Reduction of Elopement Using a Multicomponent Treatment in Young Children with ASD

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Cover Page Footnote
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Zina Eluri, Kimberly A. Zoder-Martell, Ivette Andrade, and Noemi Trevino

Abstract

Elopement, leaving a caregiver’s side without permission or supervision, is a behavior that is more prevalent among children with autism as compared to their typically developing peers. With potentially fatal consequences (e.g., exposure to open water, traffic, and strangers), it is reported to cause high levels of stress for caregivers. In the present study, we evaluated the assessment and treatment of elopement using a multicomponent treatment package to address the multiple functions of elopement. Treatment consisted of verbal instructions, blocking, and differential reinforcement of other behaviors with extinction (DRO w/ EXT). An ABAB reversal design was utilized to assess treatment effectiveness. Results showed a significant reduction of elopement following the first phase of treatment for both participants. However, for one participant, previous reduction rates were not reached upon reimplementation. The implications for practice and limitations are discussed.

Children with autism spectrum disorder (ASD) often engage in elopement. Elopement has been defined as any instance of an individual leaving an area or socially acceptable perimeter, without the permission and/or supervision of caregivers (Boyle et al., 2023; Call et al., 2011; Kodak et al., 2004; Lang et al., 2009; Lang et al., 2010; Lehardy et al., 2013; Perrin et al., 2008; Piazza et al., 1997; Tarbox et al., 2003; Wells et al., 2019). Elopement from a classroom or instructional setting can lead to decreased opportunities for learning, distractions for other children, increased work for instructors, and the need
for more staff to ensure safety (Chambers et al., 1980; Davis et al., 2013; Perrin et al., 2008). Additionally, eloping can have potentially fatal consequences including exposure to open water, traffic, and strangers (Davis et al., 2013; Garner, 1990; Lehardy et al., 2013; Perrin et al., 2008).

Elopement is a commonly reported behavior in individuals with developmental disabilities (Anderson et al., 2012; Jacobson, 1982; Wiggins et al., 2020). Anderson and colleagues published a study on the prevalence of elopement among individuals across the lifespan with ASD. Data compared rates of elopement of children with autism with their siblings and found that 49% of those sampled with ASD had engaged in elopement at least one time after their fourth birthday, in contrast to 13% of typically developing siblings. In the age range of 4 to 7 years, 46% of children with ASD engaged in elopement, compared to 11% of typically developing siblings. Although elopement can be as brief as a few seconds with a child running out of a room without permission and running back in with minimal potential negative effects, a majority of children in the study conducted by Anderson and colleagues (i.e., 53%) were missing for a long enough time period to trigger concern (41.5 minutes on average). Additionally, 65% of children were exposed to traffic hazards, and 24% of the children were exposed to drowning. Furthermore, at least half of the families that had experienced elopement reported that this behavior kept the family from being able to enjoy outdoor activities, elopement was the source of significant stress for the family, and the family had not received any guidance for preventing or addressing elopement. Due to the potential for the most severe consequences of elopement, effective assessments and treatments should be identified to reduce the occurrence of this behavior (Anderson, et al., 2012; Boyle & Adamson, 2017; Davis et al., 2013; Lehardy et al., 2013).

To effectively treat elopement, functional analytic (FA) assessment
procedures are often used to help identify what reinforcers are maintaining the behavior, by testing different experimental conditions to identify the environmental consequences that support the behavior (Iwata et al., 1994). The results of the FA are then incorporated into a function-based intervention to reduce problem behavior (Lehardy et al., 2013; Piazza et al., 1997). Despite the utility of FA, there are occasional cases in which the FA yields inconclusive or undifferentiated results (Eluri et al., 2016; Schlichenmeyer et al., 2013) that may result in ineffective treatments if the true function is not adequately identified. When results of the FA are unclear, researchers will restructure and reconduct the FA by acquiring additional information that may alter the implementation of the FA conditions, which may lead to a delay in interventions. Researchers, conversely, may decide to move forward with treatments that are designed to target multiple functions under the assumption that the behavior has multiple functions (Hanley et al., 2014), is inherently reinforcing (automatically reinforcing), or cannot be adequately identified in the context of an FA. Often, these interventions necessitate the use of a multicomponent treatment package to be able to adequately control the behavior.

Several methods have been identified in the treatment of elopement, many of which include multiple intervention components. Boyle and Adamson (2017) reviewed the recent literature about elopement and found that noncontingent reinforcement (NCR) and functional communication training (FCT) are commonly used intervention procedures to treat elopement. NCR is an antecedent intervention in which the individual is given access to a maintaining reinforcer on a time-based schedule (e.g., fixed interval, variable interval) regardless of their behavior. Frequent access to the reinforcer decreases the probability of the individual engaging in the problem behavior to gain access to that specific reinforcer. The eventual goal is that the environment becomes
enriched, and reinforcement will become an abolishing operation to the occurrence of problem behavior. It may be used to deliver positive, negative and automatically reinforcing stimuli.

