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Assessment and Function-based Treatment of Elopement in Children with Autism

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by

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We the undersigned committee hereby approve the attached thesis, "Assessment and Function-based Treatment of Elopement in Children with Autism," by Marissa Elizabeth Kamlowsky.

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Abstract

Title: Assessment and Function-based Treatment of Elopement in Children with Autism

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Elopement is a dangerous behavior exhibited by some individuals with autism, and accurately identifying the function of elopement is important to develop successful treatments. Functional analyses for elopement have been developed to mimic contingencies appearing in the natural environment; however, some of these analyses are limited by the required retrieval component. The current study replicated previous research which used a latency-based functional analysis that eliminates the retrieval component in order to safely and more precisely identify the function of elopement. In addition, we extended previous latency-based research by evaluating a treatment to reduce elopement. Specifically, we evaluated latency-based functional analyses to assess elopement exhibited by two children with autism. We then implemented function-based treatment packages for both children. Results showed that the treatment packages were effective to reduce elopement.

Keywords: behavior analysis, elopement, functional analysis, latency-based measure

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Dedication

This study is dedicated to Brandon Nixon, whose continuous encouragement, patience, and support help me to succeed in my passions as a clinician and a researcher. Thank you.

Chapter 1

Introduction

Problem Behavior in Children with Autism

Children diagnosed with autism spectrum disorder (ASD) often display deficits in social interaction, nonverbal communication, and development of relationships (American Psychiatric Association, 2013). The lack of communicative abilities for these individuals can hinder appropriate interactions with others and lead to various and less appropriate means of communicating their wants and needs. Accordingly, children diagnosed with ASD and other intellectual disabilities are at a greater risk of engaging in problem behavior relative to typically developing peers (Horner, Carr, Strain, Todd, & Reed, 2002). These maladaptive behaviors can include physical aggression, self-injury, property destruction, pica, stereotypy, and elopement, among others (Hanley, Iwata, & McCord, 2003). Previous studies have found that up to 94% of children diagnosed with ASD engage in at least one form of challenging behavior (Jang, Dixon, Tarbox, & Granpeesheh, 2011; Matson, Wilkins, & Macken, 2009). Children who engage in these types of problem behaviors are at risk of educational challenges, limited social relationships, and physical danger (Jang et al., 2011). Some of these maladaptive behaviors pose a greater risk than others by limiting both social and educational opportunities as well as creating risk of bodily injury in dangerous situations.

Elopement

Elopement is defined as leaving a designated area without caregiver permission (Lehardy, Lerman, Evans, O'Connor, & LeSage, 2013). Individuals with intellectual disabilities, including ASD, engage in elopement more frequently than typically developing peers (Piazza et al., 1997). Studies show that approximately 25-50% of children diagnosed with autism elope, which indicates a need for effective analysis and treatment methods (Andersen, Law, Marvin, & Lipkin, 2019). A study by Jang et al. (2011) evaluated the frequency of various problem behaviors in relation to symptom severity across 84 children with ASD. They found that elopement occurred in 56% of cases, which ranked as the third highest problem behavior out of 18 measured behaviors across individuals (Jang et al., 2011). Elopement was also found to be one of the behaviors most commonly endorsed as "severe" among children with ASD (Jang et al., 2011). Furthermore, evidence suggests that elopement often occurs across multiple settings (Piazza et al., 1997).

An educational environment is one setting in which children with autism may engage in elopement. Previous studies found that learning in children who engage in elopement within school settings can be disrupted (Lang et al., 2010). Elopement that occurs in classroom settings not only disrupts the individual's learning, but it also affects the education of other students. Another environment in which elopement may occur is a public setting, which can lead to more dangerous

situations. Individuals who engage in elopement in public contexts that pose a risk for bodily harm, such as eloping into traffic, are often required to stay in more restricted environments to reduce the risk of injury or death (Piazza et al., 1997). Additionally, children diagnosed with autism who elope are at an increased risk of being hurt or killed by drowning (Lehardy et al., 2013).

These findings were confirmed in a study by Anderson and colleagues (2012) who surveyed over 1,000 caregivers of children with ASD and found that 49% of caregivers reported at least one instance of elopement from their child after the age of four. Anderson et al. (2012) also found that 26% of respondents stated that their child was gone long enough to cause concern for the child's safety. Furthermore, researchers reported that of the children who engaged in elopement long enough to cause concern, 24% were in danger of drowning and 65% were in danger of traffic injury (Anderson et al., 2012). Therefore, individuals with autism who engage in elopement face higher rates of death than the general population (Traub & Vollmer, 2019). The risk of injury or death associated with elopement not only puts the behaving individual in substantial danger, but it also places a significant burden on the caregiver. Due to the potentially life-threatening nature of this behavior, accurate assessment and intervention methods are warranted.

Functional Analysis

Functional analysis (FA) is widely accepted as the gold standard for treating problem behavior in applied behavior analysis research and practice. This

assessment methodology consists of identifying and manipulating environmental variables that influence and maintain current contingencies of problem behavior (Hanley et al., 2003). FA is well-known for its success in systematically determining the *function* of individuals' behavior, or the effect a specific response has on the environment (Hanley et al., 2003). Before the development of FA technology, descriptive assessment methods were often utilized to understand problem behavior. These descriptive assessments consisted of merely identifying antecedents and consequences of a target response (Horner, 1994). FA expands on this type of assessment by targeting specific environmental events that can be manipulated in order to systematically observe an effect on behavior (Horner, 1994).

Before practitioners could pinpoint the function of a target problem behavior, treatment used to reduce problem behavior often consisted of superimposing strong contingencies of reinforcement or punishment over current reinforcement contingencies maintaining the target behavior (Hanley et al., 2003). These arbitrary contingencies decreased problem behavior due to the powerful nature of the stimulus and were not directly related to the underlying function of the target response. Rather than overlaying powerful contingencies on current sources of reinforcement to modify or decrease behavior, FA leads to behavior change by identifying determinants of specific responses to classify function (Hanley et al., 2003). Based on the results of an FA, researchers and practitioners

can program treatment interventions that target the underlying cause of a problem behavior. In summary, this type of analysis improved treatment of problem behavior by progressing from an arbitrary-based treatment methodology to function-based interventions.

The initial FA done by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994) included six participants displaying various levels of self-injury across several settings. The purpose of this study was to determine the extent to which a functional relation existed between self-injury and specific environmental contingencies (Iwata et al., 1982/1994). The environmental conditions Iwata et al. (1982/1994) included were social disapproval, academic demand, alone, and unstructured play. The social disapproval condition assessed the extent to which attention functioned as positive reinforcement for each participant's target behavior. The academic demand condition assessed the extent to which escape functioned as negative reinforcement for each participant's target behavior. The alone condition assessed the extent to which the target behavior was sensitive to automatic reinforcement. The unstructured play conditioned served as a control for the other three conditions. Experimenters evaluated the level of self-injury that occurred in each test condition relative to the level of self-injury that occurred in the control condition to identify which environmental contingency most likely maintained the participants' behavior. Iwata et al. (1982/1994) observed a notable increase in target responding during a specific condition for six of the nine

participants, indicating a precise and empirically validated method of assessing self-injury at the individual level. Additionally, the within-subject variability of self-injury displayed by participants suggested that certain environmental variables produced higher levels of self-injury and played a role in the maintenance of target behaviors (Iwata et al., 1982/1994).

Modifications to Functional Analysis

Since its inception in 1982, FA methodology has been adapted to analyze numerous types of problem behaviors exhibited by individuals with various types of intellectual disabilities (Davis, Kahng, Schmidt, Bowman, & Boelter, 2012). Specifically, this technology has been modified to identify the determinants of aggression, property destruction, noncompliance, sexual behaviors, rumination, and elopement, among others (Davis et al., 2012). Comprehensive models of functional analyses have been systematically replicated to extend across multiple populations, settings, and various topographies of problem behavior (Hanley et al., 2003).

