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Functional Assessment and Treatment of Elopement Occasioned by Transitions

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FUNCTIONAL ASSESSMENT AND TREATMENT OF ELOPEMENT OCCASIONED BY TRANSITIONS

by

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Elopement is a dangerous behavior in children with developmental disabilities because it greatly increases the risk of accidents that lead to serious injury or death. The dangers of elopement are especially high during transitions because these situations increase the chance that a child will gain unsupervised access outside, where the most serious accidents typically occur. Despite its severity, assessment methodologies that specifically evaluate the contextual variables found during transitions are not available. Additionally, treatment for elopement during transitions typically involves antecedent interventions which do not address function. Continued research on effective and efficient means for the assessment and treatment of elopement during transitions is needed. The current study consisted of three phases. In Phase 1, we conducted a trial-based transition functional analysis (TBTFA) to identify the function of elopement during transitions. This analysis informed the development of a function-based intervention. In Phase 2, we used an ABAB reversal design to evaluate the effects of the intervention on elopement and appropriate transitions and evaluated the generality of effects in outside settings. Finally, in Phase 3, we evaluated whether a stimulus used during treatment set the occasion for appropriate transitions when treatment was terminated. The TBTFA successfully identified a function of elopement during transitions for one out of three participants. Additionally, elopement during transitions

decreased and appropriate transitions increased for all three participants. Results of the stimulus control assessment indicated that we did not successfully establish a discriminative stimulus to occasion appropriate transitions.

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INTRODUCTION

Elopement is defined as leaving a supervised or safe area without the care of a responsible person (Lambert, Finley, & Caruthers, 2016). According to a review by Barnard-Brak, Richman, and Moreno (2016), 44% of children with developmental disabilities or other special health care needs elope. However, the prevalence of elopement is higher among children with autism spectrum disorder (ASD) compared to children with other intellectual and developmental disabilities (Barnard-Brak et al., 2016; Kiely, Migdal, Vettam, Adesman, & Martinuzzi, 2016). In a review of caregiver reports of elopement, Anderson et al. (2012) found that 49% of respondents reported their children had eloped at least once since the age of 4 years. Often, these children may find themselves in dangerous situations. For example, in the same review, 65% of caregivers reported their child had close calls with traffic injuries and 24% reported close calls with drowning (Anderson et al., 2012). Additionally, children who elope may end up getting lost. Anderson et al. (2012) found that 49% of parents said their child went missing when the child eloped. The average time that children went missing was around 41.5 minutes (Anderson et al., 2012).

Individuals with ASD engage in elopement in many different contexts and for a variety of reasons (Anderson et al., 2012; Boyle & Adamson, 2017; Call, Alvarez, Simmons, & Valentino, 2011). One context in which individuals with ASD may elope is during transitions. Transitions typically involve a change from one activity to another and may also involve a change in location. Call et al. (2011) reviewed the medical records of patients they served for the past 10 years at their clinic and found 11 cases that involved elopement. Of those, three involved elopement during transitions. The remaining cases involved elopement in schools and community settings. It is likely that these cases also involved elopement during transitions

because schools and community settings typically involve numerous opportunities to transition between activities (Sainato, Strain, Lefebvre, & Rapp, 1987).

Elopement during transitions can be especially difficult for children with ASD for many reasons. First, transitions are a common part of an individual's day and occur frequently. As a result, opportunities for elopement are high. This may increase the number of times the behavior comes in contact with potential reinforcers. Second, children who elope during transitions that involve going from inside to outside settings may be at a higher risk for contacting those dangerous situations mentioned before, such drowning or traffic injuries. Finally, elopement during transitions can delay completion of important daily activities, which is a requirement for success in many different environments throughout an individual's life. Given the high prevalence of elopement among children with ASD and the significant problems associated with engaging in the behavior during transitions, it is extremely important to identify effective and efficient assessment and treatment strategies that can be used by caregivers and clinicians.

Assessment of Elopement

As with all other problem behavior, it is important to understand the function of elopement during transitions in order to develop an effective treatment (Hagopian & Gregory, 2016). Typically, to identify the function of problem behavior, researchers and clinicians complete a functional behavior assessment, which often includes a functional analysis (FA: Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994). An FA is the most rigorous assessment method for identifying the function of problem behavior. During an FA, hypothesized antecedents and consequences are manipulated and their effects on problem behavior are measured within a number of conditions. These conditions are typically run in well controlled environments where the antecedent and consequences can be precisely and immediately

manipulated. There is over 30 years of research available on effective and efficient FA methodologies for a variety of problem behaviors in different contexts (Beavers, Iwata, & Lerman, 2013; Hagopian & Gregory, 2016; Hanley, Iwata, & McCord, 2003). However, research on elopement is limited compared to other topographies of problem behavior. In a recent review, Boyle and Adamson (2017) identified 12 published studies pertaining to the assessment and treatment of elopement in the past 15 years. We conducted a similar brief literature review of studies on the assessment and treatment of problem behavior. In this brief review, we excluded elopement and entered the same keywords in the same electronic databases used in Boyle and Adamson. This brief search generated a total of 1,331 studies published in the last 15 years. One reason why research on elopement is limited may be because functional assessment of elopement is especially challenging. For example, adventitious reinforcement can confound the assessment. During typical FA conditions, when an individual elopes from the assessment room, the individual may gain access to outside toys/activities, friends who were in different settings, and to physical activity (e.g., running and wandering). Unplanned access to these potential reinforcers complicates the interpretation of the results of the assessment. Including retrieval procedures in the FA conditions can minimize access to potential reinforcers. These typically consist of guiding the individuals back into the assessment room when elopement occurs. Boyle and Adamson noted that 58% of published studies identified through their literature review on elopement included retrieval procedures. For example, Call et al. (2017) used a retrieval procedure where they returned the participants to the location from which they eloped following 20 seconds of access to reinforcers during conditions. Similarly, Falcomata, Roane, Feeney, and Stephenson (2010) guided participants back to a chair 30 seconds after an instance of elopement during FA conditions. While retrieval procedures may be helpful in limiting access to potentially

reinforcing items and activities during FA conditions, they introduce new confounds to the assessment. In this case, the physical guidance and attention given to the individual during retrieval procedures introduces unplanned attention that may also serve as adventitious reinforcement. Alternative modifications to assessment procedures for elopement are still needed to control for this potential confound.

Fortunately, recent adaptations of FA technologies help address this challenge. Trial-based FAs and latency-based FAs are two modifications that may reduce the effects of this confound because they eliminate the need to retrieve an individual in the middle of an FA condition (Lambert, Finley, & Caruthers, 2016; Neidert, Iwata, Dempsey, & Thomason-Sassi, 2011). For example, in a trial-based FA, problem behavior is assessed within discrete control-test segments. Specifically, a trial begins with a 2-min control segment in which a hypothesized reinforcer for the problem behavior is present. After the 2-min control segment, a 2-min test segment begins. During the 2-min test segment an establishing operation for the hypothesized reinforcer is present. If problem behavior occurs during the test segment, the reinforcer is delivered and the trial is subsequently terminated (Bloom, Iwata, Fritz, Roscoe, & Carreau, 2011). As a result, in a trial-based FA for elopement, the individual does not need to be retrieved during the conditions. The same is true when conducting a latency FA. During this assessment, the latency to problem behavior is measured instead of frequency or rate. During the FA conditions, procedures are similar to the ones originally described in Iwata et al. (1982/1994) except conditions are terminated after the occurrence of problem behavior (Thomason-Sassi, 2011). Thus, just like the trial-based FA, the individual does not have to be retrieved.

A recent study by Lambert et al. (2016) compared the efficiency and effectiveness of latency and trial-based FAs in the assessment and treatment of elopement. The authors conducted

a latency FA and a trial-based FA for a child who engaged in elopement at a university-based clinic. The assessments were conducted in two adjacent rooms connected by a single doorway. Both assessments identified similar functions of elopement and both led to successful interventions. Additionally, while the latency FA took less time to conduct, both assessments took between two to three hours. Nonetheless, while trial-based FAs and latency FAs may reduce some of the confounds related to adventitious reinforcement during FA conditions, these assessments do no address the other potential challenges related to assessment of elopement during transitions.

Assessment of Problem Behavior During Transitions

The typical FA strategies first described in Iwata et al. (1982/1994) may not always be effective for assessing elopement that occurs during transitions. Specifically, transitions often involve many idiosyncratic variables that are not typically present during an FA. For instance, transitions may create aversive contexts that increase the value of escape as a reinforcer. If an individual has a history of transitioning to locations with less reinforcement available, a demand to transition may become a warning stimulus that signals worsening conditions (Michael, 2004). This warning stimulus (i.e., the demand to transition) may in turn evoke behaviors that have resulted in the avoidance or escape of those worsening conditions (Michael, 2004). For example, if a child is often asked to transition from a highly preferred environment, where highly preferred items are available, to a less preferred environment, where highly preferred items are unavailable, this will create aversive contexts. These contexts could potentially evoke behaviors that have resulted in the termination of those activities in the past. In a recent study by Jessel, Hanley, and Ghaemmaghami, (2016), the rate of problem behavior and the duration of time it took a participant to transition between different schedules of reinforcement were evaluated

under different conditions. While the researchers observed problem behavior for only one participant during all transitions, they saw that all participants took longer to transition when going from a dense reinforcement schedule to a lean reinforcement schedule. This study demonstrates how transitions to lean reinforcement contexts may create problematic situations. It is also possible that problem behavior could occur during transitions as a result of the physical movement required to make a transition (Jessel et al., 2016; McCord et al., 2001). If an individual finds physical activity aversive, a demand to transition to a different physical location may evoke behaviors that result in escape of the required physical activity. As a result, analyzing these variables may be necessary when evaluating the function of elopement during transitions.