Another commonly used reinforcement-based intervention to treat elopement is FCT. FCT involves teaching the individual a communicative response to obtain the reinforcer that was maintaining the target behavior (Boyle et al., 2023; Carr & Durand, 1985; Hagopian et al., 1998). The goal of FCT is for the individual to increase the use of a socially appropriate replacement behavior, while decreasing the rate of problem behavior. In a study conducted by Boyle and colleagues (2023), researchers were able to effectively implement the use of FCT alone to reduce elopement in a 4-year-old boy for one function, but not for the other functions, without additional treatment components to address the other functions. This suggests that for behaviors maintained by multiple functions, multiple treatment components are often needed.

Although NCR (Piazza et al., 1997) and FCT (Davis et al., 2013) have been demonstrated to be effective in the treatment of elopement, these procedures may not always be practical. When using NCR, caution must be taken to avoid inadvertently reinforcing the problem behavior (Camp et al., 2000). Additionally, with FCT, the individual may engage in the communicative response at high rates and at times when reinforcement is not available to be delivered, making this procedure impractical and difficult to generalize to the natural environment (Hagopian et al., 1998).

Differential reinforcement is another set of procedures that has been used to reduce problem behaviors, and is perhaps among the most widely used behavior reduction techniques (Lennox et al., 1988). When using differential reinforcement, a behavior or response class of behaviors is reinforced while the target behavior(s), a particular behavior or behavior class, is not reinforced or is reinforced at lower rates. Some of the most utilized differential reinforcement procedures for elopement include differential reinforcement of
alternative behaviors (DRA) and differential reinforcement of other behavior (DRO).

DRA is a procedure in which a more appropriate response is selected to produce reinforcement at higher rates than the problematic response (Athens & Vollmer, 2010). Initially, the alternative behavior is reinforced continuously while the behavior that is being targeted for reduction is not reinforced (Vollmer et al., 1999). Because the alternative behavior will result in high rates of reinforcement, the probability of that behavior reoccurring increases. The behavior chosen to replace the maladaptive behavior should preferably already exist in the individuals’ range of behaviors prior to the intervention, and should ideally produce the same type of consequence as the problem behavior (Vollmer et al., 1999). Piazza and colleagues (1997) implemented DRA to decrease eloping in a 4-year-old child who would elope from parents in open areas. Treatment consisted of the child being able to pick from either receiving attention or having free access to running (a preferred activity) as reinforcement when he did not engage in elopement. DRA resulted in decreases in eloping and the low rates were generalized (Piazza et al., 1997).

Differential reinforcement of other behavior (DRO) was the least frequently used procedure in the treatment of elopement (Boyle & Adamson, 2017), even though DRO, historically, has been considered one of the most commonly used procedures to reduce challenging behaviors (Vollmer et al., 1993). DRO might be a more viable option than DRA when an alternative behavior is not readily available and cannot be easily taught. Typically, DRO involves the delivery of reinforcement contingent on the non-occurrence of the response targeted for reduction for a specified amount of time or at a predetermined moment in time (Hammond, et al., 2011). Piazza and colleagues (1997) used DRO to decrease elopement of an 11-year-old boy who had diagnoses of severe intellectual disability, ASD, bipolar disorder, and ADHD. FA of elopement revealed that it was maintained by access to a tangible item and attention. Treatment
consisted of DRO. Elopement was not blocked due to the fact that mom would not be able to consistently block in the natural environment. An 80% reduction of elopement was immediately observed upon implementation of the DRO procedure.

Commonly, other procedures are used in combination with reinforcement-based procedures in the treatment of elopement, due to a lack of behavior suppression by the use of only reinforcement-based procedures. Other procedures often used, when reinforcement-based procedures alone are not effective, include extinction (Davis et al., 2013; Falcomata et al., 2010; Lang et al., 2010; Perrin et al., 2008), time-out (Kodak et al., 2004), and response blocking (Boyle et al., 2023; Call et al., 2011; Lang et al., 2010; Lehardy et al., 2013; Stevenson et al., 2015; Tarbox et al., 2003). Falcomata and colleagues (2010) used FCT in combination with extinction to treat the elopement behavior of a 5-year-old male. A functional analysis was conducted and the function of the behavior was identified as access to tangibles in the form of playing with a door. The child was taught to touch a card to request access to play with the door and was permitted access if he appropriately requested. If the child eloped, the access to door play was blocked. Results indicate that when FCT plus extinction was used, elopement was reduced to near zero rates across three settings.

Although extinction effectively reduced elopement in this study, it is not always possible to implement, especially in cases where elopement is maintained by attention. For example, if a child’s elopement is maintained by attention and the child elopes into the road, it is too dangerous to ignore this behavior because safety and retrieval procedures would be the main priority, and retrieval procedures inherently require attention. A similar study that evaluated the effects of elopement maintained by playing chase was conducted using a multi-component treatment package that included FCT to request for chase, DRA, and a basket hold used as a punishment procedure contingent on elopement in an 8-year-old boy (Blowers et al., 2020). Results indicated that elopement was
able to be reduced partially by FCT, but was not able to suppress the behavior completely without the use of punishment procedures. Another study conducted by Boyle and colleagues (2020) combined FCT and tolerance training to treat elopement in an 8-year-old boy, without the use of extinction or response blocking. Tolerance training involved increasing the amount of wait time prior to engaging in stereotypy with a door, which was used as a reinforcer.