The increasing literature incorporating FA methodology has further examined various modifications to the experimental methods originally developed by Iwata et al. (1982/1994). Procedural modifications include the alteration of test conditions, research design, and methodology in order to best fit the target response and clinical conditions. Although FA technology is typically used in research settings, components of the assessment can be easily adapted and used in clinical

settings so that practitioners may accurately analyze problem behavior (Iwata & Dozier, 2008).

In 1991, Northup et al. evaluated the use of a brief FA consisting of a reduced number of sessions and a shorter duration of sessions when assessing the aggressive behavior of three individuals. This study demonstrated the rapid effects acquired by the contingencies established during functional analyses, and it showed clinical utility in situations requiring time restraints or involving severe risk (Northup et al., 1991). An additional adaptation to FA methodology is the use of trial-based FAs. Sigafoos and Saggers (1995) developed this modification to the standard FA which reduces the time required of the assessment by performing the FA in discrete trials and measuring the occurrence and nonoccurrence of a target behavior. Another modification to FA methodology is the FA of precursor behaviors (Smith & Churchill, 2002). This type of FA is ideal in the clinical assessment of severe behavior disorders. By identifying the maintaining variables for the target behavior through a precursor assessment, clinicians may be able to reduce the risk of harm during functional analyses of severe problem behavior by decreasing or eliminating the target behavior's occurrence altogether (Smith & Churchill, 2002). Finally, Thomason-Sassi, Iwata, Neidert, and Roscoe (2011) measured latency to the first response in individual functional analyses of problem behavior. These researchers utilized a latency-based measure in place of frequency or duration measures in order to decrease risk and potential assessment confounds

(Thomason-Sassi et al., 2011). Similar to other adaptions of the standard FA, this procedure depicts the relationship between problem behavior and environmental contingencies; however, it allows for fewer instances of problem behavior to occur by measuring the latency to the first response only (Thomason-Sassi et al., 2011). This type of measure is particularly advantageous when safety and feasibility of assessment are of concern, and it may be especially useful in functional analyses of elopement (Lambert, Lopano, Noel, & Ritchie, 2017).

Functional Analysis of Elopement

Although the FA methodology that was originally developed for the assessment and treatment of self-injury has been extended and modified to analyze a variety of other problem behaviors, there is little research utilizing FA methodologies in the treatment of elopement (Andersen et al., 2019; Piazza et al., 1997). Specifically, in a review of FA literature, Hanley et al. (2003) found that only 2.9% of the included studies through the year 2000 evaluated the use of functional analyses to treat elopement. A separate review by Lang et al. (2009) found only five experimentally controlled FA studies of elopement published in behavior analytic journals. In a more recent review of the FA literature, Boyle and Adamson (2017) found a total of 12 studies in which 27 different functional analyses of elopement were conducted. These researchers noted that 45% of published articles concerning elopement found it to be multiply controlled (Boyle & Adamson, 2017).

Elopement often produces sudden reactions from caregivers in an attempt to intercede the behavior and maintain safety (Iwata & Dozier, 2008). Although safety should be considered above all other variables, the response required from caregivers in the natural environment may inadvertently strengthen the problem behavior through positive reinforcement in the form of attention. Consequently, providing these reactions may lead to an overall increase in problem behavior (Iwata & Dozier, 2008). Similar reactions are often required to maintain client safety when conducting functional analyses of elopement in experimental settings. An issue arises when attempting to maintain experimental control because the delivery of any consequence other than the programmed consequence may interfere with the internal validity of the FA procedure. Internal validity of an FA refers to the extent to which the change in behavior during each test condition is a function of the specified consequence and not a function of any other variable (Cooper, Heron, & Heward, 2007).

Piazza et al. (1997) modified the original FA and conducted subsequent reinforcer assessments to evaluate the elopement of three children diagnosed with intellectual disabilities. Researchers attempted to mimic the natural settings in which the participants typically eloped; therefore, participants were always required to be retrieved, and elopement was not ignored in any condition (Piazza et al., 1997). Specifically, therapists retrieved all participants contingent on elopement on a fixed-time schedule. Researchers identified treatment packages for all three

participants and generalized their interventions to the natural environment (Piazza et al., 1997). In this study, Piazza et al. (1997) arranged conditions that allowed for repeated opportunities of elopement and multiple occasions for participants to contact the programmed consequences in each test condition. These researchers noted that because a retrieval component is nearly always required contingent on elopement in experimental methods, the internal validity of functional analyses of elopement may be compromised (Piazza et al., 1997). The purpose of separating each test condition within an FA is to create an isolated contingency that controls for other variables that may contribute to the occurrence or nonoccurrence of a specific behavior. By retrieving the participants in all test conditions, Piazza et al. (1997) introduced attention as a potential unintended consequence that could have contributed to any behavior change in addition to or in place of the programmed consequence. In an attempt to control for this confound, Piazza et al. (1997) conducted reinforcer assessments to identify functional reinforcers when necessary. Nevertheless, researchers found that one participant's data were marked undifferentiated due to a suspected social influence from the retrieval component, which made the identification of function difficult for that participant (Piazza et al., 1997).

The method and results of Piazza et al. (1997) were replicated by Tarbox, Wallace, and Williams (2003). Researchers conducted functional analyses of elopement for 3 participants in naturalistic settings, including an indoor public mall

and a classroom. In this study, the participants' caregivers and therapists were trained to conduct the functional analyses in place of the experimenters in an attempt to closely mimic the naturally occurring contingencies in which elopement took place (Tarbox et al., 2003). Experimenters recorded the frequency of both elopement and communication across tangible, demand, attention, and control conditions in a multielement design (Tarbox et al., 2003). During each 10-minute session, the therapist or caregiver conducting the FA was required to retrieve the participant by gaining hand contact and using physical guidance contingent on elopement (Tarbox et al., 2003). Additionally, a confederate experimenter was required to follow the participant during each test session to ensure safety in the public setting (Tarbox et al., 2003). Following the analysis, researchers developed function-based treatments (Tarbox et al., 2003). Although this method of FA mimicked naturally occurring contingencies, it is limited by several associated safety concerns and the required retrieval component. The physical contact occurring with participant retrieval may confound results by delivering inadvertent attention (Tarbox et al., 2003).

A study by Lang et al. (2010) evaluated the FA and treatment of elopement for one participant across two school settings. Researchers compared results of an FA and corresponding treatment in a group classroom to the results of an FA and corresponding treatment in an individual research room (Lang et al., 2010). FA sessions run in the group classroom were structured to mimic the naturally

occurring contingencies, and the classroom consisted of the participant, the experimenter conducting the analysis, data collectors, two or three teachers, and three to six children present in the classroom (Lang et al., 2010). Sessions that were run in the individual resource rooms consisted of only the participant, the experimenter conducting the analysis, and one to two data collectors (Lang et al., 2010). Researchers measured the percentage of each five-minute session in which the participant eloped across attention, escape, tangible, and control conditions in a multielement design (Lang et al., 2010). Additionally, researchers evaluated the influence of experimental setting on the occurrence or nonoccurrence of elopement using an ABAB design (Lang et al., 2010). Similar to Tarbox et al. (2003), researchers mimicked naturally occurring contingencies in the FA, but they were required to physically retrieve the participant contingent on elopement in all test conditions (Lang et al., 2010).

In this study, researchers acknowledged the potential confound of attention delivery due to the retrieval component, and they attempted to minimize this effect by providing minimal attention during retrieval in the escape and tangible conditions while providing multiple forms of attention during retrieval in the attention condition (Lang et al., 2010). Results of the FA indicated differentiated results for the participant, and they showed that the maintaining reinforcer varied across the two school settings (Lang et al., 2010). Following the FA, experimenters developed function-based treatments in the form of continuous attention and

noncontingent access to tangible items. These results support the use of function-based treatments for elopement, and they highlight the role that experimental setting may play in naturalistic FA procedures. Although researchers in this study were able to identify possible functions for this participant, the retrieval component of the analysis remains a potential confound to this method of assessment. Additionally, the function-based treatments developed for this participant may not be feasible in typical school settings (e.g., noncontingent access to television, providing continuous attention for 30 minutes, etc.) (Lang et al., 2010).

