contingent on the nonoccurrence of elopement (i.e., a differential-reinforcement-of-other-behavior [DRO] schedule). Attention consisted of verbal and physical interaction (e.g., saying, "You're doing a great job," while patting him on the back). Small pieces of chips were given to Ray by the therapist each time he consumed the previous chip. Ray was allowed to choose between the two reinforcers by touching one of two colored index cards (12 cm by 7 cm) that corresponded to attention (green card) or chips (blue card). If Ray touched a card, the corresponding reinforcer was delivered. At-

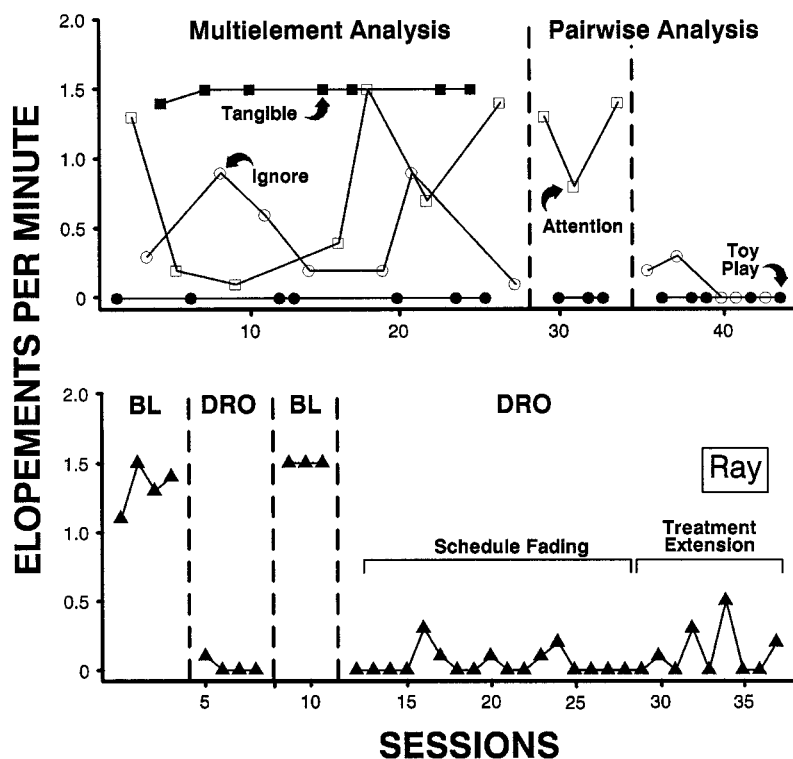


Figure 1. Number of elopements per minute during the functional analysis (top panel) and during the treatment assessment for Ray (bottom panel).

tempts to touch both cards were blocked. Elopement (leaving Room A) resulted in the resetting of the DRO timer, and no attention or chips were delivered (the therapist blocked his attempts to eat the chips in Room B). The DRO interval resumed when Ray reentered Room A. These consequences were implemented because Ray's mother could not block or prevent Ray from running away because of his size, but she agreed not to give him food items (e.g., chips) when he ran away.

Following the treatment analysis, the schedule of reinforcement was thinned and the treatment was extended across different settings. The thinning of the schedule occurred over eight sessions, and the final schedule arrangement consisted of access to 55 s of attention or 25 s of chips delivered contingent on remaining in Room A for 5 min. Eight additional sessions were con-

ducted under this arrangement. Subsequently, treatment was extended to various places, including hospital vending areas, the hospital cafeteria, and restaurants in the community.

#### RESULTS AND DISCUSSION

During Ray's functional analysis (top panel of Figure 1), high levels of elopement were consistently observed in the tangible condition relative to the toy play condition. Ray engaged in more variable levels of elopement in the ignore and attention conditions relative to the toy play condition. Pairwise comparisons (attention and ignore) and control (toy play) conditions were conducted because rates of elopement were similar across these two test conditions. When attention was compared to toy play, Ray engaged in high levels of elopement in the attention condition, suggesting that attention served

as reinforcement for elopement. When ignore was compared to toy play, Ray engaged in near-zero levels of elopement in both conditions, suggesting that Ray's elopement was not maintained independent of social reinforcement. The reason for the similar rates of elopement during attention and ignore conditions of the multielement analysis was not clear. As Vollmer, Marcus, Ringdahl, and Roane (1995) suggested, it is possible that some individuals may have difficulty discriminating between the rapidly alternating contingencies during the multielement functional analysis. It appears that this may have been the case with Ray, who may not have discriminated between the attention and ignore conditions when they were rapidly alternated during the multielement analysis because of the similarity of the two conditions (i.e., the only difference was the verbal reprimand in the attention condition). In addition, behavior may not have been extinguished in the ignore condition because, at times, the same therapist conducted both conditions. The differences between conditions may have been easier to discriminate when only two conditions (test and control) were compared during the pairwise analysis. However, this hypothesis is speculative.

The results for the treatment assessment are depicted in the bottom panel of Figure 1. In the baseline condition (first and third phases) during the treatment assessment in which elopement produced access to adult attention and chips, Ray engaged in high levels of elopement. During the treatment condition (second and fourth phases) in which the DRO schedule was implemented, Ray engaged in near-zero levels of elopement. In addition, near-zero levels of elopement were maintained during schedule thinning. Although elopement was somewhat variable when treatment was extended to other settings, it remained substantially lower than baseline.