Time-out is another procedure that has been used in a treatment package for elopement. Kodak and colleagues (2004) assessed and treated elopement of a 5-year-old female with ADHD whose elopement behavior was maintained by attention. The intervention consisted of a combination of non-contingent attention and time-out as a consequence for. Results indicated that, during baseline, the child was engaging in this behavior 90% of the time and upon initiation of treatment an immediate drop was observed to occur less than 5% of the time. During the final sessions, complete suppression of the problem behavior was observed (Kodak et al., 2004). Time-out procedures seem to be effective, but cannot be effectively used if elopement is maintained by escape from demands; thus, its utility is limited to elopement maintained by social positive reinforcement.

Last, response blocking, where a child is prevented from eloping, is another procedure that has been used in combination with reinforcement-based procedures in the treatment of elopement. In a study using DRO, Call and colleagues (2011) evaluated the effects of DRO with and without blocking as a treatment for elopement. They used a reversal design to compare the effects of DRO without blocking, DRO with blocking, and DRO with inconsistent blocking on a variable ratio 2 schedule for elopement, with the researcher blocking elopement approximately every 2 opportunities, maintained by tangibles. Their results indicated that consistent blocking was a necessary component in reducing elopement in a 5-year-old boy.

One treatment that has not been used in the elopement literature has been verbal instructions in combination with DRO and blocking. Verbal instructions or rules are commonly used to teach skills (Harrison
& Pyles, 2013; Lancioni et al., 2011) and serve as a discriminative stimulus to establish antecedent control (Skinner, 1957). Verbal instructions have been utilized in treating other challenging behavior (Lang et al. 2010; Vasquez et al., 2017), but little is known about their effectiveness in reducing elopement. One exception was a study conducted by Boyle and colleagues (2019), where rules were used in combination with a differential reinforcement procedure without blocking to reduce the latency of elopement in a 6-year-old girl with autism. The rule stated that if the child stayed by the researcher, then the child could run when instructed to do so. Results indicated that latency to elopement went from a mean of 4 seconds in baseline to 54 seconds at the end of treatment.

The purpose of the current study is to (a) identify the function(s) of elopement in two children, (b) extend the research by utilizing a synthesized baseline based on the results of a functional analysis that adequately captures elopement in a naturalistic environment, and (c) examine the effectiveness of a multicomponent treatment package that consists of a verbal instruction, DRO, and blocking, in the treatment of elopement. Verbal instructions were critical to this study, to help the researcher gain antecedent control over the behavior by giving a verbal statement of the expectations and to indicate that the intervention procedures were now in place. DRO was chosen given the limited use of this treatment for this behavior in the research, and the theory behind the effectiveness of DRO which is that all behaviors except for the target (e.g., elopement) will be reinforced. This is especially important, given that this behavior arguably has multiple functions or often leads to inconclusive results in a naturalistic setting. It was also believed that a major cause of elopement in a naturalistic setting is that it is not always clear to the child that this behavior was unacceptable by parents and was never specifically targeted for reduction. Last, response blocking and retrieval procedures were included as a safety mechanism for the participants. Please see Table 1 for a summary of the treatment package.
### Table 1

<table>
<thead>
<tr>
<th>Behavior</th>
<th>FA Results</th>
<th>Multicomponent Treatment Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elopement (Hector)</td>
<td>Verbal Instructions: Indicated start of session and antecedent intervention “(name of participant), you have to stay with me.” Used to gain antecedent control over the behavior.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DRO (targeted to address the attention and escape functions): Demands placed to walk, sit, or stand with the examiner</td>
<td></td>
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<tr>
<td></td>
<td>If the child did not elope, the child was given a break from demands to sit, stand, or walk <em>(escape function)</em> and attention <em>(attention function)</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If the child eloped, the response was blocked and the child was retrieved with little attention, demands were reinstated <em>(escape function)</em></td>
<td></td>
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<tr>
<td></td>
<td>Blocking and retrieval: If the child attempted to elope, the response was blocked while minimizing attention.</td>
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<tr>
<td></td>
<td>If the child eloped, the examiner followed the child and retrieved them while minimizing attention.</td>
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<tr>
<td></td>
<td>These procedures were not used if the child did not elope or attempt to elope</td>
<td></td>
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</tbody>
</table>
**Table 1 continued**

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<th>Behavior</th>
<th>FA Results</th>
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<tbody>
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<td>Attention</td>
<td>Verbal Instructions</td>
<td>Indicated start of session and antecedent intervention “(name of participant), you have to stay with me.” Used to gain antecedent control over the behavior.</td>
</tr>
<tr>
<td></td>
<td>DRO (targeted to address the attention and escape functions)</td>
<td>Demands placed to walk, sit, or stand with the examiner:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If the child did not elope, the child was given a break from demands to sit, stand, or walk (escape function), tangible items (tangible function), and attention (attention function)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If the child eloped, the response was blocked and the child was retrieved with little attention (attention function), no access to tangibles (tangible function), and demands were reinstated (escape function)</td>
</tr>
<tr>
<td>Elopement (Natalia)</td>
<td></td>
<td>Blocking and retrieval If the child attempted to elope, the response was blocked while minimizing attention.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If the child eloped, the examiner followed the child and retrieved them while minimizing attention.</td>
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<td>These procedures were not used if the child did not elope or attempt to elope.</td>
</tr>
</tbody>
</table>
Method