Assessing whether transitions signal an aversive context due to changes in reinforcement schedules or due to requirements of physical activity, as described above, requires an assessment that is designed to specifically evaluate these idiosyncratic variables. Functional assessments that focus on idiosyncratic variables in the context of transitions are limited. McCord et al. (2001) provide one of the first attempts at a detailed analysis of problem behavior evoked by transitions. During FAs to evaluate self-injurious behaviors (SIB) occasioned by transitions, McCord and colleagues exposed participants to four different types of transitions: 1) activity initiation with location change, 2) activity initiation without location change, 2) activity termination with location change, and 4) activity termination without location change. During Activity Initiation transitions, the participants were left alone for 2 min, after which they were prompted to begin a number of different activities, such as daily living tasks, chores, getting access to food, or engaging in social interactions with therapists. During transitions with no location change, participants initiated the activities in one location. During transitions with a location change, participants were prompted to move 7 to 10 meters to another area of the room to initiate

activities. If the participants engaged in SIB during the transition, the activity was terminated for the remainder of the 2 min. If the transition involved a location change, after the occurrence of SIB, in addition to terminating the activity, the participant was returned to the initial location. If SIB occurred during any of these transitions, it was considered to be maintained by negative reinforcement. During Activity Termination transitions, the participants were first prompted to engage in different activities, such as daily living tasks, work tasks, eating, or socializing with a therapist. After 2 min the participants were asked to terminate these activities with no other activity taking their place. During transitions with no location change, after the activity was terminated, the participant remained in the same location. During transitions with a location change, participants were required to move 7 to 10 meters to another area in the room to terminate the activity. If the participants engaged in SIB during these transitions, the participant resumed the activity. If the transition involved a location change, the participant was also returned to the initial location. If problem behavior occurred during these transitions, it was considered to be maintained by positive reinforcement. Finally, the authors included a transition with a required location change but no activity in either location to study the effects of a simple location change. Problem behavior that occurred under this transition was thought to be maintained by negative reinforcement (i.e., escape from physical activity). Differentiated results were observed for both participants involved in the study, which allowed the researchers to identify the specific function of SIB. Based on these analyses, the authors designed successful function-based interventions, and SIB decreased for both participants.

The analysis conducted by McCord et al. (2001) was an elegant analysis of problem behavior evoked by transitions. However, these procedures evaluated SIB and not elopement.

Therefore, it is unclear if these procedures could effectively be used for the assessment and treatment of elopement during transitions.

Treatment of Elopement During Transitions

Currently, research on the treatment of elopement during transitions involves antecedent manipulations, such as signaled and advanced notice (Brewer et al., 2014; Flannery & Horner, 1994) or functional communication training combined with other interventions, such as differential reinforcement or extinction (Boyle & Adamson, 2017). Despite the demonstrated effectiveness of these interventions, they can present special challenges to practitioners. For instance, because elopement can be very dangerous, it may not be possible to implement extinction. One way to address this issue is to implement treatment in a controlled setting where dangers are minimized. For example, in Lambert et al. (2016), treatment was implemented in a university-based clinic to maximize safety. However, one limitation of this strategy is that the individual might engage in high levels of appropriate transitions in the controlled setting after successful treatment but might continue to engage in elopement when transitioning in the community. In other words, the skill may not generalize to other contexts that are less controlled (i.e., where dangers are difficult to manage, and putative reinforcers are difficult to withhold). Stokes and Baer (1977) suggest several strategies for facilitating generalization, including programming common stimuli that are present across both the controlled and natural settings. Piazza, Hanley, and Fisher (1996) programmed a common stimulus to function as an s-delta for automatically-maintained pica, another behavior for which extinction and generalization may prove to be a challenge. Specifically, the authors paired a purple card with response interruption to block the individual from consuming cigarette butts, along with a reprimand. In the presence of a yellow card, the individual was allowed to consume the cigarette butts. The authors found

that after pairing the purple card with extinction and reprimands in a controlled setting, it functioned as an s-delta for pica in less controlled community settings, even when the response interruption procedures and reprimands were terminated. Similar procedures could be used in the treatment of other dangerous behaviors, such as elopement during transitions. However, these procedures have not been applied to the treatment of elopement during transitions.

Summary

In sum, McCord et al. (2001) conducted a detailed analysis of the idiosyncratic variables associated with transitions while Lambert et al. (2016) evaluated the efficiency of alternative assessments to prevent the influence of confounding variables correlated with elopement. However, these two assessments in isolation do not adequately address the challenges associated with elopement during transitions. While McCord et al. (2001) addressed the need for detailed analyses of transitions, their procedures were used to assess SIB and not elopement, therefore we do not know if the same procedures would effectively identify the function of elopement during transitions. Additionally, the total duration of the assessment was 9 hours. In contrast, Lambert et al. successfully identified the function of elopement without the need of retrieval procedures by conducting a trial-based FA and latency FA and both assessments took between 2 to 3 hours. However, Lambert et al. did not assess the idiosyncratic variables found during transitions. Therefore, an ideal approach to the assessment of elopement during transitions may be one in which the various idiosyncratic variables associated with transitions are evaluated (i.e., a la McCord et al., 2001) within an efficient paradigm (i.e., a la Lambert et al., 2016).

Additionally, current treatment of dangerous behaviors, such as elopement during transitions, often involves the use of antecedent interventions in well controlled settings. However, treatment effects observed in well controlled settings may not generalize to other

settings. Contextual variables found in community settings may be very different from the contextual variables found in treatment settings. Therefore, elopement may not maintain at low levels when moving to a community setting. The more dissimilar training conditions are from conditions in which the target behavior should be displayed, the less likely generalization will occur (Stokes & Baer, 1977). However, given the dangers of elopement, initial treatment in a well controlled setting may be necessary. Programming a common stimulus during the treatment of dangerous behaviors, like elopement during transitions, may help alleviate the concern related to generalization of treatment effects.

To address these concerns related to the assessment and treatment of elopement during transitions, the current study consisted of three phases. During Phase 1, we modified and extended assessment procedures in both McCord et al. (2001) and Lambert et al. (2016) by combining them for the assessment of elopement during transitions. In Phase 2, we used the information from the assessment to design and implement a multi-component treatment package to decrease elopement and increase appropriate transitions. During this phase, we programmed a common stimulus and evaluated the generality of the intervention in community settings. Finally, in Phase 3, we conducted a stimulus control assessment to evaluate whether the programmed stimulus exerted stimulus control over appropriate transitions.

Research Questions

1. To what extent can a trial-based transition function analysis (TBTFA) for elopement identify the function of elopement during transitions in children with autism spectrum disorder (ASD) in a clinical setting?
2. What are the effects of a treatment package consisting of differential reinforcement of appropriate transitions, a programmed common stimulus, and a token economy on the

occurrence of appropriate transitions and elopement during transitions of children with ASD in a clinical setting?

3. What are the effects of a treatment package consisting of differential reinforcement of appropriate transitions, a programmed common stimulus, and a token economy on the occurrence of appropriate transitions and elopement during transitions of children with ASD in community settings?
4. What are the effects of the presence of a GPS wrist device as a common stimulus on the occurrence of appropriate transitions of children with ASD in a controlled but novel environment?

GENERAL METHODS

Participants and General Setting

Three children diagnosed with autism spectrum disorder (ASD) participated in this study. Demographics for each participant are depicted in Table 1. All three children were either receiving Applied Behavior Analytic (ABA) services at a university-based clinic for at least one year or were on the waiting list for receiving ABA services and were enrolled in the study while waiting for services. Participants were referred for participation in the study due to elopement that occurred at the clinic and/or in the community/home with caregivers. Liam was 5 years old and was receiving 15 hours per week of ABA services at the clinic. Liam had been receiving services at the university-based clinic for almost 2 years. Liam communicated in full sentences, could follow complex instructions, and engaged in elopement during transitions multiple times per day at the clinic and when out in the community with his caregivers. Noah was 6 years old and was on the waiting list to receive ABA services at the clinic. Noah communicated by using gestures and pointing, could follow simple one to two step instructions, and frequently engaged

in elopement when out in the community according to caregiver reports. Noah also engaged in self-injurious behaviors in the form of head hitting, however these behaviors were not assessed or treated as part of this study. William was 5 years old and was receiving 25 hours per week of ABA services at the clinic. William had been receiving services at the university-based clinic for 1 year. William was learning to communicate using one to two-word sentences but mostly used gestures and one-word utterances to communicate his wants and needs. William engaged in elopement during transitions multiple times per day and when out in the community according to his clinician's and caregivers' reports.