## EXPERIMENT 2: OWEN

### METHOD

#### *Functional Analysis*

Owen's mother reported that he ran away in all situations (e.g., in the community, at school) and noted that he often attempted to obtain stringy items (e.g., pieces of a mop) when he eloped. She typically allowed him to play with these objects following elopement. Five functional analysis conditions (attention, demand, ignore, tangible, and toy play) were assessed using a multielement design.

The setting and descriptions of conditions for Owen's functional analysis were similar to those described for Ray, with the following exceptions. During demand sessions, the therapist issued instructions using sequential verbal, gestural, and physical prompts on a fixed-time (FT) 40-s schedule. If Owen completed the task following the verbal or gestural prompt, he received praise from the therapist and a break until the beginning of the next 40-s interval. If Owen eloped, the therapist removed the materials and turned away from him until the start of the next 40-s interval (i.e., he was permitted to escape from the task). If Owen eloped between instructions, he was guided back to the chair at the next 40-s interval and given a new instruction.

During tangible sessions, a string (56 cm in length and 2 cm in diameter) was placed in Room B. Owen was allowed to play with the string in Room B for 2 min prior to the start of the session. When the session began, the therapist guided Owen into Room A. Contingent on elopement, Owen was allowed to play with the string in Room B until the 40-s interval elapsed. The string was tied to a table in Room B to prevent it from being brought back into Room A.

### *Reinforcer Assessment*

During reinforcer assessment, a concurrent-operants design (Catania, 1963; Herrnstein, 1970) was used to evaluate the reinforcing effects of attention and access to a tangible item in three phases. The order in which the two variables were assessed was randomly determined and occurred as follows: attention versus control in the first phase; access to the tangible item versus control in the second phase; access to the tangible item versus access to adult attention versus control in the final phase.

During the functional analysis, the highest rates of elopement occurred in the tangible condition, followed by the attention condition. Therefore, we began our assessment by evaluating the reinforcing effects of these two stimuli (tangible item and attention). Laminated cardboard shapes corresponded to the different consequences available for card touching throughout each assessment. After Owen touched a card, all cards were removed and the consequence associated with that card was available for 30 s. Touching a green rectangle resulted in access to the tangible item (string), touching a yellow triangle resulted in access to attention (e.g., saying, "You're doing a great job," while patting him on the back), and touching a red square resulted in no differential consequence (control).

Prior to the start of the reinforcer assessment, training trials were conducted in which Owen was allowed approximately 5 s to independently touch a card placed on a table in front of him. After 5 s, if Owen did not touch a card, sequential verbal, gestural, and physical prompts were used to prompt him to touch one of the cards (randomly determined) to allow him to contact the corresponding consequence. Attempts to touch more than one card simultaneously were blocked. Access to the chosen consequence was delivered immediately following a card

touch. Training trials were discontinued when Owen independently engaged in card touching for 80% of three consecutive blocks of 10 trials. Before each individual session of the reinforcer assessment, training trials were conducted to expose Owen to the consequences for touching each card in the session (descriptions of the phases and the stimuli assessed are presented below). Trials ended for each individual session when he independently chose any card except the control card for three consecutive trials.

Sessions were 10 min in length and were conducted in a room (3 m by 5 m). Owen was seated in a chair at a table and was verbally prompted to touch a card at the start of the session. Touching a card resulted in the contingencies described above for 30 s on a fixed-ratio (FR) 1 schedule (e.g., if Owen touched the yellow triangle, he received 30 s of adult attention). When Owen touched a card, the cards were removed. The location of the cards was randomly rearranged during the reinforcement interval. Following the reinforcement interval, Owen was repositioned in front of the cards and was verbally prompted to touch a card. He was blocked from leaving the chair until he touched a card. Otherwise, if Owen did not touch a card, no differential consequence occurred.

### *Treatment Assessment*

The treatment assessment was conducted using an ABAB design. The baseline phase (A) was followed by the introduction of treatment (B), a return to the baseline phase (A), and a reintroduction of treatment (B).

Sessions were 10 min in length and were conducted in the same rooms (A and B) used in the functional analysis and reinforcer assessment. Treatment was evaluated in the tangible condition of the functional analysis because (a) rates of elopement were highest in the tangible condition during the functional analysis, (b) the reinforcer assessment



demonstrated that the tangible items were more effective reinforcers than attention was, and (c) the antecedent conditions for the tangible sessions (i.e., the absence of materials, adult attention, and tasks) were identical to those of the attention, ignore, and toy play conditions.

In all sessions, the tangible item (string) was located in Room B, and, prior to each session, Owen was given access to string for 2 min. The baseline and treatment conditions were similar to the tangible condition in the functional analysis (i.e., contingent on elopement, Owen gained access to the string in Room B). In addition, Owen was given continuous noncontingent (NCR) access to string-like items in Room A during treatment. The string-like items included ropes, bungee cords, and shoelaces and were placed on the table in Room A. Owen was prevented from taking the strings from Room A to Room B. Elopements were ignored by the therapist (i.e., the therapist provided no differential consequence); however, Owen was able to obtain the string in Room B when he eloped.

