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### Using Behavioral Skills Training and In Situ Training to Teach Children Diagnosed with Autism to Avoid Hazards

Danielle Vesel

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**Using Behavioral Skills Training and In Situ Training to Teach Children Diagnosed with  
Autism to Avoid Hazards**

by

Danielle Vesel

A Thesis

Submitted to the Graduate Faculty of

St. Cloud State University

in Partial Fulfillment of the Requirements

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Master of Science

in Applied Behavior Analysis

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### **Abstract**

Previous literature has examined the use of behavioral skills training (BST) and in situ training (IST) to teach safety skills; however, very little research has investigated this training across several hazard classes. This study investigated the effectiveness of BST and IST used to teach safety skills. Initial assessments were completed with three unique stimuli within three distinct hazard classes (i.e., nine stimuli): sharp objects, medication containers, and cleaners. Assessments revealed training was necessary for children to demonstrate safety skills. Assessments completed after training occurred demonstrated that IST was a necessary component for participants to engage in all three safety skills taught within the training. Furthermore, individual differences between participants were demonstrated through the number of sessions in which skill demonstration occurred.

*Keywords:* behavioral skills training, in situ training, safety skills, medicine, chemical cleaners, sharp objects

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## **Chapter 1: Introduction and Literature Review**

Children can encounter a variety of hazards in their lifetime. Providing children with training on how to respond to hazardous materials could prevent some deaths due to unintentional injury. In 2017, preventable deaths accounted for over 4,000 of the children under 15 who died (Kochanek et al., 2019). Accidental poisoning or exposure to noxious substances was the fifth leading cause of unintentional death among children under 15 (Kochanek et al., 2019). Recommendations for preventing poisonings involve storing toxic products and medications out of sight and reach of children and safely disposing of medications or drugs that are expired or no longer needed (Centers for Disease Control and Prevention, 2019). Although children who are provided training might be able to avoid potential hazards, it is possible that children diagnosed with autism and other disabilities need additional training to better discriminate between hazardous and non-hazardous materials.

To adults interested in providing children with training, there are two primary methods: passive training and active training. Safety training on hazards might involve not touching the dangerous item, leaving the area, and notifying an adult about the item (Gatheridge et al., 2004; Miltenberger et al., 2009; Petit-Frere, 2019). Passive methods for teaching these behaviors involve providing information through lectures, discussions, written materials, or videos (Holly et al., 2019). This method provides instructions on how to respond to the hazard but does not require the learner to actively participate in the responses (Holly et al., 2019). An active training method called behavioral skills training (BST) provides instructions, modeling, rehearsal, and feedback (Gatheridge et al., 2004; Holly et al., 2019). This method is considered active because

it provides instructions on responding while also requiring the learner to actively engage those instructions, often through a contrived situation called in situ training (IST; Holly et al., 2019).

BST has been used to teach a variety of safety skills to children, such as firearm safety (Miltenberger et al., 2009), poison safety (Petit-Frere, 2019), fire safety (Rossi et al., 2017), and abduction prevention (Gunby et al., 2010). Additionally, this method has been used to teach both typically developing children (Dancho et al., 2008; Miltenberger et al., 2009) and children diagnosed with autism and other disabilities (Petit-Frere, 2019).

In a comparison study of active and passive training methods, Gatheridge et al. (2004) compared BST to the commercially available level 1 Eddie Eagle gun safety program and a control group that received no training. BST involved instructions, modeling, rehearsal and positive and corrective feedback. The Eddie Eagle<sup>1</sup> training involved several components such as discussions, illustrations of safe and unsafe behavior, videos, coloring books, and posters, provided to the students as listed in the curriculum. The control group was not provided any training until after assessments were completed. Results demonstrated that while both the BST and Eddie Eagle groups were able to recite the safety skills, the BST group was better in demonstrating those skills. Although no assessment outside of the facility in which training took place was conducted, this study demonstrated that children who were provided an opportunity to practice safety skills were better at completing those skills after training was completed.

Noticing that studies on safety skills often teach multiple exemplars in one skill or one exemplar across several skills, Rossi et al. (2017) aimed to teach children three exemplars for three types of hazards: three firearms, three liquid poisons, and three types of fire-starting agents.

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<sup>1</sup> For more information on the Eddie Eagle program you can visit <https://eddieeagle.nra.org/>

Children were first taught to tact the examples of the hazards. The children were then assessed for demonstration of the safety skills. When a participant failed to demonstrate the necessary safety skills, BST was implemented. One exemplar from a hazardous group was taught to mastery before the other exemplars were taught. Once participants completed training, all participants were able to demonstrate the safety skills for trained and untrained exemplars of a hazard. This study also assessed these skills across settings, demonstrating that safety skills can be taught across settings and exemplars to participants with ASD.

When BST alone is ineffective either through skill demonstration or in generalization, some studies use IST as an additional component (Miltenberger et al., 2009). In situ assessments involve an environment in which the participant does not know that their skills are being assessed (Dancho et al., 2008; Miltenberger et al., 2005; Miltenberger et al., 2009). In these types of assessments and trainings, the lack of safety skill demonstration is interrupted with a training session (Dancho et al., 2008; Himle et al., 2004; Miltenberger et al., 2005; Miltenberger et al., 2009).