Table 1

Participant Characteristics

Participant	Age	High Preferred Stimuli	Years in Clinic
Liam	5	iPad & Playing w/ Friends	2 years
Noah	6	Spin toys & Cookies	On Waiting List
William	5	iPad and Playing Outside	1 year

Initial assessment and treatment sessions were conducted during the participant's regularly scheduled sessions at the clinic or during specially scheduled sessions for William. The clinic served approximately 31 clients and consisted of 38 behavior technicians, five board certified behavior analysts, and two administrative staff. The clinic contained 12 therapy rooms across two floors and various community rooms (e.g., living room, kitchen areas, laundry room, and playgrounds). Finally, the clinic was located on a relatively busy intersection, contained three general exits, and had a swipe card entry system. Clients at the clinic were allowed to move around to the different community rooms with supervision during their therapy sessions.

PHASE 1: TRIAL-BASED TRANSITION FUNCTIONAL ANALYSIS (TBTFA)

An FA of elopement during transitions was conducted for each participant. The assessment procedures were based on a combination of procedures derived from McCord et al. (2001) and Bloom et al. (2011). We refer to this assessment as a trial-based transition FA (TBTFA). Additionally, we conducted a concurrent operants assessment for one participant to further confirm the results of his TBTFA.

Materials and Setting

The TBTFA was conducted in a room separate from the participant's clinical sessions. The room was divided into two sections by affixing masking tape on the floor. Conditions were conducted by the lead experimenter, research assistants, and/or the behavior technicians assigned to work with the participant during their regularly scheduled sessions. All staff wore different colored lanyards to distinguish between different transitions during the assessment (Connors et al., 2000).

Dependent Variables, Measurement, and Interobserver Agreement

Elopement was individually defined for each participant. For Liam and Noah, elopement was defined as having one or two feet on the other side of the masking tape for at least 5 seconds or more. William's elopement occurred at higher frequencies. Specifically, unlike Liam and Noah, the average inter-response time between each instance of elopement for William was 5 seconds. Therefore, in order to be sensitive and ensure that we were capturing the occurrence of elopement for William, elopement was defined as having one or two feet on the other side of the masking tape for at least 10 seconds or more. Additionally, for Noah, data on head hitting during FA conditions were collected (Bell & Fahmie, 2018; Carr & Durand, 1985; Querim et al., 2013). Head hitting was defined as his hands and/or fists making contact with his cheeks, forehead,

and/or the top of his head in a quick repetitive motion. Data were collected on the occurrence and non-occurrence of elopement during each trial of the TBTFA. During the concurrent operants assessment, time allocation was measured using 5-second partial interval recording.

Behavior technicians, research assistants, and/or the lead investigator served as primary observers during the TBTFA and collected data in-vivo. Research assistants served as secondary observers. The secondary observer simultaneously but independently scored elopement during the TBTFA for inter-observer agreement (IOA) for at least 30% of trials. Trial-by-trial IOA was used to assess the reliability of data collection. Specifically, we compared data collected by the primary and secondary observers. The number of trials with agreements by both observers was divided by the total number of trials and multiplied by 100. Agreements were defined as any trial in which both observers scored an occurrence and non-occurrence of elopement. Treatment fidelity data were also collected during at least 30% of trials to ensure that the behavior technicians and research assistants continued to implement the procedures with a minimum of 90% correct implementation. IOA during the TBTFA was 99.4% across all participants. Treatment fidelity was 100% across all participants.

Procedures

Preference Assessments

Participant preferences were assessed in order to identify stimuli to use during assessment and treatment sessions. Preference for edible and tangible items were assessed by conducting a paired-choice preference assessment (Dattilo, 1986; Fisher et al., 1992). Additionally, a free operant preference assessment was conducted in order to identify preferred and non-preferred activities (Ortiz & Carr, 2000). Items used in the preference assessments were identified by

conducting an interview with both the caregiver and the participant's clinical supervisor. Stimuli from the preference assessment were used during the TBTFA and treatment sessions.

TBTFA

We conducted four types of transitions: 1) Attention, 2) Access to Tangibles, 3) Escape, and 4) Location Change. Transitions were structured in a trial-based format similar to that described by Bloom et al. (2011). However, one primary modification was implemented. Specifically, unlike the procedures described in Bloom et al., where trials were conducted throughout the participant's typical day and during their daily activities, trials were conducted in a room separate from the participant's clinical sessions. The room was divided into two sides and participants were asked to transition between both sides of the room. This was done in order to decrease the need for retrieval procedures if and when elopement occurred. Each transition trial consisted of a 2-min control segment and a 2-min test segment. Behavior technicians and/or research assistants approached the participants, said, "Let's walk", and then proceeded to walk to the other side of the room with the participant. Each transition type is described below and in Table 2. We conducted a total of 20 trials for each transition type. The sequence of the transition trials was counterbalanced with two specific considerations. First, the location change transition never occurred prior to the attention nor tangible transitions. This was controlled because conducting a location change transition immediately prior to an attention or tangible transition meant that the participant would have access to attention or tangibles for a full 6 minutes prior to the test segment. It was possible that this could affect the motivating operation for attention and tangibles, specifically making them less valuable as reinforcers (Hammond, Iwata, Rooker, Fritz, & Bloom, 2013). Second, for the same reason, two of the same transition trials were never conducted following each other. Finally, it is important to note that for Noah only, we included

termination criteria for head hitting. Transition trials were terminated if Noah engaged in at least five instances of head hitting during any transition trial.

Table 2

Trial-Based Transition Functional Analysis Transition Types

Condition	Control Segment (2 minutes)	Test Segment (2 minutes)
Attention Transition	Adult Attention Moderately Preferred Items Available	No Adult Attention Moderately Preferred Items Available
Access to Tangibles Transition	No Adult Attention High Preferred Items Available	No Adult Attention High Preferred Items Available
Escape Transition	No Adult Attention	Demands Placed
Location Change	Adult Attention High Preferred Items Available	Adult Attention High Preferred Items Available

Attention Transition

This condition tested whether elopement was maintained by access to attention. In this condition, the participants were prompted to transition from one side of the room, where attention was available, to the other side of the room, where no attention was available. The side of the room with attention consisted of continuous social and/or physical attention. The side of the room with no attention consisted of moderately preferred stimuli and no attention. During the 2-min control segment, participants were prompted to stay on the side of the room with attention for 2 min. The test segment began after 2 min expired or if any instance of elopement occurred

during the control segment. During the test segment, participants were prompted to transition from the side of the room with attention to the side of the room with no attention. If the participant eloped, the participant was allowed to go back to the other side of the room and attention was delivered for 30 seconds. After 30 seconds, the test segment was terminated, and the trial ended. If no elopement occurred, the test segment continued until the 2 min expired.

Access to Tangibles Transition

This condition tested whether elopement was maintained by access to preferred environments. In this condition, the participant was prompted to transition from one side of the room, where highly preferred stimuli were available, to the other side of the room, where low preferred stimuli were available. The side of the room with highly preferred stimuli consisted of stimuli identified as highly preferred through the preference assessment. The side of the room with low preferred stimuli available consisted of a chair and stimuli identified as low preferred in the preference assessment. No attention was delivered on either side of the room. During the 2-min control segment, participants were prompted to stay on the side of the room with highly preferred stimuli for 2 min. The test segment began when 2 min expired or if any instance of elopement occurred during the control segment. During the 2-min test segment, participants were prompted to transition from the side of the room with highly preferred stimuli available to the side of the room with low preferred stimuli available. If the participant eloped to the side of the room with highly preferred stimuli, the participant received access to the highly preferred stimuli for 30 seconds. After 30 seconds, the test segment was terminated, and the trial ended. If no elopement occurred, the test segment continued until the 2 min expired.

Escape Transition

This condition tested whether elopement was maintained by escape from aversive situations. In this condition, the participants were prompted to transition from one side of the room, where low preferred stimuli were available and no attention was provided, to the other side of the room, where a non-preferred task was presented. For all participants this included academic tasks such as matching stimuli, identifying objects, and counting numbers. The side of the room with low preferred stimuli available consisted of a chair and low preferred stimuli. No attention or demands were delivered on this side of the room. In the side of the room where a non-preferred task was presented, a demand to complete an academic task was delivered by a behavior technician approximately every 5 seconds. Compliance with the demand resulted in praise. Non-compliance and other problem behavior resulted in most-to-least prompting in order to evoke a correct response. During the 2-min control segment, the participant was prompted to stay on the side of the room with low preferred stimuli available and no attention or demands for 2 min. The test segment began when 2 min expired or if any instance of elopement occurred during the control segment. During the 2-min test segment, participants were asked to transition from the side of the room with low preferred stimuli available and no attention to the side of the room where a non-preferred task was presented. If the participant eloped back to the side of the room with low preferred stimuli and no attention, the participant was allowed to escape the non-preferred task for 30 seconds. After 30 seconds, the test segment and the entire trial ended. If no elopement occurred, the test segment continued until 2 min expired.