Following the treatment analysis, the treatment was extended across different settings and caregivers. Owen's mother and teacher were trained to implement the treatment contingencies (i.e., to provide Owen with noncontingent access to string and no differential consequence for elopement). Training was conducted first by the therapist modeling the treatment contingencies for the mother or teacher. Next, the mother or teacher role played implementation of the treatment with a confederate (a therapist). Finally, the mother or teacher implemented the treatment with Owen while the therapist observed and provided feedback. Nine sessions were conducted in the rooms described above with Owen's mother as therapist. Three additional sessions were conducted in Owen's home by his mother, and three sessions were conducted in Owen's school by

his teacher. During all sessions, the mother and teacher implemented the treatment contingencies described above.

#### RESULTS AND DISCUSSION

During Owen's functional analysis (top panel of Figure 2), the highest rates of elopement occurred in the tangible condition followed by the attention condition suggesting that his elopement may have been maintained by access to tangible items (i.e., access to stringy items). However, we could not rule out the possibility that Owen's elopement was sensitive to multiple sources of reinforcement, because rates of elopement were relatively similar across three (attention, demand, ignore) of the four test conditions relative to the toy play condition. It was possible that the lack of differentiated results for Owen were due to his failure to discriminate between conditions, as suggested for Ray. However, with Owen, rates of elopement were equivalent across conditions that were highly dissimilar (i.e., demand vs. ignore); therefore, it seemed less likely that failure to discriminate between session contingencies contributed to the lack of differentiation between conditions. Therefore, rather than conduct additional functional analysis sessions, we decided to evaluate whether a reinforcer assessment could be used as an indirect method for identifying potential reinforcers for use in the treatment of elopement.

The results of the reinforcer assessment are depicted in Figure 2. Owen touched the card that produced attention more often than he touched the control card in the first phase of the reinforcer assessment, suggesting that attention functioned as a reinforcer. He touched the card that produced access to the tangible item more often than he touched the control card in the second phase, suggesting that access to the tangible item functioned as a reinforcer. During the third phase, Owen touched the card to ob-

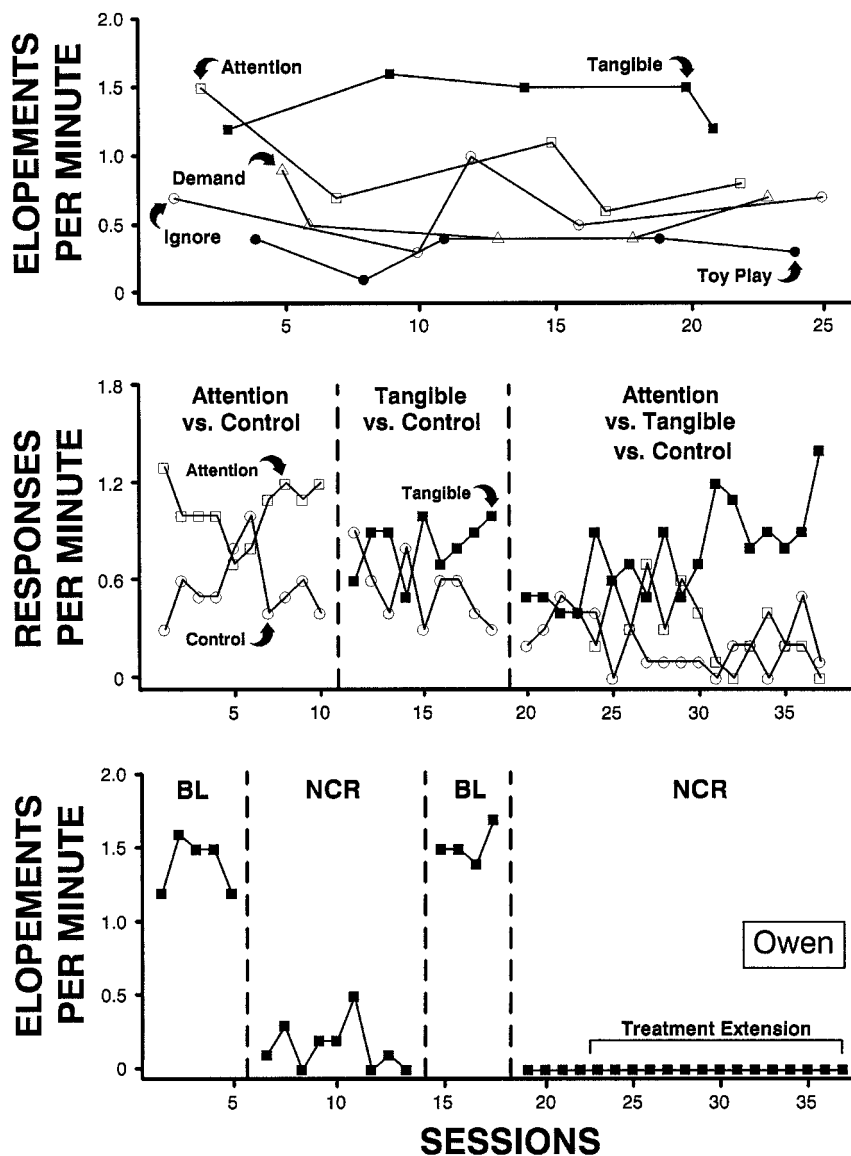


Figure 2. Number of elopements per minute during the functional analysis (top panel), number of card touches per minute during reinforcer assessment (middle panel), and number of elopements per minute during the treatment assessment for Owen (bottom panel).

tain the tangible item at a high rate and more often than he touched the attention and control cards, suggesting that access to the string was a more effective reinforcer than was adult attention.

