RESPONSE LATENCY AS A MEASURE OF BEHAVIOR IN THE ASSESSMENT AND TREATMENT OF ELOPEMENT

By

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To Sala Traub and Eli Grushka
יוסף לברכה
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RESPONSE LATENCY AS A MEASURE OF BEHAVIOR IN THE ASSESSMENT AND TREATMENT OF ELOPEMENT

By

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May 2016

Chair: Timothy R. Vollmer
Major: Psychology

Elopement is defined as leaving an area without supervision or permission. It is a common form of behavior among individuals with disabilities, but it is relatively underrepresented in the research literature. Treatments for elopement are typically antecedent-based and limit the individual’s access to movement through tracking devices, door alarms, and locks. One barrier to experimentally assessing elopement, in addition to the dangers posed to the individual, is the need to retrieve the subject following an instance of elopement. Retrieval of the subject presents a serious potential confound to the assessment, because all elopement trials end with at least physical attention, and attention is known to be a common reinforcer for problem behavior. The current study eliminated the need for retrieval by conducting a functional analysis of elopement in two adjoining rooms, first comparing the latency to elopement to response allocation (Experiment 1) and then by measuring latency alone (Experiment 2) in a trial-based format. The identified functions of elopement matched across both data analysis modalities in Experiment 1, indicating that latency is a valid measure of the function of elopement. The trial-based FA in Experiment 2 showed a significant time savings in identifying the function of behavior over a session-based assessment. We then implemented a function-based treatment (Experiment 3) that taught asking and waiting for permission and introduced transferrable stimuli
in the form of red and green cards that signaled when leaving the area was available. Results indicated that elopement serves idiosyncratic social functions in young children with intellectual and developmental disabilities, and that function-based treatments are effective at reducing elopement attempts to near-zero levels. The results of Experiment 3 provide a proof of concept for a more comprehensive behavioral intervention for elopement, based on differential reinforcement.
CHAPTER 1
INTRODUCTION

Elopement, often defined as leaving a designated area without supervision or permission, is a common behavioral problem among individuals with intellectual and developmental disabilities (I/DD) (Jacobson, 1982). Recent reports indicate that nearly, or possibly more than, 50% of children with autism have eloped (Anderson et al., 2012; Jang, Dixon, Tarbox, & Granpeesheh, 2011). Research also reports that about one in three adults with autism continues to elope from residential or day treatment care (Matson & Rivet, 2008). Elopement, and specifically the increased risk for accident and injury while unsupervised, has been cited as a contributing factor to higher death rates among individuals with autism than in the overall population (Shavelle, Strauss, & Pickett, 2001; Mouridsen, Bronnum-Hansen, Rich, & Isager, 2008).

Several studies have cited the threats to the safety and well being of individuals who elope if they escape into an unsafe environment: 65% of children with autism who elope from home put themselves in danger of traffic accidents, and 24% are in danger of drowning (Anderson et al. 2012; Jang et al., 2011). Elopement can also indirectly lead to additional risks such as becoming lost, missing meals or medications, being lured by strangers, and other undesirable consequences of lapsed supervision. Furthermore, elopement can interfere with regular treatment and instruction and disrupt the individual’s typical activities (Chambers, Sanok, & Streifel, 1980). Individuals who engage in elopement are often placed in more restrictive settings and require additional staff support to manage their behavior (Padgett, Garcia, & Pernice, 1984).

Despite the pervasiveness of elopement among individuals with I/DD, relatively little research has been published on the functional analysis, treatment, or systems management of this
behavior. Preventive interventions and elopement management systems are more often described and used in geriatric populations and with individuals diagnosed with dementia, where the focus is typically on antecedent control and environmental management (Lai & Arthur, 2003). Within the I/DD literature elopement is often noted as untargeted behavior in a subject’s repertoire or as behavior that is managed using broad, antecedent, environmental interventions without first analyzing the function of the behavior. A recent review of the elopement literature by Lang et al. (2009) cited only 10 studies published in peer-reviewed, behavior-analytic journals that focused on research-based procedures for the assessment or treatment of elopement in individuals with I/DD. Of these 10 studies, only 5 of them could be classified as experimental (i.e., using an adequate design to demonstrate experimental control); the remaining 5 were case studies using a simple AB design.

In one notable experimental treatment of elopement, Piazza et al. (1997) conducted a functional analysis using procedures similar to those described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994). Initial multielement FA results were only differentiated for one of the three participants, though a subsequent pairwise reinforcer assessment allowed the experimenters to identify reinforcers that functionally competed with elopement for the remaining two subjects. In addition to the lack of differentiated results, the authors noted several additional limitations. Most notably, the need to retrieve the subject following an instance of elopement presented a potentially confounding variable, as retrieval necessarily provides at least a minimal amount of attention to the behavior regardless of the experimental condition. Attention is known to be a powerful source of reinforcement for many types of problem behavior (Lovaas, Freitag, Gold, & Kassorla, 1965; Hanley, Iwata, & McCord, 2003). Piazza et al. attempted to minimize these potential effects by providing significantly more attention (and
higher-quality attention) in the attention condition only, and by introducing a fixed-time interaction across all conditions in the form of manually guiding the individual to sit. The authors also noted the challenge to assessment presented by not retrieving the individual; specifically that only one opportunity to observe elopement would be present in each session. Furthermore, retrieval was necessary, even outside of the experimental session, to prevent lapses in supervision and an increased risk to the participant, though repeated exposure to retrieval following elopement from an FA session could inadvertently reinforce the behavior.

Several studies subsequent to the Piazza et al. investigation have attempted to further modify the FA procedures to more efficiently assess the function of elopement. Tarbox, Wallace, and Williams (2003) extended the methods used by Piazza et al. by conducting the functional analysis sessions in settings analogous to those in which elopement was most reported to occur (e.g., enclosed shopping area, day program) and by using the subjects’ primary caregivers as the therapists. Several additional studies have examined elopement in settings and contexts in which the behavior is more likely, such as specific school classrooms (Lang et al., 2010), school hallways (Falconata, Roane, Feeney, & Stephenson, 2010), and an outdoor softball field (Kodak, Grow, & Northup, 2004). Kodak et al. (2004) tested a briefer functional analysis method, using 5-min sessions in the context of an ongoing kickball game. Perrin, Perrin, Hill, and DiNovi (2008) conducted a brief functional analysis of elopement by preschoolers based on the procedures outlined by Northup et al. (1991). However, the pairwise design used by Piazza et al. (1997) to identify reinforcers for two of the three subjects in their study has not been replicated in the literature and may yield more differentiated results.

In the first study to directly address the experimental confounds presented by needing to retrieve the subject following an instance of elopement, Lehardy, Lerman, Evans, O’Connor, and
LeSage (2013) evaluated a single-room functional analysis method to eliminate the need for subject retrieval. In this procedure, elopement from one side of the room to the other (delineated by a tape line on the floor) resulted in the therapist following the subject, providing brief access to a potential reinforcer, and subsequently switching the contingency back to the initial side of the room (i.e., relocating contingencies instead of retrieving the subject). When the results of this evaluation were compared with a similar assessment allowing elopement to a separate room, the same function was identified using the single-room assessment as with the two-room assessment, suggesting that two distinct locations may not be necessary to evaluate elopement experimentally.

An alternative to modifying the assessment environment to more accurately assess the function of elopement is to use a different dimension of the behavior as the primary dependent measure. In the case of elopement specifically, one such measure may be latency to the response. In the natural environment elopement typically occurs in a single instance; the subject rarely runs back and forth in what could be considered a “bout” of behavior. Therefore, latency to the response may be not only a useful indicator of the variables that are likely to produce the response, but also a logical one. Latency has previously been used to measure the strength of a response in the context of teaching adaptive skills (e.g., Ardoin, Martens, & Wolfe, 1999; Wehby & Hollahan, 2000), as an indicator of treatment effectiveness (e.g., Goh, Iwata, & Kahng, 1999; Zarcone, Iwata, Hughes, & Vollmer, 1993), to demonstrate the presence of a response-class hierarchy of problem behavior (Lalli, Mace, Wohn, & Livezey, 1995), and to select the demands most likely to evoke problem behavior in the context of an FA (Call, Pabico, & Lomas, 2009). The use of latency as the primary dependent measure of function during an FA, though, has been largely absent from the literature.
In a notable exception, Thomason-Sassi, Iwata, Neidert, and Roscoe (2011) compared latency to the first response to overall response rate in a series of functional analyses. In a retrospective analysis of existing FA data, they found that latency and response rate indicated the same function of behavior in 33 out of 38 cases; the authors noted, however, that in the five cases in which the indicated functions did not correspond, latency may not have been an accurate measure of the function of behavior. Specifically the authors proposed that the stimulus conditions in the FA sessions may have produced a single, initial response quickly to sample the contingencies, but that the lack of a functional reinforcer for the behavior in that session extinguished subsequent responding. In such a case, measuring latency alone – without the full session data with which to compare it – may yield false-positive results in an FA and lead to the selection of an ineffective treatment. However, the high degree of correspondence overall between latency and response rate, coupled with the practical utility of latency as a measure in the assessment of specific behaviors such as elopement, warrant further investigation.

To date, two studies have used latency as the sole measure of function in an FA of elopement. Neidert, Iwata, Dempsey, and Thomason-Sassi (2013) conducted trial-based FAs of elopement with two students using latency as the sole dependent measure. Despite undifferentiated results for both subjects, the authors noted the relative ease, efficiency, and safety of the procedure. They also suggested that a lack of control over the consequences of elopement in a trial-based FA (i.e., not controlling the environment outside the session room from which the subjects eloped) may have contributed to the undifferentiated results. Davis et al. (2013) conducted a trial-based FA with an eight-year-old boy and determined that his elopement was maintained by attention and tangibles. However, they noted that by not controlling the contingencies and reinforcers in the post-elopement environment, access to these following the
first instance of elopement could have affected subsequent rates of behavior had they retrieved the subject and continued with the session. These uncontrolled variables and their effects on future behavior limit the extent to which latency to the first response can be interpreted as suggestive of function. Therefore, more research is needed to control for both antecedent and consequent environments and to further validate that the latency to elopement is indicative of the function of the behavior.

