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Evaluating the Use of Behavioral Skills Training to Teach Substitute Caregivers to Identify Hazards

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by

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Abstract

The leading cause of death for children across the world is unintentional injuries (UNICEF 2001). Hazards such as accessible pools, poisons, and small ingestible items are the leading causes of unintentional injuries. Behavioral interventions such as Project 12-Ways/Safe Care have been used to teach parents how to be proactive in structuring a home free of accessible hazards by teaching the parents to identify and remove hazards in their home. Though the Project 12-Ways/Safe Care model has over 30 years of literature supporting its efficacy, the model has not been tested with substitute caregivers who often play a critical role in keeping children safe. Therefore, this study evaluated the degree to which substitute caregivers could identify and remove hazards after being trained on the Project 12-Ways/Safe Care Home Accident Prevention Inventory Revised Protocol. Results suggest participants required multiple sessions of in-vivo feedback to learn to discriminate between hazardous and non-hazardous items. Limitations and future research are discussed.

Introduction

Unintentional injuries (e.g., choking) are responsible for the deaths of over 12,000 children aged 0 to 19 in the United States (Borse et al., 2013; Welch & Bonner, 2013) and are the leading cause of death for children across the world (UNICEF, 2001). In addition, unintentional injuries are the cause of 9.2 million emergency room visits every year (Borse & Sleet, 2009). Of the emergency room visits caused by unintentional injuries, most are children under the age of five (Phelan et al., 2005). There is a broad spectrum of incidents that are labeled unintentional injury. For example, according to the CDC Childhood Injury report, the leading causes of death for unintentional injuries for children under 5 years old are suffocation, fire, burns, and drowning (Borse et al., 2008). Consuming poisonous items, burns, and choking also result in a high number of unintentional non-death injuries for children 5 years old and under (Borse et al., 2008). A typical example of the kind of unintentional injuries that result from unidentified hazards in the environment is strangulation or suffocation which can be caused by a number of hazards like loose cables, plastic bags, and crib wedges (Kraus, 1985). A related injury is drownings, which also often result from a lack of proper supervision by the caregiver (Kemp & Sibert, 1992).

Though the data are not causal, unintentional injuries are sometimes attributed to child abuse or neglect (Kemp & Sibert, 1992). Risk for child abuse and child neglect increases with the number of risk factors children are exposed to in their environments, with a 20% increase in risk for children exposed to four or more risk factors (Brown et al., 1998). Risk factors can also predict recurrence of child abuse and child neglect in families (Coohey, 2006). Some known risk factors include young parents, high rates of single parenthood, psychological illness, complications during childbirth, low birth weight, and lower education in the mother (Schlossesser et al., 1992, Sidebotham et al., 2001). A history of abuse has been found to be less significant against other risk factors for predicting recurrence of child abuse and child neglect except in the case of sexual abuse of the mother (Sidebotham et al., 2001). A child going to the emergency room because of unintentional injury may also be at high risk for incurring a disability that will adversely affect them throughout their entire lives (Brosbe et al., 2011; Tham et al., 2013).

A common place for access to hazards that lead to unintentional injuries is the family home (Nagaraja et al., 2005; Phelan et al., 2005). About 90% of injuries happen at home under the supervision of a caregiver (Phelan et al., 2005; UNICEF, 2001). Within the home, younger children are less likely to be able to identify a hazard than older children, with children under five being at greater risk for injury than children over the age of nine. (Nagaraja et al., 2005; Phelan et al., 2005). The extent to which a caregiver can attend to a child's exposure to hazards at home is a major predictor of that child's likelihood of being injured and sent to the emergency room (Morrongiello et al., 2006).

Family composition and by extension, the people responsible for supervising a child are of significant importance and one of the most deciding risk factors for unintentional injuries, increasing the likelihood that a child would die from unintentional injuries by up to six times when a child is living with unrelated adults (Schnitzer, 2008). Large families, families with a single parent, and families with stepparents have also been found to be at greater risk for child maltreatment with children in adopted families being at significantly lower risk (Van Izendoorn et al., 2009). An area of analysis that has not been isolated in attempting to understand unintentional injuries is the role of substitute caregivers. Typically referred to as babysitters, substitute caregivers may be poorly screened by parents and lack an understanding of expectations and needs (Kourany & Labarbera, 1986). Though substitute caregivers play a critical role in caring for children, there is limited literature specifically evaluating the effectiveness of teaching childcare skills to current and future substitute caregivers (DeBord & Sawyers, 1996; Hackman et al., 2012).

As implied in the term, unintentional injuries are not unavoidable, and they can be greatly reduced using behavioral interventions. Specifically, researchers suggest that hands on behavioral training and environmental changes, as compared to education in prevention alone (Wynn et al., 2016), is the principal method for long term behavior change that helps parents prevent the occurrence of unintentional injuries with their children (DiGuiseppi & Roberts, 2000). Within the behavioral literature, researchers have taught children how to respond if they encounter a hazardous item (Dancho et al., 2008) and taught parents to identify, remove, or safely store hazardous items. For example, King and Miltenberger (2017) evaluated video modeling to teaching children with autism spectrum disorder (ASD) to move away from a pill container and tell a parent about the hazardous item. The authors found two of three participants required in-situ training in addition to video modeling to reach mastery criterion and one participant required incentives. In a second study, Petit-Frere (2019) evaluated the use of modified BST that included least-to-most prompting to teach eight young children with disabilities to move away from a pill container and tell an adult. The authors found the participants were able to engage in the trained behaviors without the use of in-situ training. Though both of these papers demonstrate promising results for teaching children to identify pill containers, move away, and report to an adult, more research needs to be conducted on the generalizability of these skills to other known household hazards. Vanselow and Hanley (2014) evaluated the use of a computerized behavioral skills training to teach safe responses in the presence of hazards showing results for generalization with limited in-situ assessments. Future research should evaluate the replicability of these findings and further analysis of which children may need in-situ feedback versus BST alone.

Though it is important for children to learn to identify and respond safely to known household hazards due to the difficulty in removing all hazards in an environment, the primary responsibility for maintaining a safe, hazard free environment is incumbent upon supervising adults. The latter is particularly important in light of the findings by Morosohk (2020) that tangible reinforcers were required during BST training and at follow-up for children to reach mastery criteria for safely responding to hazardous items in the environment. This suggest stimulus control for the safe responding behavior may only be achieved with the use of tangible reinforcers. This raises the question about whether or not the safe responding behavior will maintain under thin schedules of reinforcement and/or extinction. These questions further highlight the importance of adults maintaining safe, hazard free environments.

One behavioral approach to teach parents to identify and remove or secure hazards in the home environment is called the home accident prevention inventory (HAPI). Tertinger et al. (1984) was the first published article supporting the use of the HAPI protocol. The authors taught six families to identify hazards and then remove or secure them from children's reach. Initial training led to a decrease in hazards within the family home. Of the six families trained, only one family was reported for another instance of neglect at a two year follow-up (Guastaferro & Lutzker, 2019). Barone et al. (1986) revised the HAPI training to include an audio-slide show to train three families. All three families had a reduction of hazards per room from baseline to follow up (e.g., Family A mean 84 to 9). Mandel et al. (1998) revised the HAPI protocol to include falling and drowning hazards. Lutzker et al. (1998), Mandel et al. (1998), and Metchikian et al. (1999) all reported a reduction of hazards in the family homes after training with the revised protocol called the HAPI-R. Similar results were found when the HAPI-R protocol was used to teach Spanish-Speaking families to decrease accessible hazards in their homes (Cordon et al., 1998). The HAPI-R protocol continues to be used within the Project 12-Ways/Safe Care model. The behavioral intervention within the HAPI-R protocol functions on a 4-step teaching model where participants are given an explanation of the target prevention skill, the skill is then modeled for them, the participant practices the skill, and then they are given feedback until mastery criteria is met. These protocols have been evaluated beyond the previously mentioned single subject design studies to include larger scale evaluations.