In two studies by Miltenberger and colleagues (2005; 2009) BST combined with IST was evaluated for firearm safety. Participants in both studies were provided two BST sessions and within 30 minutes of that training were put in a baited situation in which they located a firearm. Participants that did not demonstrate the safety skills during the in situ assessment were provided IST. Essentially, a lack of skill demonstration was interrupted, and the participant was required to practice the skills. Although neither study directly compared BST to the combination of BST and IST, both demonstrated that the combination of trainings was effective.

Similarly, two studies by Johnson and colleagues (2005; 2006) found that BST in combination with IST was effective in teaching abduction prevention skills to children. In Johnson et al. (2005), instructions, modeling, rehearsal, and feedback were used to train participants abduction prevention skills. Within 15 minutes of that training sessions completion, an in situ assessment was implemented. If the child demonstrated the skills, the child received praise. If the child did not demonstrate the skills, the experimenter interrupted the assessment and provide corrective feedback, modeling of the skills, and instructions. The child was then required to rehearse the skills. In Johnson et al. (2006), three training groups were compared: BST, BST and IST, and a control. BST alone and BST and IST were more effective in teaching skill demonstration, but skill demonstration from participants in the BST and IST group maintained over a three-month period at a higher rate when compared with the BST only group. One limitation the authors noted included that the IST portion of the study acted as additional training that the BST only group did not receive, possibly accounting for this discrepancy in maintenance data.

In many of these studies (Johnson et al., 2005; Johnson et al., 2006; Miltenberger et al., 2005; Miltenberger et al., 2009), participants were not identified as having any disabilities. Children diagnosed with autism spectrum disorder (ASD) or other disabilities might need more practice of the skills to acquire and maintain the skills necessary to promote safety. It is possible that children with disabilities might not acquire the safety skills as quickly as the children in these studies or that the combination of BST and IST could be more or less effective for these children. Additionally, the children in the Miltenberger et al. (2005; 2009) studies were not used as their own control and instead were compared with other children. Although BST has been

compared with typically developing children in the acquisition of safety skills, it has not been thoroughly assessed with children diagnosed with ASD or other disabilities. The purpose of this study is to teach children diagnosed with ASD to avoid multiple exemplars of hazards using BST and IST.

## Chapter 2: Method

### Participants

Three participants were recruited from a Midwestern clinic that provides services for children diagnosed with ASD and similar disabilities. All participants had received an independent diagnosis of autism spectrum disorder before the start of the study. Inclusion criteria for study participation included: (a) a speaker and listener repertoire, (b) accurately identifying personal past events, and (c) a tacting repertoire.

Participant 1 was a 6-year-old male who had been receiving applied behavior-analytic services at the center for 22 months. Participant 2 was a 5-year-old female who had been receiving applied behavior-analytic services at the center for 19 months. Participant 3 was a 5-year-old male who had been receiving applied behavior analytic services at the center for 20 months.

### Setting

All participants received the safety skills training at the clinic in which they received services. Training took place in an observation room to ensure that no other children at the center were exposed to the hazards.

Generalization assessments took place in various locations around the clinic that were not the original training location, such as a playroom and an office within the facility. For each generalization assessment, the target child was the only child present in the room. Appropriate times and locations within the facility were discussed with staff to ensure that the child is not distracted by other people in the facility.

### Materials

A task analysis for implementing the BST procedure was created to maintain consistency of implementation across participants (Appendix A). Three hazard exemplars were used for three different skills: medications, sharp objects, and cleaning chemicals. For medication training, a prescription medicine bottle, an over-the-counter pill bottle, and a Ziploc bag were all filled with tic tacs and super glued shut. For chemical training, a Lysol spray bottle, a Windex spray bottle, and a store-bought unmarked spray bottle were washed with soap and water, disabled so they spray component would not function, and filled with water and food coloring. For sharp objects, a dull knife made of plastic with a retractable blade, a needleless syringe, filled with water, and the end glued shut, and silicone shards that look like broken glass were used.

### **Target Behavior**

The target behaviors for all hazardous materials were (a) not touching the material, (b) creating distance from the item, and (c) informing an adult about the hazard. The child was recorded to be touching the hazardous material if they engaged in any behavior that resulted in bodily contact with the material or using an object to touch the material (e.g., a pen, a toy). The child was recorded as creating distance from the item if (i) if the child left the surrounding environment (i.e., reaching at least the door frame within a room) after seeing the hazardous material or (ii) called out to an adult to remove the item. The child was recorded as notifying an adult if they verbally relayed that they found the hazardous material. The behaviors were tracked in the graphs through color codes showing correct and incorrect steps. For example, black represented that the child touched the hazardous material and white represented that the child did not touch the object at all (see Figure 1). Additionally, for the second two skills of leaving the

area and telling an adult, a gradient will be used to show when these skills occurred in 15 s increments from the start of the trial.

### **Interobserver Agreement**

Interobserver agreement was calculated for the relevant skills in at 69%, 66%, and 82% of sessions for Participant 1, Participant 2, and Participant 3, respectively. Agreement was calculated at 96% for Participant 1, 96% for participant 2, and 88% for participant 3. The author collected data throughout the study by watching the recorded sessions. Agreement was recorded if the trainer and the author rated the child with the same score. Agreement was calculated as agreement divided by agreement plus disagreements and multiplied by 100.