Thomason-Sassi et al. (2011) demonstrated good correspondence between latency and response rate, which suggests that latency to the first response does, in most cases, correspond with the function of behavior. Measuring response rate, however, renews one of the primary confounds of assessing elopement, namely the need for retrieval. An alternative to rate as a point of comparison may be response allocation. Allocation of responding to one of two alternatives has been used as a measure of preference for behaviors within a response class (e.g., DeLeon, Fisher, Herman, & Crosland, 2000), available treatment packages (e.g., Hanley, Piazza, Fisher, Contrucci, & Maglieri, 1997), and reinforcers (e.g., Roane, Vollmer, Ringdahl, & Marcus, 1998). By measuring relative allocation of session time to each of two environments (i.e., a test condition and a control condition) and comparing it to the latency to elopement from one environment to the other, we may begin to determine whether the latency to the first response is in fact indicative of the subject’s preference. For example, a subject may elope from one environment to the other within 10 s, but after experiencing the contingencies in the second environment return to the starting location and remain there for the rest of the session. In this case, the short latency to the initial elopement would suggest a possible functional relation, but the equally quick return – and overall allocation of session time – to the starting location would indicate a preference for those contingencies. However, if the subject remained in the second
location following the initial elopement at 10 s, allocation of responding to the second option would suggest that latency was a valid measure of preference. Finally, if the subject were slow to elope from the initial location, this would also suggest that the contingencies in that environment were not evocative of the behavior and not indicative of its function.

The purpose of the first two experiments in this dissertation research was to examine further refinements to functional analysis methods that will facilitate efficient and safe assessment of elopement as a target behavior. Specifically, we presented two environments in a concurrent operants arrangement and evaluated the latency to elopement in a pairwise design. Both the availability of two environments with functionally opposite contingencies and the use of latency to elopement as the primary dependent measure were selected in order to minimize assessment time and the risks associated with repeatedly evoking elopement. No study to date has combined these methods to provide a clear, efficient procedure for the functional analysis of elopement. Experiment 1 compares the latency data to session allocation in a session-based FA to demonstrate the effectiveness of the latency measure in identifying function, and Experiment 2 examines the efficiency of measuring latency alone in a trial-based FA similar to those conducted by Neidert et al. (2013) and Davis et al. (2013).

Though several studies have included a treatment component, most have focused on differential reinforcement of other behavior (DRO) and noncontingent reinforcement (NCR) as primary interventions for elopement (e.g., Call, Pabico, Findley, & Valentino, 2011; Lang, Davis et al., 2010; Piazza et al., 1997). These interventions proved successful for the duration of those studies, but they are limited in that they do not teach the individual how to appropriately access permission to leave the area. To date, only two studies have incorporated functional communication training (FCT) into their treatment for elopement. Tarbox et al. (2003) conducted
FCT with two subjects and successfully reduced their elopement for the duration of the study. Falcomata et al. (2010) introduced delay fading after teaching the communicative response. However, neither of these studies demonstrated maintenance of the communicative response or the sustained reduction of elopement, limiting the scope of the results.

A model for schedule thinning following FCT is provided by Hanley, Iwata, and Thompson (2001). After teaching a functional communication response (depressing a microswitch) to replace self-injurious behavior in three subjects, the experimenters systematically introduced a delay to reinforcement following the response, followed by a multiple schedule arrangement to bring responding under discriminative control of an environmental stimulus. This schedule thinning procedure was effective at controlling when alternative responses were emitted while maintaining low rates of the original problem behavior. Such an arrangement would be useful for the long-term treatment of elopement, as the alternative response of requesting the reinforcer or asking to leave the area cannot always be reinforced.

Therefore, the purpose of Experiment 3 in this dissertation research was to systematically replicate Hanley, Iwata, and Thompson (2001) by implementing a treatment for elopement based on the differential reinforcement of an alternative response (asking for permission to leave) and teaching the additional response of waiting for permission. No studies have taught waiting as part of a treatment package for elopement, and only two have taught a functional communication response, so this treatment constitutes an extension of the current literature on the treatment of elopement.
CHAPTER 2
EXPERIMENT 1: SESSION-BASED FA

Rationale

The purpose of this experiment was to extend the assessment methods for elopement currently present in the literature by conducting an FA of elopement in two adjoining locations. This unique approach allowed for the direct comparison of conditions in which the potential establishing operation (EO) influencing reinforcement for elopement was maximized (“test” condition) and conditions in which the potential EO was minimized (“control” condition). The juxtaposition of these opposing contingencies was hypothesized to facilitate clear discrimination between areas and their related contingencies while containing the assessment to an area in which retrieval of the participant is not necessary. In addition, this experiment evaluated the relative effectiveness and practicality of using latency and response allocation as primary response measures in a functional analysis of elopement.

Methods

Subjects and Materials

Six subjects completed Experiment 1; relevant demographic information and the specific referral problem are listed in Table 2-1. All subjects were between 3 and 8 years of age, had a diagnosed I/DD, and were referred to the study due to parent and teacher concerns about elopement. All sessions took place in an empty classroom at the subjects’ school containing a 7’x9’ room within the treatment area, equipped with a 2’x2’ window for viewing. A camping tent measuring 8’x8’x5’ was placed immediately outside the room. The tent had two opposing zippered entrances, one of which was left permanently open with flaps pulled back and was placed in the open doorway of the room. The zippered entrance on the opposite side of the tent was kept closed during sessions, but the zipper was freely accessible
to the subjects and therapists. The tent had a fabric roof and sides with clear plastic or mesh windows. During functional analysis sessions data collectors and observers stood along the three sides of the tent not adjacent to the room to prevent subjects from eloping beyond the confines of the tent, though this rarely occurred during assessment sessions. Data collection took place using handheld computers or smart phones, and some sessions were videotaped using a handheld video camera to facilitate data collection, treatment integrity checks, and interobserver agreement. Additional materials specific to session types were present as needed and are described below.

**Procedure**

The functional analysis of each subject’s elopement was conducted using a sequential pairwise design. Based on parent and teacher reports of when elopement often occurred and what contingencies may have been maintaining the behavior, three socially mediated consequences were tested for all subjects: attention, tangibles, and escape from demands. The order of these conditions was counterbalanced across participants. Additional conditions were included for Violet and Jasper based on the results of their initial evaluations; for Violet this was a tangible condition with ignoring in both test and control (as opposed to attention), and for Jasper this was a combined escape and tangible test condition. Each potential function was tested in isolation by presenting alternating test and control sessions. Test sessions were those in which the subject began the session in the test condition (which was designed to maximize the EO for the putative reinforcer), and in control sessions the subject began the session in the control condition (which was designed to minimize the EO for the putative reinforcer). Prior to the first session of the day, the subject received 15 seconds exposure to the contingencies in both the room and the tent. Following exposure the subject was instructed to enter the location
corresponding to the test condition for test sessions, or the location corresponding to the control condition for control sessions. When the session began the subject could move freely between the two locations, and the contingencies changed according to where the subject was located.

Each evaluation continued with alternating test and control sessions until stability in the data was attained (based on visual analysis), at which point the next evaluation began. All sessions were 5 min, which has been shown to be as effective as longer sessions at identifying the function of behavior (Wallace & Iwata, 1999) and was less likely to lead to fatigue due to the age of the subjects. The two different contingencies were presented in the room and tent as concurrent operants (Fisher, Piazza, Bowman, Hagopian, Owens, & Slevin, 1992). Two different therapists implemented the contingencies in the two locations, and the specific therapists for each contingency and the location of the contingencies were randomized across trials. This was done to prevent any one location from becoming preferred due to its association with a reinforcer and to counteract any bias a subject had toward one location (e.g., the tent over the room). Data collectors outside both locations (i.e., outside the tent with a view of the room through the window) recorded the duration of time the subject spent in each location (allocation) and the point in the session when elopement first occurred (latency).

Attention Comparison. In the attention comparison a therapist in one location (the test condition) ignored the subject while a therapist in the other location (the control condition) provided continuous attention in the form of general comments, reciprocal conversation, and/or light physical contact (e.g., bounces, tickles). The specific form of attention provided to each subject was based on caregiver report and direct observation of the type(s) of attention the subject responded to and sought out. In this and all subsequent pairwise comparisons the subjects
could move freely between the two locations, and the contingencies changed when the subject’s feet crossed the threshold of the doorway into the new location.

**Tangible Comparison.** Prior to each session in the tangible comparison, the subject selected a toy from an array of available toys. During each session a therapist in the test condition provided continuous attention but no access to the selected item or toy, while the therapist in the control condition provided continuous attention plus access to toys or items. Attention was provided in both locations to prevent confounding a tangible function with an EO for attention and took the form of general conversation, interactive play with the toys (in the control location only), or light physical play. If a subject attempted to carry a toy from the control location to the test location, the therapist in the control location took the toy back without comment and maintained it in the control location.

**Tangible-Ignore Comparison.** Tangible sessions with ignoring were conducted for Violet only. Observations of her standard tangible sessions indicated that she may have been more sensitive to the attention that was available in both locations, so we conducted tangible-ignore sessions to remove the potential confound of therapist attention. These sessions were identical to the regular tangible sessions, with the exception that no attention was provided by either therapist in either location. Violet was allowed to select a toy and play with it in the control location, and no toy was available in the test location. No interactive play with the toy was available during these sessions.

**Escape Comparison.** In the escape comparison the therapist in the control condition ignored the subject while the therapist in the test condition presented continuous demands. If the subject did not respond within 3 s of the initial verbal demand, the therapist modeled the response for the subject while issuing the demand again (e.g., “touch your nose like this”). If the
subject still did not respond within 3 s of the model prompt, the therapist physically prompted compliance with the demand. Demands were chosen based on two criteria. First, the skill had to be in the child’s repertoire, which was determined by observing the child and gathering anecdotal reports from teachers. Second, demands did not involve any additional items and pertained only to verbal and motor skills; thus, most demands were of the form “touch your nose,” or “give me a high-five.” The exclusion of tasks such as sorting or bagging eliminated the potential for confounds with the tangible condition, as the subject did not have access to any outside items in the demand condition. A break (ignoring) was selected as the control contingency in place of continuous attention to contrast more saliently with the demand context and to allow for the possibility of capturing a social avoidance function as well as an escape from demand function.

**Escape to Tangibles Comparison.** An escape to tangibles comparison was included in Jasper’s functional analysis only. Jasper’s escape comparison and tangible comparison both indicated some functional maintenance of his elopement, but observations during and outside of sessions suggested that each condition served as an EO for the other; that is, exposure to demands increased the reinforcing value of escaping to access tangible items, and the presence of tangibles outside the demand environment increased the aversiveness of the demand context. Therefore, we combined the two conditions to maximize the EO for elopement in test sessions and maximize the abolishing operation (AO) in control sessions. In this condition continuous demands of the type described in the escape comparison were provided in the test location, and tangible items selected from an array of available toys were provided in the control location. The therapist in the control location provided continuous attention (to match the level of attention associated with continuous demands) and interactive play with the toys. All other contingencies
(three-step prompting for demands, restricted access to toys upon elopement out of the control location) remained the same as in the individual comparisons.