Gershater-Molko et al. (2003) evaluated the intervention components, including HAPI-R, of Project Safe Care (further referred to as Safe Care) with 41 families and found that the families' involvement in Safe Care reduced access to hazards in the home by over 70%. The Safe Care model was implemented state-wide in Oklahoma where 2175 families received the package of services and there was a 26% reduction in recidivism for families who received Safe Care (Guastaferro & Lutzker, 2019). Specific to the HAPI-R protocol, Rostad et al. (2017) also found significant reductions in access to hazards across four rooms in the homes of 57 families that participated in a state-wide Safe Care program in Georgia. Unlike other educational programs that have been evaluated for efficacy of unintentional injury prevention, the HAPI-R protocol includes education, skill acquisition, and coaching with objective data recording versus self-report (Damashek & Kuhn, 2014). These elements along with cultural adaptations (Slemaker et al., 2017) make the HAPI-R protocol a promising approach to preventing unintentional injury (Damashek & Kuhn, 2014).

Though the HAPI-R protocol has been evaluated with parents, there are no published studies evaluating the implementation of the protocols with substitute caregivers. Thus, the purpose of this study was to answer the question to what extent would the use of behavioral procedures to teach the HAPI-R protocol increase a substitute caregiver's ability to identify hazards that have been found to cause unintentional injuries among young children. This study also assessed the social validity of the HAPI-R protocol with substitute caregivers.

Method

Participants and Settings

Five undergraduate students from a southeast university in the United States participated in this study. All participants were working with young children but were not parents. Participants were required to score below 80% on the HAPI-R checklist to be included in the study. Recruitment for the study was conducted by sending information to University instructors to share with their students. Participants earned a $25 gift card of their choice for participating in the study. Boff was a 22-year-old female. Wallace and Hector were 20-year-old males. Dorothy was a 20-year-old female. Sabrina was a 19-year-old female who scored above the 80% threshold during her first baseline assessments so was not included in the study.

Baseline, intervention, post-BST, and generalization sessions were conducted within offices and a kitchen space within a university building. The same rooms were used for baseline and post-BST sessions. Training occurred in different areas than baseline and post-BST sessions excluding the playroom. All generalization rooms were novel to the participants. Each office was approximately 11 x11 ft with one entrance. The offices were outfitted with a toy box, toys, chairs, and a couch. The kitchen had a refrigerator, sink, cabinets, and trash can. Researchers staged each room with hazards and recorded the location of each hazard before the participants entered the room.

Target Behavior and Data Collection

Primary Dependent Variable (DV)

The primary DV for the participants was the percentage of hazards identified and either removed or documented on a piece of paper if they could not be corrected or removed. Hazards were codified and scored using the Home Accident Prevention Inventory Revised (HAPI-R) (See Appendix A for HAPI Data Collection Sheet). The HAPI-R includes 10 categories of hazards and hazards from each of these categories were included in all assessments except for two categories (firearms and drowning) due to the constraints of conducting the study in a University setting. The firearm and drowning categories were taught in the informational part of the training but were not assessed in rehearsal. Scores were determined by dividing the number of identified hazards by the number of hazards hidden in the room. For example, if the participant removed five hazards and there were 25 hazards hidden in the room, we divided five by 25 and multiple by 100 for a score of 20%. The locations of each hazard were recorded with a video camera when the room was staged. After the participant exited the room with identified hazards either removed from the room (e.g., small choking hazard) or fixed (e.g., outlet reported to be covered), the researchers compared the items found or listed against the master hazard scenario list.

Secondary Dependent Variables

Non-Hazards. Data was collected on the number of items identified by participants that did not meet the definition of a hazard on HAPI-R. The total number of non-hazards was achieved by adding the number of items written down on the paper for need of correction and the number of items removed from the room as hazards. For example, if the participant wrote down three toys that were not hazards and also removed two non-hazardous candles, we would record five non-hazards for the room.

Ratio of Hazards to Non-Hazards. The ratio of hazards was calculated by first dividing the total number of hazards by non-hazards for a preliminary ratio score. The preliminary ratio score was then subtracted from one for a secondary ratio score. The secondary ratio score was then converted to a negative number, positive number, the number zero, or the number one. The following headers will provide examples of each converted number.

Converted Negative Number. If the secondary ratio score was less than 1, the number was converted to a negative number. For example, if five hazards were identified and 15 non-hazards were identified, we divided five by 15 for a preliminary ratio score of .3333. This preliminary score was then subtracted from one for a secondary ratio score of .666667. The secondary score was then converted to a -.666667 to denote there were more non-hazards identified compared to hazards.

Converted Positive Number. If the secondary ratio score was a negative number, that number was converted to a positive number. For example, if 26 hazards were identified and one non-hazard was identified, we divided 26 by one for the preliminary ratio of 26. This preliminary score was then subtracted from one for a secondary ratio score of -25. The secondary score was then converted to a positive 25 to denote there were more hazards identified compared to non-hazards.

Number Zero. If the preliminary ratio was a one, that number was converted to a zero. For example, if eight hazards and eight non-hazards were identified, we divided eight by eight for a preliminary ratio of one. This preliminary score was then converted to a zero to denote there were an equal number of hazards to non-hazards.

Number One. If the preliminary ratio was a zero, that number was converted to a one. For example, if 23 hazards and zero non-hazards were identified, we divided 23 by zero for a preliminary ratio of zero. This preliminary ratio was converted to a one to denote there were no non-hazards identified.

Inter-observer Agreement (IOA)

Two independent observers compared the hazards found to the master datasheet that included the list of hazards for each room and scenario for 93% of all sessions. Individual participant IOA data can be found in Table 1. IOA was calculated by comparing item by item. If the two observers agreed the item was found, a one was scored. If the two observers did not agree the item was found, a zero was scored. The summation of all ones was then divided by the total number of ones possible. For example, if there was an agreement on 25 items and disagreement on two, we divided 25 by 27 and multiplied by 100% for an agreement of 93%. IOA was 100% for all sessions across both baseline and intervention phases for all participants.

Treatment Fidelity

Treatment fidelity was collected for 100% of all baseline sessions with a mean score of 100%. Across all post-BST sessions, including with the visual and generalization, treatment fidelity was calculated for 70.3% of all sessions (fidelity checklist can be found in Appendix B) with a mean score of 97.3% (range 75% - 100%). These steps were scored either correct or incorrect by research assistants through video recordings of the sessions and trainings. Percentage of correct steps engaged in was calculated by taking the total number of "YES" answers and dividing it by the total number of "YES" and "NO" answers and then multiplying by 100. There was one assessment for Dorothy between assessment 11 and 12 where the room was not staged correctly so the data was not graphed. During Wallace's kitchen generalization probe, a bowl of hazards was unintentionally left in the room which resulted in a lower fidelity score for that room. Table 2 depicts individual participant's treatment fidelity data. The fidelity for all BST training sessions was 100%.

Social Validity

Each participant was asked to complete a pre- (Appendix C) and post-intervention (Appendix D) survey asking them questions about their confidence on identifying hazards and if they believed training to learn to identify hazards was important. Individual ratings can be found in table 3.

Pre-Intervention

For the first question, asking if the participant felt confident in their own ability to identify hazardous items and scored on a scale of one to five with five being very confident and one being very unconfident, the mean was 2.2. In the second question the participant was asked what their confidence was in their ability to supervise children and was scored in the same manner as question one, the mean was 3.4. The third question asked the participants how necessary they felt it was for them to receive training on identifying hazards for children and was scored on a scale of one to five with five being very necessary and one being very unnecessary, the mean was 3.4. The fourth question asked the participant how necessary they felt it was for others to receive training on identifying hazards for children and was scored in the same manner as question three, the mean was 3.4. The fifth question of the survey asked the participants how necessary they felt it was for individuals to practice identifying hazards before supervising children and was scored in the same manner as question four with a mean of 5.

Post-Intervention

In the post-intervention survey, Wallace reported feeling more confident in his ability to identify hazards with a score of four from his pre-intervention score of two. He reported the training packet was effective at a score of three but he gave BST intervention and feedback a score of five as very effective with helping him learn to identify hazards.