### **Social Validity and Side Effects Questionnaires**

After participation in the study, parents were provided two questionnaires to complete and return (Appendices B and C). The social validity questionnaire provided information on how effective the parents found the intervention to be. The side effects questionnaire highlighted any potential changes in behavior at home that might be related to the study participation.

### **Design**

A multiple baseline design across skills with an embedded probe design was used to assess the acquisition of safety skills. Hazardous materials included were randomly assigned to a tier using a random number generator. In the first three days of assessments, each hazard was assessed once. The first hazard class continued to be assessed, resulting in nine baseline assessments (three assessments for each of the three items). When the hazards in the first tier were up for mastery, the hazard class in the second tier was assessed again, resulting in twelve baseline assessments. When the items in the second hazard class were up for mastery, the hazard

class in the third hazard class was assessed, resulting in twelve baseline assessments. This was done to record any generalization of the safety skills across hazard classes. Data post-BST were collected to determine if BST alone allowed the child to acquire the necessary safety skills. If the child failed to demonstrate the necessary safety skills after receiving BST, were immediately be placed into the IST. Mastery criterion was defined as three consecutive assessments in which all skills were demonstrated. Visual analysis was used to observe changes within participant data.

## **Procedure**

### ***Informed Consent***

A meeting with the child's parent or guardian was completed to provide information about the study, answer any questions, and obtain consent for the child to participate in the study and be video recorded. Parents were informed that they could withdraw their child at any point within the study without repercussions. All procedures were approved by the author's institutional review board and the supervisor of the clinic at which the children receive services prior to the start of the study. Additionally, if the child emitted three consecutive statements of noncompliance related to task demands of the study, this was considered the child withdrawing consent for that session's participation and session was terminated. Three consecutive session terminations resulted in the participant's removal from the study.

Staff members who worked with participants were recruited and trained to complete training sessions. Individual meetings were completed with staff members to provide information about the study, answer questions regarding their involvement, and obtain consent for their participation in the study and to be video recorded. Staff members were informed that they could withdraw from the study at any time.

### *Staff Training*

Staff who regularly worked with the participants were trained to provide BST and conduct in situ assessments. BST was used to train staff to complete sessions. Instructions included those listed in the task analysis that was also provided to staff in written form to refer to throughout the study. Modeling was provided through a video model with the author and another adult acting as a confederate child. The video model highlighted many behaviors that the participants might engage in and how the instructor should respond for each phase of the study. The initial training video for all phases of the study was approximately 24 minutes long. Shorter, phase-specific videos that were provided to the staff members were less than 10 minutes in length. The instruction and modeling components of training were delivered in an online format to reduce contact between staff members and provide a uniform training across staff. Rehearsal and feedback components were completed by the experimenter and staff member. Feedback was provided after rehearsal was completed. Mastery criterion for staff training included demonstrating 100% correct responding across three consecutive rehearsals. Once the staff member completed the initial training, they were provided the video model corresponding to the phase their primary participant was currently in.

### *Assessments*

**Preference Assessment.** A single stimulus engagement preference assessment was completed before the study to determine what sort of brief activities the trainer and the participant could engage in once assessments were completed. Activities consisted of tasks that would require the trainer and participant to interact in some way or require help from the trainer and take 5-15 minutes to complete.

**Skill Assessments.** Skill assessments were conducted before the implementation of safety training to assess whether the child could demonstrate the target skills in the presence of the hazardous materials before training occurs. Children that could demonstrate all of the skills before training began were excluded from the study. Assessments were conducted again after training to determine if the child could then demonstrate the necessary safety skills in the presence of the hazardous materials. The assessments took place in various locations around the clinic in which the child receives services. This evaluated whether the skills generalized to new locations. Other children were kept at a distance and out of the room in which training or assessment occurred. Assessments for each item lasted approximately 1 minute.

During assessments, the child selected an activity that he or she and the trainer would complete together in another room. The trainer accompanied the child to that location and relayed that they needed complete a short task before the activity began, but that the child could enter the area and set up the activity while he or she waited. The trainer would accompany the child to the location but remain outside the room in which the hazardous material was located. This would allow the trainer to observe the child while remaining out of sight. The child was left alone in the room for up to one minute. If the child touched the hazardous material in some way or did not distance themselves from the hazard within the one-minute time, the trainer would enter the room and remove the hazardous material without commenting on its presence. Any behaviors related to the safety skills were recorded. In any times at which the materials were not being used for assessment or intervention purposes, they were kept safely out of sight and reach.

### ***Tact Training***

Prior to the start of the experiment, participants were assessed on the ability to tact potential hazards that were taught in this study. If participants did not have the repertoire necessary to tact images of the hazard, training was completed so the participant was able to appropriately label the hazard. Mastery criterion for tacting included 80% correct responding across three consecutive sessions.