Location Change Transition

In this condition, the activity on both sides of the room was identical and consisted of access to attention, identical highly preferred toys, and no demands. A prompt to transition from

one side of the room to the other side involved a physical activity demand (i.e., demand to move) but no other change in activity. This condition was implemented as a control condition and was hypothesized to evoke no elopement if elopement was maintained by social contingencies. Any elopement that occurred during this condition was hypothesized to be maintained by either automatic reinforcement (i.e., elopement or movement itself was reinforcing) or escape from physical activity (i.e., changing locations). Trials consisted of two control segments. During the start of the first 2-min control segment, participants were prompted to stay on one side of the room where highly preferred items were available, continuous attention was delivered, and no demands were placed. The second control segment began when the 2 min expired or if any instance of elopement occurred in the first control segment. During the second control segment, participants were prompted to transition to the other side of the room, where attention and highly preferred stimuli were still present, and no demands were placed. If the participant eloped back to the other side of the room, the participant was allowed to continue to gain access to the highly preferred items and attention was continually delivered for 30 seconds. After 30 seconds, the control segment was terminated. If no elopement occurred, the control segment continued until the 2 min expired.

Concurrent Operants Assessment

In order to further clarify if escape was a maintaining variable for elopement during transitions for William, we conducted a concurrent operants assessment. Specifically, we evaluated William's time allocation to both the control and test segments for all transition types except the location change transitions. This was done by conducting additional 5-min conditions in which William was allowed to move freely between the control and test segment sides of the room for attention, access to tangibles, and escape transitions. The control and test segments

were set up in a similar way as in the TBTFA. The different sides of the room were labeled as Side A and Side B. The side of the room where control and test segments were implemented were counterbalanced across sessions in order to ensure that control or test segments were not always run on the same side. During the concurrent operants assessment, William was not instructed to transition between control and test segments and instead was allowed to move freely between each side.

Results and Discussion

We compared the percentage of trials with elopement in the test segments relative to the control segments for each transition type for all participants. If problem behavior occurred most often during the test segments relative to the control segments, it suggested that elopement during transitions was maintained by the specific reinforcers found in that transition trial. If the percentage of trials where elopement occurred was similar across both control and test segments, it suggested that other motivating operations were in place and further analyses were warranted.

Figure 1 depicts the results of the TBTFAs for all three participants. The percentage of trials in which elopement occurred for both control and test segments are depicted on the y-axis. Liam's TBTFA results are depicted in the top panel. Liam engaged in elopement most often during the test segments for access to tangibles (92%) and attention (100%) transitions relative to the control segments. During the location change transitions, Liam did not engage in elopement. Liam engaged in less elopement during the test segments for escape transition trials (42%) relative to the control segments (58%). However, given that we observed high levels of elopement during the test segments for attention transitions, we determined that Liam's elopement during the control segments of the escape transitions was more likely a function of Liam gaining access to the therapist's attention. Specifically, during the control segments for the

escape transition trials, Liam was deprived of adult attention and had access to low to moderately preferred items. Therefore, these conditions could have served as an establishing operation for attention-maintained behaviors. Taken together, the results of Liam's TBTFA suggest that elopement during transitions was maintained by attention, access to tangibles, and, to a lesser degree, escape from demands.

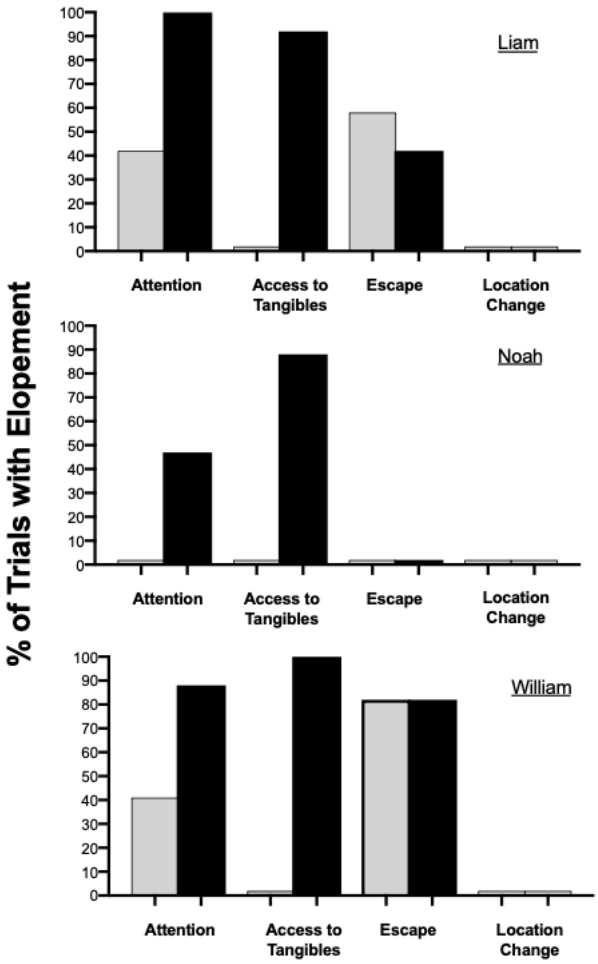

Figure 1. TBTFA results for all three participants.

Noah's TBTFA results are depicted in the middle panel of Figure 1. For Noah, elopement occurred most often during the test segments for access to tangibles (88%) and attention (47%) transitions. Noah did not engage in elopement during any of the control segments across all

transitions. Additionally, only 3% of overall trials were terminated due to head hitting. Given the results of Noah's TBTFA, we determined that his elopement was maintained by social positive reinforcement in the form of access to tangibles.

William's TBTFA results are depicted in the bottom panel of Figure 1. William engaged in elopement during 100% of the test segments for access to tangibles transitions. He also engaged in elopement more often during the test segments for attention transitions (i.e., 85%) relative to the control segments (i.e., 40%). During the escape transition trials, William engaged in high levels of elopement during both the control (i.e., 80%) and test (i.e., 85%) segments. As a result, while we were confident that elopement during transitions for William was maintained by access to tangibles and attention, we could not rule out an escape function because of the high levels of elopement during both control and test segments. Therefore, we conducted a concurrent operants assessment to further evaluate the reinforcers for William's elopement during transitions. Figure 2 depicts the results for William's concurrent operants assessment. The percentage of intervals in which William allocated his time to either side of the room are depicted on the y-axis. During the attention conditions, William's time allocation was variable across both sides. During the access to tangibles conditions, William allocated 100% of his time to the control side (e.g., side A) where he had continuous access to high preferred items. During the escape conditions, William allocated his time more often to the control side (e.g., side B) where he was left alone, and no demands were placed. Given these results, we determined that William's elopement was most likely maintained by social positive reinforcement in the form of access to tangibles and social negative reinforcement in the form of escape from demands.

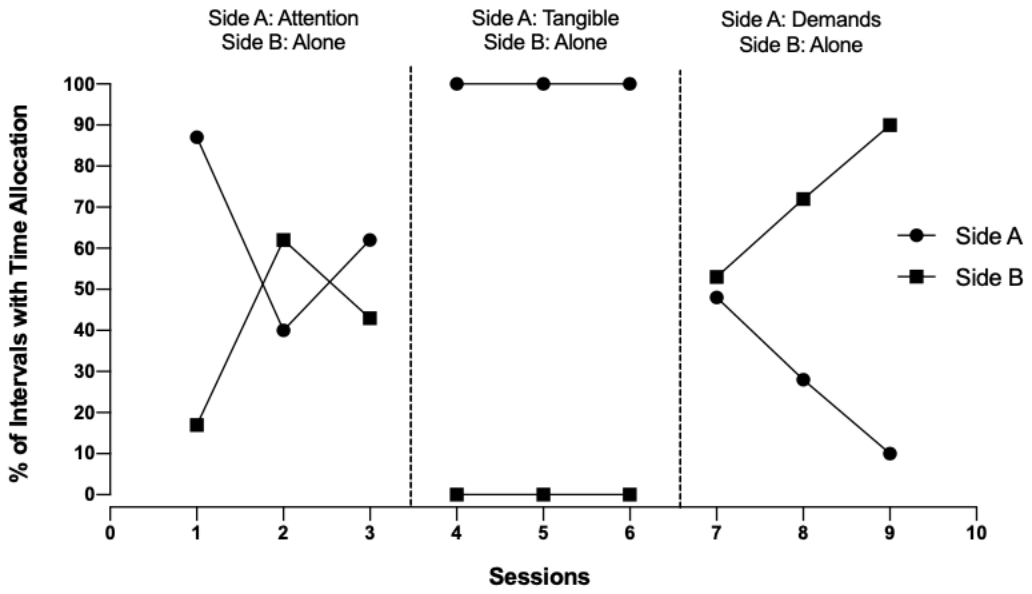

Figure 2. Concurrent Operants Assessment results for William.

In sum, the TBTFAs showed clear results for one participant (i.e., Noah). The results for the other two participants (i.e., Liam and William) were not as clear. However, for Liam, we were able to identify potential reinforcers for elopement during transitions based on further analyses of the relative levels of elopement in the control and test segments during all transition trials. During the escape transition trials for William, the relative levels of elopement between the control and test segments were almost equal. As a result, we conducted a concurrent operants assessment for William to further clarify whether escape functioned as a maintaining variable of elopement during transitions. In previous studies, concurrent operants assessments have shown to identify the same reinforcers for problem behavior as functional analyses (Berg et al., 2007). During the escape conditions of the concurrent operants assessment for William, we observed progressively more differentiated results as we continued with the conditions. This may have been indicative of William learning the contingencies on both sides of the room as we continued to expose him to the conditions. Given that we calculated the overall occurrence of elopement

during transition trials in the TBTFA, this type of responding may not have been as evident. As a result, if William responded in the same way during the TBTFA, we would not have been able to see it. However, we anecdotally analyzed William's data from the TBTFA as a series of trials over time and did not see a similar pattern. Specifically, William did not engage in elopement more often during the test segments as he continued to get exposure to the different contingencies.