Phillips, Briggs, Fisher, and Greer (2018) attempted to mitigate the confound of supplemental attention in the form of retrieval. These researchers evaluated the use of a trial-based FA conducted in a school setting that entirely eliminated the retrieval component associated with other assessments of elopement. Adequate means of ensuring safety were implemented by strategically arranging the environment to reduce risk, including restricting the assessment to certain areas within the school (Phillips et al., 2018). Teachers assessed the occurrence and nonoccurrence of elopement during tangible, attention, and escape trials after maximizing the motivation for elopement in a 2-minute control period (Phillips et al., 2018). Researchers then used results from the trial-based FA to determine appropriate interventions. This trial-based method of FA within a school setting provided instructions for teachers to conduct function-based assessments without the required help of professionals (Phillips et al., 2018). Additionally, this study

highlighted the value in designing an experimental method that controls for the social reinforcement component in the form of retrieval when assessing elopement.

A limitation of trial-based FA methodology is the lack of consistency in results with standard FA results. One study found that the results of trial-based functional analyses corresponded with results of standard functional analyses in only 60% of cases (Bloom, Iwata, Fritz, Roscoe, & Carreau, 2011). An alternative to using trial-based FA methodologies may be the use of latency-based measures during an FA, which eliminate the retrieval component associated with standard functional analyses of elopement while maintaining higher correspondence to their results.

Latency-based Functional Analysis

Latency-based functional analyses measure the time from the presentation of a specific environmental event to the first occurrence of a target response (Traub & Vollmer, 2019). Researchers then compare response-latencies across test conditions to determine functional relations. There are numerous benefits to using latency-based measures in the FA of problem behavior. A response-latency analysis eliminates the need to evoke high rates of problem behavior when conducting functional assessments. Additionally, it produces results that closely align with standard functional analyses. In a study by Thomason-Sassi et al. (2011), researchers compared results from 10 independent functional analyses and observed corresponding functions between latency assessments and standard

assessments for 90% of cases. These results indicate agreement between standard FA results and results of functional analyses using latency-based measures. Therefore, this method of assessment may be most efficient when analyzing behaviors that pose risk when occurring at high frequency. Additionally, measuring latency to a target response may be the most practical method of assessment when identifying the function of a behavior that does not occur repeatedly in a single burst. Furthermore, this type of measure may prove more practical when assessing behaviors that require a therapist to reset the condition or retrieve the participant before the next opportunity for a target behavior is available (Traub & Vollmer, 2019).

Using latency-based measures when assessing the function of elopement eliminates the retrieval component if conducted in a secure environment. Additionally, this type of measure eliminates the need for repeated instances of elopement within one episode. By removing the retrieval component from the analysis, researchers can more accurately pinpoint the maintaining reinforcers of elopement for an individual by eliminating occasions for accidental reinforcement. By reducing the number of responses required to identify function, experimenters may be able to conduct functional analyses of elopement in a more practical way.

Neidert, Iwata, Dempsey, and Thomason-Sassi (2013) conducted a trial-based FA of elopement using latency to response as the dependent measure. This assessment allowed researchers to analyze elopement without requiring immediate

retrieval of participants. For this study, researchers included two adult participants and measured latency to elope across ignore, attention, and demand test conditions (Neidert et al., 2013). Researchers compared latency to elope in a multielement design, and they determined that a shorter latency in any one test condition relative to the control condition indicated that elopement was maintained by the reinforcer in that test condition (Neidert et al., 2013). Although researchers did not immediately retrieve participants contingent on elopement, this FA procedure required a secondary observer to return the student to the testing area after a five-minute period following elopement (Neidert et al., 2013). Researchers were also required to use a reversal design and a pairwise comparison in addition to the multielement design to assist in clarifying undifferentiated results, and elopement was suspected to be multiply controlled for both participants (Neidert et al., 2013). The variable latencies observed across all three test conditions may have been the result of a lack of discrimination, multiple sources of reinforcement, interaction effects, or failure to identify accurate sources of reinforcement (Neidert et al., 2013). Although this study demonstrated the utility of latency to response as a dependent measure and reduced potential confounds associated with the retrieval component, the trial-based format may have produced results that are inconsistent with standard FA results.

Traub and Vollmer (2019) evaluated the use of a latency-based FA of elopement by alternating test and control sessions to identify potential reinforcers.

Similar to other latency-based functional analyses, researchers measured the latency to response of a single instance of elopement in place of a standard measure that requires repeated instances of elopement. Experimenters conducted the assessment in two areas within a single room separated by a physical divider, and they measured both latency to elope and allocation of time to each area to identify the function of elopement for nine participants (Traub & Vollmer, 2019). Specifically, researchers measured allocation of time in combination with latency to elope in order to compare the reinforcement effect indicated by different measurement methods. Researchers measured both dependent variables across attention, tangible, and escape from demands conditions (Traub & Vollmer, 2019). The experimenters used pairwise comparisons to evaluate latency to elopement and allocation of time in order to demonstrate either a reinforcement effect or demonstrate no reinforcement effect (Traub & Vollmer, 2019). Corresponding results between the latency-based measure and allocation measure displayed convergent validity, indicating that a latency-based measure accurately identified sources of reinforcement for participants' elopement (Traub & Vollmer, 2019).

Researchers were able to successfully identify a probable function for each participant's elopement using latency-based measures; additionally, researchers were able to identify the maintaining reinforcers without requiring repeated instances of the target behavior or retrieval of the participant. Despite the successful identification of maintaining reinforcers, the study was limited by the

lack of application of FA results to treatment. That is, Traub and Vollmer (2019) conducted an assessment only; no treatment data were presented. The purpose of the current study was to replicate the findings of Traub and Vollmer (2019) by conducting a latency-based FA of elopement. Furthermore, the current study extended previous findings by evaluating treatments for participants' elopement based on results of the assessment.

Chapter 2

General Methods

Participants and Settings

Participants in this study included 2 children diagnosed with ASD with ages ranging from 4-7. At the time the study was conducted, both participants received early intervention behavioral services or severe behavioral services at a local autism treatment center. Additionally, both participants met the inclusion criteria of engaging in elopement as a target problem behavior with moderate to high frequency. Specifically, both participants eloped or attempted to elope at least one time per hour. Sessions took place in a therapy room of a local autism treatment center or a room in the participant's home. Similar to Traub and Vollmer (2019), the session area was divided into two sides using a room divider (area A and area B), and each area was associated with a contingency. In this study, area A represented the noncontingent reinforcement contingency (NCR) and area B represented the test or extinction contingency (EXT). The NCR area was associated with either continuous vocal or physical attention, access to tangible items, or a break from demands, depending upon the condition. The EXT area was associated with no vocal or physical attention, no access to tangible items, or the presentation of continuous demands, depending upon the condition. The room divider left an opening between the edge of the divider and the wall to create a doorway. Experimenters conducted sessions two to three days per week for four to

six weeks in order to complete the FA. Treatment evaluations were conducted following the functional analyses, and follow-up data were collected by experimenters for a maximum of 10 weeks.

Prior to beginning the FA phase, baseline levels of the frequency of elopement during the child's session were collected using continuous data recording. The baseline frequency of each participant's elopement was compared to the frequency of elopement following assessment and treatment interventions to evaluate any behavior change in the natural environment. Data were collected using paper, pens, laptops, and timers. Some sessions were videotaped using a handheld camera to facilitate procedural integrity and to collect interobserver agreement.

Response Measurement and Interobserver Agreement (IOA)

Elopement. Experimental observers recorded the latency to the first elopement response for all test and control sessions as the primary dependent measure. Similar to Traub and Vollmer (2019), elopement in this study was defined as the moment in which a participant first crosses the line of division in the therapy room from the starting area to the adjacent area. This was scored as an instance of elopement, and experimenters recorded the latency in seconds from the start of the session to this instance. Examples of elopement included running, walking, or crawling into either area. Nonexamples of elopement included dropping to the floor, running around, or engaging in noncompliance within the

same area. As a secondary measure, researchers recorded allocation of time in each area. For this study, allocation was defined as the duration of time a participant spent in each area. Using continuous recording measures, experimenters recorded the duration of participants' allocation in each area in total seconds.