**Response Measurement and Reliability**

“Elopement” was defined as placing one foot across the threshold of the doorway between the room and the tent. The threshold of the room was indicated by a natural break in the flooring between the small room used for the functional analysis and the larger treatment area that housed the adjacent tent. Elopement was scored at the moment that the subject’s foot crosses the threshold, regardless of where the subject went after that response was made. Therefore, if the subject placed one foot across the threshold from the test location to the control location and stopped, elopement was scored and the control contingencies were implemented until the subject moved his/her foot back toward the test location. Although this minimal response technically met the definition of elopement, in a vast majority of instances subjects moved completely into the other location. In all sessions, response allocation was scored by location (room versus tent) as opposed to by contingency (test versus control). This was done to ensure that subjects did not demonstrate a preference for either physical location. Allocation was then converted to contingency – based on the distribution of contingencies for each particular session – for data analysis and identification of function.

Decisions regarding the stability of the data and the function of behavior were made based on latency data alone; response allocation data were used to compare the conclusions drawn from the latency to the initial response to the full-session allocation of responding. Functions were considered “matched” when the function identified by examining the latency data was the same as the function identified by examining the allocation data, and matches between latency and allocation data were considered validation of latency as a measure of the function of elopement.
Independent observers scored an average of 43% of sessions (range, 26-54%). Interobserver agreement was then calculated for latency and allocation measures. Interobserver agreement (IOA) for latency was calculated by determining the time at which each observer scored the first elopement of the session, dividing the shorter latency (in seconds) by the longer latency (in seconds) and multiplying by 100 to obtain a percent agreement. Latency IOA was 95.3% (range, 90.5-97.4%) for all subjects combined. Allocation IOA was calculated by determining the percent of session scored in the test condition for each observer, dividing the smaller value by the larger value and multiplying by 100 to obtain a percentage. Allocation IOA was 95.9% (range = 93.2-97.5%) for all subjects.

Results

Results for Kieran’s assessment are displayed in Figure 2-1. Latency to elopement in the attention comparison was highly variable and showed no systematic differentiation. Average latency to elopement was 76 s in test sessions and 156 s in control sessions. Allocation data also showed no clear differentiation; Kieran allocated an average of 47% of session time to the test location and 53% of session time to the control location. In the escape comparison Kieran eloped in an average of 116 s in test sessions and an average of 197 s in control sessions, and the latency to elopement was clearly differentiated beginning with session 7. In the final three control sessions Kieran did not elope at all. The allocation data showed the same pattern of initial variability and later differentiation, and he allocated an average of 33% of session to the test location and 67% of session to the control location. Kieran showed immediate differentiation in the tangible comparison, with an average latency to elopement of 8 s in test sessions and 235 s in control sessions. He allocated an average of 2% of session time to the test location and 98% to the control location. Based on the clear differentiation and consistently low latencies to elopement in the tangible comparison, as well as the eventual differentiation in the escape
comparison, it was concluded that Kieran’s elopement was maintained by tangibles and escape from demands.

Ivan’s assessment data are depicted in Figure 2-2. Ivan consistently eloped quickly in test sessions of the escape comparison (mean = 30 s) and showed more variability in elopement from control sessions (mean = 91 s). Ivan allocated 28% of escape sessions to the test location and 72% to the control location. In the attention comparison Ivan showed no differentiation between session types; he eloped in an average of 76 s from test sessions and 68 s from control sessions. The allocation data were also variable and inconsistent, with Ivan spending an average of 47% of session in the test location and 53% in the control location. Ivan’s clearest results were in the tangible comparison, in which his average latency to elopement was 22 s in test sessions and 225 s in control sessions. Ivan only spent an average of 4% of sessions in the test location, with 96% of the session spent in the control location. Based on the clear results in the tangible comparison and the consistently low latencies to elopement in the test sessions of the escape comparison, we concluded that Ivan’s elopement was maintained by tangibles and escape from demands.

Violet’s assessment data are displayed in Figure 2-3. In the tangible comparison Violet eloped following an average of 76 s in test sessions and 158 s in control sessions. Latencies to elopement were highly variable and showed little differentiation during the standard tangible sessions (i.e., those in which attention was available in both locations), and Violet allocated an average of 37% of session time to the test location and 63% to the control location. When continuous attention was removed for the tangible-ignore comparison, clear differentiation was seen in both the latency and allocation measures; elopement occurred after an average of 6 s in test sessions and 253 s in control sessions. Violet allocated 10% of tangible-ignore sessions to the test location and 90% to the control location. Latency data were clearly differentiated in the
attention comparison; latency to elopement in the test sessions averaged 29 s, and in the control sessions latency averaged 183 s. Allocation data were also clearly differentiated by session 6, with Violet allocating 18% of session time to the test location and 82% to the control location. Latency data in the escape comparison were variable, but latencies to elopement were shorter overall in the control sessions (mean = 36 s) as compared with test sessions (mean = 106 s). Allocation data were not consistent with the latency measure, with Violet allocating more session time (65%) to the control location than the test location (35%). Due to the clear results in the attention comparison, as well as the lack of differentiation in the tangible comparison when attention was available and the short latency to elopement from the break condition of the escape comparison, we concluded that Violet’s elopement was reinforced by attention.

Figure 2-4 depicts results for Jasper’s assessment. Latencies to elopement in the test sessions of the escape comparison were consistently low (mean = 23 s), while more overall variability was seen in the control sessions (mean = 147 s). Jasper did not systematically allocate session time to either location, spending an average of 39% of session in the test location and 61% in the control location. Latencies to elopement in the attention comparison were also variable and tended to covary across session types; Jasper eloped in an average of 149 s in test sessions and 73 s in control sessions. Jasper allocated session time nearly equally to the two locations in the attention comparison (56% to test and 44% to control locations). Some differentiation in latency and allocation measures was seen in the tangible comparison. In test sessions Jasper eloped in an average of 68 s, while in control sessions eloped occurred after an average of 259 s. Jasper allocated 22% of tangible session time to the test location and 78% to the control location. The clearest results were obtained when the escape and tangible assessments were combined in an escape-to-tangible comparison. In these sessions latency to elopement was
clearly differentiated (mean = 26 s in the test sessions and 259 s in the control sessions) and Jasper allocated nearly all of the session time (96%) to the control location. Based on the results of this final comparison we concluded that Jasper’s elopement was maintained by escape from demands, especially when escape produced tangibles.

Figure 2-5 shows the results of Tanya’s assessment. In the attention comparison Tanya’s elopement was highly variable and inconsistent. Latency to elopement in test sessions averaged 42 s, and in control sessions it averaged 96 s. Tanya allocated 42% of session time to the test location and 58% to the control location. Elopement was also variable in the tangible comparison, though some differentiation was seen in the latency to elopement. Tanya eloped in an average of 62 s from tangible test sessions and an average of 180 s from tangible control sessions, and her allocation favored the control location (76% as opposed to 24% allocated to the test location). Latency to elopement was the shortest most consistently in test sessions in the escape comparison, during which Tanya eloped in an average of 23 s, compared with an average latency of 101 s to elopement in the escape control sessions. Tanya allocated 36% of escape sessions to the test location and 64% to the control location. Based on the relatively low variability in latency to elopement in escape test sessions and the differentiation in the last six sessions of the tangible comparison, we determined that Tanya’s elopement was maintained by tangibles and escape from demands.

Mikey’s assessment results are displayed in Figure 2-6. Mikey’s responding was highly variable throughout the assessment, but some differentiation was seen toward the end of the tangible comparison. Latencies to elopement averaged 112 s in tangible test sessions and 211 s in tangible control sessions; also notable was that Mikey did not elope at all from the final 6 tangible control sessions. He allocated an average of 30% of tangible session time to the test location.
location and 70% to the control location. In the escape comparison Mikey’s elopement covaried across session types, with an average latency of 173 s in test sessions and 120 s in control sessions. Mikey’s allocation slightly favored the test location (58%) over the control location (42%). In the attention comparison Mikey’s responding was also highly variable and undifferentiated; he eloped in an average of 158 s from test sessions and 195 s from control sessions, and he allocated 38% of session time to the test location and 62% to the control. Despite the high degree of variability in Mikey’s data, the clearest differentiation was seen in the tangible comparison, indicating that Mikey’s elopement was maintained by tangibles.

Table 2-2 displays the identified functions for each subject’s elopement when function was based on latency data and on allocation data. For all six subjects, the same function was indicated by both methods of data analysis. Four of the subjects had multiply controlled elopement; therefore, functions of behavior matched in 10/10 cases overall.

**Discussion**

We identified the function(s) of elopement for six preschool-aged subjects using a sequential pairwise FA and measuring the latency to the first response. The function of elopement was found to be idiosyncratic across subjects; one subject’s elopement was maintained by attention, one by tangibles, one by a combination of escape from demands and tangibles, and three subjects had multiple functions of escape from demands and tangibles. These results are consistent with prior research on the functional analysis of elopement, which has shown that individuals will elope in a manner reinforced by variety of consequences.

We also compared the results obtained from measuring latency to the first response to the overall session allocation to the test and control environments in order to provide an independent validation of latency as a measure of function. For all subjects, the function(s) identified through the latency measure matched the function(s) indicated by the full-session allocation. That is, for
the subjects whose latencies to elopement were most clearly differentiated in the escape assessment, their session allocation showed the clearest preference for the control condition in the escape comparison, and so on. The consistency of these results provides strong evidence for latency to responding as a valid measure of behavioral function in the assessment of elopement.

One possible lack of correspondence is seen in the escape comparison of Violet’s assessment, for which the allocation data indicated a potential escape function that was not suggested by the latency data. This possible false negative result highlights that the results of a latency FA must be interpreted cautiously and verified through the implementation of successful treatment; however, the same can be said of all FAs and therefore is a minor limitation of these findings.