The results of the treatment assessment are also depicted in Figure 2. In the baseline condition (first and third phases), in which elopement resulted in access to the tangible

item, Owen engaged in high levels of elopement. During treatment (second and fourth phases), in which Owen was given continuous noncontingent access to tangible items while elopement also resulted in access to the tangible item, he engaged in near-zero levels of elopement. From a conceptual standpoint, the paradigm used during treatment was similar to a concurrent-operants

arrangement. In this type of arrangement, two or more responses are available at the same time, and each is correlated with a different schedule or type of reinforcement (Catania, 1992). In this case, remaining in Room A and eloping to Room B were simultaneously available, and each was correlated with different reinforcers (a variety of strings in Room A and a single string in Room B). In addition, the effort associated with each response was different (eloping to Room B involved a higher response effort than remaining in Room A). Consistent with studies on concurrent-operants arrangements, Owen allocated his time almost exclusively to the behavior (remaining in Room A) that resulted in a higher quality of reinforcement (Miller, 1976) and was associated with a lower response effort (Horner & Day, 1991).

At home, Owen's mother gave him access to stringy items when she could not engage him in a structured activity (e.g., when she was preparing dinner). The school provided Owen with stringy items following completion of tasks. When the treatment was extended to different caregivers (i.e., mother and teacher) and environments (i.e., home and school), treatment gains were maintained. Owen did not engage in elopement when his mother or teacher implemented the treatment.

### EXPERIMENT 3:

#### TY

#### METHOD

##### *Functional Analysis*

Ty's mother reported that when he ran away, he would often stop, turn around and laugh, and see whether anyone was following or paying attention to him. She usually chased after him and reprimanded him for running away. She indicated that he did not attempt to obtain tangible items when he

ran away. Therefore, attention, demand, ignore, and control sessions were conducted with Ty. The functional analysis was conducted using a multielement design in which four conditions (attention, ignore, demand, and toy play) were alternated according to a random schedule.

The procedures used in Ty's functional analysis were different from those described for Ray and Owen because the analysis was conducted in an open common area (8 m by 24 m) to more closely approximate the conditions under which Ty eloped in the natural environment (i.e., he typically ran away when he was with an adult in an open area). Located within the common area were four doorways and numerous chairs and sofas lining the walls. Ty could not open the doors independently because of his size. Prior to each session, the therapist would explain the session contingencies to Ty. In all conditions, the therapist prompted Ty to walk next to him or her on an FT 30-s schedule across all sessions by briefly guiding Ty to the therapist's side while saying, "Stay next to me." After this brief prompt, the therapist had no further physical contact with Ty until the next 30-s interval.

The demand session consisted of instructing Ty to walk to a designated work area and then to complete a task (putting crumpled pieces of paper into a bin) in that area. The therapist issued the instruction, "Walk with me" and, when Ty and the therapist reached the work area, the therapist issued instructions to Ty using sequential verbal, gestural, and physical prompts. If Ty completed the task, he received verbal praise from the therapist and then was prompted to walk toward the next work area. If Ty eloped during any part of the transition or during the instructional sequence in the work area, the therapist stopped walking and issuing instructions for the remainder of the 30-s interval (i.e., Ty was permitted to escape from the task).

During attention sessions, the therapist

delivered attention in the form of a brief verbal reprimand (e.g., "Don't run away") while running after him contingent on elopement. The therapist continued to run after Ty until the end of the 30-s interval. If Ty walked appropriately (remained within 3 m of the therapist), no differential consequence was delivered.

During the control condition, elopement resulted in no differential consequence. In addition, Ty received brief verbal attention every 30 s contingent on 5 s of no elopement.

In the ignore condition, no differential consequence was provided for appropriate walking or elopement. That is, the therapist continued walking in the same general direction as he or she had been walking before elopement occurred, and no verbal or physical attention was provided to Ty following elopement.

#### *Reinforcer Assessment*

The reinforcing effects of running versus those associated with the control condition were assessed in an ABAB design. Next, a concurrent-operants paradigm was used to compare attention to a control condition. A concurrent-operants paradigm then was used to compare the reinforcing effects of running and attention to a control.

Rates of elopement were equivalent across all conditions in Ty's functional analysis, which suggested that (a) elopement or running away produced its own reinforcement, or (b) the behavior was maintained by multiple sources of reinforcement (i.e., access to adult attention, escape from demands, and the automatic reinforcement derived from running away). Methods for identifying the specific reinforcement directly produced by a behavior have not been well developed (Vollmer, 1994). We speculated that because Ty's elopement consisted of running away and persisted in the absence of social consequences (ignore condition), elopement

may have been maintained by the consequences produced by running. We attempted to evaluate the reinforcing effects of running by assessing whether it would strengthen another response (card touches). A comparison of the potential positive reinforcers (attention and running) was conducted.

Index cards corresponded to the different consequences available for card touching throughout each assessment. After Ty touched a card, all cards were removed and the consequences associated with that card were available for 30 s. Touching a blue card resulted in access to running, touching an orange card resulted in access to attention, and touching a white card resulted in no differential consequence (control). Running consisted of the therapist and Ty running side by side in the hallway (the therapist held Ty's hand so that Ty remained in the hallway). The therapist did not otherwise interact with Ty while running. Attention consisted of verbal praise and physical contact (e.g., saying, "You're doing a great job," while patting him on the back).