Additionally, observers recorded the frequency of other potentially dangerous problem behaviors during each session based on the participant's history of problem behavior to maintain participant safety. If at any point in the study a participant engaged in topographies of problem behavior at a rate that imposed a risk on the participant, the session was terminated.

Interobserver agreement (IOA). Experimenters collected interobserver agreement data on latency-based measures for a minimum of 33% of all sessions. Similar to Traub and Vollmer (2019), researchers calculated latency to response IOA by comparing independent observers' scored time of the first instance of elopement. Experimenters divided the shorter value by the longer value and converted the result into a percentage.

Experimental Design

This study utilized a multielement design to depict the relationship between contrived social contingencies and latency to elopement. Experimenters rapidly alternated attention, tangible, escape from demand, and control conditions in order to compare each participant's latency to elope across conditions. During test sessions, each participant began in area B where he was exposed to the

unavailability of reinforcement. If the participant eloped to area A, he was exposed to free availability of social reinforcement. During control sessions, the participant began in area A where he was exposed to free availability of social reinforcement, and elopement resulted in no programmed consequence. Researchers varied the order of conditions across participants to maximize treatment integrity and minimize potential order effects. Additionally, the contingencies and experimenters associated with areas A and B were randomly rotated to minimize potential effects any one area or experimenter may have had on the participants' behavior.

Procedures

Functional analysis. This study consisted of an assessment phase and a treatment phase for both participants. During the assessment phase, experimenters first conducted caregiver interviews using the behavioral checklist *Questions About Behavioral Function (QABF)* to gain a preliminary understanding of the function of each participant's elopement (Paclawskyj, Matson, Rush, Smalls, & Vollmer, 2000). The results of the QABF informed experimenters of any conditions that were not necessary to include for each individual participant's FA. Additionally, the results of the QABF were compared with the results of the latency-based FA to analyze consistency of various assessment methods. If the QABF indicated a potential tangible function for either participant, researchers asked additional questions further investigating the specifications of the potential tangible item(s)

maintaining the target behavior. These questions allowed researchers to explore the conditions in which gaining access to specific tangible items, locations, or events evoked problem behavior.

Based on the results of the QABF, experimenters arranged appropriate test sessions for each participant's latency-based FA. All test and control conditions of the FA were session-based and lasted five minutes each. Immediately before beginning sessions, researchers conducted a pre-exposure session in which participants were introduced to the operating contingencies in both areas A and B for 15 s. No data were recorded during pre-exposures. If at some point during pre-exposure, test sessions, or control sessions the participant engaged in problem behavior that posed a risk to his safety, the session was terminated immediately.

Attention. The attention test condition in this study was conducted to determine whether participants engaged in elopement in order to access adult attention. Prior to beginning the session, experimenters removed all items and furniture from the therapy room. At the start of the session, the participant and one experimenter began in area B (EXT). Another experimenter was located in area A (NCR). No toys or other leisure items were available in either area of the therapy room. In area B (EXT), the experimenter withheld attention. The participant was free to enter area A (NCR) or remain in area B (EXT). If the participant eloped to area A, the experimenter in area A provided continuous vocal and physical attention (e.g., general comments, praise, tickles, etc.). The specific form of

attention provided was individualized to the participant based on caregiver or therapist report. The participant was free to move between both areas of the therapy room for the duration of the five-minute session.

Tangible. The tangible test condition was conducted to determine whether participants engaged in elopement to access tangible items. This condition was run only for participants for which a potential tangible function was indicated by the QABF assessment. Additionally, the tangible item(s) used in this condition were the specific item(s) indicated by therapists or caregivers. If a tangible function was indicated from the QABF assessment but no specific tangible item was known, researchers conducted a 3-minute free operant preference assessment prior to each tangible test session. The highest preferred tangible item was used in the tangible test session. Prior to beginning the session, experimenters removed all items and furniture from the therapy room. In this test, the participant and one experimenter began the session in area B (EXT). Another experimenter was located in area A (NCR). The tangible item was freely available only in area A (NCR) for the duration of the test session. Adult attention was continuously available to participants in both areas A and B to minimize potential confounds with attention and tangible delivery. If the participant eloped to area A (NCR), the participant received continuous access to the tangible item. If the participant attempted to bring the tangible item into area B (EXT), the experimenter in area B removed the

item. The participant was free to move between both areas of the therapy room for the duration of the five-minute session.

Escape. The escape test condition in this study was conducted to determine whether the participant engaged in elopement to escape tasks. The demands used in this condition were responses that the participant was capable of performing independently. Additionally, demands used in this condition did not require the use of materials. Prior to starting the session, experimenters removed all items and furniture from the therapy room. The participant and one experimenter began the session in area B (EXT). Another experimenter was located in area A (NCR). The experimenter in area B placed continuous demands on the participant using a three-step prompting sequence to ensure compliance (verbal, model, physical prompts) for the duration of the 5-minute session. Throughout session, the experimenter issued demands such as "touch your nose" and "clap hands". If the participant complied with the given demand, the experimenter continued to issue subsequent demands for the duration of the test session. If the participant did not independently comply with the demand within 3 s, the experimenter again issued the demand while adding a model prompt (e.g., "Clap hands, like this"). The experimenter then modeled the action of clapping hands and allowed the participant 3 s to comply with the demand. If the participant again did not comply with the demand, the experimenter repeated the vocal instruction a third time while using graduated guidance to physically prompt the participant to clap his hands. This

sequence of prompting continued for the duration of the 5-minute session. The experimenter in area A (NCR) did not deliver demands or attention throughout the session. Additionally, no toys were available in either area. If the participant eloped from the EXT area to the NCR area, the experimenter placing demands immediately discontinued issuing the demand. If the participant entered back into area B (EXT) at any point during the five-minute session, the experimenter resumed issuing demands to the participant. The procedure stated above continued for the duration of the test session. The participant was free to move between both areas of the therapy room for the duration of the five-minute session.

Control. This condition served as a control for all other test conditions. During control sessions, the participant and one experimenter began the session in the NCR area. The NCR area consisted of free access to attention, preferred tangible items, and a break from demands. Another experimenter was located in the EXT area where no tangibles, attention, or breaks from demands were available. No programmed consequences were implemented for the target response or any other response.

Treatment evaluation. Individualized treatment packages were developed and implemented for each participant based on the results of the latency-based functional analyses. Researchers alternated the treatment phase consisting of the programmed intervention with a baseline phase in which the participant received the functional reinforcer contingent upon elopement. This alternating ABAB

design allowed researchers to observe effects of the programmed treatment on elopement and demonstrate experimental control. Experimenters collected data on participants' latency to elope and allocation in each area for both baseline and treatment phases.

Chapter 3

Results

Results of the FA for Wyatt are depicted in Figures 1 and 2. Wyatt eloped from the extinction area with the shortest latency during the tangible and attention conditions while his latency to elope during the escape condition was variable across sessions. His mean latency to elope during the tangible, attention, and escape conditions was 9, 30, and 127 s, respectively. IOA data were collected on Wyatt's latency to elope for 36% of all FA sessions and averaged 96.5% (range, 75% to 100%). Accordingly, Wyatt allocated the most time in the NCR area during the tangible and attention conditions while his allocation during the escape condition was variable. Wyatt did not elope during the control condition.

The variability observed in the escape condition for Wyatt suggests that the attention provided with demands may have confounded test sessions. We conducted a pairwise analysis to compare the effect of delivering difficult demands to delivering less difficult demands while holding the delivery of attention constant throughout the session. Wyatt's mean latency to elope during the difficult demand condition and the less difficult demand condition was 36 and 300 s, respectively. IOA data were collected on Wyatt's latency to elope for 50% of all sessions and averaged 97.4% (range, 93% to 100%). Figure 2 depicts the differentiation observed by comparing Wyatt's latency to elope across sessions. The results of the FA in combination with the results of the pairwise analysis indicated that access to

tangibles, access to adult attention, and escape from difficult demands maintained Wyatt's elopement.