Noah's TBTFA results showed the clearest differentiation across transitions. One reason for this may be that Noah was not a current client at the clinic and, as a result, the contextual variables (i.e., toys, therapists, etc.) in each transition trial were more salient because he had no prior history with them. Similarly, Noah would only attend the clinic to participate in the research sessions. However, Liam and William both were current clients and, as a result, the assessment sessions would sometimes begin during the middle of their day. This allowed room for other motivating operations to come in place during the sessions. Specifically, Liam and William might have seen coming to the FA room as an escape from their therapy rooms where they were required to work. Therefore, the motivating operations that were being established during the 2-min control segments for each transition trial may not have been as salient.

PHASE 2: TREATMENT EVALUATION AND GENERALIZATION PROBES

In Phase 2, we implemented and evaluated a function-based treatment package based on the results of the TBTFAs for each participant using an ABAB reversal design. The goal of treatment was to decrease elopement during transitions and increase appropriate transitions. Treatment for Liam and Noah consisted of access to highly preferred items and attention contingent on appropriate transitions. For William, treatment consisted of access to highly

preferred items and a break from work contingent on appropriate transitions. Additionally, for Liam, we evaluated the generalization and maintenance of the treatment effects to other settings.

Materials and Setting

Given that elopement is a dangerous behavior, the intervention was initially implemented in a controlled setting (i.e., the university-based clinic). The clinic served as a safe place to practice appropriate transitions because it was well controlled (i.e., swipe-access doors and gated outdoor spaces) and contained several staff who could ensure the participant's safety. However, in order to ensure that treatment effects generalized to other settings, we sought to establish a stimulus that could be easily used in the community as discriminative for appropriate transitions. A GPS wrist device was used as a common stimulus to help promote generalization from the clinic to other environments. Specifically, we evaluated whether the GPS wrist device could be paired with the treatment package so that it could be taken with the participant into less controlled settings to decrease the likelihood of elopement during transitions in those settings while also serving as a safety device if the child did happen to elope. All GPS wrist devices were provided to the participants by the lead experimenter. Generalization trials for Liam were conducted at a local super market and in his home.

Dependent Variables, Measurement, and Interobserver Agreement

Behavior technicians and/or research assistants served as primary observers and collected data in-vivo during treatment sessions. Data were collected on the percentage of trials with elopement and appropriate transitions. Elopement was individually defined for each participant. For Liam and Noah, elopement was defined as moving more than 1.5 meters from an adult without permission. Much like the TBTFA, in order to ensure our measurement system was sensitive, for William elopement was defined as moving more than .5 meters away from an adult

or attempting to move away from an adult during transitions. Appropriate transitions were defined as any instance in which the participant walked near or beside an adult for the entire transition. Trials were defined as an opportunity to transition from one place to another. A trial began when a behavior technician or research assistant asked the participant to transition by saying "Let's walk." A trial ended when the participant arrived at the destination or when the participant eloped. If a participant stopped walking during the transition and/or engaged in other problem behaviors, elopement was not scored. A correct trial was recorded if the participant walked beside or near the adult for the entire transition. An incorrect trial was recorded if the participant eloped at any time during the transition. Trials were grouped into 10-trial blocks and the percentage of trials with appropriate transitions during the block was calculated. Data were also collected on the average meters that the participant appropriately transitioned (i.e., the average distance the participant walked without elopement across the 10-trial block). Distance was recorded with a distance measurement wheel. Lastly, data were collected on the pre- and post-transition activities that were present during all transitions. Transitions were categorized into four types of transitions: 1) Tangible, 2) Escape, 3) Attention, and 4) Preferred. A tangible transition was defined as moving from a location where highly preferred items were available to a location with low to moderately preferred items available. An escape transition was defined as moving from a location where no demands were present to a location where demands were delivered. An attention transition was defined as moving from a location where highly preferred attention was delivered to a location where highly preferred attention was not available. A preferred transition was defined as moving from a location where highly preferred items/activities and attention were available to a location with similar environmental conditions.

Research assistants served as secondary observers. The secondary observers simultaneously but independently scored target responses for IOA for a minimum of 30% of sessions. Treatment fidelity data were also collected for a minimum of 30% of sessions during treatment. Trial-by-trial IOA was used to assess the reliability of data collection. Specifically, we compared data collected by the primary and secondary observers. The number of trials with agreements by both observers was divided by the total number of trials and multiplied by 100. Agreements were defined as any instance in which both observers scored a correct or incorrect trial. IOA during treatment was 90% for Liam, 100% for Noah, and 98.7% for William. Treatment fidelity was 96.7% for Liam, 99.8% for Noah, and 94.3% for William.

Procedures

Baseline

During baseline, the participants did not wear the GPS wrist device. The behavior technician or research assistant instructed the participant to transition from one location of the clinic to another by saying "Let's walk." During baseline sessions, transitions consisted of a number of different pre- and post-transition activities. However, we ensured that some of the transitions consisted of the specific pre-and post-transition activities from the TBTFA that were found to maintain elopement. For example, if the participant's elopement was found to be maintained by access to preferred activities/items, we ensured that some of the pre-transition activities consisted of access to highly preferred items and some of the post-transition activities consisted of removal of the highly preferred items. If the participant appropriately transitioned to the next location, the behavior technicians or research assistants did not deliver any reinforcers and instead began an activity at the location. For example, if the participant was prompted to transition to the living room, the behavior technician or research assistant prompted the

participant to play a board game. If elopement occurred, the behavior technicians or research assistants attempted to block elopement by extending their arms in front of the participant's body. If blocking was unsuccessful, the behavior technician allowed the participant to go back to the pre-transition activity. For example, if the participant was prompted to transition out of the playroom and the participant eloped back into the playroom during the transition, the behavior technician attempted to block elopement. If blocking was unsuccessful, the participant was allowed to go back to the playroom.

Differential Reinforcement of Appropriate Behaviors plus Token Economy (DRA+T)

The treatment package included multiple components and was based on the specific maintaining variables identified in the TBTFA. Treatment packages were individualized for each specific participant. However, the general treatment package consisted of differential reinforcement of appropriate transitions (DRA), a GPS wrist band, and a token economy. Participants earned tokens for each appropriate transition. Tokens were exchanged for access to the maintaining variables identified through the TBTFA (e.g., attention, access to tangibles, opportunities to run, etc.). Trials were conducted just as discussed in baseline except the consequences for appropriate transitions and elopement were different. The behavior technician or research assistant began a trial by saying "Okay, let's walk" and reviewed the contingency prior to the onset of the trial by saying "If you walk with me, you will earn a token. After three tokens, you can go to the playroom/get your iPad/etc." Contingent on an appropriate transition, the participant received a token. He then continued to transition until he earned three tokens. After earning three tokens, participants exchanged the tokens for access to variables that maintained problem behavior during the assessment. If a participant eloped during the transition trial, behavior technicians attempted to block with minimal attention and represented the trial. If

blocking was unsuccessful, the behavior technician walked to the participant and brought him back to the area where he first eloped from with minimal attention (e.g., limited eye contact and physical guidance).

Liam

Prior to treatment, Liam had a history with token economies and had one in place at the clinic during his treatment. During the DRA plus token economy for Liam, after he earned three tokens, he was allowed to exchange the tokens for access to his iPad and/or playing with friends. Additionally, for Liam, instead of stating the specific item or activity that he was working for, the behavior technicians told Liam that he would earn three tokens and exchange them for "Liam Time". This change was done because the motivating operations present during any given time for different reinforcers changed within and throughout trials.

Noah

According to caregiver reports, Noah had a token economy in place at school. Given that Noah was not a current client at the clinic and did not have other programming occurring with this treatment, all transition trials for Noah consisted of the pre- and post-transition activities found to maintain elopement during the TBTFA. That is, Noah was asked to transition away from a highly preferred items and/or locations for all trials during treatment. Noah began sessions by getting non-contingent access to spinning toys and cookies. Noah was then prompted to transition away from the items and activities. After he earned three tokens, he was allowed to go back to the location where he had access to his highly preferred items and activities.

William

Prior to treatment, William did not have a token economy in place during his treatment at the center. During DRA plus token economy for William, after he earned three tokens, he was

allowed to exchange his tokens for a break from work where he had access to his iPad and other activities, such as playing outside. William's performance did not improve with the initial treatment. As a result, a few modifications were made to William's treatment. Specifically, in addition to a token, William also earned a small edible after each appropriate transition. In addition, the criteria for exchanging tokens was lowered so that after one token, William could immediately exchange the token for his highly preferred items/activities.

In addition to the DRA and token economy, all participants also wore a GPS wrist device during transitions. The wrist device was placed on the participants' wrist immediately prior to a transition trial. The behavior technicians stated the following rule, "When your watch is on, that means you need to walk." For participants with limited verbal repertories, the device was simply placed on their wrist for them and the behavior technicians delivered a vocal statement of "Let's Walk." When the participant completed the transition, the behavior technician prompted the participant to take off the device.