Design

A non-concurrent multiple-baseline across participants design was employed to analyze the effectiveness of BST to teach substitute caregivers how to identify hazards.

Procedures

Pre-Experimental Procedures

The researcher and participant exchanged emails to identify a mutual time to meet to discuss the consent, sign the consent, and complete the pre-intervention social validity scale.

Baseline

There were five rooms utilized during baseline assessments. Two rooms were offices used to stage as office areas, one was a kitchen area, one was a sitting area converted to a living room for staging, and the playroom was staged in a large open room. There were four categories: office, playroom, kitchen, and living room. Each room had pre-planned datasheets for the staged hazards (See Appendix E for staging scenarios). Each room was staged with 25-30 hazardous items based on the pre-planned scenarios. The order of the room was randomized for each participant within the block of scenarios. The first time a room was staged, the researchers would video record where each hazard was located to ensure accurate replication of the location of hazards for future participants receiving the same scenario. If a participant's baseline extended past four rooms, the participants were exposed to scenario one for all rooms before being exposed to scenario two for the same room. For example, the first time a participant was exposed to the playroom, they were exposed to the pre-planned hazards for playroom scenario 1. The second time they were in the playroom, they were exposed to the pre-planned hazards for playroom scenario 2. Participants were read the following script, "You have 20 minutes to sweep the room to make it safe for a toddler. There may or may not be hazards in the room. If you find hazards that can be removed, place them in this box. If the hazard cannot be removed or fixed, write it on this blank sheet of paper." If the participant finished before the 20 minutes elapsed, the session was terminated. Participants did not receive any feedback during or following their completion of baseline assessments. After the participant exited the training area, the researcher immediately compared the hazards found to the hazards on the master pre-planned data sheet.

Behavioral Skills Training (BST)

Each participant was provided a training packet that included information about common hazards that lead to emergency room encounters for small children and the importance of storing and removing hazardous items to prevent injury. The participants were then provided with live instructions and descriptions about each hazard category. Participants then followed the researcher into a staged training room where they observed the researcher scan the room for hazards listed on the HAPI-R checklist. During this model, participants were allowed to ask questions. Next, they were escorted to pre-staged rooms and directed to scan the room for hazards. Participants were informed they could ask two questions of the researcher during the practice and still score 100%. The researcher was in the room with the participant and wrote down the items the participant found as they were scanning the room. After each room, the researcher would review the items found and answer any questions the participant had about discriminating between hazards and non-hazards. Participants were required to meet a mastery criterion of 100% accuracy across all three rooms to proceed to post-BST assessments. All participants scored 100% in their first three rooms, so the researcher did not have to re-stage the rooms for further practice. One 90 min BST session was conducted with each participant.

Post-BST Assessments

To evaluate whether the BST training increased each participant's ability to identify hazardous items, post-BST assessments were conducted identical to baseline in the same rooms and novel rooms to assess for generalization to other rooms. Participants who scored below 100% in post-BST assessments were immediately provided in-vivo feedback. During in-vivo feedback, the participants followed the researcher back into the room where the researcher would point out an area that might include a hazard and ask the participant if they were able to identify any hazardous items in the area. If the participant was not sure, the researcher would identify the hazard for the participant.

Visual Support

If a participant had three sessions below 100%, the researchers introduced a visual (see Appendix F). Participants were provided information about using the visual as a reminder of categories they should consider when evaluating the room for hazards as well as reminders for questions the participant should be asking themselves throughout the scan. Once a participant scored 100% in each room, they were then exposed to generalization rooms.

Generalization.

The generalization rooms were rooms that the participants had not previous been exposed to during the study. These assessments were conducted identical to the post-BST assessments and included the visual support for the one participant who progressed to the generalization rooms. See Appendix G for staging scenarios.

Results

Figure 1 depicts the results for the primary dependent variable. During baseline, Boff identified an average of 37% (range 17% - 59%) of hazards. For the one session post-BST, Boff showed a substantial increase by identifying an average of 72% of hazards. During baseline, Wallace identified an average of 43% (range 3% - 73%) of hazards with variability across each of the different rooms. During post-BST, Wallace's correct identification of hazards increased to an average of 85% (range 77% - 100%). After adding a visual to the post-BST, Wallace identified an average of 93% (range 71% - 100%) of hazards. During generalization sessions, Wallace's correct identification of hazards increased to an average of 97% (range 92% - 100%) with less variability. During baseline, Dorothy identified an average of 22% (range 3% - 38%) of hazards. After BST, Dorothy's average of correctly identified hazards steadily increased to an average of 80% (range 54% - 96%) of hazards. Upon adding a visual support, Dorothy displayed an upward trend in identifying hazards with an average of 81% (range 74% - 96%). During baseline, Hector identified an average of 43% (range 14% - 86%) of hazards.

Figures 2 – 5 depict the ratio of hazards to non-hazards identified in the rooms. Boff, Wallace, and Dorothy all had a change from baseline to intervention based on their ratio of hazards to non-hazards identified. Figure 6 depicts the mean change by phase and room for Wallace. There is an overall increase in identification of hazards across all rooms. The most notable change for Wallace is in the playroom, kitchen, and office. During baseline he identified an average of 41% of hazards in the playroom, 33% in the kitchen, and 35% in the office. Post-

BST he identified an average or 84% of hazards in the playroom, 77% in the kitchen, and 82% in the office. After adding the visual support, he identified an average of 98% in the playroom, 86% in the kitchen, and 100% in the office. During the generalization assessment, he identified 100% of hazards in the playroom, 100% in the kitchen, and 92% in the office. When Wallace entered the kitchen for the generalization probe, there was a bowl of hazards unintentionally left in the room. He was able to identify 100% of the staged hazards and also brought the research team the bowl of hazards he was unaware was not part of the staging.

Figure 7 depicts the mean change by phase and room for Dorothy. During baseline she identified an average of 21% of hazards in the living room, 33% in the playroom, 29% in the kitchen, and 4% in the office. Post-BST, she identified an average of 96% of hazards in the living room, 54% in the kitchen, and 90% in the office. We added the visual support before conducting the post-BST assessment in the playroom. After adding the visual support, she identified an average of 83% in the living room, 96% in the playroom, and 74% in the kitchen.

Discussion

This study extended the research conducted on the HAPI-R protocol to substitute caregivers. Extending the research to the young adult population that do not yet have children could be beneficial in multiple ways including but not limited to the probability that these young adults might often be asked to care for younger siblings, they might work in settings with children such as daycares or camps, and they might one day have their own children that will benefit from the knowledge and skills that were learned (Kourany & Labarbera, 1986).

While variability occurred across participants, especially within the baseline phase, overall increases in correct identification of hazards were observed for all participants after BST and in-vivo feedback. These results were similar to those found in studies that trained parents using the HAPI-R protocol (Cordon et al., 1998; Lutzker et al., 1998; Mandel et al., 1998; Metchikian et al., 1999). The studies with parents found that hazards were reduced, however, few parents reached 100% reduction of hazards in their homes which also occurred with the participants in this study reaching the high 90's but not 100%. Behavioral skills training (BST) within the HAPI-R protocol implements a 4-step teaching model where participants are given instruction on the skill, the skill is then modeled, they rehearse the skill, and then they are given feedback until they reach mastery criteria. The use of this BST model was not effective in improving the identification of hazards to 100% and required the implementation of a less efficient intervention, in-vivo feedback to improve scores for hazard identification for all participants. The visual support was added in an attempt to improve hazard identification to

100% but based on the results it is not clear if the visual support was helpful as participants hazard identification remained high but rarely reached 100%. This finding is similar to the previous research with the HAPI-R protocol which requires in-home, in-vivo feedback. In addition, this finding of a need for in-vivo feedback is similar to other study outcomes and recommended best practices of training adults to implement behavioral protocols outside of the training environment (Shapiro & Kazemi, 2017).