Function-based treatment results for Wyatt are depicted in Figures 3, 4, and 5. We implemented a DRA + EXT treatment package for tangible, attention, and escape conditions. Each treatment package consisted of providing functional reinforcement contingent upon an independent mand and discontinuing reinforcement for elopement across all treatment sessions. Treatment effects were evaluated using an ABAB reversal design across 5-minute sessions and 15-minute extended treatment probes. The DRA + EXT treatment package was effective in increasing Wyatt's latency to elope across tangible, attention, and escape conditions.

Figure 3 depicts the results of the DRA + EXT treatment evaluation for elopement maintained by access to tangible items for Wyatt. During baseline phases in which the tangible item was delivered contingent upon elopement, Wyatt eloped with a mean latency of 5 s. During treatment phases in which functional communication resulted in 30-s access to the tangible item and elopement resulted in extinction, Wyatt eloped with a mean latency of 276 s. Additionally, during 900-s extended treatment probes, Wyatt eloped with a mean latency of 900 s. IOA data were calculated on Wyatt's latency to elope for 59% of all sessions and averaged 100%. Additionally, treatment integrity data were collected for 47% of all sessions and averaged 100%.

Figure 4 depicts the results of the DRA + EXT treatment evaluation for elopement maintained by access to attention for Wyatt. During baseline phases in which adult attention was continuously delivered contingent upon elopement, Wyatt eloped with a mean latency of 14 s. During treatment phases in which functional communication resulted in 30-s access to adult attention and elopement resulted in extinction, Wyatt eloped with a mean latency of 267 s. Additionally, Wyatt eloped with a mean latency of 815 s during 900-s extended treatment probes. IOA data were calculated on Wyatt's latency to elope for 61% of sessions and averaged 99.9% (range, 99% to 100%). Additionally, treatment integrity data were collected for 44% of all sessions and averaged 100%.

Figure 5 depicts the results of the DRA + EXT treatment evaluation for elopement maintained by escape from difficult demands for Wyatt. During baseline phases in which escape from difficult demands was continuously delivered contingent upon elopement, Wyatt eloped with a mean latency of 13 s. During treatment phases in which functional communication resulted in a 30-s break from demands and elopement resulted in extinction, Wyatt did not elope. Additionally, Wyatt did not elope during the 900-s extended treatment probes. IOA data were calculated on Wyatt's latency to elope for 81% of sessions and averaged 96.8% (range, 67% to 100%). Additionally, treatment integrity data were collected for 44% of all sessions and averaged 100%.

Results of the FA for Jacob are depicted in Figure 6. Jacob eloped with short latencies during the attention condition and did not elope during the tangible, escape, or control conditions. His mean latency to elope was 9 s in the attention condition and 300 s in all other conditions of the FA. IOA data were collected on Jacob's latency to elope for 58% of all FA sessions and averaged 96.7% (range, 83% to 100%). Jacob also allocated the majority of time during each attention session in the NCR area. The differentiated results observed across test conditions of the FAs for both participants indicated that the contingencies of the assessment were salient.

Treatment results for Jacob are depicted in Figure 7. His treatment consisted of the continuous delivery of noncontingent attention and discontinuing reinforcement for elopement. Treatment effects were analyzed in an ABAB reversal design comparing the effects of functional reinforcement to the effects of NCA + EXT on elopement. Jacob's mean latency to elope in the attention condition increased to 300 s with the treatment package. Instances of elopement were decreased to zero with the continuous delivery of attention, and treatment effects maintained when the schedule of attention delivery was thinned. IOA data were collected on Jacob's latency to elope for 64% of all treatment sessions and averaged 100%. Additionally, treatment integrity data were collected for 76% of all sessions and averaged 100%.

Chapter 4

Discussion

This study evaluated the utility of a latency-based FA of elopement in the development of function-based treatments for two children with autism. We conducted latency-based FAs to identify maintaining sources of reinforcement for both participants based on the methods established by Traub and Vollmer (2019). Additionally, we developed function-based treatments for both participants that effectively decreased their elopement.

Wyatt's latency-based FA indicated three probable functions. We observed differentiated responding in the tangible and attention conditions while his responding during the escape condition was variable. Similar to Traub and Vollmer (2019), each FA session was preceded by a 15-s pre-exposure to orient Wyatt to the contingency on each side of the room. We believe the contingencies in the tangible and attention conditions were salient based upon the quick differentiation achieved. However, we suspect that the contingency in the escape condition of the FA was less salient due to inconsistencies in the demands placed and confounding attention delivered with the demands.

We were able to achieve differentiation in the escape condition upon running a subsequent pairwise analysis. For this analysis, the room was divided into two areas with one therapist located in each area. One side of the room was associated with the continuous delivery of difficult demands and the other side of

the room was associated with the continuous delivery of less difficult demands. The demands placed in the difficult area were strictly fine motor tasks while the demands placed in the less difficult area were strictly gross motor tasks. In both areas, the therapist delivered continuous demands and utilized a 3-step prompting sequence to ensure compliance. Wyatt began each session in the area with difficult demands, and we measured his latency to elope from the area with difficult demands to the area with less difficult demands. We also measured Wyatt's allocation of time in each area for the duration of the session. This analysis allowed us to compare Wyatt's latency to elope in the presence of difficult demands to his latency to elope in the presence of less difficult demands. Additionally, this analysis allowed us to control for the delivery of attention in the form of physical prompts.

The results of Wyatt's FA are similar to results obtained in previous FAs of elopement. Neidert et al. (2013) conducted trial-based FAs of elopement using latency-to elope as the dependent measure. Researchers in this study conducted initial FAs and subsequent pairwise analyses to clarify variable results, and elopement was suspected to be multiply controlled for both participants (Neidert et al., 2013). Additionally, Traub and Vollmer (2019) observed differentiation across two test conditions and variability in another condition across several participants. The procedures used in Wyatt's assessment replicated both the latency-based FA and the pairwise comparison conducted in Neidert et al. (2013) and Traub and

Vollmer (2019). Furthermore, the matched pattern of allocation data to the latency to elopement data in the current study coincide with the matched data patterns obtained by Traub and Vollmer (2019).

The DRA + EXT treatment package used to decrease Wyatt's elopement was effective across all three functions of elopement. Effects of the treatment package were observed in an ABAB reversal design. During baseline phases, we presented the functional communication card in the test area. During these sessions, elopement resulted in functional reinforcement and card touches did not result in any programmed consequence. Following baseline sessions, we conducted FCT trials in which prompted card touches resulted in the functional reinforcer. Once Wyatt achieved the mastery criterion of 80% independent card touches across 2 consecutive training sessions, we conducted the treatment phase. During treatment phases, we again presented the functional communication card in the test area. Independent card touches resulted in functional reinforcement for 30 s, and extinction was implemented for any instances of elopement.

The controlled environment used in the treatment phase of this study allowed us to implement extinction contingent upon elopement without risking the safety of the participant. Other studies utilizing DRA in the form of FCT in the treatment of elopement have not included extinction in the treatment package (Falcomata et al., 2010; Tarbox et al., 2003). However, the use of extinction procedures in combination with FCT has been shown to be more effective than

FCT alone in reducing problem behavior (Hagopian et al., 1998). The latency-based measure used in this study may allow for safer measurement of elopement, and the procedures used may allow researchers and practitioners to more safely implement extinction during treatment of elopement.

Differentiation was more quickly observed during Jacob's FA of elopement. Based upon procedures used in Traub and Vollmer (2019), all FA sessions were preceded by the 15-s pre-exposure to orient Jacob to the contingencies on each side of the room. Similar to the results of one participant from Traub and Vollmer (2019), Jacob eloped with short latencies during the attention condition and long latencies during the control condition. Jacob only eloped during the attention condition, suggesting that attention was the sole function of his elopement. The quick differentiation observed in combination with no elopement in the control condition indicate that the contingencies were salient to Jacob. The results of Jacob's latency-based FA replicate the results obtained by Traub and Vollmer (2019), and these findings further suggest that latency-based measures may be effective in identifying the function of elopement in children with intellectual disabilities.