Participants and Setting

Participants. Participants were two Hispanic children diagnosed with autism spectrum disorder actively enrolled in a university-based clinic, who were being treated for a variety of behavioral concerns, including elopement. Hector is a four-year-old boy who struggled with expressive and receptive language, engaged in repetitive play, and whose caregivers reported that he would elope from settings such as parking lots, parks, beaches, street sidewalks, and other open areas. Natalia is an active three-year-old girl who spoke using single words, engaged in rigid play, and struggled to respond to her name. Natalia reportedly engaged in elopement in public areas such as restrooms, stores, outdoor markets, sidewalks, and parking lots. Elopement had at some point resulted in increased risk of the dangers of drowning, being run over and/or getting lost for both participants. Natalia had previously eloped and been missing in a high traffic public setting for approximately 15 to 20 minutes, resulting in increased concerns regarding her safety with regard to this behavior.

Setting. Elopement trials were conducted in a long hallway within a university building. The hallway was approximately 120 feet long, but during sessions 50 feet were utilized by the participants and researcher. Six trained undergraduate research assistants unknown to the child directly would stand on either side of the hallway, to ensure the participant would not pass this perimeter. These research assistants were part of a research lab, but were not directly working with these children. Research assistants were given basic instructions regarding what to do and where to stand. They were instructed to make sure that the child did not pass by a specific barrier and leave out of the double doors, which were possible on either side of the hallway. If the child passed the barrier, the research assistants were instructed to stand in front of the door and block access without looking at the child if the researcher was not immediately available.
These trained students gave the impression that they were studying, walking through, or communicating with friends during the trials so that the researcher could simulate a natural community-like environment, while offering the child an opportunity to elope without concern for physical safety. The hallway had floor to ceiling glass windows on one side that offered a view of an outside courtyard area and large-scale paintings on the other side. Assessment and treatment sessions lasted 5 minutes.

**Response Measurement and Interobserver Agreement**

Elopement was defined as any instance of the participant moving at least two feet away from the researcher without consent by either walking or running. During treatment for both participants, attempts to elope were also counted. Attempts were defined as any instance of the participant lunging forward in an attempt to pick up the pace and separate from the researcher. Frequency data was collected using a paper and pencil system, given that our data collectors needed to be mobile throughout all phases of the study. A primary observer and a secondary observer collected frequency data independently and simultaneously for the target response. Total interobserver agreement was assessed for 75% of all functional analysis and baseline sessions and 70% of treatment sessions for each participant. Interobserver agreement was calculated using the formula (smaller measurement/larger measurement) x 100. The mean agreement for frequency of elopement for Hector and Natalia, during the functional analysis, was 97% (range of 83% to 100%) and 98% (range of 86% to 100%), respectively. Mean agreement for frequency during baseline was 97% for Hector (range, 92% to 100%) and 100% for Natalia. Lastly, mean agreement, during treatment, for occurrences of elopement for Hector and Natalia was 100%.

**Assessment Procedures**

*Paired choice preference assessment.* A paired choice preference assessment (Fisher et al., 1992) was conducted for each participant because the results of this assessment would yield a
hierarchy of items, with the item at the top of the hierarchy being used in the tangible conditions of the FA. The preference assessment began by identifying eight items the participant gravitated toward or played with at home. This information was gathered through informal observations and indirect assessments (interviews with parents/guardians). These eight items were then recorded on the paired choice preference assessment data sheet, and each item was compared with every other item to obtain a hierarchy. The researcher placed one item in each hand and presented both items to the participant while saying, “(name of the child), pick one.” The data collectors then recorded on data sheets the item that the participant chose. The process was repeated until all items were paired with every other item. If the participant grabbed both of the items presented, the researcher would retrieve them, place the matching notecard at the end of the stack, and represented the items again later. If the participant reached for one item, the participant was given access to the item for 30 seconds. At the end of the 30 seconds, the item was retrieved and another set of items was immediately presented. The items identified as low, medium, and highly preferred were used in each of the participants’ FA and during treatment.