### ***Behavioral Skills Training***

Before training begins, the trainer reviewed the BST task analysis. During the training session, the trainer explained that there were dangers around the target hazard and provided instructions to not touch the hazard, distance themselves, and tell an adult if the child ever encountered the target hazard. After providing instructions, the trainer presented one hazard replica (which will now be referenced as the “hazard”) from a hazard class to model the skills of not touching the hazard, leaving the area, and telling an adult. The child then rehearsed those skills while the trainer provided behavior specific praise and corrective feedback. Corrective feedback included restating the instruction and having the child rehearse the skill again. The child rehearsed the skills until they could demonstrate the entire sequence of target behaviors three consecutive times. The child was then provided a 2-5 minute break in which they could complete a preferred activity. Once the break was completed, the trainer introduced a second exemplar from the hazard class and completed training with that item. This process was completed a third time for the third exemplar in that hazard class.

In the subsequent training session, the trainer reviewed the instructions again with the child, modeled the appropriate behaviors, and provided both positive and corrective feedback when the child rehearsed the skills. The child had to demonstrate all safety skills for three

consecutive rehearsals with each item in the hazard class for two training sessions to have completed the training portion of the study.

**Termination criterion.** Training sessions were terminated if the client engaged in three consecutive refusal responses to a task demand. This included verbal responses such as, “no,” “I don’t want to,” “No thanks,” or “I want to be done.” If three consecutive sessions were cancelled due to refusal statements, the child was removed from the study.

### *Post Behavioral Skills Training Assessments*

Once the training was completed, assessments were conducted identically to baseline to determine if the BST was sufficient to provide the children with safety skills. The trainer told the child that they and the trainer would go to another location to complete an activity together, but the trainer needed to complete a task first. The child was told that they could begin to set up the activity or play while they waited for the trainer. The hazard was placed in the room in a visible location before the child entered. The child remained in the room for up to one minute. If the child did not leave the area and report the hazard within that minute period or the child was observed touching the hazard, the trainer would enter the room and remove the item without commenting on its presence. The child and trainer then completed the activity together. If the child did not demonstrate the safety skills with the item, they were immediately moved to the next phase of the study.

### *In Situ Training*

If the child did not demonstrate all of the safety skills taught in training during these post BST assessments, the child was immediately placed into IST. Placing the child into IST was done to reduce the number of opportunities for the child to interact with the hazards and

potentially practice unsafe behavior outside of this setting. Assessments began as previously described in baseline. During IST, the trainer entered the room, pointed out the hazard and recited the safety skills one should demonstrate when finding a hazard. The trainer then required the child to rehearse the safety skills until they could demonstrate the skills correctly three consecutive times. Once the demonstration of the skills was completed, the trainer engaged in the brief activity with the child.

### ***Formative Explorations***

When Participant 2 did not respond to the intervention, a distraction free environment was provided. In these assessments, toys were put away while the hazard remained present. Later, an incentive was added for that participant. The trainer would state that if the participant were to locate a dangerous item and remember what to do, the participant would be able to do a fun activity with the trainer. The trainer then waited approximately 5 minutes before beginning the assessment. If the participant demonstrated all safety skills, they were given access to the specified item or activity. This vocal prompt was later faded to be delivered approximately an hour before the session began and then not at all. The activity/item delivery was also thinned to be provided on an intermittent schedule.

### ***Generalization Sessions***

Assessments for generalization were conducted throughout all phases of the study in a room that was not the initial training location. Baseline generalization probes were conducted identically to baseline assessments (but took place in a different location). Generalization probes throughout the intervention were identical to whatever condition the hazard was in during the

probe. For example, generalization probes in IST involved the interruption of engagement with the hazard and required rehearsal of the safety skills.

### **Fidelity**

The author or an independent observer completed a fidelity checklist for 99% of sessions for each participant 1, 100% of sessions for participant 2, and 76% of sessions for participant 3. BST checklist items were specified to ensure that the trainer stated the safety skills for each hazard, demonstrated those safety skills for the child, had the child rehearse the skills while providing behavior specific praise and corrective feedback (Appendix D). Assessment checklist items included not leaving the child alone for more than the specified minute, correctly stating the safety skills, having the child demonstrate those skills three times while the trainer implements behavior specific praise and corrective feedback. Fidelity for participant 1 was calculated at 98% (83-100%). Fidelity for participant 2 was calculated at 96% (66-100). Fidelity for participant 3 was calculated at 95% (66-100%).

### Chapter 3: Results

Figures 1, 2, and 3 show scores for all three participants during baseline, post-BST, and IST phases of the study. The first skill of not touching the item is graphed either as black (item was touched) or white (item was not touched). The second and third skills of creating distance between the item and the child and telling an adult are graphed in a gradient to show at what time within the minute the skills were completed. White bars show that the skill was demonstrated in 0-14 s, light gray bars show that the skill was demonstrated in 15-29 s, medium gray shows that the skill was demonstrated in 30-44 s, the dark gray shows that the skill was demonstrated in 45-59 s, and black bars show that the skill was not demonstrated. None of the participants reliably demonstrated all safety skills when finding the hazard and all three participants touched the at least one of the hazardous items during baseline assessments.

All of the participants encountered tact training, as they did not demonstrate the necessary tacting skills during initial assessments. None of the children were recorded as reporting non-hazardous items as hazardous to any staff members at the center. All of the participants had at least one session terminated based on the termination criterion.