Prior to the start of the reinforcer assessment, training trials were conducted in which Ty was allowed approximately 5 s to touch a card placed on a table in front of him. After 5 s, if Ty did not touch a card independently, sequential verbal, gestural, and physical prompts were used to prompt him to touch one of the cards (randomly determined) to allow him to contact the corresponding consequence. Attempts to touch more than one card simultaneously were blocked. Access to the chosen consequence was delivered immediately following a card touch. Training trials were discontinued when Ty independently engaged in card touching for 80% of three consecutive blocks of 10 trials. Before each individual session of the reinforcer assessment, training trials were conducted to expose Ty to the consequences for touching each card in the session. Trials ended for each individual ses-

sion when he independently chose any card except the control card for three consecutive trials.

Sessions were 10 min in length and were conducted in a hallway. Ty stood in front of a table and was verbally prompted to touch a card at the start of the session. Touching a card resulted in the contingencies described above for 30 s on an FR 1 schedule (e.g., if Ty touched the orange card, he would receive 30 s of adult attention). When Ty touched a card, the cards were removed. The location of the cards was randomly rearranged during the reinforcement interval. Following the reinforcement interval, Ty was repositioned in front of the cards and was verbally prompted to touch a card. He was blocked from leaving the table until he touched a card. Otherwise, if Ty did not touch a card, no differential consequence occurred.

#### *Treatment Assessment*

Treatment was assessed in two different functional analysis conditions, ignore and demand. A multielement analysis was used to compare the ignore baseline condition with differential reinforcement of appropriate behavior (DRA) plus blocking. Treatment for Ty's elopement in the demand condition was evaluated using an ABAB design. The A phase was the demand baseline condition of the functional analysis, and the B phase was DRA plus blocking.

All sessions were 10 min in duration and were conducted in the same area as the functional analysis. Because elopement persisted across all functional analysis conditions, two treatment assessments were conducted, one in the ignore condition and a second in the demand condition. These two conditions were chosen because the planned treatment (providing access to attention and running contingent upon appropriate walking) would have been implemented similarly for the ignore, attention, and toy play sessions.

That is, the antecedent conditions for the ignore session (i.e., the absence of materials, adult attention, and tasks) were identical to those of the attention and control conditions. However, the presence of demands in the demand condition necessitated that a treatment evaluation be conducted under those specific stimulus conditions.

The baseline condition for the first treatment assessment was identical to the ignore condition in the functional analysis (i.e., no differential consequences were provided for either elopement or appropriate walking). Treatment consisted of DRA and blocking. Reinforcement was delivered for 5 s of appropriate walking and consisted of providing Ty with a choice between 30 s of attention or 20 s of access to running. Attention was verbal and physical interaction (e.g., saying, "Great walking next to me," while giving him a "high five"). Running consisted of the therapist and Ty running side by side (the therapist held Ty's hand to prevent falling). The therapist did not otherwise interact with Ty while running. Ty made choices between reinforcers by touching one of two index cards that corresponded to attention (green card) or running (blue card). The cards were attached to a board that was placed in front of Ty by the therapist when Ty reached criterion for reinforcement. If Ty touched a card, the corresponding reinforcer was delivered. Attempts to touch both cards were blocked. All attempts to elope were blocked. Blocking was used so that Ty would have access to running only as a consequence for appropriate walking rather than as a consequence for elopement.

Following this treatment analysis, the schedule of reinforcement was thinned. A token economy (Kazdin & Bootzin, 1972) was introduced so that delivery of attention or running could occur at times and in settings that were convenient to the mother. The value of each token was equivalent to 15 s of attention or 15 s of running. The

schedule of reinforcement was thinned over six sessions, during which the time when tokens could be exchanged was also extended. The final arrangement consisted of token delivery contingent upon 30 s of appropriate walking, with token exchange occurring after 5 min.

Treatment for Ty's elopement in the second treatment assessment (demand condition) was conducted in an ABAB design. The baseline condition was identical to the demand condition in the functional analysis in which the therapist and Ty walked between two work areas. Instructions were delivered to complete a task in the work areas, and compliance resulted in praise. Elopement resulted in a 30-s break from the task. The treatment condition consisted of differential reinforcement and blocking for elopement. Reinforcement consisted of a choice between 30-s access to attention or 20-s access to running, as described above, contingent on 5 s of appropriate walking or staying in the task area. Compliance continued to result in verbal praise. Following treatment in the demand condition, the schedule of reinforcement was thinned as described for the ignore condition, and the treatment was extended to different settings in the hospital during the final four sessions.

#### RESULTS AND DISCUSSION

Ty consistently engaged in elopement in all assessment conditions, suggesting that his elopement was maintained either independent of the social environment (i.e., automatic reinforcement) or by multiple sources of reinforcement. The middle panel of Figure 3 depicts the results for the reinforcer assessment of running. Ty touched a card to gain access to running more frequently than he touched a control card. The high peaks in the data during the second and fourth phases correspond to the first session conducted in each session block, and the low levels of card touches correspond to the ses-

sions conducted later in each session block. Thus, it appeared that access to running was a reinforcer; however, its effects were greatly attenuated after repeated exposure to the reinforcer (i.e., satiation).