Though separation in the data paths was the clearest indicator of a functional relationship in this study, several interesting patterns emerged in the data that could inform treatment and environmental modifications. Ivan’s escape data, for example, showed less overall differentiation than his tangible data, due to several low latencies to elopement in the control sessions. However, the latencies to elopement in his escape test sessions were uniformly low, never exceeding 80 s, indicating that Ivan is likely to elope from an environment in which demands are present. The fact that he sometimes eloped from the break (control) environment may indicate an additional function (such as an EO for toys in Ivan’s case), but the consistent elopement from the test environment pointed to a likely functional relationship that should not be discounted in treatment planning. The pairwise design of this FA may have aided in detecting these patterns, whereas the more common multielement format could have masked the effects due to the intersection of multiple data paths. The pairwise design, therefore, may have clarified results that otherwise would have appeared highly variable and indiscriminable.
Violet’s attention data showed a pattern similar to that of Ivan’s escape assessment, with consistently low latencies to elopement in test sessions and more variable latencies in the control sessions. Her initial tangible sessions, in which attention was freely available in both locations, showed a high degree of variability and little differentiation. Only when attention was removed from both locations did Violet allocate responding and elope quickly to the location with the toy present. These results indicate that the availability of attention successfully competed with toy access for Violet, suggesting that for her, attention was a more potent reinforcer (especially when this information is combined with the direct attention comparison). In this way, the results of her tangible assessment bolstered the results in her attention comparison and gave stronger evidence of an attention function for her elopement.

Mikey’s tangible assessment data showed a pattern of responding suggestive of a potential treatment for his elopement. In the final six control sessions of the tangible comparison Mikey did not elope at all. Despite some variability in his test session data, this clear effect in the control sessions suggests that a possible AO was present. For Mikey, a possible treatment for elopement would be to provide access to a moderately preferred item in the location in which he needs to stay, as this appeared to prevent elopement. These results also demonstrate the importance of including the control sessions as a point of comparison, as they may indicate which variables are most likely to compete with the target behavior.

Of the six subjects who completed this experiment, five had elopement at least partly maintained by tangibles. Concern has been raised in the literature regarding the inclusion of the tangible condition in the functional analysis (Rooker, Iwata, Harper, Fahmie, & Camp, 2011; Shirley, Iwata, & Kahng, 1999); these authors warn that tangible conditions are likely to produce false-positive responding due to the highly reinforcing nature of tangible items and the ease with
which a tangible function may be conditioned through repeated exposure. It is important to note, however, that the subjects referred for this study were often accessing toys or food in their natural environments as a consequence of their elopement, (e.g., eloping to a playground, kitchen, or playroom), and the teachers making the referrals – in all cases – suspected a tangible function. Therefore, it is less surprising that those suspicions were experimentally confirmed. Previous research has also suggested that for very young children, such as those in this study, toys are a likely reinforcer for many types of problem behavior as they often have access to them in the natural environment (Kurtz et al., 2003). In addition, the fact that tangible access often suppressed elopement – most notably in Mikey’s case – may inform treatment in as much as giving subjects access to tangibles may reduce their likelihood to elope even from environments they otherwise find aversive.

A major limitation of this experiment was the time needed to complete each assessment. An average of 53 sessions were conducted with each subject, translating to a total assessment time of 4 hours and 25 min. Given the dangerous nature of elopement and the challenges already noted in the literature with safety and efficiency of assessment, this time should be significantly reduced in order for the assessment to have practical value. However, the current experiment served dual purposes: first to assess the function of elopement and to determine treatment, and second to compare the data analysis methods of latency and allocation to determine whether latency was truly indicative of behavioral function. Therefore, this experiment should be viewed as partly translational and, as such, not directly prescriptive of methods to be used in an applied setting. Experiment 2 in this line of research, then, serves the purpose of translating the results of this experiment to a more practical approach for use in clinical, school, and possibly home, settings.
Table 2-1. Subjects and demographic information for Experiment 1.

<table>
<thead>
<tr>
<th>Name</th>
<th>Gender</th>
<th>Age at Start of Study</th>
<th>Diagnosis</th>
<th>Referral Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kieran</td>
<td>M</td>
<td>3 yr 11mo</td>
<td>Developmental Delay</td>
<td>Running away from adult supervision during transitions, outdoor play</td>
</tr>
<tr>
<td>Ivan</td>
<td>M</td>
<td>4 yr 3 mo</td>
<td>Prader-Willi Syndrome</td>
<td>Jumped over playground fence; ran across public street</td>
</tr>
<tr>
<td>Violet</td>
<td>F</td>
<td>5 yr 3 mo</td>
<td>Down Syndrome</td>
<td>Wandering away from group when outdoors; running ahead of group during transitions</td>
</tr>
<tr>
<td>Jasper</td>
<td>M</td>
<td>3 yr 2 mo</td>
<td>Developmental Delay</td>
<td>Running away from adult supervision during transitions; leaving seat or assigned area in class</td>
</tr>
<tr>
<td>Tanya</td>
<td>F</td>
<td>5 yr 5 mo</td>
<td>Down Syndrome</td>
<td>Escaped playground through fence; wandered into empty classrooms and cafeteria</td>
</tr>
<tr>
<td>Mikey</td>
<td>M</td>
<td>3 yr 5 mo</td>
<td>Autism</td>
<td>Darting away from class during transitions; leaving seat or assigned area in class</td>
</tr>
</tbody>
</table>

Table 2-2. Functions of elopement based on latency and allocation data.

<table>
<thead>
<tr>
<th>Name</th>
<th>Function based on latency</th>
<th>Function based on allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kieran</td>
<td>Tangibles &amp; Escape</td>
<td>Tangibles &amp; Escape</td>
</tr>
<tr>
<td>Ivan</td>
<td>Tangibles &amp; Escape</td>
<td>Tangibles &amp; Escape</td>
</tr>
<tr>
<td>Violet</td>
<td>Attention</td>
<td>Attention</td>
</tr>
<tr>
<td>Jasper</td>
<td>Escape to tangibles</td>
<td>Escape to tangibles</td>
</tr>
<tr>
<td>Tanya</td>
<td>Escape &amp; Tangibles</td>
<td>Escape &amp; Tangibles</td>
</tr>
<tr>
<td>Mikey</td>
<td>Tangibles</td>
<td>Tangibles</td>
</tr>
</tbody>
</table>
Figure 2-1. Assessment data for Kieran. Latency to elopement (left column) and session allocation (right column) for each pairwise comparison in the order they were conducted. Grey symbols in latency graphs denote no response.
Figure 2-2. Assessment data for Ivan.
Figure 2-3. Assessment Data for Violet.
Figure 2-4. Assessment data for Jasper.
Figure 2-5. Assessment data for Tanya.
Figure 2-6. Assessment data for Mikey.
CHAPTER 3
EXPERIMENT 2: TRIAL-BASED FA

Rationale

Based on the results of Experiment 1, latency is a valid and efficient measure of the function of elopement. The purpose of this experiment is to demonstrate the utility of the latency measure in quickly identifying the function of elopement. Two prior studies evaluated the function of elopement in a trial-based format; however, the results of those studies were largely undifferentiated. This experiment applies the test-control design of Experiment 1, which facilitated quick discrimination between environments and conditions, to the trial-based FA in an effort to obtain more orderly, conclusive outcomes.

Methods

Subjects and Materials

Three subjects – Ned, Ace, and Liam – completed Experiment 2; their demographic information and referral problems are listed in Table 3-1. For Ned and Ace, sessions were conducted in two 8’x12’ rooms that were joined by a 2’-wide doorway. There was a single door in one of the rooms that exited to the hallway; this door was kept closed during sessions. Both rooms were empty of all furniture and contained only the materials needed for sessions (i.e., toys during tangible sessions). For Liam, sessions were conducted in a single, 10’x20’ room with two windows, two doors that were kept closed during sessions, and a partial-wall divider. The divider was the only furniture present in the room. As in Experiment 1, the starting location and assignment of contingencies to the two rooms was counterbalanced. All observation and recording materials were identical to those used in Experiment 1.
Procedure

The trial-based FA was conducted identically to Experiment 1, with the exception that sessions were terminated following a single instance of elopement. Sessions were presented in an alternating test-control format identical to that of Experiment 1, and each potential function was tested in a counterbalanced sequence across subjects. Attention, escape, and tangible functions were tested for Ace and Liam; only attention and escape functions were tested for Ned because caregiver reports and prior observations yielded no evidence of a potential tangible function. An additional condition testing for automatic reinforcement was also included for Liam. In this comparison the social contingencies were held constant across both locations. In test sessions both therapists ignored Liam and no toys or materials were present to constitute an environment similar to a no-interaction session. In control sessions, a similar toy was available in both locations and therapists provided free access to attention to constitute a play environment. When Liam eloped from one location to the other the same contingencies were implemented by the second therapist.

Prior to the first session each day, the subject had 15 s exposure to the contingencies in each location. The subject was then brought into the starting location and under those contingencies (the test condition of each evaluation for test sessions, and the control condition of each evaluation for control sessions) until elopement occurred. When the subject eloped a second therapist in the other location immediately implemented the opposing contingencies. Sessions were terminated when the opposing contingency had been implemented for 15 seconds.

Response Measurement and Reliability

Response definitions were identical to those in Experiment 1. The threshold between the two rooms was delineated by a break in the carpet panels in the doorway between the two locations. Independent observers scored an average of 45% of sessions (range, 44-54%) and
agreement was calculated for the latency to elopement in the manner described for Experiment 1. IOA was 97.6% (range, 96.5-98.3%) for all subjects.

**Results**

Results for Ned are displayed in Figure 3-1. Ned’s latency to elopement was highly variable and undifferentiated in the escape comparison, with an average latency of 84.5 s in test sessions and 87.6 s in control sessions. In the attention comparison, though, clear differentiation was seen by session five, and the average latency to elopement in test sessions (56.6 s) was significantly lower than in control sessions (167.2 s). Therefore, we concluded that Ned’s elopement was maintained by attention.

Figure 3-2 shows results for Ace. Ace’s elopement was highly variable in the attention comparison, and little differentiation was seen between test and control sessions. Ace eloped more quickly on average in the test sessions, though (67.4 s), as compared with the control sessions (150.2 s); however, these results were neither consistent nor systematic enough to suggest an attention function for his elopement. Latency to elopement was undifferentiated in Ace’s escape comparison as well. Initially latencies were low in both test and control sessions but they increased in the final four sessions of the escape comparison. Average latency to elopement was 82.3 s in escape test sessions and 97.8 s in escape control sessions. The greatest differentiation was seen in Ace’s tangible comparison. In all but two sessions (7 and 11) Ace eloped more quickly in test sessions than in control sessions, and in the last seven sessions clear separation was seen between test (average latency to elopement = 75.3 s) and control sessions (average latency = 244 s). Therefore we concluded that Ace’s elopement was maintained by tangibles.