As observed in the data, two participants, Wallace and Hector, appeared to improve during the baseline phase. This may have been due to a testing effect as we noticed that once they inadvertently found hidden objects, they started looking harder and even appeared to create rules for what might be a hazard. For example, Wallace told us during the BST training that in the last few baseline sessions he “was just looking for the things that were hidden and removing those” without discriminating between what was actually hazardous or not. While he removed numerous hidden items, he often did not remove items that were hazardous if they were out in the open (e.g., a pack of cigarettes sitting on the table). Once Hector found one hidden small item under a rug in session four he began tearing the room apart and turning all of the furniture over suggesting that he may have also believed that the hazardous items were all hidden. Unfortunately, due to Covid restrictions and difficulty with recruitment, we were not able to recruit and run all of the participants at the same time so that we could implement a multiple probe design. A probe design may have decreased some of the possible learning effects or rule following behaviors that might have occurred as this design could have allowed for exposing the participants to each room only one time instead of multiple times.

Given that participants may have created arbitrary rules for identifying hazards in baseline, we felt that it was important to evaluate if participants were discriminating between what was a hazard and what was safe to remain in the room. The removal of non-hazards varied greatly in baseline with Dorothy removing over 100 non-hazardous items in her last baseline session and Hector removing anywhere from 20-100 non-hazardous items across his baseline sessions. Immediately upon the implementation of BST, the removal of non-hazardous items decreased for all participants and remained near zero across the intervention phases suggesting that the training improved participants' ability to discriminate hazardous and non-hazardous items. This is an important socially valid result because as a caregiver or babysitter one would not remove everything from a room to make it safe for a child but instead would only remove items that were dangerous. In baseline, some of our participants even removed toys that were appropriate for toddlers to play with including toy blocks, non-poisonous markers, and toys cars.

There were several limitations to this study. First, limited data points were collected for Boff as she withdrew from the study due to her being exposed to COVID by another member of her household and she was subsequently quarantined. Second, as described earlier, the experimental design of the study may have limited our ability to determine the effects of the intervention for at least one participant (Wallace), due to possible learning effects from repeated exposure to the rooms. Third, while we attempted to accurately simulate possible scenarios that exist within home settings, and conducted generalization sessions in new rooms, it was not possible to simulate every possible hazard that exists within home environments (including pools, fireplaces, and weapons). And last, the number of non-hazards in each room was not set and thus we had no record for how many total non-hazards were in each of the rooms. This study was conducted in offices and open areas at a University because it was not feasible to access homes safely during the COVID-19 pandemic. Future research might consider extending this study to home settings and other environments that children attend such as daycares and grandparents' homes. Additional studies could also consider specifically selecting participants that currently work with young children as identifying hazards would be an important skill for them to acquire and use. There was one participant who was excluded from participation for scoring above inclusion criteria during baseline assessments. This participant reported that they had a history of working with children. Future studies might evaluate differences in identifying hazards based on experience and training in working with young children.

To conclude, this study extends the research on teaching the identification of hazards to substitute caregivers and showed that these caregivers were able to discriminate hazardous and non-hazardous items after training. Continued in-vivo feedback was needed for participants to reach a high level of accurate performance suggesting that it was not easy for participants to scan a room and quickly identify hazards. Setting up the rooms and in-vivo feedback was time consuming for both researchers and participants. Future research might examine ways to teach these skills in a more efficient yet effective manner that can be widely distributed (i.e., creating interactive videos or using virtual reality) to increase safe environments for young children.

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Appendix A: HAPI Checklist

Home Accident Prevention Inventory—HAPI

Assessment Form

Parent ____________ **Child** ____________ **Provider** ____________

Child's Reach ____________ **Child's Eye-level** ____________

Room ____________ **Session #** ______ **Date** ____________

Assessment Baseline Training End of Module **Assessment Type** Formal Informal

POISON	Hazard item (count)	Total
Beauty products		
Medications		
Cleaning products		
Paints, solvents, etc.		
Pesticides, herbicide, etc.		
Poisonous plants		
Alcoholic beverages		
Tobacco, THC, or nicotine		

CHOKE	Hazard item (count)	Total
Small objects (e.g., toys, candies, push pins, etc.)		

SUFFOCATION	Hazard item (count)	Total
Cords		
Plastics		
Sleep hazards [infant homes]		

DROWNING	Hazard item (count)	Total
Standing water in basins		
Unsecured toilet		

FIRE/ELECTRICAL	Hazard item (count)	Total
Combustibles		
Fireplaces without screens		
Outlet/switch without plate/safety cover		
Appliances without covers		
Damaged electrical cords/plugs		

FALL/ACTIVITY RESTRICTION	Hazard item (count)	Total
Balcony/porch/loft		
Steps		
Windows		
Objects in walkway		
Activity restriction		

SHARP OBJECT	Hazard item (count)	Total
Knives, scissors, corkscrews, vegetable peelers, etc.		

FIREARM	Hazard item (count)	Total
Guns, rifles, BB guns, etc.		

CRUSH	Hazard item (count)	Total
Objects over 10 pounds (e.g., TV, bookshelf, boxes, etc.)		

ALLERGEN/ORGANIC	Hazard item (count)	Total
Air allergens (e.g., smoke, dust)		
Decaying food/dirty dishes		
Evidence of infestation		

Appendix B: Treatment Fidelity Checklist

Participant Name:	Session #:	Date:	Trainer:
Data Collector:			
Baseline or Treatment			
Treatment Fidelity: Baseline			
Placed 25-30 hazards in room before participant arrived	Yes / No / NA		
Told participant to enter the room and find all hazards, remove or fix hazards	Yes / No / NA		
BST Training Steps			
Provided Video Instructions	Yes / No / NA		
Provided Video Model	Yes / No / NA		
Provided Opportunity for Participant to Practice	Yes / No / NA		
Provided Feedback	Yes / No / NA		
Had Participant practice until reaching 100% accuracy across three rooms	Yes / No / NA		
Post-BST with and without Visual Assessments (circle one)			
Placed 25-30 hazards in room before participant arrived	Yes / No / NA		
Told participant to enter the room and find all hazards, remove or fix hazards	Yes / No / NA		
If the participant scored below 100%, provided feedback	Yes / No / NA		
If the participant scored 100%, did not provide feedback	Yes / No / NA		
Provided visual	Yes / No / NA		

Appendix C: Pre-Intervention Social Validity Survey

Initials:______________ Date:______________

Please fill out this survey prior to participation in the study.

1) How confident are you in your ability to identify hazardous items that could harm a toddler or younger aged child?
   5 – Very Confident
   4 – Somewhat Confident
   3 – Confident
   2 – Somewhat Unconfident
   1 – Very Unconfident
2) How confident are you in your ability to safely supervise children?
   5 – Very Confident
   4 – Somewhat Confident
   3 – Confident
   2 – Somewhat Unconfident
   1 – Very Unconfident
3) How necessary do you think it is for you to receive training on identifying hazards for children?
   5 – Very Necessary
   4 – Somewhat Necessary
   3 – Necessary
   2 – Somewhat Unnecessary
   1 – Very Unnecessary
4) How necessary do you think it is for others to receive training on identifying hazards for children?
   5 – Very Necessary
   4 – Somewhat Necessary
   3 – Necessary
   2 – Somewhat Unnecessary
   1 – Very Unnecessary
5) How necessary do you think it is for individuals to practice identifying hazards before supervising children?
   5 – Very Necessary
   4 – Somewhat Necessary
   3 – Necessary
   2 – Somewhat Unnecessary
   1 – Very Unnecessary

Appendix D: Post-Intervention Social Validity Survey

Initials:______________ Date:______________

Please fill out this survey after completion of the study.