The results of the reinforcer assessment of attention appear in the bottom left panel of Figure 3. Ty touched the card associated with adult attention more often than he touched the control card, suggesting that adult attention functioned as a reinforcer. The results of the simultaneous assessment of running, attention, and control appear in the bottom right panel of Figure 3. When all three cards were simultaneously available, Ty touched the attention card at the highest rate, followed by the running card and the control card. These results suggested that attention served as a more potent reinforcer than access to running.

The results of the functional analysis and reinforcer assessments were integrated into a treatment package designed to reduce Ty's elopement and increase his appropriate walking (Figure 4) during the first treatment assessment. Baseline was associated with high levels of elopement and low levels of appropriate walking. Treatment, consisting of differential reinforcement of appropriate walking and blocking attempts to elope, resulted in near-zero levels of elopement and high levels of appropriate walking. It should be noted that due to the blocking component, Ty never successfully eloped during the analysis. All of the responding during treatment represents attempts to elope. If Ty attempted to elope, the therapist blocked elopement, which resulted in Ty staying within 3 m of the therapist and thereby maintaining high levels of appropriate walking. In addition, near-zero levels of elopement and attempts to elope and high levels of appropriate walking were maintained during the thinning of the reinforcement schedule.

Treatment for Ty's elopement was also

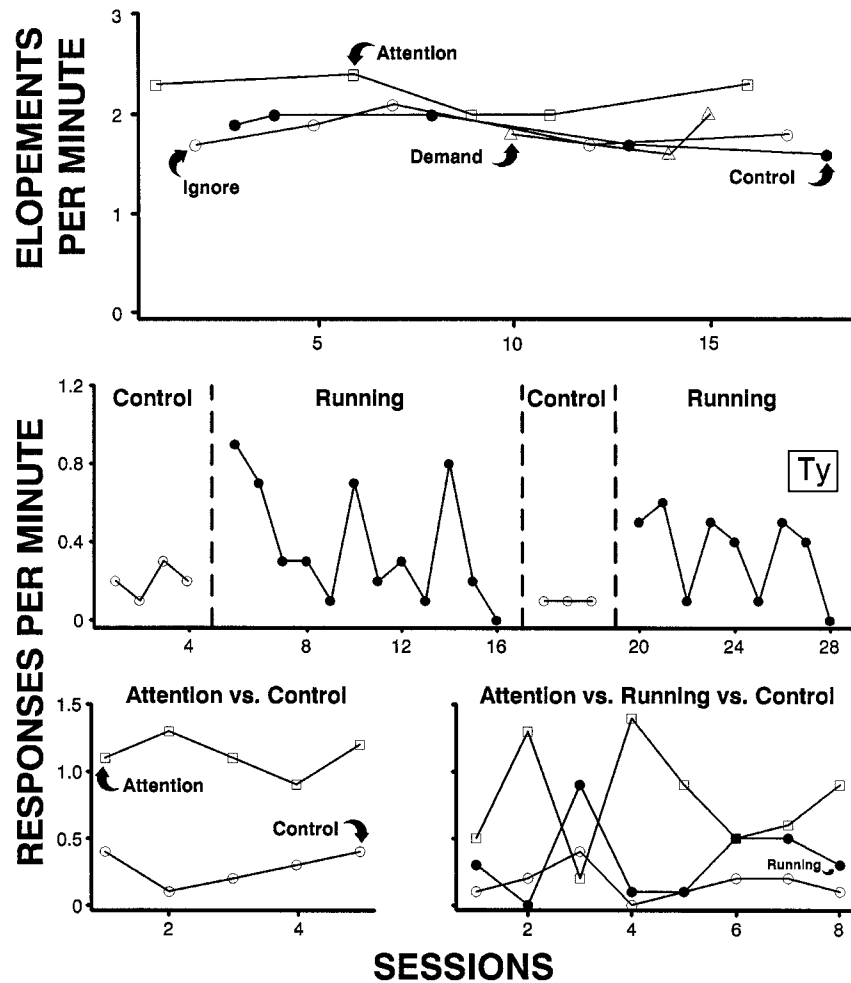


Figure 3. Number of elopements per minute during the functional analysis (top panel) and number of card touches per minute during reinforcer assessments for Ty (middle and bottom panels).

evaluated in a second treatment assessment (demand condition). The data for this analysis appear in the third and fourth panels of Figure 4. During baseline (first and third phases), Ty engaged in high levels of elopement and a low percentage of appropriate walking. During treatment (second and fourth phases), in which attempts to elope were blocked and appropriate walking received differential reinforcement, Ty engaged in near-zero levels of elopement and attempts to elope and high levels of appropriate walking. Near-zero levels of elopement and high levels of appropriate walking were

also maintained during the thinning of the reinforcement schedule and extension of treatment to other settings.