Figure 3-3 displays results for Liam. In the tangible comparison Liam eloped quickly in all test sessions (average latency = 16 s) and in all but one control session (average latency = 55
Moreover, it was observed that Liam rarely engaged with the tangible item when in the control location, indicating that the item itself was not evoking elopement. In the attention comparison Liam also eloped quickly in all sessions, with slightly lower latencies in control sessions (average = 13.5 s) than in test sessions (average = 25 s). Similar results were seen in the escape comparison in the final eight sessions, with an average latency to elopement of 25.3 s in test sessions and 65.5 s in control sessions. A final comparison testing for automatic reinforcement also showed little differentiation and short latencies to elopement across all sessions (31 s in test; 20.3 s in control). Based on Liam’s quick elopement across all conditions and the lack of differentiation based on social contingencies, we concluded that Liam’s elopement was maintained by automatic reinforcement.

Discussion

We identified the functions of elopement for three subjects using a trial-based functional analysis that measured latency to elopement. As in Experiment 1, the results of this experiment demonstrated that elopement can be maintained by idiosyncratic variables for children with I/DD and that latency is a valid measure of that function. Most importantly, this experiment demonstrated that combining the latency measure with a pairwise, test-control design yields clear results.

As anticipated there was a significant time savings in the trial-based FA over the session-based FA used in Experiment 1. The individual evaluations were comparable in terms of the number of sessions required to arrive at a conclusion regarding function; in Experiment 1 pairwise evaluations averaged 16.7 sessions (range, 6-40), and in this experiment evaluations averaged 14.3 sessions (range, 8-22). However, whereas each session in Experiment 1 had a uniform, 5-min duration, sessions in this experiment were terminated 15 s after the first instance of elopement, yielding an average session duration of only 1 min, 25.5 s. Over the course of an
average pairwise evaluation, then, the trial-based FA translated into a time savings of approximately 63.2 min per subject, or over an hour less assessment time for each potential function tested. Table 3-2 shows the actual time saved for each participant in experiments 1 and 2. For the subjects in Experiment 1, the total assessment time using the session-based method was calculated by multiplying the number of session in their assessment by 5 min, and the total assessment time using the trial-based method was calculated by adding 15 s to the latency to the first elopement in each session and adding the resulting duration of each session together. For the subjects in Experiment 2 the same methods were used, but the trial-based measure represents their actual assessment time. The total time saved by using the trial-based method of functional analysis ranged from 103 min (1 hr, 43 min) for Kieran to 271 min (4 hr, 31 min) for Tanya, with an average time savings of 151 min across all subjects. Considering the dangerous nature of elopement, this reduction in assessment time (and the resulting ability to begin a function-based treatment days, and possibly weeks, sooner) make the trial-based FA a preferable option to the longer, session-based alternative. In clinical practice we may be able to further reduce the total assessment time by testing the most probable functions (as indicated by direct observations and interviews) first, and only moving to additional comparisons if a functional relation is not identified.

The results of this experiment further illustrate the idiosyncratic function of elopement; each subject in this experiment eloped for different reasons. In addition, Liam’s elopement was reinforced by non-social stimuli, termed automatic reinforcement. Automatic reinforcement can take two primary forms: positive, in which the behavior itself produces a stimulation or result that is reinforcing, and negative, in which the behavior naturally results in the removal or attenuation of an aversive stimulus. In Liam’s case, we hypothesized that his rapid elopement
from one location to the other, regardless of the social contingencies presented in each location, was reinforced by the act of running itself and the stimuli it produced. To date, no published studies of elopement have specifically tested for sources of automatic reinforcement, and few have addressed methods of reducing elopement maintained by non-social sources of reinforcement such as access to stereotypy (Falcomata et al., 2010). Treating automatically reinforced behavior has long been a challenge in behavior analysis because, unlike socially mediated reinforcers, the natural products of behavior cannot be withheld programmatically (Shore & Iwata, 1999; Vollmer, 1994). Common interventions for other automatically reinforced behaviors such as stereotypy and self-injury have included noncontingent access to items that compete with the behavior (e.g., Britton, Carr, Landaburu, & Romick, 2002; Roscoe, Iwata, & Goh, 1998), response blocking or interruption (e.g., Carr, Dozier, Patel, Adams, & Martin, 2002), and manipulation of the sensory stimuli produced by the behavior (e.g., Mazaleski, Iwata, Rodgers, Vollmer, & Zarcone, 1994; Roscoe et al., 1998). However, noncontingent access to competing items often requires continuous prompting and redirection and rarely reduces rates of the target behavior to zero, and procedures like response blocking and sensory extinction may serve as punishers (Mazaleski et al.) or contribute to increased rates of the target behavior and other problem behaviors both during and after treatment sessions (Hagopian & Adelinis, 2001; Hagopian & Toole, 2009). Furthermore, in the context of elopement, these interventions may also serve to limit access to appropriate and even essential activities such as taking walks, exercising, and increasing levels of independence. Future research should investigate treatment strategies to reduce rates of elopement maintained by automatic reinforcement that do not rely on restrictive measures.
### Table 3-1. Subjects and demographic information for Experiment 2.

<table>
<thead>
<tr>
<th>Name</th>
<th>Gender</th>
<th>Age at Start of Study</th>
<th>Diagnosis</th>
<th>Referral Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ned</td>
<td>M</td>
<td>5 yrs 11 mo</td>
<td>Autism</td>
<td>Running away from adult supervision during instruction, play, transitions; leaving classroom without permission</td>
</tr>
<tr>
<td>Ace</td>
<td>M</td>
<td>6 yrs 2 mo</td>
<td>Autism</td>
<td>Running away from adult supervision during transitions; leaving classroom during instruction</td>
</tr>
<tr>
<td>Liam</td>
<td>M</td>
<td>4 yrs 5 mo</td>
<td>Autism</td>
<td>Running out of buildings, attempting to climb through windows</td>
</tr>
</tbody>
</table>

### Table 3-2. Comparison of assessment time using session- and trial-based methods.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Total Time - Session</th>
<th>Total Time - Trial</th>
<th>Time Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kieran</td>
<td>195 min</td>
<td>92 min</td>
<td>103 min</td>
</tr>
<tr>
<td>Ivan</td>
<td>150 min</td>
<td>46 min</td>
<td>104 min</td>
</tr>
<tr>
<td>Violet</td>
<td>270 min</td>
<td>106 min</td>
<td>164 min</td>
</tr>
<tr>
<td>Jasper</td>
<td>255 min</td>
<td>112 min</td>
<td>143 min</td>
</tr>
<tr>
<td>Tanya</td>
<td>395 min</td>
<td>124 min</td>
<td>271 min</td>
</tr>
<tr>
<td>Mikey</td>
<td>310 min</td>
<td>175 min</td>
<td>135 min</td>
</tr>
<tr>
<td>Ned</td>
<td>170 min</td>
<td>59 min</td>
<td>111 min</td>
</tr>
<tr>
<td>Ace</td>
<td>265 min</td>
<td>117 min</td>
<td>148 min</td>
</tr>
<tr>
<td>Liam</td>
<td>210 min</td>
<td>33 min</td>
<td>177 min</td>
</tr>
<tr>
<td>Average</td>
<td>247 min</td>
<td>96 min</td>
<td>151 min</td>
</tr>
</tbody>
</table>
Figure 3-1. Assessment data for Ned. Filled symbols represent test sessions and open symbols represent control sessions. Grey symbols indicate no response.
Figure 3-2. Assessment data for Ace.
Figure 3-3. Assessment data for Liam.
CHAPTER 4
EXPERIMENT 3: TREATMENT

Rationale

The purpose of Experiment 3 was to apply functional communication training methods to the treatment of elopement for a subset of the children for whom the function of elopement was identified using an experimental analysis (i.e., Experiments 1 and 2). Teaching a broad communicative response such as “I want to go out” addresses the key characteristic of elopement, namely the lack of permission to leave the area. Furthermore, teaching such a response (rather than a specific mand for a particular toy, for example) seems more likely to generalize to other situations in which the subject may be at risk for elopement if the behavior is under the functional control of multiple reinforcers or if the function of behavior changes over time. For one subject, we also thinned the schedule of reinforcement and brought responding under the stimulus control of a relevant stimulus signaling the availability of reinforcement. This experiment demonstrated the feasibility of teaching an alternative skill to elopement that could potentially generalize more readily to the subject’s natural environment. To date, no studies have used the signaled availability of permission to leave an area as part of a treatment package for elopement.

Methods

Subjects and Materials

Five subjects from Experiments 1 and 2 – Kieran, Jasper, Liam, Mikey, and Ned – completed this experiment. These procedures began as soon as their assessments were concluded, and was conducted in the same setting as their assessments. Materials included handheld computers for data collection and any toys needed in the control condition (if the control setting included tangible items). The schedule thinning component for Mikey and Ned
introduced red and green cards measuring 4’x6’. The green card served as the \( S^d \) (stimulus correlated with reinforcement) for the functional communication response (FCR) and the red card served as the \( S^\Delta \) (stimulus correlated with extinction).

**Procedure**

This experiment constituted a systematic replication of the FCT and schedule-thinning procedures in Hanley et al. (2001); FCT was conducted in an ABABC reversal design and schedule thinning was conducted using a changing-criterion design. An FCR was identified for each subject based on the subject’s verbal ability. Unlike most FCT procedures, the response to be taught was not specific to the reinforcer for the behavior (for example, asking for a toy or a break) but rather was a general mand that served as an alternative behavior to the elopement it replaced (that is, asking for permission to leave the room). For Kieran and Jasper the FCR was “I want to go out”; for Ned it was “out please”; and for Mikey it was “out.” As Liam’s elopement was maintained by automatic reinforcement, he was required to sit at a table at the start of sessions and his target FCR was “I want to get up.” All sessions began under test conditions similar to those in the FA, and the functional reinforcer for elopement was available in the second location. For Kieran and Mikey, whose elopement was maintained by tangibles, attention was provided in the room and both attention and a preferred toy were provided in the tent contingent on emission of the FCR. For Jasper, whose elopement was maintained by both escape from demands and tangibles, task demands similar to those used in the assessment were presented in the room and free attention and a preferred toy were available in the tent. For Ned, whose elopement was maintained by attention, the therapist in Location A (where he began treatment sessions) provided no eye contact, verbal, or physical attention, and a second therapist in Location B provided free attention in the form of basic conversation, compliments, tickles,
and physical play. Liam’s treatment was conducted in his regular session room where he was required to sit at a table at the start of each session, and he was allowed to move about the room contingent upon emitting the FCR.