1) How confident are you in your ability to identify hazardous items that could harm a toddler or younger aged child?
   5 – Very Confident
   4 – Somewhat Confident
   3 – Confident
   2 – Somewhat Unconfident
   1 – Very Unconfident
2) How confident are you in your ability to safely supervise children?
   5 – Very Confident
   4 – Somewhat Confident
   3 – Confident
   2 – Somewhat Unconfident
   1 – Very Unconfident
3) How necessary do you think it is for you to receive training on identifying hazards for children?
   5 – Very Necessary
   4 – Somewhat Necessary
   3 – Necessary
   2 – Somewhat Unnecessary
   1 – Very Unnecessary
4) How necessary do you think it is for others to receive training on identifying hazards for children?
   5 – Very Necessary
   4 – Somewhat Necessary
   3 – Necessary
   2 – Somewhat Unnecessary
   1 – Very Unnecessary
5) How necessary do you think it is for individuals to practice identifying hazards before supervising children?
   5 – Very Necessary
   4 – Somewhat Necessary
   3 – Necessary
   2 – Somewhat Unnecessary
   1 – Very Unnecessary

Initials:_____________ Date:_____________

Please fill out this survey after completion of the study.

6) How effective were the videos in helping you learn how to identify hazardous items?
   5 – Very Effective
   4 – Somewhat Effective
   3 – Effective
   2 – Somewhat Ineffective
   1 – Very Ineffective
7) How effective was the training packet in helping you learn how to identify hazardous items?
   5 – Very Effective
   4 – Somewhat Effective
   3 – Effective
   2 – Somewhat Ineffective
   1 – Very Ineffective
8) How effective did you believe BST was in training how to identify hazards?
   5 – Very Effective
   4 – Somewhat Effective
   3 – Effective
   2 – Somewhat Ineffective
   1 – Very Ineffective
9) How effective did you believe Booster Training was in training how to identify hazards? (If Applicable)
   5 – Very Effective
   4 – Somewhat Effective
   3 – Effective
   2 – Somewhat Ineffective
   1 – Very Ineffective
10) How effective did you believe In-Situ Training was in training how to identify hazards? (If Applicable)
   5 – Very Effective
   4 – Somewhat Effective
   3 – Effective
   2 – Somewhat Ineffective
   1 – Very Ineffective

Appendix E: Hazards Master List

	Play Room	Living Room	Kitchen	Office 1	Office 2
Scenario 1	Nail Polish, Nail Polish Remover, Pills, Lysol, Febreeze, Writing Utensil, Eraser, Battery, Key, Small Candles, Paperclips, Crib Cord, Plastic Food Wrapper, Exposed Outlet, Scissors, Razer, 10lb Shelf	Lotion, Pills, Beer, Marbles, Batteries, Tacks, Grocery Bag, Box of Cigarettes, Needles, TV	Sunscreen, Pills, Nose Spray, Bag of Cough Drops, Soap, Glass Cleaner, Febreeze, Air Duster, Aerosolized Roach Killer, Beer, Hair Tie, Batteries, Grocery Bag, Plastic Food Wrapper, Lighter, Outlets, Scissor, Knives, Toaster, Blender, Rodent	Pills, Cleaner spray, Roach bait, Toothpicks, Paperclips, Quarters, Thumb Tacks, Outlets, Shelves, Droppings	N/A
Scenario 2	Nail Polish, Nail Polish Remover, Pills, Febreeze, Writing Utensil, Eraser, Battery, Key, Small Candles, Paperclips, Crib Cord, Plastic Food Wrapper, Scissors, Razer, 10lb Shelf	Pills, Brake Oil, Batteries, Thumb Tacks, Grocery Bag, Outlets, Needles	Sunscreen, Pills, Nose Spray, Bag of Cough Drops, Soap, Glass Cleaner, Febreeze, Air Duster, Aerosolized Roach Killer, Beer, Hair Ties, Batteries, Grocery Bag, Plastic Food Wrapper, Lighter, Matches, Outlets, Scissor, Knives, Toaster, Blender, Rodent	N/A	Nail Polish, Pills, Body Mist, Febreze, Brake Fluid, Paint, Roach Bait, Paperclips, Batteries, Grocery Bags, Matches, Outlets, Shelves, water cooler, Dust Buster
Scenario 3	Nose Spray, Pill, Febreeze, Box of Cigarettes,	Hairspray, Carpet Cleaner,	Nail Polish, Nail Polish Remover, Pills, Soap, Glass	Lotion, Nasal Spray,	N/A

	Writing Utensil, Hair Ties, Marbles, Paperclip, Push Pin, Zip Ties, Grocery Bag, Lighter (1), Matches, Damaged Electrical Cord, Scissors, Razer, Rodents	Crazy Glue, Spray Paint, Bug Spray, Beer, Candles, Erasers, Batteries, Key, Lighter, Match, Outlets, Razor, Folding Table Against Wall, Rodent	Cleaner, Febreze, Brake Fluid, Batteries, Zip Ties, Paper Clips, Grocery Bag, Matches, Outlets, Scissor, Writing Utensil, Microwave	Inhaler, Pill, Glass Cooktop Cleaner, Cascade, Brush Cleaner, Nails, Grocery Bags, Outlets, Damaged Cord, Scissors, Shelves, Dirty Vacuum	
Scenario 4	Nail Polish, Nail Polish Remover, Pills, Febreeze, Battery, Key, Small Candles, Paperclips, Crib Cord, Grocery Bag, Matches, Exposed Outlet, Damaged Cord, Scissors, Razor, 10lb Shelf (1)	Sunscreen, Carpet Cleaner, Brush Cleaner, Brake Fluid, Bug Spray, Candles, Batteries, Thumb Tacks, Eraser, Grocery Bag, Lighter, Match, Outlets, Razor, Folding Table Against Wall, Rodent	Pills, Nose Spray, Glass Cleaner, Febreeze, Air Duster, Spray Paint, Aerosolized Roach Killer, Beer, Hair Ties, Batteries, Grocery Bag, Lighter, Matches, Outlets, Scissor, Knives, Rodent	N/A	Nail Polish, Sunscreen, Carpet Cleaner, Dish Liquid, Wasp Killer, Roach Bait, Zip Ties, Candle, Paper Clips, Battery, Bottle Cap, Crib Cord, Grocery Bags, Matches, Outlets, Scissors, Shelves, Water Cooler
Scenario 5	Pills, Febreeze, Roach Killer, Battery, Key,	Pills, Brake Oil, Roach	Cascade, Febreeze, Soap, Air Duster, Spray	N/A	N/A

	Small Candles, Eraser, Grocery Bag, Matches, Exposed Outlet, Damaged Cord, Razer	Killer, Batteries, Thumb Tacks, Marbles, Eraser, Grocery Bags, Outlets, Damaged Cord, Nails	Paint, Beer, Cigarette Box, Hair Ties, Batteries, Grocery Bag, Lighter, Matches, Outlets, Scissor, Knives, Microwave, Rodent		

Appendix F: Visual Support

Creating a Safe Room for Toddlers		
Hazard Categories to check for:	Fire and Electrical	Small ingestible
	Crib cords/Plastics	Firearm
	Solid/Liquid poisons	Sharp objects
	Falling (e.g., stairs)	Drowning (e.g., pool)
Questions to ask yourself		
Did I go through the room clockwise?	*Yes*	*No*
Did I check under and inside of all reachable areas (including under carpet)?	*Yes*	*No*
Did I consider scaffolding opportunities when considering items within reach?	*Yes*	*No*
Did I check to ensure all cabinets/shelves are secured to the wall?	*Yes*	*No*

Appendix G: Generalization

	Generalization Living Room	Generalization Office	Generalization Play Room	Generalization Kitchen
Scenario 1	Glass Cleaner, Nail Polish, Nail Polish Remover, Nail Polish, Nasal Spray, Pills, Brake Fluid, Roach Killer, Batteries, Thumb Tacks, Eraser, Paperclips, Grocery Bags, Lighter, Outlets, Scissors, Rodent	Lotion, Sun Screen, Hand Sanitizer Bottles, Pills, Carpet Cleaner, Motor Oil, Roach Trap, Box of Cigarettes, Batteries, Marbles, Roll of Food Wrapper, Outlets, Scissors, Shelves	Nail Polish, Lotion, Pills, Nasal Spray, Carpet Cleaner, Glass Cleaner, Spray Paint, Roach Killer, Marbles, Eraser, Food Wrap, Grocery Bags, Outlets, Damaged Cord, Scissors, Bookshelf, Rodent	Lotion, Pills, Nasal Spray, Carpet Cleaner, Brush Cleaner, Soap, Brake Fluid, Roach Killer, Box of Cigarettes, Batteries, Matches, Thumb Tacks, Food Wrap, Outlets, Scissor, Microwave, Rodent

Appendix H: IRB Approval Letter

UNIVERSITY of SOUTH FLORIDA

APPROVAL

January 4, 2021

Carlos Abarca
5902 Memorial Highway
Apt 508
Tampa, FL 33615

Dear Mr. Carlos Abarca:

On 1/3/2021, the IRB reviewed and approved the following protocol:

Application Type:	Initial Study
IRB ID:	STUDY001928
Review Type:	Expedited 6, 7
Title:	Evaluating the Use of Behavioral Skills Training to Teach Substitute Caregivers to Identify Hazards
Approved Protocol and Consent(s)/Assent(s):	• IRB Protocol; • IRB Consent; Approved study documents can be found under the 'Documents' tab in the main study workspace. Use the stamped consent found under the 'Last Finalized' column under the 'Documents' tab.