**Functional analysis.** The experimental functional analysis was derived from the methodologies of Iwata and colleagues (1994). The researcher guided the participant into the hallway area, as described above, to indicate beginning elopement sessions in the designated area. Each session lasted 5 minutes. Attention, demand, tangible and play conditions were alternated at random in a multielement design. The attention condition was developed to match a situation in the natural environment in which a behavior is followed by a similar type of social disapproval, and that consequence serves to maintain the behavior of concern through the delivery of socially mediated positive reinforcement. The demand condition was established to assess the possibility that an individual would engage in a particular behavior of interest in order to escape or avoid a situation in which they are being requested to do things, often termed negative reinforcement.
The purpose of the tangible condition is to assess the possibility that
the individual is engaging in the target behavior to gain access to a
physical item that he/she wants. The unstructured play condition was
developed to serve as a control for all other conditions, in which toys
are present and attention is being provided noncontingently while
target behaviors are being ignored. Additionally, the unstructured
play condition was developed to simulate an environment that is
enriched and, thus, lower levels of the target behavior should be
observed. High rates of the target behaviors in this condition may
be an indication of an automatic or sensory function, particularly
when higher rates are observed across conditions. These conditions
will be described in detail below.

**Attention.** The participant was directed to the hallway area. The
researcher began the session by saying, “Come on, I need to make a
phone call.” The researcher then turned away from the participant
and walked along with the participant while pretending to be on a
phone call. Attention was made contingent on elopement. When
the participant eloped, the researcher immediately turned toward
the participant and ran after the participant and said “(name of the
child), please don’t do that.” All responses other than the target
behavior were ignored.

**Demand.** The participant was directed to the hallway and
presented with various demands. The researcher placed the
demands to walk, sit, and stand with them in rotation by saying,
for example, “Sit with me.” When the participant complied, the
researcher praised the participant by saying things such as “Good
job,” and immediately presented another demand. If the participant
did not comply with the demand after three seconds, the researcher
would initiate three-step guided compliance procedures. Once the
demand was complete, another demand was presented. Escape from
demands was made contingent on elopement. If the participant
engaged in elopement, the researcher immediately stopped the
demand and turned away from the participant saying, “Okay, you
can take a break.” The participant was then permitted to take a break.
(elope) for 30 seconds with undergraduate research assistants on the team blocking all relevant exits to ensure the child’s safety at all times. After the 30 second break, the researcher walked toward the participant and continued with the demands. All responses other than the target behavior were ignored.

**Tangible.** The participant was directed to the hallway. The researcher then presented the participant with a highly preferred item and provided uninterrupted access for two minutes. When the two minutes lapsed, the researcher removed the item and the tangible condition in the functional analysis began. The participants had full view of the tangible items. Access to the preferred item was made contingent on elopement. When the participant engaged in elopement, the researcher immediately presented the preferred item, and said “Here is your (name of the item).” All other responses were ignored.

**Play.** The play condition was used as a control condition by providing a noncontingently reinforcing environment. This condition involved ensuring that no demands were placed on the child, a variety of toys were made available (low to medium preferred as identified by preference assessment), and attention was freely available. The experimenter delivered attention at least once every 30 seconds either noncontingently or contingent on appropriate behaviors, such as “I like the way you play.” All instances of elopement were ignored.

**Experimental Procedures**

An ABAB reversal design was used to assess the treatment. The first phase was a baseline (A), which served as a visual and quantifiable depiction of how often the target behavior was occurring prior to treatment. The next phase included the introduction of the treatment package (B). Following the implementation of the treatment package, the treatment was removed (A) to determine if the effects observed during treatment were the direct result of the treatment or if another process was responsible for the changes.
Lastly, treatment was reinstated (B) given the social significance of treating this specific target behavior. Each session lasted 5 minutes.

**Baseline.** In most cases, the results of the functional analysis are used as the initial baseline. However, given that elopement appeared to have multiple functions for both participants, a synthesized baseline, as described by Hanley and colleagues (2014), was used. A synthesized assessment is one in which the consequences that were found to be maintaining elopement behavior were provided simultaneously during each baseline session with the understanding that there is a combination effect occurring and the target behavior is being maintained not only by one function or another, but rather by the interaction between multiple functions. A detailed description for each child is provided below.

The results of Hector’s FA indicated that elopement was maintained by attention and escape from demands. Thus, his baseline condition included the researcher directing him to the hallway and presenting him with various demands. The researcher placed demands on the participant to walk, sit and stand with them in rotation, for example by saying, “Walk with me.” When the participant complied, the researcher praised the participant by saying “Good job” or “Nice sitting,” and immediately presented another demand. If the participant did not comply, the researcher began three step-guided compliance procedures. Once the demand was complete, another demand was presented. If the participant engaged in elopement, the researcher immediately ran after the participant saying “Hector, please don’t do that.” Once the researcher was within two feet of the participant another demand was presented and the process was repeated. All responses other than the target behavior were ignored, and thus did not result in a break from demands or access to attention.

The results of Natalia’s FA indicated that that elopement was maintained by attention, tangible, escape from demands, and automatic reinforcement, or was multiply maintained. Thus, she was directed to the correct area and there were medium to highly
preferred toys available for Natalia to play with, crayons and foam letters (as identified by the preference assessment). The researcher began by saying, “Let’s play.” During play with the tangible items, the researcher presented demands to the participant to walk, sit, and stand with them in rotation. For example, the researcher would place the demand “Walk with me,” while the participant was simultaneously engaging in play with the available toys. When the participant complied, the researcher praised the participant by saying “Good job,” “Nice sitting” or “Nice playing,” and immediately presented another demand. If the participant did not comply, the researcher followed three-step guided compliance procedures. Once the demand was complete, another demand was presented. If the participant engaged in elopement, the researcher would immediately run after Natalia saying “Natalia, please don’t do that,” and give her access to her highest preferred item, as determined through a paired-choice preference assessment, for 30 seconds. Once the thirty-second time elapsed, the researcher would remove the items and say, “Let’s play” and the process was repeated. All responses other than the target behavior were ignored, and thus she would not receive a break from demands, attention from the researcher, or access to her highly preferred item.