Generalization Probes

Generalization trials for Liam were conducted by his mother. Trials were identical to baseline session trials with the exception of the presence of the GPS wrist device. Liam was prompted to transition for a total distance of 27 meters for each trial. During generalization probes, the DRA and token economy were not in place. A trial began when Liam's mother asked him to put on the GPS wrist device and said, "Let's walk." After the instruction was delivered, Liam was required to transition to different locations in the community setting. Transitions consisted of different pre- and post-transition activities, some of which included the specific pre- and post-transition activities from the TBTFA that were found to maintain elopement. In order to

ensure the Liam's safety, additional research assistants and the primary investigator were present and were located at all doors and exits.

Results and Discussion

Figures 3, 4, and 5 depict the results of the treatment evaluation and generalization probes for each of the three participants. Data on the percentage of trial-blocks with appropriate transitions are depicted on the primary y-axis. The average distance in meters that the participant appropriately transitioned during a 10-trial block is depicted on the secondary y-axis. During baseline, Liam engaged in appropriate transitions an average of 66% of trials for an average distance of 19 meters. During the first treatment phase for Liam, appropriate transitions increased to 93% of trials. In order to ensure we set Liam up for success, we set the initial distance requirement to 1.5 meters. The criterion for increasing distance requirements for all participants was three consecutive sessions of 90% or above. Liam quickly met the criterion and the distance requirement increased. Liam continued to show high levels of appropriate transitions when we increased the distance requirements to 3, 4.5, and 5 meters. After meeting the criterion for 5 meters, we removed the treatment package. We observed variable responding during the initial reversal. However, Liam's performance began to decline to an average of 47% appropriate transitions. As a result of the decline in performance, we re-introduced the treatment package. During the first re-instatement of the treatment package, Liam's performance was variable with an average of 84% appropriate transitions. However, we continued to increase the distance requirements as Liam continued to meet the criterion. After meeting the criterion for 18 meters, we removed the treatment package. During this second reversal, we again saw a decrease in Liam's performance from an average of 88% to an average of 60% appropriate transitions. As a result of the decline in performance, we re-instated treatment and observed an immediate

increase in his performance to 90% appropriate transitions. The distance that Liam was required to appropriately transition continued to increase as he met the distance increase criterion. After reaching 27 meters, we began generalization probes. During generalization probes, Liam engaged in appropriate transitions for an average of 99% of trials.

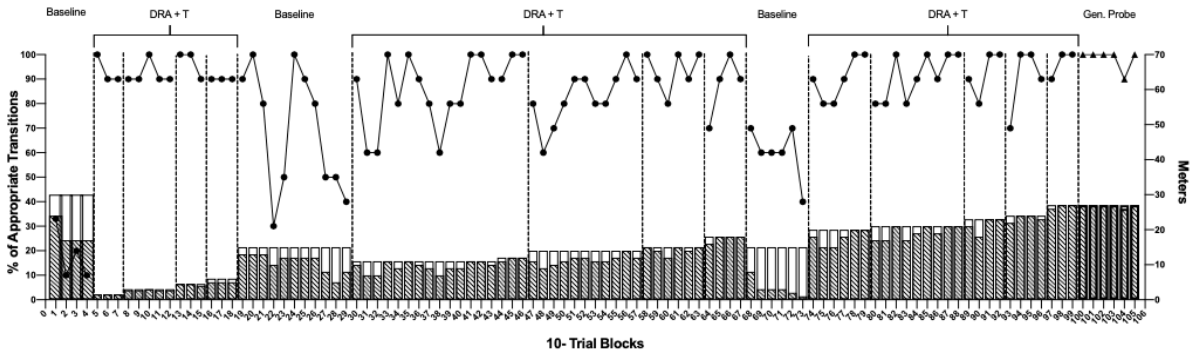

Figure 3. Treatment results and generalization probes for Liam.

During baseline, Noah engaged in appropriate transitions an average of 50% of trials for an average of 3 meters. During the first treatment phase for Noah, appropriate transitions increased to an average of 100% of trials. Similar to Liam, we set the initial distance requirement for Noah to 1.5 meters. We continued to increase the distance requirement for Noah until he was required to appropriately transition for 4.5 meters. After he met the criterion for 4.5 meters, we removed the treatment package and we observed an immediate decrease in Liam's performance from an average of 100% to an average of 37% appropriate transitions. As a result of this decline, we re-instated the treatment package and observed an immediate increase to an average of 97% appropriate transitions. After he met the criterion for 11 meters, we removed the treatment package again. During this second reversal, we saw a decrease in performance from an average of 93% to an average of 53% appropriate transitions. As a result of his decline in performance, we re-instated treatment and saw an immediate increase in his performance to 90%

appropriate transitions. The distance that Noah was required to appropriately transition continued to increase as he met the distance increase criterion. After reaching 12 meters, Noah's caregivers withdrew from the study due to difficulties with traveling to the clinic. As a result, we did not conduct a generalization probe with Noah.

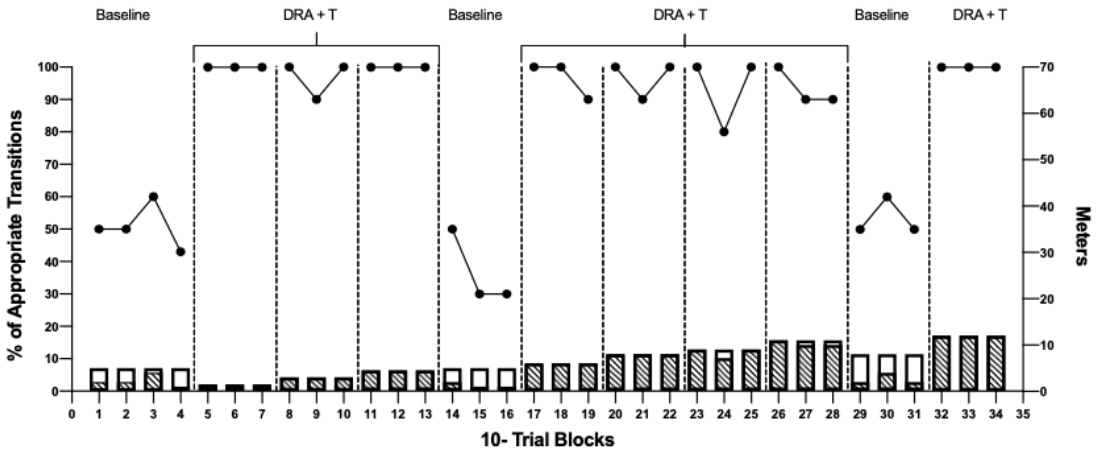

Figure 4. Treatment results for Noah.

William engaged in appropriate transitions an average of 30% of trials for an average of 3 meters during baseline. During the first treatment phase for William, appropriate transitions increased to an average of 89% of trials. Similar to the other two participants, we set the initial distance requirement for William to 1.5 meters. We increased the distance requirement for William to 3 meters. However, we started to see a decline in William's performance. After the first modification in which he earned a small edible after each token, we saw an immediate increase in William's performance to an average of 97% appropriate transitions. However, after increasing the distance requirement to 7 meters, William's performance declined again to an average of 76% appropriate transitions. After lowering the token exchange criteria, William's performance increased to an average of 85% appropriate transitions. After he met the criterion

for 7 meters, the intervention package was removed, and an immediate decrease of appropriate transitions occurred from an average of 85% to an average of 55% of trials. As a result of this decline, we re-instated the treatment package and saw an immediate increase to an average of 95% appropriate transitions. We continued to increase the distance requirement for William. Given that William had multiple treatment modifications, his clinician decided to hold on conducting generalization probes until William's performance stabilized. Therefore, generalization probes were not conducted for William.

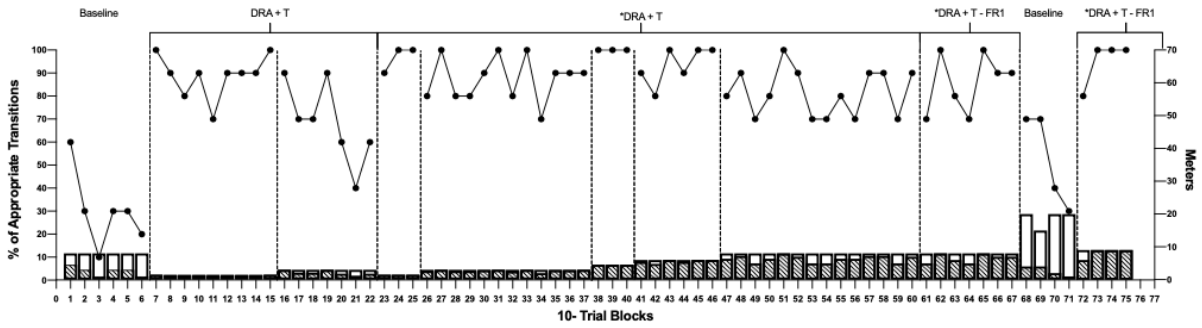

Figure 5. Treatment results for William.

Data on the types of transitions during treatment sessions are depicted in Table 3. Liam's transitions during treatment consisted of 49% tangible transitions, 49% attention transitions, 65% escape transitions, and 28% preferred transitions. For William, transitions during treatment consisted of 67% tangible transitions, 67% attention transitions, 43% escape transitions, and 39% preferred transitions. For Noah, 100% of his transitions were tangible transitions during treatment.