**Baseline.** Separate baseline sessions were conducted with Kieran, Jasper, Liam, and Mikey prior to beginning FCT; for Ned, the final test sessions from his FA were used as the initial baseline. All baseline sessions were identical to the test condition from the session-based FA in the relevant comparison. The subject always began the session in the room where the test contingencies were in place (e.g., attention but no access to toys for Kieran), and the control contingencies were in effect in the other location (e.g., attention and toy access for Kieran). Subjects could move freely between the two locations; however, it should be noted that none of the subjects independently returned to the test condition after eloping to the control location.

**Functional Communication Training.** At the start of the initial FCT session, the therapist in the room stood in the doorway and prompted the relevant FCR (e.g., “Say ‘I want to go out’”). If the subject did not emit the target response, the response was prompted again on an FT-15s schedule. Immediately upon emitting the target response, the therapist moved out of the doorway and granted the subject access to the tent and its reinforcing contingencies for 30s, after which time the subject was gently prompted to return to the room. Prompting of the target response was delayed by 1 s following each successful response until the subject began emitting unprompted responses. In addition to scheduled prompting, the FCR was prompted any time the subject attempted to elope. The FCR was considered mastered following 3 consecutive sessions with no elopement attempts and in which all communication responses were unprompted.

**Delay Fading.** Following mastery of the FCR and brief reversal phases, a signaled delay was introduced following each FCR prior to granting access to the tent. This condition closely
mirrored the delay condition in the Hanley et al. study and taught brief waiting. Immediately following an emission of the FCR the therapist said, “Wait” and put a hand up in a “stop” or “wait” signal. The therapist maintained the hand signal for the duration of the delay. When the delay interval elapsed, the therapist removed the hand signal and said “you can go” or “okay” to grant access to the tent. The initial delay was 1 s, and the delay duration was increased by 1 s following 2 consecutive sessions with no elopement attempts. The terminal delay for this experiment was 10 s (but was extended further in the schedule thinning phase).

Problem behavior was ignored during the delay interval, but a changeover delay was included to prevent adventitious reinforcement of problem behavior during the delay. At 1-s, 2-s, and 3-s delays the changeover delay equaled the delay interval; therefore, the subject had to wait without engaging in problem behavior for the duration of the interval. If problem behavior occurred, time was added to the delay interval until the waiting criteria were met. At delay intervals of 4-10 s, a 3-s changeover delay was implemented. For example, if the delay was 8 s and the subject engaged in problem behavior at 7 s, he then had to display 3 s of appropriate waiting before being allowed to access the tent, for a total delay interval of 10 s. Kieran never displayed problem behavior or contacted the changeover contingency; Mikey displayed aggression in several delay sessions, and Jasper attempted to elope during the delays on several occasions.

Because Jasper’s elopement was jointly maintained by escape from demands and access to tangibles, he experienced continuous demands in the test environment. These demands continued to be presented throughout the delay interval to mimic what likely occurred in a classroom context. However, it was noted that at longer delays Jasper repeatedly manded to leave the room throughout the delay and attempted to elope past the therapist in the doorway. We
hypothesized that this increase in behavior at longer delays was due to the continued aversive context to which he was exposed in the room; therefore, once Jasper reached the terminal (10-s) delay duration, we altered the contingencies to reduce these problem behaviors. Specifically, we terminated demands immediately upon emission of the FCR to reduce the aversiveness of the room, while continuing to require appropriate waiting for the duration of the delay to access the reinforcers in the other area. This procedural change did immediately suppress the repetitive manding and elopement attempts, suggesting that those behaviors were related to the aversiveness of the demand context and not a lack of stimulus control over the response or salience of the contingency.

**Schedule Thinning.** Mikey and Ned completed the schedule-thinning phase of treatment. Session duration varied as the duration of schedule components increased, and each session consisted of five cycles of a two-component multiple schedule. Two initially neutral stimuli – red and green index cards – were selected as the schedule-correlated stimuli to signal each of the two components of the multiple schedule. The green card served as the S\(^d\) and signaled an FR1 schedule of reinforcement wherein communicative responses were reinforced with immediate access to the clinic playroom and the reinforcing contingencies therein. The red card served as the S\(^\Delta\) and signaled an EXT component wherein no responses were reinforced. As in the Hanley et al. procedure, the initial component durations were 15 s for EXT and 45 s for FR1; the duration of the FR1 component was then increased to 60 s and remained constant for the remainder of the procedure. When responding was extinguished in the EXT component of the schedule (i.e., no FCRs during EXT components for two consecutive sessions) and no elopement attempts were recorded for two consecutive sessions, we increased the duration of the EXT
component. Schedule thinning occurred in the following intervals: 15s EXT-45s FR1; 30s EXT-60s FR1; 45s EXT-60s FR1; 60s EXT-60s FR1.

Mikey continued to mand throughout the EXT component at the start of schedule thinning. We hypothesized that this was due to intermittent reinforcement of the mands, as the initial extinction period was short (15 s) and was terminated on a fixed-time schedule. We first increased the EXT duration to 120 s, but Mikey continued to mand at high rates, so a differential-reinforcement-of-other-behavior (DRO) procedure was implemented to reduce his rates of manding during extinction. The initial DRO interval for Mikey was 8 s (the average inter-response time in prior sessions) and was increased by 2 s following two successful trials until he reached 15 s (the initial EXT duration in the programmed schedule). When Mikey successfully waited 15 s for the schedule to change for three consecutive trials with no mands (essentially meeting the original schedule requirement) he returned to the standard multiple-schedule arrangement.

Subjects began each session in the room without the reinforcer present. Prior to each session the therapist presented each of the colored cards to the subject, along with a correlated rule related to the contingencies. For example, the therapist said, “Red means you have to wait; green means you can ask to go out.” Following the instructions the therapist stood in the doorway to block elopement and held the card for the initial schedule component at approximately eye level to the subject (i.e., either down by the therapist’s knees or in front at belt height). The primary data collector standing near or within eyeline of the therapist indicated the session times at which the schedule changed; alternatively, the session timer was made visible to the therapist to independently time schedule components (these methods varied depending on therapist preference).
All mands to leave the room were ignored during the EXT component. At the end of each EXT phase the card exhibited to the subject was changed to green ($S^d$); no other signal was initially given to the subject that the contingency had changed. For Ned, an additional vocal prompt was added in session 6 (trial 26) to indicate the schedule change (e.g., “It’s green now, you can ask if you want”) and was faded out once responding came under control of the green card (trial 45). If the subject emitted the FCR (or a functional equivalent) at any time during the FR1 component, the therapist immediately granted access to the playroom and the reinforcing items/contingencies for the remainder of the schedule component. Therefore, there was only one opportunity to appropriately mand in each cycle of the multiple schedule.

**Response Measurement and Reliability**

Data were collected on the frequency of elopement attempts and mands (FCRs). “Elopement” was defined as in Experiment 1; “elopement attempts” were defined as placing any part of the foot or body on or across the threshold of the doorway or any part of the body making contact with the therapist (who was blocking the doorway and access to the tent). “Mands” were defined as any verbal (vocal, sign, or alternative communication) response that could be understood by an observer and specified leaving the current location. Therefore, “out” and “want out” were accepted as communicative responses as they specified the reinforcer, but “please” or “I want” were not acceptable communicative responses. Approximations of the prompted FCR, as well as functionally equivalent responses, were accepted as mands. For example, the FCR “I want to go out” was prompted for Kieran, but the response “Let me out please” was also reinforced and scored.

Independent observers scored an average of 40% of FCT and delay fading sessions (range, 32-55%) and agreement was calculated for the latency to the first elopement attempt and the first mand (prompted or unprompted). Latency IOA was calculated by determining the time...
at which each observer scored the first response of each type in the session, dividing the shorter latency (in seconds) by the longer latency (in seconds) and multiplying by 100 to obtain a percent agreement. IOA for latency to mands averaged 90.8% (range, 83.5-99.8%) across all subjects, and IOA for elopement attempts averaged 92.9% (range, 81.5-99.7%) for all subjects.

During schedule thinning, additional data were collected on the duration and specific intervals of each schedule component. The dependent measures for schedule thinning were the rate of elopement attempts during each component of the schedule, as well as latencies to the mand in FR1 and EXT and the rate of manding in EXT. A second observer collected data during 43% of schedule-thinning sessions for Mikey and 36% of sessions for Ned. Agreement for each dependent measure was calculated for each trial per session and then averaged across the five trials to obtain proportional agreement for each session. For Mikey IOA was 98.3% for elopement attempts, 92% for latency to mands in FR1, 95% for latency to mands in EXT, and 88.2% for the frequency of mands in EXT; for Ned IOA for all four measures was 100%.

**Results**

Kieran’s FCT results are displayed in Figure 4-1. Following baseline Kieran acquired the FCR in eight sessions and manded quickly in all training sessions. He only attempted to elope from the room in three of the eight training sessions. During the reversal to baseline Kieran eloped quickly – within the same latency range as his mands in FCT sessions – but emitted the mand simultaneously with the elopement occurrence. When we returned to FCT he continued to mand quickly and met mastery criteria in five sessions, and he mastered the 10-s delay in four delay fading sessions.

Jasper’s FCT results are displayed in Figure 4-2. Jasper eloped quickly in all but the first baseline session. In initial FCT sessions he acquired the response in nine sessions and met criteria for reversal. During the second baseline condition Jasper never emitted the FCR, but he
did elope from the session room in one of two sessions. In the second FCT phase Jasper reacquired the FCR, though he did attempt to elope on several occasions before meeting mastery criteria in session 30. Jasper did not initially attempt to elope during delay fading sessions, but as he experienced longer delays he exhibited some elopement attempts. In addition, Jasper began manding at much higher rates during the longer delays (not pictured). However, in the final delay fading session when procedures were modified to remove demands immediately (but the delay to accessing the tangibles in the tent remained at 10 s), Jasper did not attempt to elope and waited appropriately for the delay to elapse.

FCT results for Liam are displayed in Figure 4-3. Liam eloped in less than 1 min in all but one baseline session. When FCT was introduced he acquired the mand quickly and mandated to get up at similar latencies as his elopement attempts in baseline. He met the mastery criterion in session 10; however, due to a change in therapist and session room at his clinic we ran additional sessions of FCT prior to reversing to baseline to ensure that the response was mastered in his current environment. Elopement and manding occurred at similar latencies in the return to baseline phase, with both extinguishing in the final two sessions. When we returned to FCT, though, Liam quickly reacquired the mand and attempted to elope, which was extinguished by session 22. Liam met the 10-s delay criterion in only three delay-fading sessions.