**Treatment.** The items identified in the preference assessment (mentioned above) as having reinforcing properties were integrated into the treatment components. Since the results of the FA for both participants indicated that elopement was multiply controlled, it appeared that a multicomponent treatment package would be most effective in reducing elopement for both participants. The treatment package evaluated in this project involved a combination of verbal instructions, differential reinforcement of other behavior, and response blocking. The treatment package will be described in detail below.

The participant was directed to the hallway area. The session began by the researcher providing a verbal instruction, which was an antecedent manipulation.
The experimenter told the participant “(name of participant), you have to stay with me.” This was included to indicate to the participant that the contingencies were now in place and would gain controlling properties for the behavior of staying within two feet. The researcher then alternated demands to walk, sit or stand with them throughout the duration of the session. These demands were chosen because of three reasons. First, both families reported that elopement occurred when they needed their child to engage in one of the three behaviors mentioned above. Second, the topography of the behaviors already existed in their repertoire; although it was not emitted upon request. Finally, the verbal demand was expected to acquire stimulus control over appropriate behavior. Treatment also included differential reinforcement of other behaviors with extinction (DRO w/ EXT) to reinforce behaviors other than elopement or attempts to elope. Reinforcement was delivered after a predetermined amount of time, 10 seconds, which was calculated based on the inter-response time (IRT) of occurrences of elopement during baseline for each participant (Repp et al., 1976). The reinforcer delivered was determined based on both the function of elopement (as determined by the functional analysis) and the highly preferred tangible item (as identified by the preference assessment). For Hector, reinforcers included attention and escape from demands, as indicated by the results of his functional analysis. However, reinforcers for Natalia included attention, access to tangibles, and escape from demands, as indicated by the results of her functional analysis. The researcher began a 10-second timer when the participant began to comply with the demand. Three step-guided compliance was used as part of escape extinction for the behavior of elopement. For example, if the experimenter said, “Let’s walk,” once the participant started to walk, the ten-second timer was started, and contingent on the nonoccurrence of elopement for those ten seconds the experimenter delivered the preferred item while saying, “Nice walking” and allowed the child access to a highly preferred item for ten seconds during which no demands were placed. At the end of the ten seconds, the researcher retrieved
the item and placed another demand, such as “sit with me” and the process was repeated. Blocking, which has demonstrated to be an essential component in the treatment of elopement (Call et al., 2011), was included. Nevertheless, Call and colleagues acknowledge that, due to nature of the behavior, it may not always be possible to block; thus, retrieval procedures were also in place. Blocking consisted of the experimenter placing his or her hand/arm in front of the participant to physically guide the participant to stay within two feet of the experimenter, while providing the least amount of physical attention or eye contact. If the participant managed to elope, the experimenter immediately retrieved the participant, while also providing the least amount of attention and continuing the demand. The timer was then reset for ten seconds and data collectors documented the response.

Results

Data in both the FA and treatment conditions include both attempts to elope and elopement. During the FA both participants had variable rates of responding in at least two of the four conditions. Functional analysis. The results of Hector’s FA are presented in the top panel of Figure 1. Hector exhibited high levels of elopement in both attention and demand conditions. During the attention conditions, Hector’s average rate of responding was 2.2 instances of elopement per minute with his behavior at an upward trend. During demand conditions, it was an average of 1.4 instances per minute, with a steady rate in responding observed during the last two sessions. Hector eloped at a rate of 1.2 instances per minute during the first tangible condition session, however, the rate dropped and remained at zero instances of elopement for the remainder of the tangible conditions of the functional analysis. Hector never eloped during play conditions of the functional analysis. The results of Hector’s functional analysis indicate that his elopement behavior was multiply controlled by attention and escape from demands.
The results of Natalia’s FA are presented in Figure 1, bottom panel. Rates of elopement were variable in all of the conditions. The highest rates of elopement were observed during the attention conditions, with an average rate of responding of 2.84 instances per minute. An upward trend in elopement was observed toward the end of the assessment. During tangible conditions, the average rate was 1.64 instances per minute. Rates during the demand conditions averaged 1.52 instances of elopement per minute. Lastly, the average rate of responding was 0.92 instances per minute during play conditions. It should be noted that, throughout the play conditions, Natalia would occasionally request to be carried by the researcher and the
researcher complied with this request in this condition only, which may explain the lower average rates of responding throughout that condition. The rates of elopement that were observed throughout the FA suggest that Natalia’s elopement is multiply maintained.