Participant 1 demonstrated a lack of safety skills during baseline assessments. The participant touched several of the items, including medication containers, cleaners, and sharp objects. After receiving training on the medication hazard class, participant one continued to touch the medication containers during assessments. Participant 1 then received IST for that hazard class. Initially, the participant continued to touch the medicine containers. After 5 sessions in IST, participant 1 met mastery criterion for the medication containers and was assessed for any generalization of those skills to the cleaners. Participant 1 scored higher in

cleaner baseline probes when compared to initial baseline assessments, as he demonstrated all three safety skills for three of the six baseline assessments, but did not meet mastery and thus was trained on the cleaners. Participant 1 mastered the cleaners immediately after receiving training. When sharp objects were reassessed, the participant did not demonstrate all of the skills consistently, and was thus provided training on the sharp objects. Once training was completed on the sharp objects, Participant 1 met mastery criteria immediately and did not need additional IST for that hazard class.

Participant 2 demonstrated a lack of safety skills during baseline assessments, never demonstrating all three safety skills. During baseline, participant 2 frequently touched sharp objects and medication containers, but did not touch the cleaners. After receiving training, participant 2 did not touch the sharp items, but did not leave the area or tell an adult. Participant 2 continued to remain in the room with the item and did not notify an adult about the hazard, but demonstrated the safety skills with 100% accuracy when prompted during IST. It was noted that the items and activities used during assessments were very highly preferred and thus those items and activities might have been competing with skill demonstration. After session 24, a distraction free environment was provided during assessments to evaluate if skill demonstration would occur. During assessments in which highly preferred items were not visible, the participant left the room in three out of the five assessments, but only mentioned that there was a hazard in one of those assessments. An incentive was then added. Once the incentive was added, the participant mastered skill demonstration with the sharp objects and was able to probe out of the cleaners and medicine hazard classes.

Participant 3 demonstrated a lack of safety skills during baseline assessments. Participant 3 touched some of the hazards, including cleaners and sharp objects, but did not touch the medication containers. Due to the termination criterion, Participant 3's involvement in the study was terminated during BST. Teaching this child to safely respond to finding hazardous items is necessary, as the child did touch the items; however, that training will occur outside of the current study.

The parents of Participant 1 and Participant 2 completed the side effects questionnaire and the social validity questionnaire. Participant 1's parent reported that they agreed (rating of 4) that Participant 1 demonstrated more caution around cleaning chemicals and medications, that they disagreed (rating of 2) that Participant 1 showed more caution around sharp objects, and that they strongly disagreed (rating of 1) that Participant 1 was upset after participation. Participant 2's parent reported that they strongly agreed (rating of 5) that Participant 2 showed more caution around cleaning chemicals and medications, that they agreed (rating of 4) that Participant 2 showed more caution around sharp objects, and that they strongly disagreed (rating of 1) that Participant 2 was upset after participation. Neither parent left comments about other changes they had noticed. Participant 1's parent rated that they agreed (rating of 4) that they were happy with their child's participation and that they would recommend the intervention to others. Participant 2's parent reported that they strongly agreed (rating of 5) that they were happy with their child's participation and that they would recommend the intervention to others.

## Chapter 4: Discussion

The purpose of this study was to teach children diagnosed with autism to appropriately respond to multiple exemplars of hazards using BST and IST. Each child was already able to tact one of the hazard classes before training began but required tact training on the other two hazard classes. One child reported feeling scared when shown the image of the knife, demonstrating the importance of knowing how to react when finding this hazard. All three children demonstrated a lack of safety skills in baseline assessments. Two of the three children made comments about the presence of the hazard while in the room with the hazard but made no attempts to leave the area or locate an adult. Furthermore, two of the participants would pick up the item to give to the adult, letting them remove it from the room. Although this is still a lack of safety skill demonstration, as the participant is touching the item, it shows that the participants were able to identify something that did not belong in the room before they received training.

This study adds to the literature in which IST was needed as an additional intervention for BST (Miltenberger et al., 2005; Miltenberger et al., 2009). Participant 1 did not demonstrate the safety skills until IST was implemented and needed training on each hazard class before consistently demonstrating the safety skills. Furthermore, Participant 2 needed the additional component of an incentive to demonstrate safety skills, supporting literature such as Bergstrom et al. (2014), in which one participant needed an incentive to demonstrate safety skills. This highlights the differences between individual learners.

Additionally, it is worth noting that although Participant 2 started demonstrating the safety skills once the incentive was added, the incentive was not once used. The provided incentive involved the delivery of coloring pages featuring Participant 2's preferred movie

characters. Participant 2 would complete skill demonstration, receive the coloring page, and then request to do another activity instead of coloring the page. The coloring pages were then provided on an intermittent schedule, though Participant 2's skill demonstration maintained.

Social validity scores report that parents were happy with their child's participation in the study, though both parents rated caution with sharp objects as being lower than cleaning chemicals and medicine containers. It is possible that the participants are exposed to sharp items more than chemical cleaners and medicine containers, allowing for familiarity to create a lack of safety skill demonstration with those items.

The unique graphing within this study expands upon the current literature in that children may demonstrate some of the skills while not demonstrating others. Although previous literature has provided a sufficient depiction of skill demonstration, this graphing method more clearly shows how quickly the participants responded to the hazards in their environment. The current study also changed the target behavior of leaving the room to creating distance from the item. Previous literature had not yet included this concept that distance from a hazardous material could be completed in more than one way. Although it is still a valuable skill for a child to leave the area in which a dangerous item is located, it might also be appropriate for the child to call out to a parent or caregiver and have them safely remove the item from the location. Although the children in this study were taught to leave the room during training, both participants called out to an adult in more than one assessment.