Mikey’s FCT results are displayed in Figure 4-4. After baseline, in which Mikey eloped quickly in all sessions, he acquired the FCR in eleven sessions. Mikey eloped in all three baseline sessions following training, and he simultaneously emitted the FCR in two of the three sessions. Mikey met mastery criteria in five additional FCT sessions and quickly reached the 10-s delay criterion. Delay fading sessions continued because Mikey often exhibited aggressive
responses during the delay; in the final two sessions of delay fading, though, Mikey had no elopement attempts and no instances of aggression.

Figure 4-5 displays Mikey’s data from schedule thinning. Mikey’s responding during the EXT component of the multiple schedule did not extinguish in the initial schedule arrangement (middle panel), despite low latencies to manding in the FR1 component (top panel) and elopement attempts in only two sessions (bottom panel). We therefore increased the duration of the EXT component in an attempt to allow Mikey’s responding to contact extinction, but his rate of manding increased along with the duration. We then implemented a DRO, rather than FT, contingency to change the schedule to FR1, which did successfully extinguish Mikey’s manding in EXT.

Ned’s FCT data are depicted in Figure 4-6. Ned acquired the FCR in five sessions; in the final two sessions he did not attempt to elope at all and met mastery criterion for the response. He quickly eloped when we returned to baseline, though, and in two of those three sessions he simultaneously manded to leave (i.e., he asked to leave the room while eloping from it). Ned reacquired the FCR in the absence of elopement attempts as soon as we reinstated the contingency, meeting mastery criteria in the minimum number of sessions (two). Ned’s manding became more variable once the delay to reinforcement was implemented, and in several sessions he attempted to elope during the delay period. Despite this, however, Ned did meet the 10-s waiting criterion in the final trial of session 23. As the mastery criterion for this portion of treatment was two trials with appropriate waiting we continued the phase for an additional session, during which Ned neither asked to leave nor attempted to elope.

Following delay fading we implemented schedule thinning with Ned, as shown in Figure 4-7. In the first two phases of the multiple schedule Ned rarely manded to leave the room,
regardless of which component of the schedule was in place. He did, however, contact the contingency in the FR1 component enough to meet the criteria to increase the EXT duration. Beginning with trial 26 we added a vocal prompt when the schedule changed from EXT to FR1 to augment the salience of the change of the colored card. With this vocal prompt Ned began manding more frequently and with shorter latencies in the FR1 component of the schedule, while manding in the EXT component remained at zero. Some manding emerged when the EXT duration was increased to 45 s, and we were also able to fade out the vocal prompt by trial 45. The EXT duration was extended to 60 s, with Ned’s manding during the EXT component extinguishing by trial 55. With the exception of one trial early in the initial phase, Ned did not attempt to elope at all during schedule thinning.

Table 4-1 shows the mean latencies to elopement and mands by condition for all five subjects in the initial FCT and delay-fading phases of treatment. For all subjects, the latencies to elopement and mands varied inversely, with lower latencies to the behavior that was reinforced (elopement in baseline, mands in FCT and delay fading) and significantly higher latencies for the behavior that was not being reinforced. The exception to that was manding in the second baseline condition for Kieran, which occurred at similar latencies to elopement.

**Discussion**

All five subjects were taught a communicative response (requesting permission to leave the assigned area) that successfully competed with elopement. In addition, systematic delay fading was used to teach the subjects to wait for permission to be granted before leaving the area. With Ned we successfully thinned the schedule of reinforcement to a waiting interval of 60 s; this treatment will be transferred to his regular session room and the schedule thinned further to approximate intervals he would typically be asked to wait for attention. Mikey’s responding was brought under external stimulus control and extinguished during presentation of an S^A, though
the duration of EXT will need to be extended further to bring his responding to appropriate levels in his classroom.

Several interesting and unexpected outcomes were noted during FCT. Three subjects – Kieran, Mikey, and Ned – independently emitted the FCR (“I want to go out”) while eloping during return-to-baseline sessions, even though the FCR had never been trained in sessions in which elopement was not blocked. This indicated that the FCR and the elopement response had become part of the same response class. Further indication of this functional equivalence is seen in the latencies to eloping and manding during baseline and FCT sessions, respectively. When elopement was reinforced in baseline sessions, it occurred at latencies similar to that of manding in FCT sessions (when the mand was the only response reinforced). This suggests that both responses were part of the same operant class and the subjects engaged in whichever response would be reinforced in a particular session.

Also of note was the second baseline phase of Liam’s treatment, in which no elopement attempts or mands occurred for multiple sessions. It is unlikely that a change in environmental variables led to this temporary reduction in behavior, as Liam’s assessment data showed that his elopement had little, if any, sensitivity to socially mediated variables. It is possible that the change in therapist, schedule, and session room that occurred prior to the phase change affected the background rates of running and physical activity for Liam; for example, on several occasions it was reported that outside of session Liam would complete his academic work while standing at a table, as opposed to sitting in a chair. If he did have increased access to movement and running over the course of the day, this may have contributed to some level of satiation and reduced Liam’s EO to elope or run during our sessions. These satiation effects, if they occurred at all, were temporary, though, and the recovery of both elopement attempts and appropriate
FCRs in subsequent sessions demonstrated that Liam would still elope from his seat if the proper EO was present. However, pre-session satiation could be investigated as a treatment component for automatically reinforced elopement in future studies.

It is possible that continuing to prompt the FCR following elopement attempts during training could have led to the development of a behavior chain in which the subject first attempted to elope, then waited for the prompt to emit the target mand. This was not observed with any of the subjects in this study, perhaps because the initial prompting of the FCR and subsequent prompt fading allowed the response to contact reinforcement enough to prevent chaining. Such prompt dependence and chaining of problem and replacement behavior has been observed in similar procedures, though (Fisher et al., 1993), and remains a possibility whenever prompts are issued contingent upon problem behavior. In such an event, the implementation of a changeover delay may break the temporal chain between problem behavior, prompt, and alternative response (Lalli, Casey, & Kates, 1995).

Several patterns of responding were observed during delay fading. Kieran and Jasper continued to emit mands at low latencies throughout the delay fading condition, suggesting that the introduction of a delay did not reduce the EO to leave (which would likely have resulted in longer latencies to the response) but simply became a tolerable consequence of the response. Mikey and Ned both showed increased latency to responding at longer delays, suggesting that exposure to the delay – and the resulting increased exposure to the room environment – may have lessened the aversiveness of the environment. For example, Ned was observed to engage in various stereotypic or self-stimulatory behaviors (vocal scripting, touching objects on the wall, spinning in circles) during longer delays; these may have provided reinforcement in a different form and temporarily reduced the EO for attention from others. Alternatively, the increased
delay to reinforcement following the mand in delay fading sessions may have reduced the overall value of the tangible reinforcer for Mikey, making it less likely that he would emit the response required to access it. Anecdotally, Mikey had the lowest verbal ability of the five subjects and therefore had a reduced response requirement for the FCR (“out” instead of “I want to go out”); it is possible that the response effort of communicating vocally remained higher for Mikey than for the other subjects, whose verbal skills were more often used and reinforced in the natural environment, and thus led to the decreased responding overall.

Jasper engaged in high rates of manding during the longer delays, which was hypothesized to be due to the continued aversiveness of the demand context. Because a single response (the FCR) was emitted to access two reinforcers (escape from demands and access to toys) for Jasper, we are unable to differentiate between the relative values of these reinforcers. However, Jasper’s initial FA data showed a stronger escape function than tangible function (as indicated by the two tangible test sessions in which Jasper did not elope at all), so it is possible that Jasper more consistently emitted the FCR during treatment to escape the demands placed on him in the room. When the contingency was changed to apply the delay to the tangible access only, immediately terminating the demand context upon emission of the FCR, Jasper no longer repeated the mand or attempted to elope, also suggesting that the removal of the aversive stimulus was the primary reinforcer for the FCR.

Two contradictory and unexpected patterns of behavior were observed during schedule thinning. In Mikey’s case, a lack of discriminated responding may have indicated that the stimuli chosen were not sufficiently salient to differentially control responding or that Mikey could not discriminate between them. As Mikey was able to point to red and green when asked in other contexts, though, the former explanation is more likely. It is also possible that Mikey’s
responding during EXT continued to be reinforced on a variable-ratio schedule given the brief duration of the component and the response-independent alternation of the components in the multiple schedule. By implementing the DRO, wherein the schedule was only changed when responding had not occurred for a specific interval, we were able to reduce Mikey’s rates of manding when the EXT component was in place and bring his responding under control of the appropriate stimuli. However, it is possible that responding would re-emerge at longer durations of EXT. It should be noted, though, that the lack of extinction of manding in the EXT component did not lead to increased rates of elopement attempts; even when Mikey’s mands were not reinforced for 2 minutes, on most trials he waited appropriately until permission was granted to leave the room. This raises the question as to how crucial the extinction of the FCR is to the generalization of treatment to the natural environment, and whether a less stringent criterion would have better facilitated schedule thinning in Mikey’s case.

Ned’s responding during schedule thinning, unlike Mikey’s, nearly extinguished in both components of the multiple schedule. Early evidence of this was seen in the final two sessions of delay fading, when mands occurred only after longer latencies, if at all. At these longer delays and during periods of signaled extinction, Ned began to engage in other behaviors that appeared to be automatically reinforcing. Though unexpected, this result is not entirely surprising, given that access to attention can sometimes serve as an EO for increased rates of stereotypy (Roantree & Kennedy, 2006). In Ned’s case, he may have engaged in various forms of vocal and motor stereotypy in order to access alternate forms of reinforcement when attention was unavailable. Like Mikey, though, Ned did not attempt to elope during these delays, demonstrating that the treatment was effective at eliminating elopement. Furthermore, the fact that Ned did mand at times during all multiple-schedule durations suggests that the response was under proper
stimulus control and that manding would still occur when a sufficient EO and the proper Sd were present.

Though FCT appears to be an effective treatment for elopement across functions, it does pose some limitations when individuals are most likely to elope when lapses in adult supervision occur. In such cases, the absence of an individual providing supervision also constitutes the absence of an individual to mediate the delivery of reinforcement for a functional response. By teaching subjects to not only mand but also to wait for permission, we somewhat obviate this need for constant adult presence to deliver reinforcement for the alternative behavior. However, other treatments may be considered in combination with FCT to enhance treatment effectiveness, especially in the case of elopement maintained by access to running or movement itself. For example, Coltharp, Richie, and Kaas (1996) suggested introducing programmed walks and exercise times for individuals prone to wandering to provide them with regular access to similar types of movement as those produced by the problem behavior.