The research design was an ABAB design and the intervention for both participants included verbal instructions, DRO, and response blocking and retrieval procedures. As mentioned previously, Hector’s and Natalia’s interventions varied in the reinforcers delivered during the DRO procedure based on the results of the FA.

Treatment. As previously described, Hector’s baseline consisted of delivering attention in the form of a brief social reprimand and allowing a 30 second break from demands contingent on elopement. The combination of consequences was used because results of the FA indicated that his elopement behavior was maintained by both attention and escape. During baseline for Hector, the average rate was 4.53 instances of elopement per minute and an upward trend in behavior was observed (see Figure 2, top panel). When treatment was implemented Hector’s rate of elopement decreased as expected to an average of .73 instances per minute, a greater than 80% reduction. When treatment was removed during the reversal phase, Hector’s rate of elopement increased to an average rate of 2.2 instances per minute. Throughout the reinstatement of treatment, the average rate of responding was .43 instances of elopement per minute for Hector, which was an 80% reduction from the return to baseline and a 90% reduction from the original baseline.

Results from Natalia’s functional analysis revealed that her elopement behavior was sensitive to all of the consequences presented during the functional analysis; therefore, her baseline consisted of the delivery of attention, escape from demands, and access to a highly preferred tangible item contingent on elopement. Her average rate during baseline was 2.4 instances of elopement per minute (see Figure 2, bottom panel). Natalia’s average rate of elopement also decreased as expected during the first phase of treatment to an average rate of 0.4, a reduction greater than 80%.
During Natalia’s reversal, the average rate was .98 instances of elopement per minute, an increase from the first treatment phase; however, not near initial baseline rates. Natalia’s average rate of responding during the reinstatement of treatment was 1.0 instance of elopement per minute, thus, no reduction was observed from the second baseline phase.

Figure 2
Results of the multicomponent treatment package for Hector and Natalia
Discussion

Elopement is a dangerous behavior that can have potentially fatal consequences (Davis et al., 2013; Garner, 1990; Lehardy et al., 2013; Perrin et al., 2008). Additionally, elopement can be very disruptive in classrooms and in families, and the child who engages in this behavior may require constant supervision that may be difficult to provide. Given the potential for untoward consequences, it is prudent to develop effective assessment and intervention procedures to treat elopement.

The use of FA is well supported in the behavior analytic literature as a strategy to identify the function maintaining behaviors, and aids in the development of targeted intervention components (Iwata, et al., 1994). FA has been used to assess elopement (Lehardy et al., 2013; Piazza, et al., 1997) in children with ASD, and a variety of effective interventions have been identified. Effective intervention components may include NCR (Piazza, et al., 1997), FCT (Boyle et al., 2023; Carr & Durand, 1985; Hagopian et al., 1998), DRO (Hammond et al., 2011), DRA (Piazza et al., 1997), time out (Kodak et al., 2004), and response blocking (Call et al., 2011). Most often, multiple intervention components are combined to address elopement (Boyle & Adamson, 2017). However, the intervention components commonly address only one potential function of the behavior and it is conceivable that elopement may be maintained by multiple functions (Hanley et al., 2014). Furthermore, most of the studies evaluating FA procedures for elopement have been conducted in an analog setting removed from the natural environment.

The purpose of this study was to evaluate the use of FA with a synthesized baseline, to identify intervention components for two children with ASD in a naturalistic setting and to evaluate a multicomponent treatment package with verbal instruction, DRO, and response blocking. This intervention package was designed to address the multiple potential functions of elopement in the two participants.
In this study, the FA methodologies utilized were chosen because they closely resembled the conditions in which the behavior was occurring within the natural environment, as compared to previous research in which the FA was conducted inside one room or within a much smaller enclosed area. Using these more naturalistic procedures, the function of the behavior was identified and could better approximate the function of elopement in real life.

A primary purpose of this study was to utilize FA procedures to assess elopement. It was hypothesized that elopement is often maintained by multiple functions, either simultaneously or concurrently. For both participants, elopement was demonstrated to be maintained by multiple functions. Although the rates of elopement for Hector were higher during most attention conditions of the functional analysis, it was not possible to rule out a functional relationship between elopement and escape from demands. The rates of elopement during the demand condition remained moderately high and stable throughout the analysis, while reaching and remaining at zero for the tangible condition and never occurring in the play condition. It is possible that the verbal attention and physical attention provided inherently by placing demands and the use of three step-guided compliance contributed to the difference in rates between the attention and demand conditions. This suggests that the amount of attention received during the demand condition was enough to decrease the rates of elopement, but not eliminate its occurrence all together. When the contingencies of the hypothesized functions, based on the FA, were combined during baseline for Hector, his elopement behavior increased suggesting the combined effect of the two consequences was more influential than one single consequence.

Natalia emitted the highest levels of elopement during the attention condition; however, the varying but high rates of elopement throughout the FA in all conditions were an indication that her elopement was maintained by multiple reinforcers. For
Natalia, we were not as successful in demonstrating control of her elopement behavior because we could not reverse the effects of the treatment package. This could suggest that what she had learned could not as easily be unlearned. In fact, higher rates of compliance during the second baseline phase compared to the initial baseline and first treatment phase were observed. Natalia would readily sit, stand or walk with the experimenter instead of trying to elope. Eventually, elopement did increase to concerning rates after five reversal sessions. When treatment was reinstated, Natalia's behavior did decrease as anticipated, but remained at concerning rates, an average rate of one response per minute for seven sessions. Her behavior never reached the low rates that were observed in the first phase of treatment.