### GENERAL DISCUSSION

Functional analysis methodology, originally developed for the assessment of SIB, has been extended and modified to identify reinforcers for a variety of destructive behaviors. However, its extension to the behavior of elopement, as was conducted in the current investigation, posed some particular

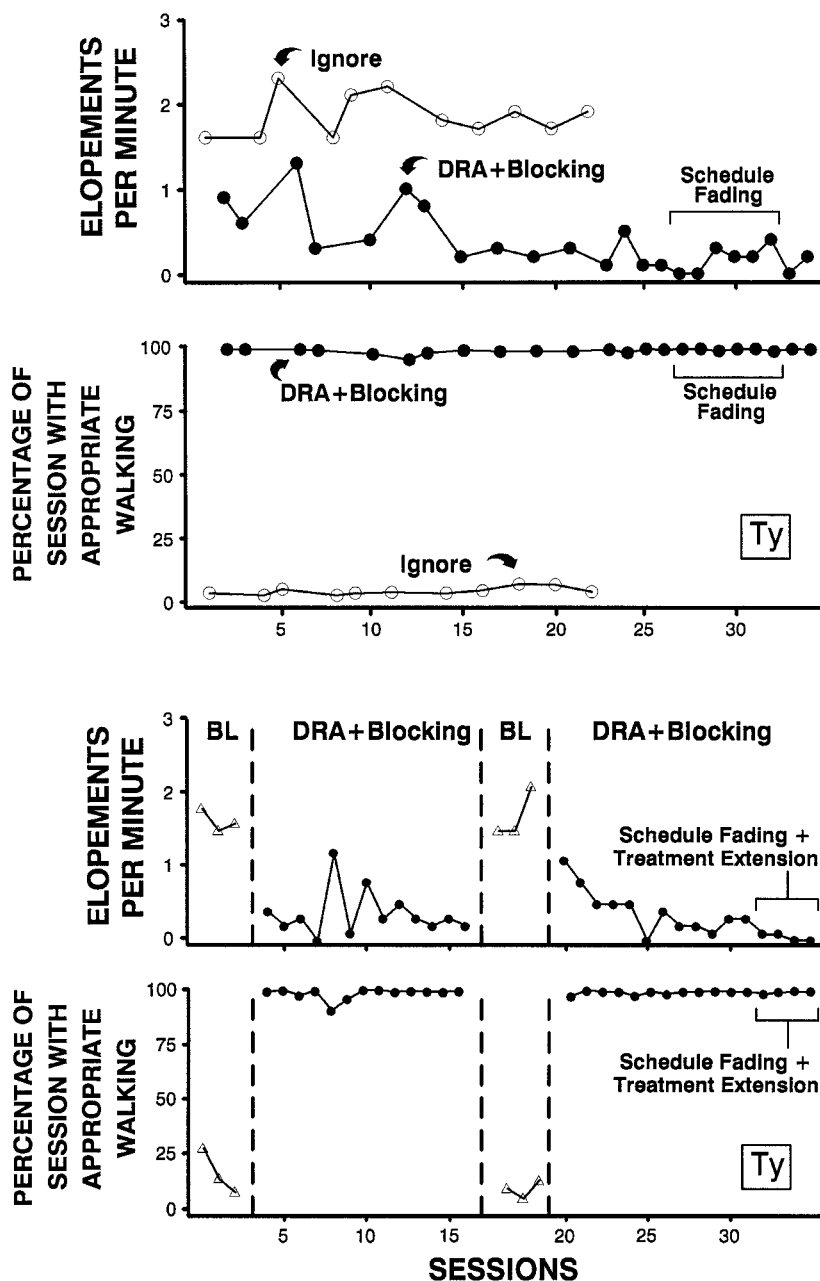


Figure 4. Number of elopements per minute (top panel) and percentage of session with appropriate walking (second panel) during the treatment evaluated in the ignore condition, and the number of elopements per minute (third panel) and percentage of session with appropriate walking (fourth panel) during the treatment evaluated in the demand condition for Ty.

methodological problems that may have affected interpretation of the results.

First, some of the typical consequences of elopement (e.g., escape from adult supervi-

sion) cannot be easily regulated because they create dangerous situations (e.g., getting hit by a car). Therefore, if the assessment of elopement is conducted in the natural environ-



ment, some preventive measures (e.g., retrieving the child from an unsafe area) must be applied when the behavior occurs, which may interfere with the internal validity of the assessment. If the behavior is assessed in an analogue environment (e.g., one or more rooms), preventive consequences may not be necessary, but the external validity of the assessment may be compromised because the naturalistic consequences are unavailable.

Second, assessment of elopement presents some challenges relative to measurement. Previous investigations of elopement were conducted in group homes or residential facilities, where elopement was measured across the day over extended periods of time (e.g., 1 year; Chambers et al., 1980; Garner, 1991). Therefore, even if the behavior occurred only once per day, the lengthy time interval (e.g., months) resulted in a sufficient baseline from which to evaluate treatment outcome. Participants in the current investigation were inpatients in a pediatric hospital in which opportunities for elopement were minimal because of high patient-to-staff ratio and restricted access to or from particular locations. Therefore, opportunities for responding were created by returning the participant to a designated area or position (Room A for Owen and Ray, next to the therapist for Ty) on a fixed-time schedule after elopement occurred throughout each session. This procedure allowed multiple episodes of elopement to occur within each session and also allowed participants to contact the prescribed consequences for elopement repeatedly. The potential confounding variable (i.e., physical attention) introduced by retrieving and returning participants to designated areas or positions was controlled by implementing this contingency as a constant during all assessment sessions. In addition, we further attempted to control for the effects of physical attention by physically guiding the participants to a different chair (Owen and Ray) or next to the therapist (Ty) throughout all sessions independent of elopement.