The current study is not without limitations. One limitation of this study includes a lack of generalization assessments in the hazard classes. Although multiple exemplars of each hazard class were used, the child received training on each item. Future research could teach two stimuli

and then assess for generalization within the hazard class with a third, novel stimulus. Similarly, generalization was assessed through using different locations in the same building. Future research could teach the skills in one location and assess for generalization to other locations such as a home or school setting.

Another limitation of this study involves the specified time provided for study completion. Although trainings were completed regularly with the children, there were several days that were missed due to Covid-19 protocols at the clinic related to illness. Future research could investigate the consistency of training delivered to the child to determine if more frequent and consistent trainings allow children to acquire the safety skills more quickly. The children in this study generally completed assessments or trainings related to this study each day that they were in the center, though several days were missed due to staff or children being out sick. Due to these protocols and the number of days in which staff and children were not in the center, maintenance data were not able to be collected.

A third limitation includes the data collection tool used during the study. There were times at which the data tool or the trainer was unavailable, making data collection more challenging for those sessions and impacted the number of sessions in which IOA data were collected.

Future research should further investigate effective training methods for those who might find BST aversive. It might be worth investigating if IST alone might be an effective teaching method for those who find BST to be aversive, as this still allows the participant to actively participate in the skills they would be learning. Participant 3 did not complete any training session entirely, frequently stating that the training was boring. BST has been effective for

teaching several skills to children (Miltenberger et al., 2009; Petit-Frere, 2019; Rossi et al., 2017) but was not effective for this child. It might also be valuable to investigate ways to further reduce contact between the child and stimuli. Anecdotally, Participant 1 was noted in several assessments to reach out slowly toward the item while looking to the door, suggesting that he understood the contingency that when the item was touched the trainer would appear. Although Participant 1 was still able to acquire the safety skills, future researchers should be cautious not to create unsafe attention-maintained behaviors.

Additionally, future research should also investigate the level of distraction that optimizes BST and IST. It is possible that some of the preferred activities that were offered in the room with the hazard were more reinforcing to engage with in the presence of the hazard, decreasing the likelihood that the child would leave to locate an adult. Future research can then investigate if providing a distraction free environment will help children acquire skills more quickly and distractions can then be faded into the environment.

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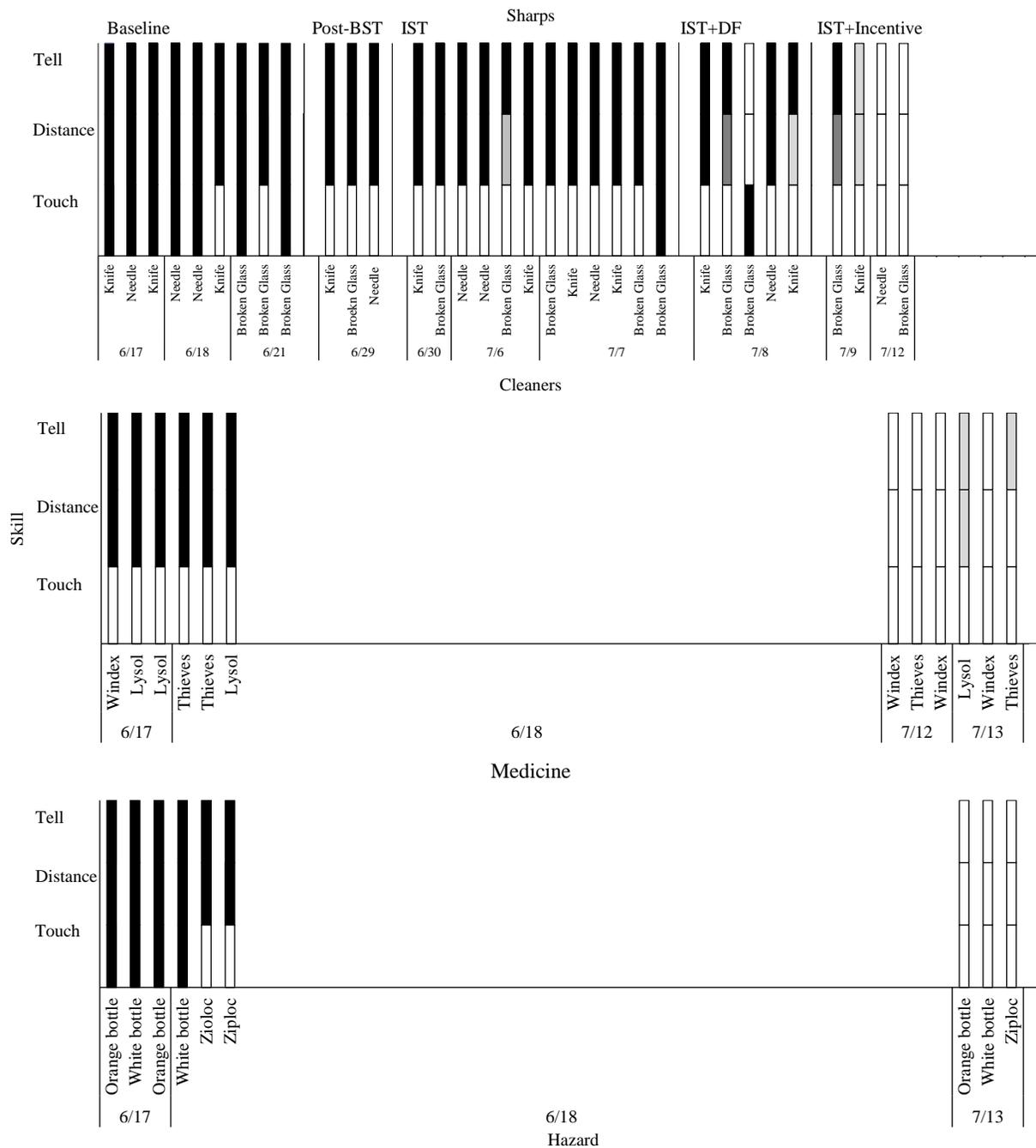
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*Note.* For Touch, segments are graphed in black to show that the item was touched or white to show that the item was not touched. For Leave and Tell, segments are graphed in white for skill demonstration in 0-14 s, light gray for skill demonstration in 15-29 s, medium gray for skill demonstration in 30-44 s, the dark gray for skill demonstration in 45-59 s, and black if the skill was not demonstrated.