A few things could explain the inability to reach complete suppression of Natalia's elopement behavior. First, her behavior seemed to be maintained by multiple reinforcers, making it difficult to control all reinforcers at once. Second, it was also possible that her behavior was maintained by automatic or sensory reinforcement and there was no apparent way to control it. As previously noted by Lehardy and colleagues (2013), there are inherent difficulties in identifying nonsocial reinforcers. This could be due to the inability to control for all of the variables that are functionally related to the target behavior. In fact, if running, in and of itself, was the source of reinforcement, our inability to block all attempts to elope could have kept her behavior on an intermittent schedule of reinforcement. Third, it is possible that the reinforcement value of her preferred item could have changed. We may have been able to alter her elopement behavior during the first phase of treatment by delivering her preferred item, providing attention, and permitting a break from demands contingent on the nonoccurrence of elopement. This could have been sufficient or strong enough to compete with the automatic function of her elopement behavior during the first treatment phase, but not during the second. A preference
assessment was not conducted at this time, and thus it is unclear whether the item continued to be preferred and could effectively compete with the hypothesized automatic or sensory function.

Given that the results of the FA suggested that elopement was multiply maintained for Hector and Natalia, the use of a multiple component intervention is intuitive and likely necessary. Practitioners who work with individuals who elope should conduct an FA to identify the function of elopement and intervention components should address all hypothesized functions of the behavior.

**Implications.** The results of this study can help to inform practice in multiple ways. First, elopement may be maintained by multiple functions that vary based on the environmental conditions. Therefore, it is important to conduct an FA before determining intervention components, and conducting the FA in a naturalistic setting may be prudent to best assess the functional consequences of elopement. Second, multicomponent interventions may be necessary to adequately address elopement. In the natural environment, there are unlimited stimuli present at any given time to which organisms are responding. Therefore, multicomponent treatment packages may be necessary in order for an intervention to successfully treat elopement across settings, people, and functions. The results of this study lend support to the need for multicomponent interventions designed to address multiple functions of a behavior.

**Limitations and future directions.** There are multiple potential limitations of this study, which warrant discussion. One limitation was that during implementation of treatment for both participants, there were some unsuccessful attempts to block elopement. The unsuccessful attempts to block instances of elopement during treatment were followed by the experimenter running after the participant, while providing the least attention; however, attention inherently exists in retrieval and redirection. This could account for some of the fluctuation in the rates of elopement. Also, as mentioned above, the behavior of running could have potentially possessed automatically reinforcing properties for Natalia's elopement behavior.
Documentation of instances in which the participants successfully eloped in data collection may have provided more information about its potential influence on Natalia’s behavior and for future applications.

Another limitation was the fact that the experiment was conducted in a public area within the university, which at times meant that random distractions would present themselves that could not be controlled. This may have influenced the amount of experimental control possible; however, this also made the assessment and treatment setting more naturalistic.

The number of participants was also a limitation. Having additional participants with socially mediated functions and additional participants with automatic functions would have allowed for comparison in results, due to function as an important variable that affected the efficiency of treatment. Furthermore, the results of the FA for both participants suggested that elopement was maintained by multiple functions. Therefore, the extent to which these results would generalize to individuals with a singular function is unknown. A possible extension of this experiment could be to increase the number of participants, separate, and compare the results of those with an automatic function versus a socially mediated function, and potentially isolate variables to determine how much of the differences in these and future results are attributed to the differences in the functions.

Additionally, future research could explore the use of synthesized assessments during functional analysis, as described by Hanley and colleagues (2014, for cases in which the target behavior is hypothesized to be multiply controlled. In this experiment, it was observed that for Hector, whose elopement was socially maintained, when the consequences that influenced his behavior were combined, the response rates (4.53 mean responses per minute in baseline) more than doubled the highest rates obtained during the functional analysis (2.2 mean responses per minute in the attention conditions). This may indicate that for multiply controlled problem
behaviors, the estimates obtained during the functional analysis may be an underrepresentation of the estimates observed in the natural environment, with the interaction of multiple functions being available simultaneously.

Future research could examine the best environments in which to effectively assess and treat elopement in a safe way. Often, researchers may struggle to effectively implement assessment and treatment procedures for elopement that resemble real world environments where the behavior naturally occurs. Given the unique nature and the safety concerns that are associated with this behavior, it is important be able to assess and treat this behavior in a safe way.

Further, research can extend to simplify and generalize the treatment, because the multi-treatment package may be very complicated to implement and may be difficult to teach to parents and caregivers. Caregivers may find it difficult to implement these procedures in the more natural environment. It is also possible that due to the complexity of the intervention, caregivers may incorrectly implement the procedures and exacerbate the behavior.

References