Within 30 days of the anniversary date of study approval, confirm your research is ongoing by clicking Confirm Ongoing Research in BullsIRB, or if your research is complete, submit a study closure request in BullsIRB by clicking Create Modification/CR.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

Jennifer Walker
IRB Research Compliance Administrator

Institutional Review Boards / Research Integrity & Compliance
FWA No. 00001669
University of South Florida / 3702 Spectrum Blvd., Suite 165 / Tampa, FL 33612 / 813-974-5638

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Appendix I: Table 1

Table 1: Inter-Observer Agreement: Percentage Collected Per Phase and Mean Scores Post-BST Includes Sessions with Visual Support

Participant	% of BL	Mean BL IOA	% of Post-BST	Mean Post-BST IOA	% of Gen.	Mean Gen. IOA
Boff	100	100	100	100	-	-
Wallace	100	100	100	100	100	100
Dorothy	100	100	62.5	100	-	-
Hector	100	100	-	-	-	-

Note. Single dash denotes data were not collected due to COVID-19 restrictions

Appendix J: Table 2

Table 2: Treatment Fidelity Data: Percentage Collected Per Phase and Mean Fidelity Scores

Participant	% of BL	Mean Fidelity	% of Post-BST	Mean Fidelity	% of Post-BST & Gen. with Visual	Mean Fidelity
Boff	100	100	100	100	-	-
Wallace	100	100	100	100	58	96.4
Dorothy	100	100	100	95	25	100
Hector	100	100	-	-	-	-

Note. Single dash denotes data were not collected due to COVID-19 restrictions.

Appendix K: Table 3

Table 3: Pre-Intervention Social Validity Scores

Question	Boff		Wallace		Dorothy		Hector		Mean
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre
1	3	-	2	4	3	-	3	-	2.2
2	5	-	5	5	4	-	3	-	3.4
3	5	-	5	5	5	-	2	-	3.4
4	5	-	4	5	5	-	3	-	3.4
5	5	-	5	5	5	-	5	-	5
6		-		5		-		-	
7		-		3		-		-	
8		-		5		-		-	
9		-		5		-		-	
10		-		5		-		-	

Note. Single dash denotes data were not collected due to COVID-19 restrictions with completing study.

Appendix L: Primary and Secondary Dependent Variable

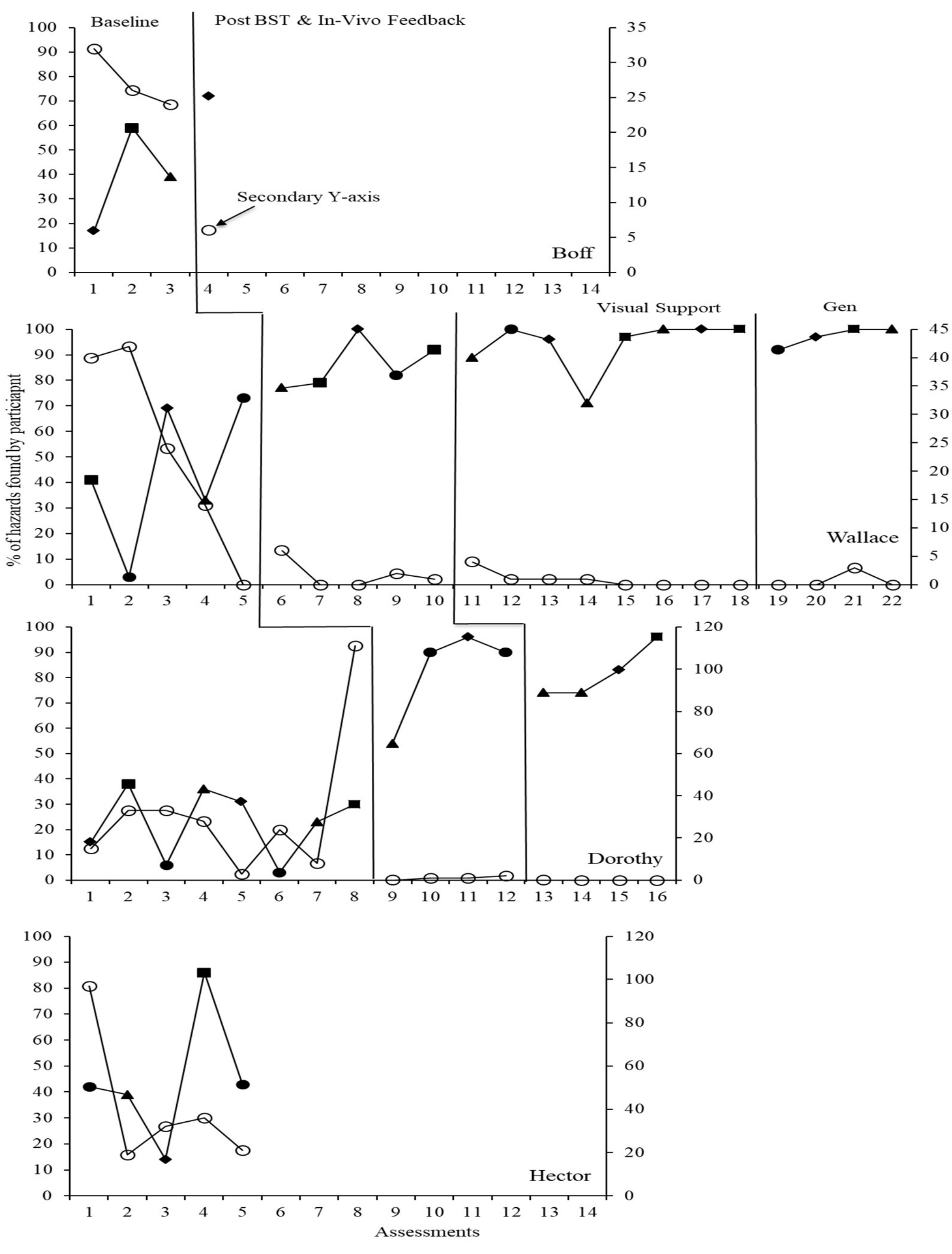

Figure 1: *Primary and Secondary DVs*

Note. Closed circles represent the office. Triangles represent the kitchen. Squares represent the play room. Diamonds represent the living room.