Table 3

Percentage of Transition Types During Treatment

Participant	Tangible	Attention	Preferred	Escape
Liam	49%	49%	28%	65%
Noah	100%.	0%	0%	0%
William	67%	67%	39%	43%

In sum, elopement during transitions successfully decreased and appropriate transitions increased for all three participants. When the treatment package was removed, a decrease in appropriate transitions was observed for all three participants. Finally, when treatment was re-instated, appropriate transitions increased for all three participants. William's treatment package required a few modifications. Specifically, William was given an edible item each time a token was delivered and the criteria for exchanging tokens was lowered to one token. That is, William only had to earn one token to get access to his highly preferred items or activities. However, after these modifications, William's appropriate transitions increased to an average of 85% of trials. One reason why treatment was successful after modifications may be because of William's lack of history with token economies. Both Liam and Noah had token economy programs at the clinic and/or at school, as reported by clinicians and caregivers. However, William did not have a token economy in place during his treatment at the center. Furthermore, William's clinicians and caregivers reported that he did not have a token economy in place at school. As a result, the

tokens may not have functioned as generalized conditioned reinforcers for William at the onset of treatment.

For Liam, treatment effects generalized to other settings. Given that we did not conduct generalization probes for Noah and William, it is difficult to say whether treatment effects would have successfully generalized for them.

PHASE 3: STIMULUS CONTROL ASSESSMENT

For treatment of dangerous behaviors, like elopement during transitions, constant supervision is required in order to maintain the individual's safety. However, extensive supervision may not always be feasible for clinicians and caregivers. The use of a stimulus to establish stimulus control during treatment, like the GPS wrist device, may be a viable procedure to ensure behaviors continue to maintain at low levels in other settings where extensive supervision is not feasible. Therefore, to evaluate whether the GPS wrist device evoked appropriate transitions we conducted a stimulus control assessment during phase 3 of the study for Liam.

Materials and Setting

The stimulus control assessment was conducted at a university office by research assistants who did not regularly work with Liam at the clinic. This was done in order to evaluate whether the GPS wrist device was discriminative for appropriate transitions in a novel environment and with novel therapists.

Dependent Variables, Measurement, and Interobserver Agreement

Behavior technicians and/or research assistants served as primary observers and collected data in-vivo during stimulus control sessions. Data were collected on the occurrence of elopement and appropriate transitions. The stimulus control assessment consisted of 10-trial

blocks that consisted of 5 trials where the GPS wrist device was present and 5 trials where the GPS wrist device was not present. A correct trial was recorded if Liam walked beside or near the adult for the entire transition. An incorrect trial was recorded if the Liam eloped during the transition.

Research assistants served as secondary observers. The secondary observer simultaneously but independently scored target responses for IOA for a minimum of 30% of trials during stimulus control trials. Trial-by-trial IOA was used to assess the reliability of data collection. Specifically, we compared data collected by the primary and secondary observers. The number of trials with agreements by both observers was divided by the total number of trials and multiplied by 100. Agreements were defined as any instance in which both observers scored a correct or incorrect trial. IOA during the stimulus control assessment for Liam was 100%.

Procedures

Stimulus Control Assessment

Sessions were identical to baseline sessions with the exception of the presence of the GPS wrist device. Sessions consisted of trials where Liam wore the GPS wrist device and trials where he did not wear the wrist device. No programmed consequences were delivered in either the GPS present or absent trials. During trials where the GPS wrist device was present, a trial began when a research assistant prompted Liam to put on the GPS wrist device and asked him to transition by saying “Let’s walk.” After the instruction was delivered, Liam was required to transition to different locations in the setting. Transitions included various pre- and post-transition activities, some of which included the specific pre-and post-transition activities from the TBTFA that were found to maintain elopement. If Liam eloped during any of the trials, the research assistant attempted to block him from eloping. Additional research assistants were present at all doors and

exits in the setting in order to ensure Liam's safety. If blocking was unsuccessful, the research assistant closest to the location where Liam was eloping to blocked him by moving towards them and neutrally guided him back to the location he eloped from with minimal attention.

Results

The data for the stimulus control assessment for Liam are depicted in Figure 6. Liam engaged in high levels of appropriate transitions for all trials regardless of whether the GPS wrist device was present or absent. Specifically, Liam engaged in appropriate transitions an average of 100% of trials when the GPS wrist device was present and an average of 90% of trials when the GPS wrist device was not present. These data indicated that the GPS wrist device did not serve as a discriminative stimulus for appropriate transitions.

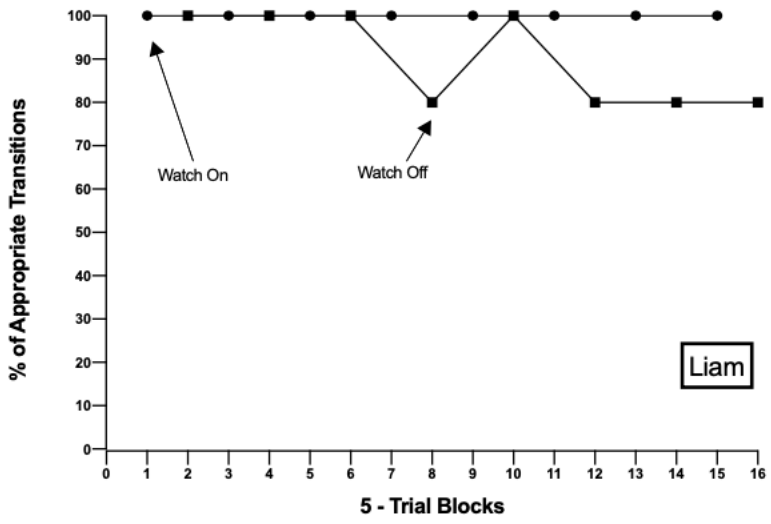

Figure 6. Stimulus control assessment for Liam.

GENERAL DISCUSSION

In the current study, we sought to answer a number of research questions. First, we were interested in the effects of conducting a TBTFA to identify the function of elopement during transitions in children with ASD in a clinical setting. Specifically, we were interested in

evaluating whether a TBTFA could yield differentiated results for elopement during transitions. The results of the TBTFAs showed clear results for one out of the three participants.

A second research question involved identifying the effects of a treatment package consisting of DRA, a programmed common stimulus, and a token economy on the occurrence of appropriate transitions and elopement during transitions of children with ASD in a clinical setting and in community settings. During treatment, we successfully decreased elopement during transitions for all three participants. Additionally, for Liam, treatment effects successfully generalized to other settings.

Our final research question involved evaluating the effects of the presence of a GPS wrist device as a common stimulus on the occurrence of appropriate transitions of children with ASD in a controlled but novel environment. Given that Noah withdrew from the study and William's treatment required modifications, we were only able to conduct a stimulus control assessment for Liam. The results of the stimulus control assessment for Liam indicated that the GPS wrist device did not establish stimulus control over appropriate transitions.

The results of the present study extend previous research on the assessment and treatment of elopement in many ways. First, while research on the assessment and treatment of elopement is limited, the research that is available does not include assessment and treatment of elopement that occurs during transitions. As mentioned previously, elopement during transitions may be difficult to assess because transitions often include a number of idiosyncratic variables that are not commonly found in typical FA conditions. Specifically, transitions may signal a change in a schedule of reinforcement (i.e., going from rich schedules of reinforcement to lean schedules of reinforcement or vice versa) or worsening event for an individual which can evoke problem behaviors (Jessel et al., 2016; Michael, 2004). The typical antecedents and consequences that are

included in FA conditions may not always capture these idiosyncratic variables and, as a result, different assessment methodologies may be needed to accurately evaluate problem behavior occasioned by transitions (Schlichenmeyer, Roscoe, Rooker, Wheeler, & Dube, 2013). McCord and colleagues (2001) were the first to successfully evaluate different assessment methodologies for self-injurious behavior that occurred during transitions. Wilder, Chen, Atwell, Pritchard, and Weinstein, (2006) and Waters, Lerman, and Hovanetz, (2009) successfully replicated these procedures for aggression, tantrums, and other disruptive behaviors. However, this research has not been extended to elopement. To our knowledge, the present study is the first to evaluate elopement in this specific context. Additionally, in the current study, we extended the procedures used in McCord et al. by including specific control-test segments during transition trials similar to the format used within trial-based FAs described by Bloom et al. (2011). This allowed for a detailed analysis of transition-specific control and test contingencies.

We also evaluated a treatment package that included DRA and a token economy, similar to the one used in Lambert et al. (2016), to decrease elopement and increase appropriate transitions. The present study extended Lambert et al. and previous research on the treatment of problem behavior occasioned by transitions by including a common stimulus during treatment. In a review by Tullis, Cannella-Malone, and Payne (2015), researchers found that both antecedent-based interventions (i.e., visual cues, advanced notice, etc.) and consequence-based interventions (differential reinforcement, functional communication training, etc.) were successful at decreasing problem behavior occasioned by transitions and were equally used in the literature. However, the authors noted that few studies evaluated maintenance and generalization of these treatment effects (Tullis et al., 2015). For dangerous behaviors such as elopement during transitions, generalization and maintenance is especially important because treatment often

occurs in controlled settings, such as well controlled clinics or classrooms, in order to ensure the safety of the individuals. However, treatment effects may not generalize and maintain outside of the well-controlled setting. Therefore, it is important to program for generalization. In this study, we programmed a common stimulus during treatment to increase generalization and maintenance. Specifically, a GPS wrist device was paired with the DRA procedure so that the wrist device might set the occasion for appropriate transitions in a community setting. We conducted generalization probes for Liam and found that treatment effects successfully generalized to other settings. However, the common stimulus we programmed into the treatment did not appear to exert stimulus control over appropriate transitions. Therefore, we do not know if the strong generality of the treatment effects for Liam was a function of other salient stimuli from the treatment package or whether it was due to other factors.