**Figure 2**

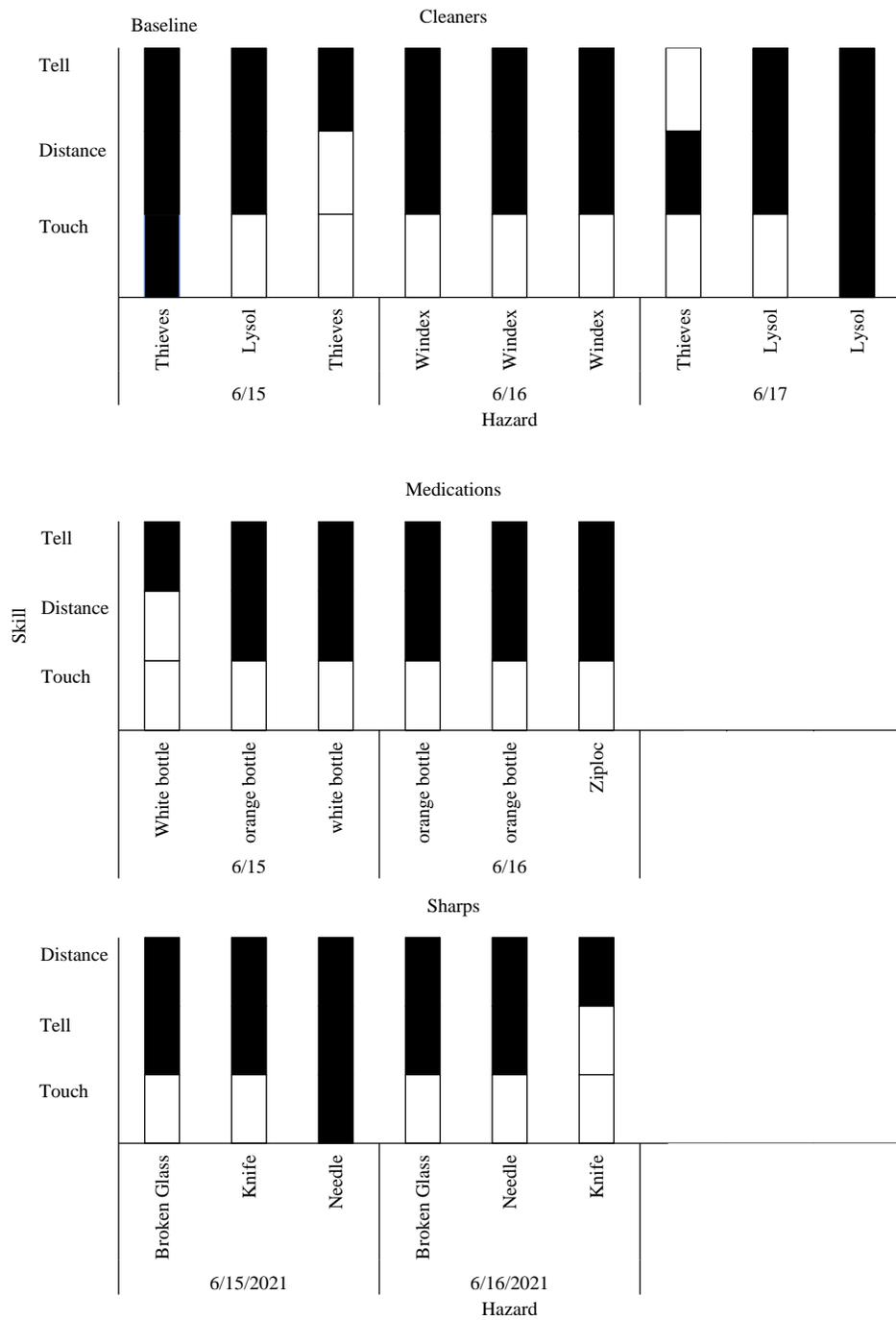
*Participant 2 Safety Skill Demonstration*



*Note.* For Touch, segments are graphed in black to show that the item was touched or white to show that the item was not touched. For Leave and Tell, segments are graphed in white for skill demonstration in 0-14 s, light gray for skill demonstration in 15-29 s, medium gray for skill demonstration in 30-44 s, the dark gray for skill demonstration in 45-59 s, and black if the skill was not demonstrated.