Appendix M: Boff Ratio of Non-Hazards

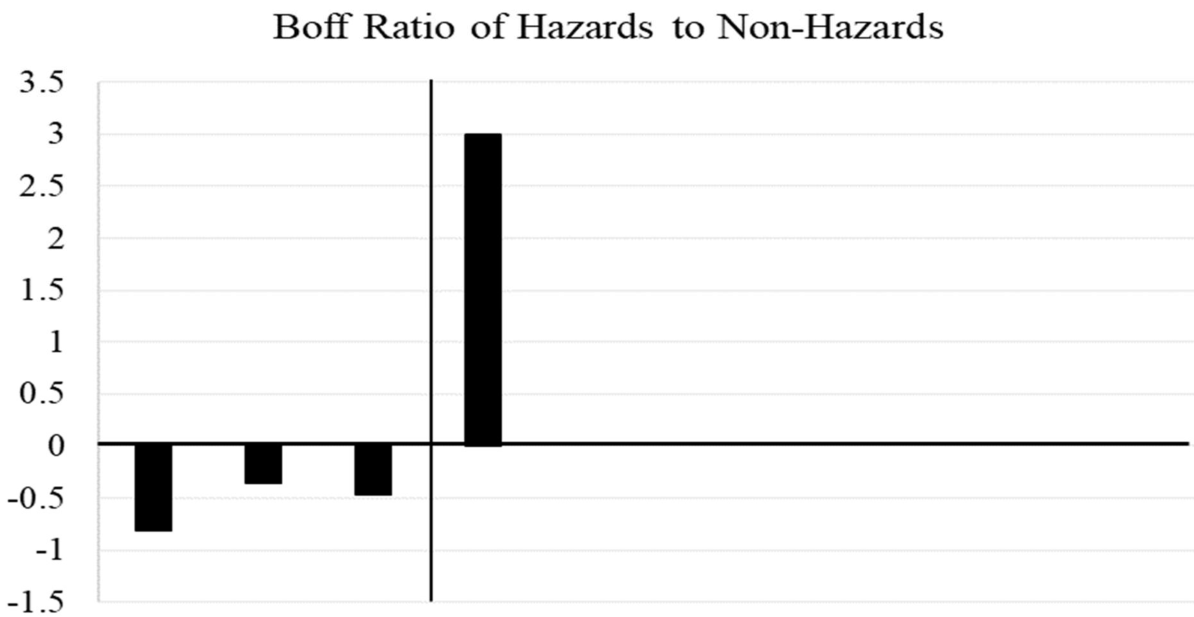

Figure 2: *Boff Ratio of Hazards to Non-Hazards*

Appendix N: Wallace Ratio of Hazards to Non-Hazards

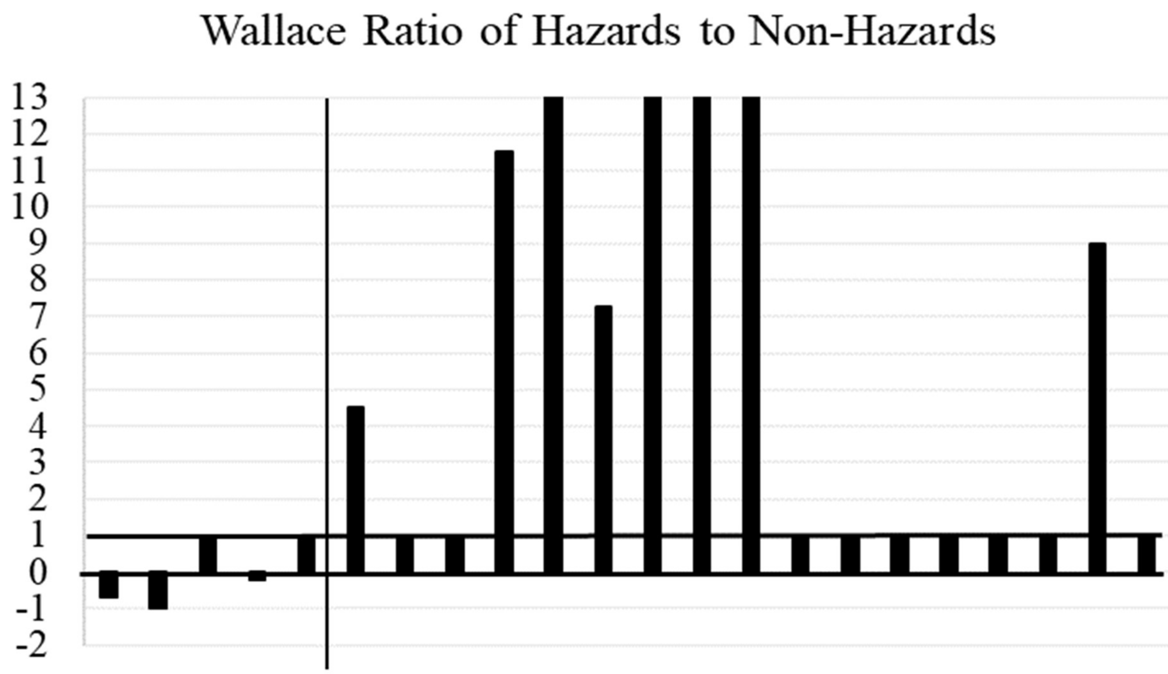

Figure 3: *Wallace Ratio of Hazards to Non-Hazards*

Note. Arrow denotes a zero.