Another possibility is that children with autism who are likely to run or elope will be treated with stimulant medications, which are often prescribed to reduce symptoms of attention-deficit hyperactivity disorder (ADHD) and impulsivity in children with disabilities (Handen, Johnson, & Lubetsky, 2000). Though in a limited number of situations in which elopement is maintained by automatic reinforcers this could be an effective treatment, the results of the current study showed that eight of the nine subjects had elopement maintained by reinforcers other than physical activity itself, suggesting that stimulant medications would not be effective in these cases. By conducting a functional analysis of elopement prior to prescribing medication aimed at reducing hyperactivity, it is likely that many children would avoid such pharmaceutical interventions.
Table 4-1. Mean latencies to elopement and mand during FCT and delay fading.

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Figure 4-1. Functional communication training data for Kieran. Grey symbols indicate no response.
Figure 4-2. Functional communication training data for Jasper.

Figure 4-3. Functional communication training data for Liam.
Figure 4-4. Functional communication training data for Mikey.
Figure 4-5. Schedule thinning data for Mikey. From top to bottom: latency to manding in FR1, latency to manding in EXT, frequency of manding in EXT, and frequency of elopement attempts in both schedule components. Grey symbols denote no response (maximum latency).
Figure 4-6. Functional communication training data for Ned.
Figure 4-7. Schedule thinning data for Ned.
CHAPTER 5
GENERAL DISCUSSION

In Experiment 1 we identified the function(s) of elopement for six children with I/DD using a session-based, pairwise functional analysis. We also compared the percent of each session subjects allocated to each condition (test versus control) with the latency to the first instance of elopement to provide validation of latency as a measure of the function of elopement. The functions suggested by both measures matched in all cases, providing strong evidence that latency does measure behavioral function. In Experiment 2 we conducted trial-based, pairwise FAs to identify the function of elopement for three additional subjects. We were able to identify a function in all three cases in a comparable number of sessions to the session-based FA, and by terminating sessions following the first instance of elopement we were able to show a significant time savings over the session-based method. Finally, in Experiment 3 we implemented functional communication training for five subjects from Experiments 1 and 2 to teach them an appropriate and functional alternative to elopement, and we thinned the schedule of reinforcement for the FCR with two subjects.

The results of this study extend the current literature on elopement by suggesting a method of assessing function – the trial-based, pairwise FA – that can yield differentiated results quickly and efficiently. The pairwise format using two distinct rooms may have improved results by allowing for easier discrimination of contingencies, making the actual elopement response more salient to the subjects, and reducing the risk of carryover effects from the more common multielement design. Latency was used in two prior studies (Davis et al., 2013; Neidert et al., 2013) to assess elopement; we were able to directly demonstrate that the latency to elopement did correlate with subsequent rates of behavior and the subjects’ preferences, making it a valid measure of function.
The identification of several social and non-social functions of elopement highlights the need for thorough assessment prior to selecting and implementing a treatment plan. The Interactive Autism Network (IAN) conducted a survey for parents to identify the probable functions of their child’s elopement (Law & Anderson, 2011); however, this survey omitted questions aimed at identifying an attention function. This omission becomes more significant given that two of the nine subjects in the current study had elopement maintained by attention. The current study only tested attention in the form of free attention to be accessed in the post-elopement environment and did not examine the role of chasing after a child as a reinforcer; it is possible that more children who elope do so to access forms of adult attention than would be identified using current survey or questionnaire measures.

Elopement as a problem behavior raises more general questions of what constitutes social and non-social reinforcement. In most FAs the tangible condition is considered a test for socially mediated positive reinforcement; that is, whether behavior occurs because it reliably leads to an adult providing access to an edible item or toy. Elopement, however, may be the result of tangible items not being provided by others in the environment, such that the only way access can be obtained is by leaving the area and accessing it oneself. In such an instance, the tangible item may best be described as an automatic positive reinforcer, as the behavior itself produces direct access to the item without mediation by another individual. In the current study we did not differentiate between tangibles that must be accessed through social mediation, such as toys or snacks, and tangibles that could be automatically accessed simply by moving to their location, such as playground equipment. Given that several of our subjects had histories of eloping to the playground and other areas that had freely accessible toys in them, it is possible that the tangible functions we identified may in fact be maintenance by automatic reinforcement and not socially
mediated reinforcement. Future research should consider including separate conditions for social and automatic tangible access and examine the nature of tangible reinforcers in the context of elopement.

All subjects in this study were between three and six years of age, which may limit the generalizability of the methods and the conclusions. For example, only two of our nine subjects (Ivan and Liam) had a history of eloping beyond the confines of the classroom or school property; the most common topographies of elopement reported for our subjects were pulling away from and running ahead of adult supervision (often referred to as ‘darting’) and leaving their assigned area of the classroom and running to an area where the contingencies were more preferred (e.g., toys available, teacher present). As compared with the topographies of elopement reported to pose the greatest risk to an I/DD population, these relatively mild forms of the behavior may not require the same vigilance to prevent or treat. In addition, these behaviors may occur, albeit at lower rates, in a large percentage of similar-aged individuals without I/DD. We would contend, however, that elopement, like other operant behaviors, is shaped by its environmental consequences and could become more severe without early treatment, and that such shaping is most likely to occur in individuals who already demonstrate risky behavior such as wandering or darting. In that sense, this study may be viewed as preventive to the extent that it eliminates a minor problem behavior and teaches an alternative skill to prevent the shaping of a more severe form of the behavior.

Treating elopement in children who present with mild topographies also reduces the risk to and effort required from clinicians. Most children of preschool age or early school age are closely supervised regardless of their problem behaviors, thus obviating the need for additional staff support for the purposes of assessment. Young children are also smaller and slower than
adults, decreasing the overall risk of the behavior (as a supervising adult can catch the child relatively easily). Clinical efficiency is also improved through the overall reduction in assessment time, as demonstrated in Experiment 2, as the function of elopement can be rapidly identified and treatment may be able to commence days or weeks earlier than with a session-based FA. The time savings noted in Experiment 2 also translate to cost savings for families and insurers who pay an average of $125/hr for BCBA services. Tanya’s FA, for example, would have been 4.5 hours shorter using the trial-based method described in Experiment 2, translating to a cost savings of $562.50. These savings may allow families to keep their children in treatment longer, allow BCBAs to move on to other cases, and improve the benefits provided by insurance companies for behavioral services if our methods are viewed as practical in addition to effective.

We had a fairly high rate of attrition throughout the study; while all subjects who began the assessment concluded with completed FAs, four – Violet, Ivan, Tanya, and Ace – were unable to begin treatment due to family relocation, school transfer, or a change in overall programming goals (i.e., their elopement was no longer the most severe behavior requiring intervention). Three additional subjects – Jasper, Kieran, and Liam – began but did not complete treatment for similar reasons. Though the treatment data from the five subjects who did participate in Experiment 3 is sufficient to experimentally demonstrate the effectiveness of the procedures, the loss of subjects throughout the study progression highlights the need for quick assessment and treatment of severe behavior and for the continuity of intervention across settings. It is possible that, had we used the trial-based FA method of Experiment 2 with Violet, Ivan, and Tanya, we would have had the opportunity to provide further treatment and include those protocols in their records when they transferred schools.
Certain limitations to FCT as an effective treatment for elopement should also be noted. The subjects in this study were young children with disabilities who are typically supervised throughout their day, either by parents, teachers, or therapists. In situations in which the individual is rarely, if ever, left unsupervised, whether due to their age or level of independence, training a communicative response to replace elopement is feasible and continuously available as an alternative behavior. However, older children, adults, or typically developing individuals who are not always supervised may selectively elope when there is no supervision, in which case FCT would not serve as an appropriate alternative. Many individuals in the foster care system, hospitals, or long-term care engage in forms of elopement under the strict stimulus control of lapsed supervision (e.g., Lang, Hartman et al., 2010; Moore, Algase, Powell-Cope, Applegarth, & Beattie, 2009); that is, they are most likely to elope when no supervisor is present to either block the elopement attempt or grant permission to leave. For these individuals, additional environmental manipulations are needed to prevent elopement from occurring and signal staff when attempts are made until the appropriate skills are taught.

Regardless of the specific topography of elopement and the conditions under which it commonly occurs, functional analysis and function-based treatment of the behavior should be considered as a complement to more commonly used, antecedent-based interventions. Most schools and clinics that serve individuals who elope are equipped with door alarms, coded or keyed door locks, closed-circuit camera monitoring, and other safeguards to prevent elopement (e.g., Moore, et al., 2009). Several studies on elopement and wandering have cited the use of sedative medication to reduce the overall level of activity in the subjects (e.g., Solomon & Lawler, 2013). These interventions, while required for safety in most cases, are highly restrictive to all the individuals in the setting and do not allow the individual who engages in elopement to
learn an alternative functional skill. In addition, it is difficult to collect accurate data on changes in the rate of behavior when there are few, if any, opportunities to engage in elopement; therefore it becomes a dangerous and difficult proposition to systematically fade such environmental supports. By incorporating functional analysis and treatment methods such as FCT into the treatment program of individuals who elope, alternative skills may be taught while locks and alarms are in place but teach a skill that will eventually allow for the fading of those restrictive elements.

The practical challenge that arises with fading environmental supports that prevent behavior such as elopement is that often individuals can discriminate when such safeguards are in use and only engage in the target behavior when they are not activated (e.g., Price, Hermans, & Grimley-Evans, 2001; Stewart & Bowers, 2011). The use of covert probes of behavior may allow clinicians to assess the continued risk of elopement in the absence of environmental modifications such as door alarms and locks. Covert probes are crucial to transferring skills acquired in training settings to the natural environment (e.g., Himle et al., 2004; Miltenberger, et al. 2005). As elopement often also occurs only when the individual is unsupervised, such covert or in situ evaluations of alternative behavior is warranted and should be studied further. Covert assessment has also been recommended for the ongoing risk assessment of problem behavior that is too severe to allow even low rates, such as sexual offending (e.g., Vollmer, Reyes, & Walker, 2012), stealing (Hinshaw, 2005; Hinshaw, Simmel, & Heller, 1995), fire setting (Houvouras & Harvey, 2014), and other dangerous behavior that often occurs only when nobody is there to observe it. Future research should investigate the feasibility and utility of using covert probes to determine the ongoing risk of elopement and when restrictive interventions are faded.
LIST OF REFERENCES


BIOGRAPHICAL SKETCH

Michele received her Bachelor of Arts degree from Brown University in 2002, where she majored in theatre arts. She later pursued behavior analysis, first receiving a Master of Science of Education (M.S.Ed.) in applied behavior analysis from Temple University in 2009 and her Ph.D. in psychology at the University of Florida in 2016. Michele is a board certified behavior analyst.