Response differentiation was observed in the functional analysis for Ray and Owen despite the existence of the retrieval contingency. Furthermore, treatments that were based on the results of functional analyses were effective in reducing elopement for these participants. The influence of the retrieval contingency is most problematic for Ty, whose functional analysis was marked by undifferentiated responding. During the reinforcer assessments, Ty responded for access to attention and running (which also may have involved a social component because Ty ran with a therapist). Both treatments that resulted in a reduction in Ty's elopement also involved social reinforcement components. Therefore, the undifferentiated responding in the functional analysis that involved a retrieval contingency, along with the behavior observed in the reinforcer and treatment assessments, make the interpretation of Ty's data and identification of behavioral function difficult. It is possible that Ty engaged in elopement to produce access to the reinforcers of attention and running. However, it is also plausible that elopement was simply maintained by attention, and high undifferentiated levels of elopement were observed in the functional analysis because the retrieval procedure functioned as adventitious social reinforcement.

A third consideration when functional analyses are modified is the extent to which the consequences in the analogue condition match those in the natural environment. Caregivers of participants in the current investigation reported that they always retrieved the participants when they ran away. By retrieving the participants, we more closely approximated these natural contingencies. However, as mentioned previously, the consequences of retrieval could have served as reinforcement for elopement in addition to or independent of the other programmed consequences (attention, escape, access to tangible items).

Because of the methodological limitations of the functional analysis of elopement, we

conducted reinforcer assessments to identify reinforcers for 2 participants. Vollmer, Marcus, and LeBlanc (1994) showed that the results of choice assessments could be used to identify stimuli for use in enriched environment treatments that were effective in reducing SIB when the results of functional analyses were equivocal. Similarly, Grace, Thompson, and Fisher (1996) showed that the results of a reinforcer assessment could be used to treat SIB when a functional analysis was difficult to conduct.

Reductions in elopement during treatment suggested that the reinforcer assessments may have been useful in identifying either the functional reinforcers for elopement or those that served as effective substitutes. That is, when reinforcement was provided noncontingently (Owen), in the absence of elopement (Ray), or for an appropriate alternative behavior (Ty), elopement was reduced. Smith, Iwata, Vollmer, and Zarcone (1993) suggested that treatment outcome is one method of verifying behavioral function. They conducted functional analyses with 3 participants with SIB, and found that SIB was multiply controlled. Smith *et al.* then tested the validity of the functional analysis results by implementing treatments that either matched an identified behavioral function (e.g., a noncontingent toy treatment when SIB was hypothesized to be maintained by automatic reinforcement) or did not match an identified behavioral function (e.g., a noncontingent toy treatment when SIB was hypothesized to be maintained by attention). If the matched treatment resulted in reductions in SIB, Smith *et al.* concluded that the identified function was confirmed. However, if the matched treatment did not result in reductions in SIB, Smith *et al.* concluded that the identified function was a spurious finding. The same logic could be applied to the present results. That is, because the assessment-derived treatments were effective in reducing

elopement, there is increased confidence in the utility of the assessments.

A final limitation of the current investigation was that the active components of multiple treatments were not isolated for Ray and Ty. Ray's treatment included access to two reinforcers (attention and tangible items) contingent on the nonoccurrence of elopement, and no access to reinforcement for elopement. Ty's treatment consisted of access to two reinforcers (attention and running) and blocking elopement. In both cases, the relative contributions of the reinforcement and extinction or blocking components were not identified. Further, the mechanism by which blocking may have reduced elopement is unclear. It is possible that the blocking procedure functioned as extinction (i.e., disrupted the response-reinforcer relation), or the presentation of blocking following an elopement attempt may have functioned as punishment for elopement (see Lerman & Iwata, 1996). The consequence for elopement was the same as the consequence for remaining in the appropriate room (i.e., access to string) for Owen, so it appeared that providing access to the functional reinforcer was effective in reducing his elopement. Future research should incorporate component analyses (Cooper *et al.*, 1995; Wacker *et al.*, 1990) to identify the active variables that were responsible for treatment effectiveness.

In the current investigation, we attempted to address issues of both internal and external validity. Sessions were conducted in relatively controlled environments (two adjacent rooms for Owen and Ray and an open common area for Ty) in which the participants could elope without concerns for their safety. Experimental control was enhanced further by prescribing the consequences for elopement (i.e., attention, access to tangible items, escape from demands) as opposed to allowing consequences to occur in an uncontrolled manner. We attempted to increase

the external validity of the study by having parents and teachers conduct the treatment in different settings (school, home, cafeterias, hospital lobby), and we demonstrated that treatment was successful in maintaining low levels of elopement when it was extended to these more naturalistic conditions.

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### STUDY QUESTIONS

1. What is elopement, why is it considered dangerous, and how was it operationally defined in this study?
2. What was the uniform consequence for elopement during all functional analysis conditions, and what were the rationales for using this consequence?
3. What data from the functional analysis suggested that food or attention maintained Ray's elopement, and why did the authors conduct a subsequent pairwise comparison?
4. Describe the key features of Ray's treatment.
5. It has been suggested that noncontingent reinforcement (NCR) may produce behavioral suppression through satiation or extinction. What feature of Owen's treatment and data partially addresses this issue?
6. Given the results of Ty's additional assessments, how might the consequence for elopement during his initial functional analysis have affected its outcome?
7. What feature of Ty's treatment presents interpretive problems?
8. The authors developed a variety of effective interventions (NCR, DRO, DRA) for elopement that was maintained by positive reinforcement. Suggest some strategies for reducing the frequency of elopement that is maintained by negative reinforcement (escape).

Questions prepared by Eileen Roscoe and Michele Wallace, The University of Florida