Appendix O: Dorothy Ratio of Non-Hazards

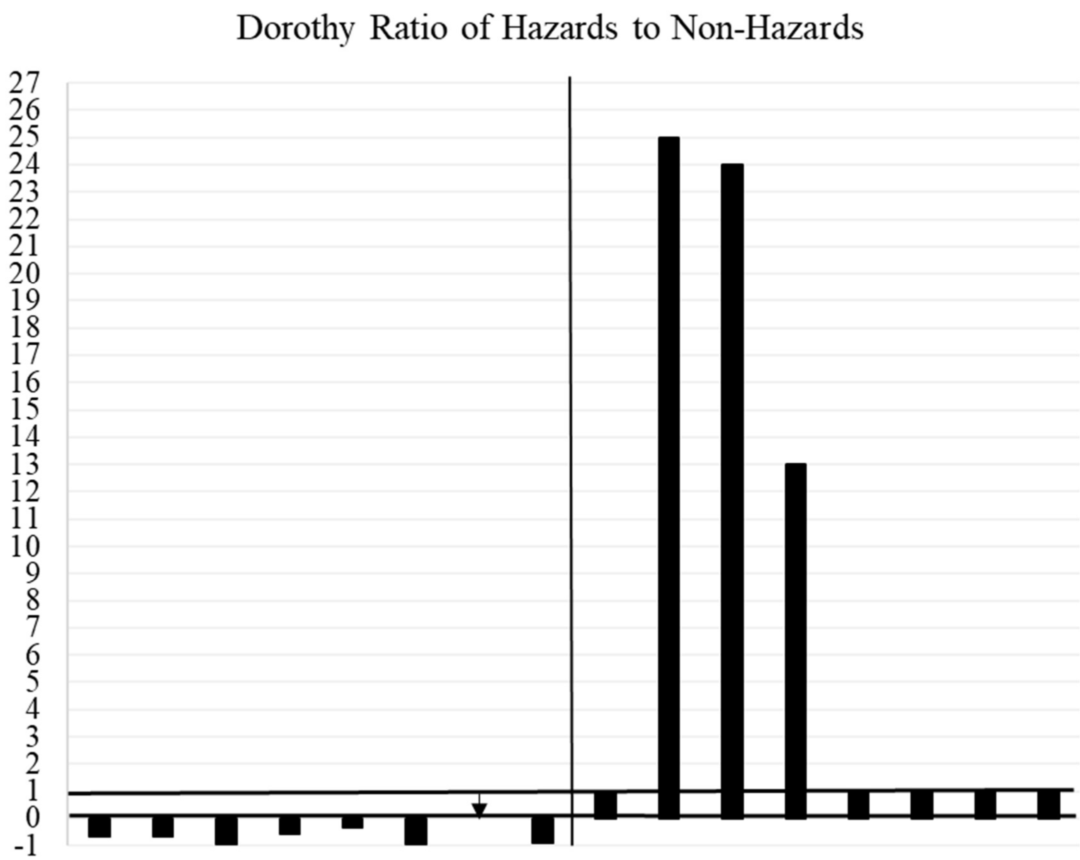

Figure 4: *Dorothy Ratio of Hazards to Non-Hazards*

Appendix P: Hector Ratio of Hazards to Non-Hazards

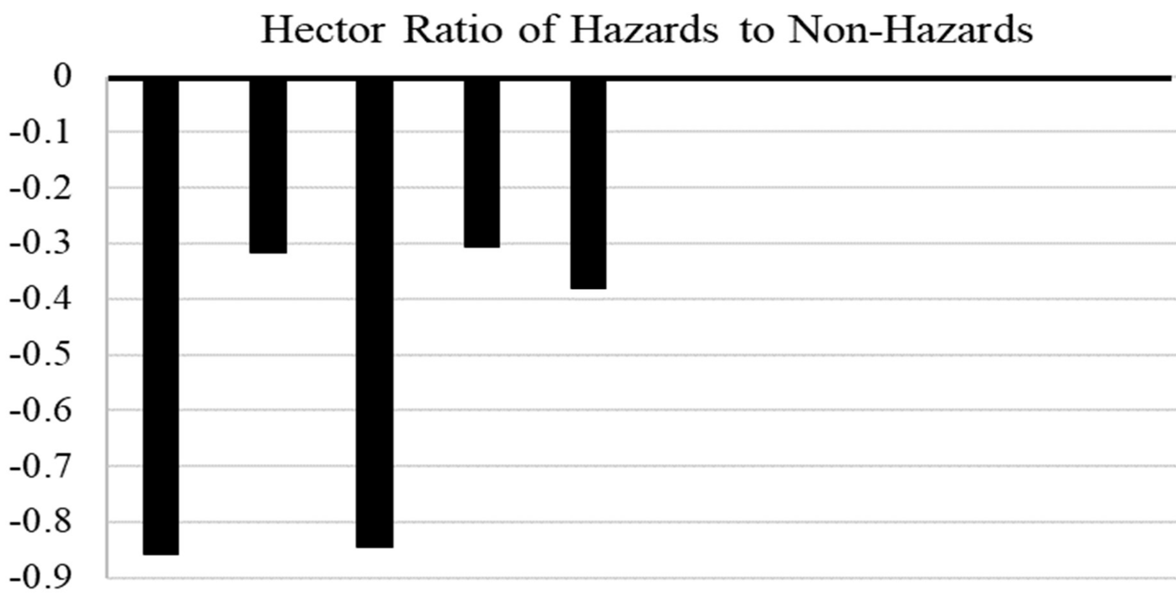

Figure 5: *Hector Ratio of Hazards to Non-Hazards*

Appendix Q: Wallace Phase to Room Comparison

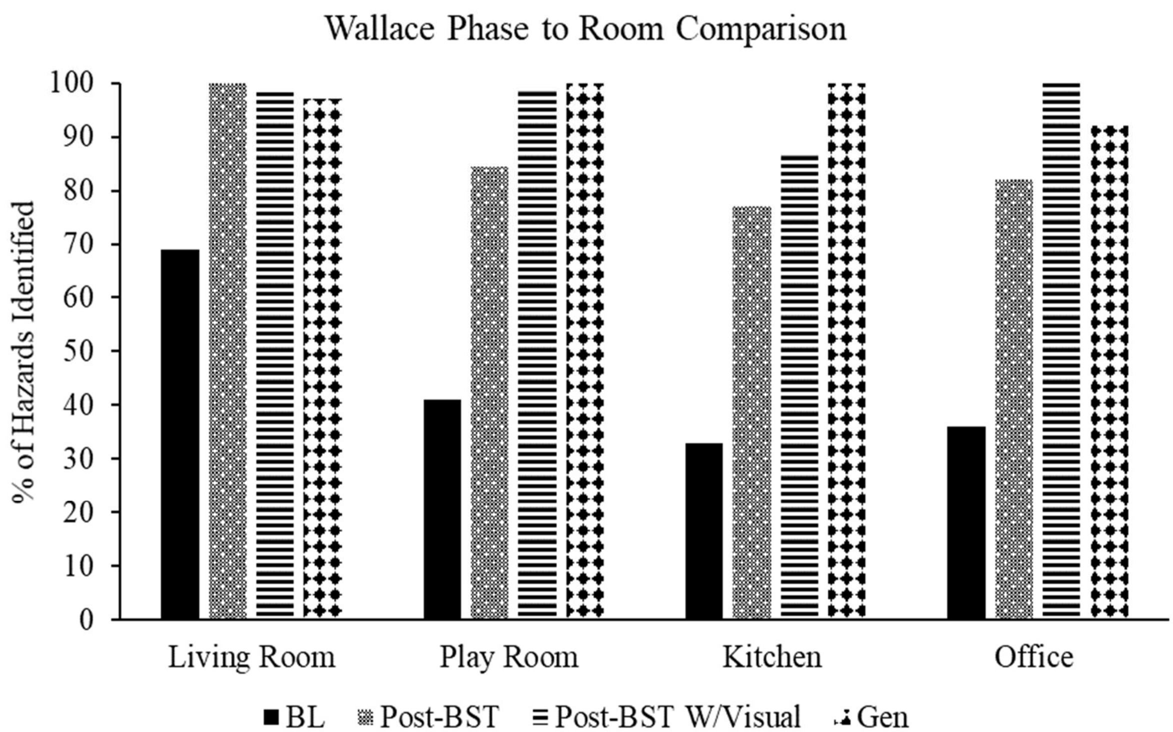

Figure 6: *Wallace Phase to Room Mean Comparison*

Appendix R: Dorothy Phase to Room Comparison

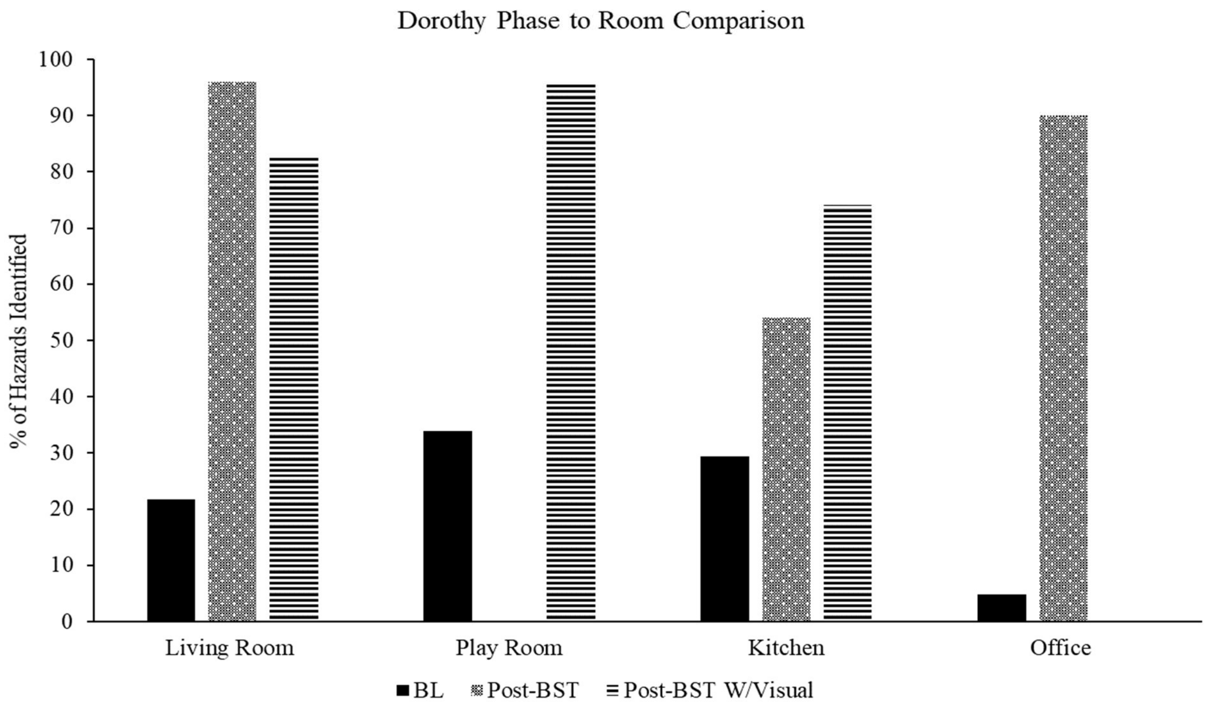

Figure 7: *Dorothy Phase to Room Mean Comparison*