We treated Jacob's elopement using a NCA + EXT treatment package. Effects of the treatment package were observed using an ABAB reversal design. During baseline phases, we provided functional reinforcement in the form of continuous access to adult attention contingent upon elopement. During treatment

phases, we provided continuous NCA in the form of praise, comments, and play. Jacob's elopement decreased to zero when providing continuous NCA across several 5-minute sessions. Additionally, his elopement remained at zero during schedule thinning and extended treatment probes.

Other studies evaluating function-based treatment of elopement have decreased instances of elopement using NCA. Kodak et al. (2004) conducted a FA of elopement for one participant in an open, outdoor field. Researchers defined elopement as running more than one meter from the designated area and measured the participant's duration of elopement across attention, escape, and control conditions (Kodak et al., 2004). Across all conditions, a therapist was required to retrieve the participant following each instance of elopement (Kodak et al., 2004). Researchers provided physical and verbal attention contingent upon elopement in the attention condition and provided minimal attention during retrieval in the other two conditions (Kodak et al., 2004). Longer durations of elopement were observed during the attention condition, and researchers concluded that attention maintained the participant's elopement.

During the treatment evaluation, researchers provided NCA on a 15-s fixed time schedule in combination with a time-out procedure (Kodak et al., 2004). NCA consisted of the delivery of response-independent praise and tickles, and a 30-s time-out was implemented contingent upon elopement. Treatment results were similarly evaluated using an ABAB reversal design consisting of baseline and

treatment phases. The treatment package immediately and substantially reduced instances of elopement to zero across several 5-minute sessions; however, researchers did not measure the effects of the intervention across sessions of longer duration or with a thinner schedule of attention delivery (Kodak et al., 2004).

Another study using NCA in the treatment of attention-maintained elopement was done by Tarbox et al. (2003). Researchers conducted a FA of elopement for three participants who engaged in dangerous rates of elopement (Tarbox et al., 2003). Specifically, all participants were under constant supervision due to the severity of their elopement (Tarbox et al., 2003). FA sessions were conducted by trained parents or staff members in individualized settings at which elopement typically occurred for each participant (Tarbox et al., 2003). Researchers measured the frequency of elopement across attention, escape, tangible, and control conditions (Tarbox et al., 2003). Throughout all conditions, participants were retrieved using physical guidance (Tarbox et al., 2003).

Higher frequencies of elopement were observed in one condition relative to the other conditions for all three participants (Tarbox et al., 2003). For one participant, elopement was found to be maintained by access to attention, and researchers implemented NCA within a reversal design (Tarbox et al., 2003). During this treatment, the participant received continuous access to adult attention, and researchers implemented a 5-s changeover delay contingent upon elopement (Tarbox et al., 2003). The treatment evaluation decreased the participant's

elopement to zero when the therapist provided continuous attention; however, treatment effects were not measured when the schedule of attention delivery was thinned (Tarbox et al., 2003).

Results obtained from both Wyatt and Jacob's assessment correspond with these earlier findings in that we obtained differentiation across conditions and identified a probable function for all participants. Additionally, the latency-based measure and experimental procedures used in the current study produced results corresponding with previous research without requiring the retrieval of participants contingent upon elopement. Furthermore, results of both Wyatt and Jacob's treatment correspond with previous research by reducing elopement using function-based interventions. Specifically, we were able to reduce Jacob's instances of elopement to zero, which corresponds to related studies using NCA as a treatment for elopement. We were also able to use FCT to decrease elopement for Wyatt without requiring the addition of a punishment procedure. The current study extends previous findings by evaluating extinction in combination with NCA and FCT as treatment for elopement. Furthermore, this study extends previous research by demonstrating the maintenance of treatment effects during schedule thinning and across extended treatment probes.

Unlike Traub and Vollmer (2019), we did not observe variability throughout the control condition for either participant. It is possible that the alternating of test and control conditions in a multielement design provided more

salient conditions than the test-control comparison used by Traub and Vollmer (2019). The current study also differed from Traub and Vollmer (2019) in that we conducted session-based assessments for both participants; no trial-based FAs were used in this study. Traub and Vollmer (2019) conducted trial-based FAs for three participants in which latency to elope were the only data reported. All trial-based sessions were terminated 15 s after the first instance of elopement, so no allocation data were obtained for these participants. The benefit of conducting session-based assessments for both participants is the ability to match latency and allocation data patterns. Finally, our study differs from Traub and Vollmer (2019) in that we observed differentiated responding for both of the participants, and the data did not suggest an automatic function for either participant.

Previous research utilizing latency as a dependent measure has been successful in identifying the function of elopement. Neidert et al. (2013) measured latency to elope during trial-based FAs for two adult participants. The use of a latency-based measure allowed researchers to analyze elopement without requiring immediate retrieval of the participants contingent upon elopement. Additionally, Neidert et al. (2013) evaluated latencies across conditions in a multielement design to allow for rapid comparison of the effects of each condition on elopement. Researchers determined the function of each participant's elopement by identifying the condition with the shortest latency relative to the latencies in other conditions (Neidert et al., 2013).

One limitation of the procedures used by Neidert et al. (2013) was the required retrieval of participants following a 5-minute delay. Additionally, the trial-based FA may have produced results that are not consistent with standard FAs. The current study compared participants' latencies to elope across conditions in a multielement design. Using the procedures described by Traub and Vollmer (2019), we conducted the FAs in an environment that allowed us to measure participants' elopement without having to retrieve them. Additionally, the current study eliminated any limitation associated with trial-based FAs by conducting session-based FAs for all participants.

There are several considerations when interpreting the results of this study. First, we only evaluated the utility of a latency-based FA and subsequent function-based treatment for two participants. Additional research is needed to evaluate the extent to which these results generalize to a greater number of participants. Secondly, the setting and procedures used by Traub and Vollmer (2019), as well as in this study, require two therapists to be present during each assessment and treatment session. Additional research is needed to compare the benefit of these procedures to the cost of additional resources.

Another limitation of this study was the inability to assess the extent to which access to a specific location maintained participants' elopement despite caregiver report indicating a potential function. Specifically, Wyatt's parents indicated that he often elopes in public locations to gain access to specific areas,

such as the water on a beach, a ride at Disneyworld, or the playground. The controlled environment we used for this assessment consisted of a closed-off room divided into two areas. Only tangible items that could be brought into the room were used in the assessment, and the setup did not allow us to measure the extent to which access to another location maintained either participant's elopement. Future research should compare the advantages of using a controlled environment that does not require retrieval contingent upon elopement to the advantages of conducting an FA in a public location that allows researchers to include preferred locations in the assessment of elopement. The development of additional FA methods that include access to a specific location may lead to more accurate and naturalistic assessment and treatment of elopement.

Another limitation of this study is that the effects of the function-based treatments were only measured for a maximum of 15 minutes. Of course, it is possible that both participants' elopement would have occurred had we extended sessions beyond 15 minutes. Future research should evaluate the external validity of the described treatments by assessing treatment effects for more substantial periods of time and across naturalistic environments. Additionally, results of the assessment and treatment in this study are limited by the use of latency as a primary measure. It is possible that a latency-based measure may not be appropriate in all evaluations of elopement. For example, a latency-based measure may not accurately represent the elopement of a child who elopes infrequently but to great

distances or long durations. Additional measures, such as frequency or duration, may be required to accurately represent instances of elopement depending upon the context in which an individual elopes.

We evaluated the use of a latency-based measure in the assessment and treatment of elopement in order to control for the retrieval component associated with measuring elopement. The procedures used in this study allowed researchers to assess elopement without providing supplemental attention in the form of retrieval or requiring repeated instances of the behavior. Additionally, the controlled setting used in the treatment phase of this study allowed researchers to utilize treatment interventions, such as extinction, that may not be possible in more naturalistic FA settings. Outcome validity measures indicate the efficacy of reducing elopement with function-based treatment interventions based on results of a latency-based FA. This study demonstrates the ability to decrease a dangerous problem behavior using function-based assessment and treatment.