There are several important considerations when evaluating this assessment method and treatment package. First, transitions typically include a change in location. Additionally, during typical trial-based FAs, trials are conducted during an individual's daily activities. While participants in this study were required to transition to another location, the assessment was conducted in a separate room away from the child's typical environment and the change in location involved going to the other side of the same room. This was done in order to decrease the use of retrieval procedures during the assessment conditions, as was done in Lambert et al. (2016). However, the participants' discrimination of the relevant contingencies in each side of the room may not have been as salient and may have impacted the results of the assessment. In order to address this concern, future researchers can conduct the TBTFA during the individual's typical day and activities as originally described by Bloom et al. (2011) and where location changes are required. However, conducting the TBTFA in this manner may introduce the need

for retrieval procedures which would present confounds and take up more resources. For example, in a recent study by Traub and Vollmer (2019), researchers used a tent that was placed immediately outside of a doorway as a different location during an assessment for elopement. While this helped to increase discrimination for the participants, the researchers had to have two additional research assistants available to conduct the assessment in order to ensure the participant did not elope outside of the tent. Therefore, if a clinician has limited resources to begin with, conducting this sort of assessment may not be a feasible option.

A consideration related to the treatment package is the types of transitions that the participants practiced during treatment. Liam and William were both current clients at the clinic and, as a result, their transitions included various pre- and post-transition activities. Thus, Liam and William did not always practice transitions that consisted of the specific pre- and post-transition activities that were found to maintain elopement during the TBTFAs. However, despite the variation in pre-and post-transition activities, elopement still decreased. One reason may be because of the unsignaled properties of the transitions (Jessel et al., 2016). In a recent translational study by Jessel et al. (2016), researchers evaluated levels of problem behavior and dawdling (i.e., when the duration of one transition was longer than another transition) during transitions. Treatment consisted of having the participants engage in two types of transitions: 1) Transitioning from a rich schedule of reinforcement to a lean schedule of reinforcement and 2) Transitioning from a lean schedule of reinforcement to a rich schedule of reinforcement. The stimuli that signaled the two different schedules of reinforcement were not visible to the participants. Thus, the participants did not know which transition they were experiencing. Researchers observed low levels of problem behavior and zero levels of dawdling for all three participants. The results of this translational study suggest that including unsignaled transitions

during treatment may decrease the probability of problem behavior. In the present study, therapists instructed the participant to transition by saying "Let's walk." Therefore, participants did not know where they were transitioning to. The unsignaled properties of the transitions may have decreased the probability of elopement occurring during transitions. However, transitions were unsignaled during both baseline and treatment sessions. Given that elopement did not decrease during baseline, the usignaled properties of the transitions alone did not contribute to the treatment effects observed in the current study.

A few limitations of the present study should be noted. First, the duration of the TBTFA for each participant was 5 hours. This is a fairly lengthy assessment, which impacts its feasibility for clinicians. A shorter assessment may be more feasible. For example, in the current study, we conducted 20 trials for all transitions. However, Lambert et al. (2016) conducted 10 trials for all conditions during the trial-based FA and only took 3 hours. Therefore, conducting 10 trials for each transition during the TBTFA in the current study may have increased the efficiency. We evaluated the data from the first 10 trials of the TBTFAs and identified similar patterns in responding as was observed at 20 trials. Therefore, decreasing the number of trials run per transition type could have decreased the length of the assessment.

The lack of differentiation in the stimulus control assessment for Liam is another limitation in the current study. We conducted a stimulus control assessment to evaluate whether the GPS wrist device had stimulus control over appropriate transitions. During Liam's assessment, we observed undifferentiated results across both watch on and watch off trials. Specifically, Liam engaged in an average of 100% appropriate transitions in watch on and 90% appropriate transitions during watch off trials. As a result, the GPS wrist device alone did not have stimulus control over appropriate transitions. Rather, Liam's high percentage of appropriate

transitions in both the watch on and watch off trials may be due to the generality of treatment effects. There are several reasons that may explain why we did not successfully establish the GPS wrist device as a discriminative stimulus for appropriate transitions. First, we attempted to establish the GPS wrist device as a discriminative stimulus during the implementation of an intervention at a clinic that serves 31 other clients. The intervention was conducted within Liam's regularly scheduled sessions that consisted of different therapists, numerous other interventions, and many other contextual stimuli. However, in many of the previous studies that have successfully established a discriminative stimulus for problem behavior, treatment was conducted in well controlled settings with minimal alternative stimuli available (Carr & Carlson, 1993; Edrisinha, O'Reilly, Sigafoos, Lancioni, & Choi, 2011; Looney, DeQuinzio, & Taylor, 2018; McKenzie, Smith, Simmons, & Soderlund, 2008; Piazza et al., 1996; Rapp, Patel, Ghezzi, O'Flaherty, & Titterington, 2009). For example, in Piazza et al. (1996) the participant experienced the intervention in a room with a table and chair, intervention materials, and a purple card. Therefore, the purple card was paired with only the relevant components of the intervention. Similarly, in McKenzie et al. (2008), treatment was conducted in a small observation room equipped with a two-way mirror. Therefore, a well-controlled setting with limited stimuli may be needed in order to successfully establish a stimulus as a discriminative stimulus that either evokes or abates appropriate and/or inappropriate behavior.

It could be said that for Liam, establishing the GPS wrist device as a discriminative stimulus may not be of great importance given the overall effectiveness of the intervention in both the clinic and the generalized settings. Specifically, as mentioned previously, Liam's generalization probes indicated that the treatment effects successfully generalized to other settings. However, there are at least two reasons why it may still be important to identify the

environmental variables needed to successfully establish a discriminate stimulus for appropriate transitions. First, the treatment package is comprised of several components which may not be easily implemented by caregivers or other individuals that interact with Liam. Therefore, establishing a stimulus as discriminative for appropriate transitions could decrease the effort needed to implement treatment while still maintaining the effects. Second, for dangerous behaviors like elopement, a high level of supervision is often needed to successfully implement treatment (Rapp et al., 2009). However, establishing a discriminative stimulus that either evokes appropriate behaviors or abates inappropriate behaviors may lessen the supervision needed to decrease and maintain zero levels of problem behavior in other settings (Piazza et al., 1996; Rapp et al., 2009).

In addition to consisting of multiple components (DRA, token economy, GPS wrist device), the treatment also took a great deal of time to produce reliable effects. Liam's treatment took a total of 3 months and consisted of 106 ten-trial blocks. Before Noah withdrew from the study, he had a total of 34 ten-trial blocks and was in treatment over 2 months. Treatment for William is still ongoing; however, at the time of this writing, he had been in treatment for a total of 2 months and had a total of 76 ten-trial blocks. Therefore, while this intervention was effective for all three participants, implementation of the intervention may be labor intensive for clinicians to implement. Future studies should conduct a component analysis of the intervention to identify the necessary components of the intervention to ensure effectiveness and efficiency.

Individuals who engage in elopement during transitions put themselves in dangerous situations that involve serious injury or death. Currently, there is very limited research on effective assessment and treatment strategies for elopement during transitions. The results of the current study suggest promising developments in the assessment and treatment of elopement

during transitions. Continued research in this area is needed to inform clinicians and to make a significant impact on the lives of many individuals and their families.

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Appendix A

HSIRB Approval Letter

WESTERN MICHIGAN UNIVERSITY

Institutional Review Board
FWA00007042
IRB00000254

Date: August 30, 2018

To: Stephanie Peterson, Principal Investigator
Denice Rios, Student Investigator for dissertation
Student Investigators: Jessica Derrick, Nicole Hollins, Jenna Silverstein, Kelsey Webster

From: Amy Naugle, Ph.D., Chair

Re: IRB Project Number 18-08-01

This letter will confirm that your research project titled "Functional Assessment and Treatment of Elopement Occasioned by Transitions" has been **approved** under the **full** category of review by the Western Michigan University Institutional Review Board (IRB). The conditions and duration of this approval are specified in the policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may **only** be conducted exactly in the form it was approved. You must seek specific board approval for any changes to this project (e.g., ***you must request a post approval change to enroll subjects beyond the number stated in your application under "Number of subjects you want to complete the study"***). Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the IRB for consultation.

Reapproval of the project is required if it extends beyond the termination date stated below.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: **August 14, 2019**

Office of the Vice President for Research
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CAMPUS SITE: 251 W. Walwood Hall

Appendix B

Data Collection Sheet

Date: _____ Primary/IOA

Block ____	Trials	Phase (_____ ft.)	Score (+) or (-)	Distance
Type of Transition				
	1			
	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10			