**Figure 3**

*Participant 3 Safety Skill Demonstration*



*Note.* For Touch, segments are graphed in black to show that the item was touched or white to show that the item was not touched. For Leave and Tell, segments are graphed in white for skill demonstration in 0-14 s, light gray for skill demonstration in 15-29 s, medium gray for skill demonstration in 30-44 s, the dark gray for skill demonstration in 45-59 s, and black if the skill was not demonstrated.

## **Appendix A**

### **BST Training Task Analysis**

#### **First Training Session**

1. Explain that there are dangers
  - a. Things that may look like something to play with or like something to eat can be dangerous or make you feel sick
2. Provide instructions on what to do when finding a hazard
  - a. Don't touch, leave the area, find and tell an adult
3. Present one hazard replica to the child
4. Model the safety skills that were provided in instructions
5. Have the child rehearse the skills
6. Provide positive and corrective feedback to the child during rehearsal
7. Child will rehearse the skill until they can demonstrate all skills three consecutive times
8. Provide a 2-5 minute break
9. Present novel hazard replica to the child
10. Model the safety skills that were provided in instructions
11. Have the child rehearse the skills
12. Provide positive and corrective feedback to the child during rehearsal
13. Child will rehearse the skills until they can demonstrate all skills three consecutive times
14. Provide a 2-5 minute break
15. Present novel hazard replica to the child
16. Model the safety skills that were provided in instructions
17. Have the child rehearse the skills
18. Provide positive and corrective feedback to the child during rehearsal
19. Child will rehearse the skills until they can demonstrate all skills three consecutive times

#### **Subsequent Training Sessions**

1. Provide instructions on what to do when finding a hazard
  - a. Don't touch, leave the area, find and tell an adult
2. Present a hazard replica to the child
3. Model the safety skills that were provided in instructions
4. Have the child rehearse the skills
5. Provide positive and corrective feedback to the child during rehearsal
6. Child will rehearse the skill until they can demonstrate all skills three consecutive times
7. Provide a 2-5 minute break
8. Present novel hazard replica to the child
9. Model the safety skills that were provided in instructions

10. Have the child rehearse the skills
11. Provide positive and corrective feedback to the child during rehearsal
12. Child will rehearse the skills until they can demonstrate all skills three consecutive times
13. Provide a 2-5 minute break
14. Present novel hazard replica to the child
15. Model the safety skills that were provided in instructions
16. Have the child rehearse the skills
17. Provide positive and corrective feedback to the child during rehearsal
18. Child will rehearse the skills until they can demonstrate all skills three consecutive times

## Appendix B

### Social Validity Questionnaire

	1	2	3	4	5
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am happy with my child's participation in this study.	1	2	3	4	5
I would recommend this intervention to other families.	1	2	3	4	5

Do you have any other comments about your child's participation in this study?

### Appendix C

#### Side Effects Questionnaire

	1	2	3	4	5
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
My child shows more caution around cleaning chemicals.	1	2	3	4	5
My child shows more caution around medications.	1	2	3	4	5
My child shows more caution around sharp objects.	1	2	3	4	5
My child is more upset after participation.	1	2	3	4	5

Have you noticed any other changes in your child?

## Appendix D

### Fidelity Checklist

#### Training Sessions

**Instructions:** Place a check next to tasks that were completed during the training session

- Explains that there are dangers around hazards
- Provides instructions on what to do when finding a hazard
- Presents a hazard replica
- Models the skills stated with hazard replica present
- Instructs child to rehearse skills
- Provides positive/corrective feedback during rehearsal
- Has child rehearse skills until child demonstrates skills for three consecutive rehearsals
- Provides a 2-5 minute break
- Presents a different hazard replica
- Models the skills stated with hazard replica present
- Instructs child to rehearse skills
- Provides positive/corrective feedback during rehearsal
- Has child rehearse skills until child demonstrates skills for three consecutive rehearsals
- Provides a 2-5 minute break
- Presents a different hazard replica
- Models the skills stated with hazard replica present
- Instructs child to rehearse skills
- Provides positive/corrective feedback during rehearsal
- Has child rehearse skills until child demonstrates skills for three consecutive rehearsals
- Provides a 2-5 minute break
- Terminates session as appropriate (3 consecutive refusal statements)

## Assessments

**Instructions:** Place a check next to tasks that were completed during the assessment

- Experimenter tells the child they will complete an activity together
- Upon arriving to baited location, experimenter tells the child they must complete a task first
- Child is left in the baited area for no more than a minute

### **In Situ Training**

- Child is interrupted if they touch the hazard
- Experimenter acknowledges hazard
- Experimenter recites safety skills
- Experimenter instructs child to rehearse skills
- Child rehearses until safety skill demonstration occurs three consecutive times
- Experimenter then transitions to activity
- Session is terminated after three consecutive refusal statements

### **In Situ Assessment**

- Child is interrupted if they touch the hazard
- Experimenter removes hazard without drawing attention to it
- Experimenter transitions to activity