As described above, future research should evaluate the extent to which the results obtained from this study generalize. Specifically, researchers should investigate the efficacy of latency-based FAs of elopement for three or more participants, and treatment evaluations should be conducted for longer session durations. Future treatment evaluations should also include component analyses to determine which aspects of the treatment packages are required for effective

decreases in elopement. Additionally, future treatment evaluations should include the generalization of treatment to naturalistic settings (e.g., classroom, home).

Future research should also expand the use of latency-based measures in the assessment and function-based treatment of other behaviors. Latency-based measures may be especially advantageous in the identification of maintaining variables during the assessment of behaviors that do not occur repeatedly in a single burst (e.g., vomiting, disrobing). Furthermore, latency-based measures may be beneficial in the FA and treatment of other dangerous behaviors (e.g., aggression, self-injury). Using latency-based measures in the assessment of these types of behaviors may allow for the identification of function without lengthy and time-consuming FAs or repeated instances of the behavior.

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Appendix

Figure 1

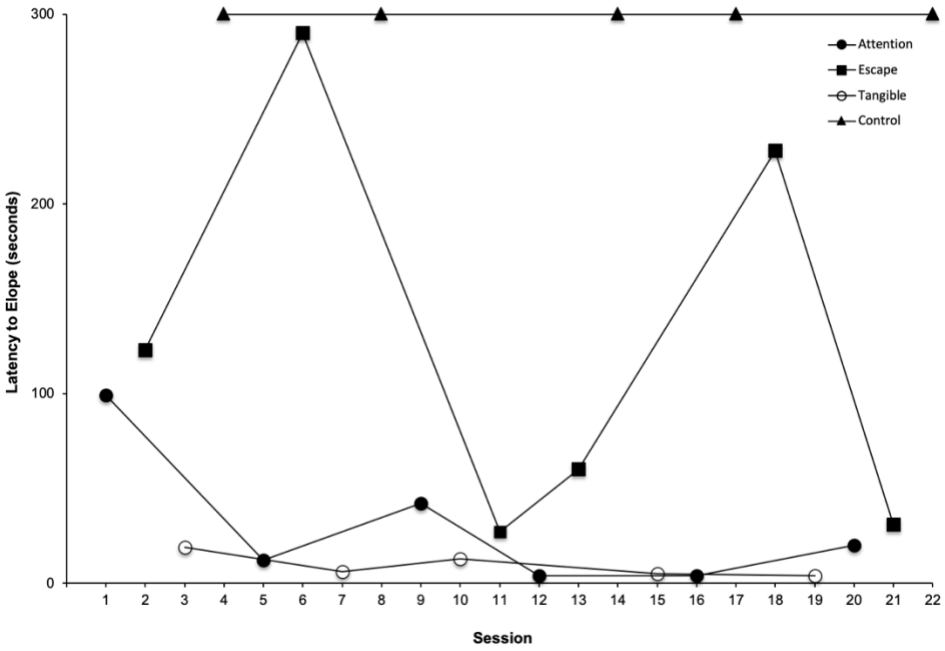

Figure 1: Results of the functional analysis for Wyatt.

Figure 2

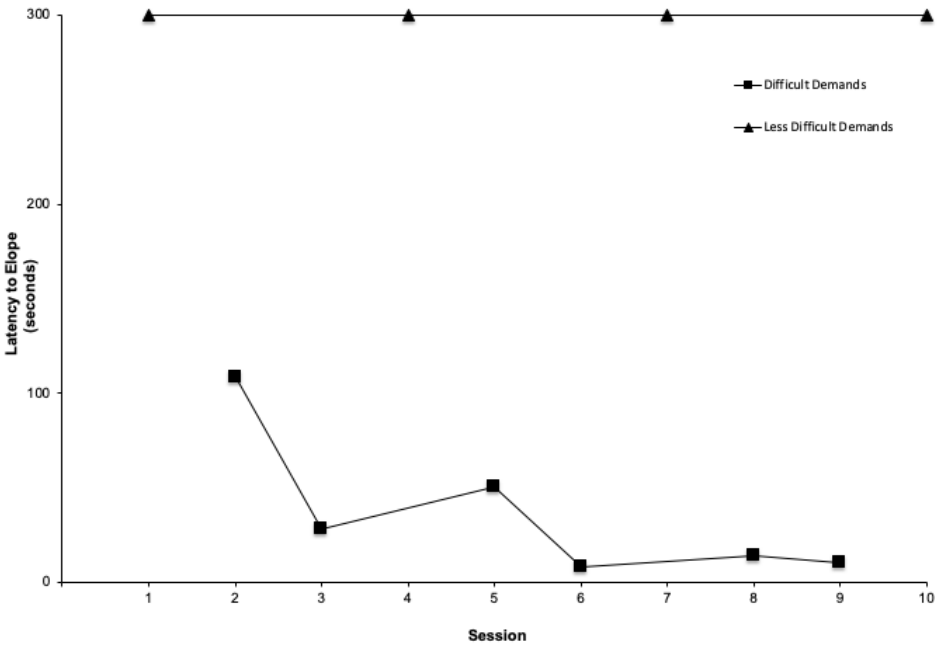

Figure 2: Results of the pairwise functional analysis for Wyatt.

Figure 3

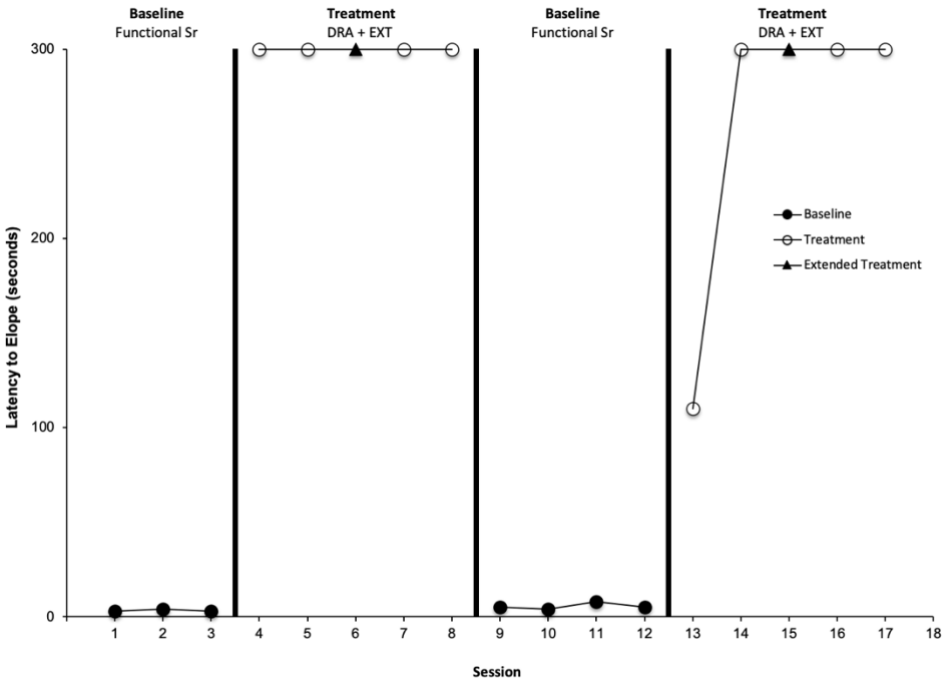

Figure 3: Results of the DRA + EXT treatment evaluation for elopement maintained by access to tangible items for Wyatt.

Figure 4

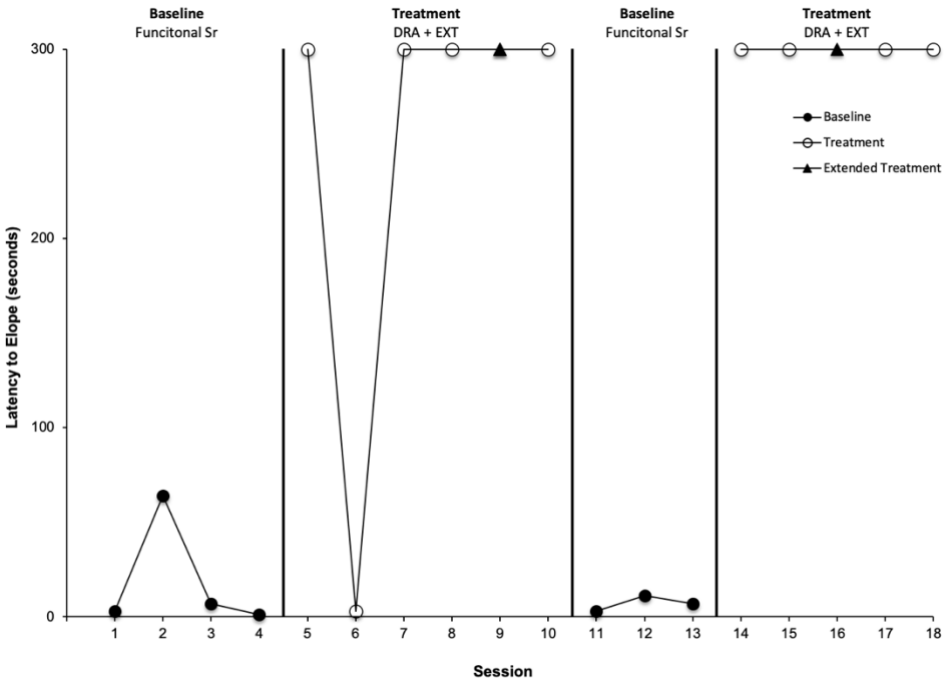

Figure 4: Results of the DRA + EXT treatment evaluation for elopement maintained by access to attention for Wyatt.

Figure 5

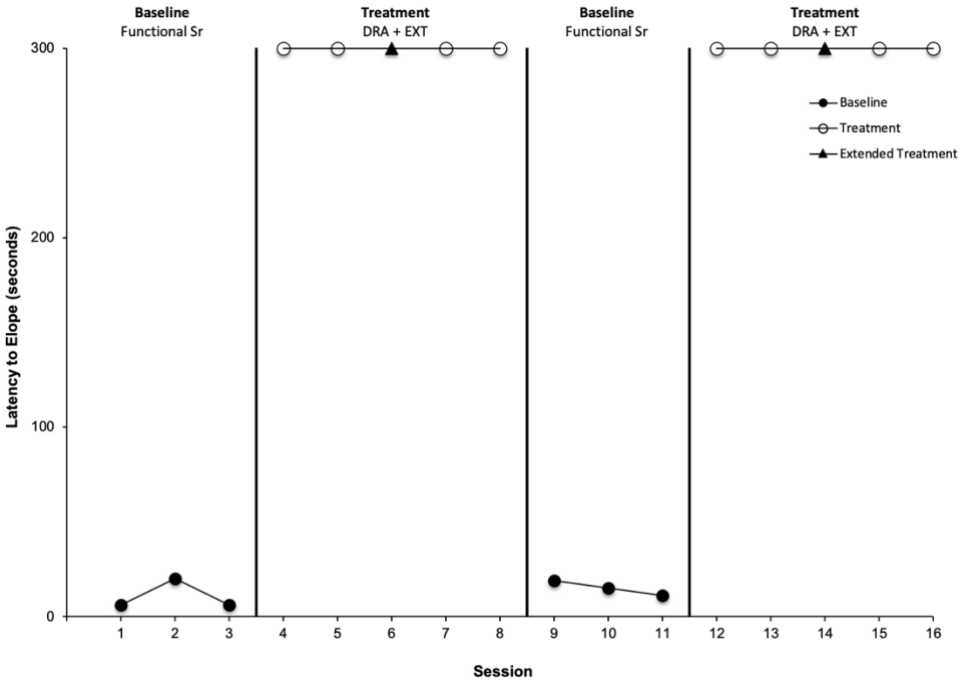

Figure 5: Results of the DRA + EXT treatment evaluation for elopement maintained by escape from demands for Wyatt.

Figure 6

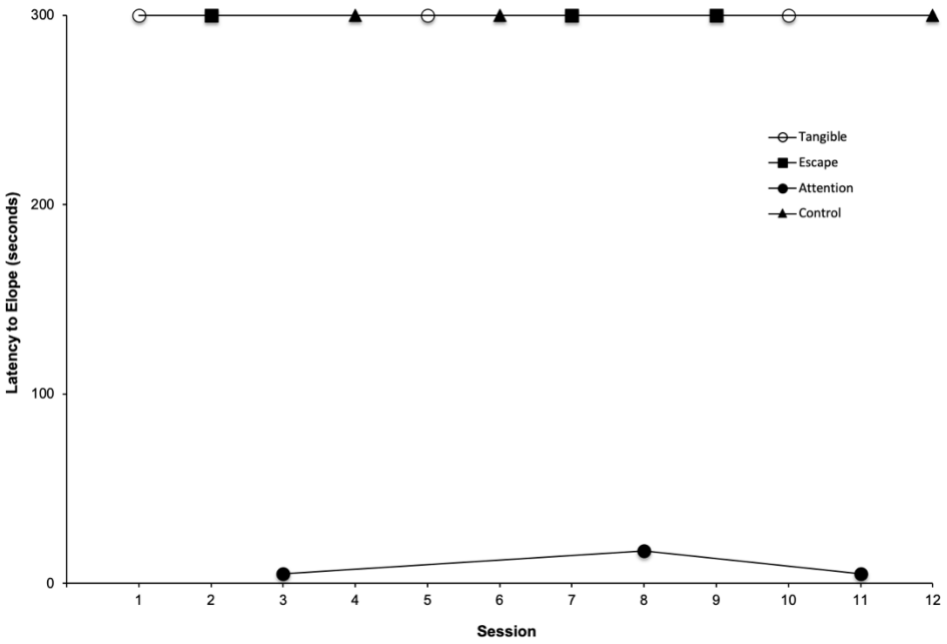

Figure 6: Results of the functional analysis for Jacob.

Figure 7

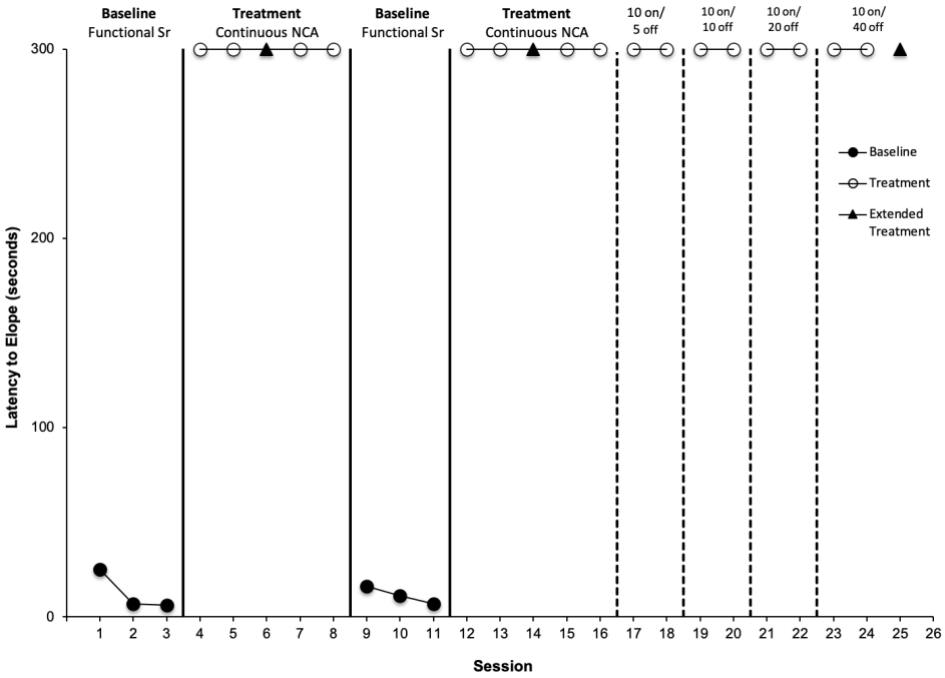

Figure 7: Results of the NCA treatment evaluation for elopement maintained by access to attention for Jacob.