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SELF-ADMINISTERED WRITTEN PROMPTS TO TEACH HOME ACCIDENT PREVENTION SKILLS TO ADULTS WITH BRAIN INJURIES

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This study evaluated the use of written checklists and task analyses as self-administered prompts to teach home accident prevention skills to 4 adults with brain injuries. Subsequent to baseline, participants used written checklists that identified potential in-home hazards but did not prompt behaviors necessary for hazard remediation. Written individualized task analyses, incorporating specific behavioral steps for correcting hazards that participants had failed to remediate during the checklist phase, were used to prompt appropriate responding when necessary. These were subsequently faded to transfer stimulus control to the natural conditions. A multiple probe technique across participants and settings was used. Results indicated that the checklist alone was sufficient to increase appropriate responses to many of the potential hazards. Individualized task analyses, when needed, resulted in appropriate remediation of all potential hazards. Generalization to untrained potential hazards occurred to some degree for all participants. Follow-up results showed that most skills trained were maintained over a 1-month period.

DESCRIPTORS: safety, brain injury, self-instruction, prompting, multiple probe technique

Each year approximately 500,000 people suffer brain injuries (National Head Injury Foundation, 1983). Cognitive and behavioral deficits that affect many areas of daily living (e.g., cooking, shopping, budgeting, etc.) are commonplace among these victims, necessitating training or retraining of basic independent living skills (Vogenthaler, 1987; Zahara & Cuvo, 1984). Individuals with brain injuries often display deficits similar to those demonstrated by other clinical populations. Because behavioral interventions have proven successful with those populations, a behavioral approach to rehabilitation with brain-injured individuals appears promising (Braunling-McMorrow, 1988; Goldstein & Ruthven, 1983). There is little empirical evidence, however, to support this assumption, especially with respect to teaching adaptive community living skills.

Over the past decade, behavior analysts have developed effective methods for teaching self-preservation behaviors to individuals with mental retardation and related disabilities. One common feature of studies in this area is an emphasis on teaching people to react appropriately to potential future emergencies or threats to self. These safety and health skills have included making emergency phone calls (Risley & Cuvo, 1980), treating illnesses and injuries (Brickley, 1978; Cuvo et al., 1986; Matson, 1980), and emergency building evacuation (Jones & Thornton, 1987; Rae & Roll, 1985). Child behavior therapists, on the other hand, have

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emphasized a primary prevention approach: teaching parents how to identify and remediate potential hazards in the home (Dershewitz, 1979; Tertinger, Greene, & Lutzker, 1984). Few studies have evaluated the effectiveness of behavioral techniques to teach independent living skills to brain-injured individuals, and no published research has presented a primary prevention approach to health or safety skills with populations moving from supervised to independent living arrangements.

Recent research in applied behavior analysis has focused on techniques with which individuals with mental retardation can promote their own instruction (Agran & Martin, 1987; Koegel & Koegel, 1988). These procedures may facilitate unsupervised responding in environments that do not deliver prompts and consequences consistently (Dunlap & Plienis, 1988). Self-administered stimuli in the form of picture prompts and self-talk involve individuals in their own behavior change by providing them the opportunity to make choices and to instruct themselves. As an alternative to self-talk and picture prompts, self-administered printed instructions combined with instructor feedback only at the end of each training trial have been effective for teaching domestic skills to persons with mental retardation (Mooney, 1988).

In a previous study, O'Reilly and Cuvo (1989) examined a behavioral training strategy that included instructor prompts and feedback in the use of written task analyses and picture cues as self-administered prompts to teach appropriate medical treatment of cold symptoms to an adult with anoxic brain injury. Written generic task analyses (which incorporated only mandatory treatment steps) combined with picture prompts were not sufficient to improve self-treatment of cold symptoms over baseline conditions. Written specific task analyses that provided detailed specification of responses resulted in criterion performance. Written individualized task analyses, tailored to participant errors, were used to fade specific task-analysis prompts and transfer stimulus control to the picture prompts alone. The role of the instructor in the O'Reilly and Cuvo study was modified from that of an active, continual supplier of prompts and consequences during trials to that of observer and provider of feedback at the end of each trial.

The present study extended the methodology for using written task analyses as self-administered prompts for individuals with brain injuries in several ways: (a) The effectiveness of written checklists as self-administered prompts was evaluated. Written checklists identified the relevant stimuli (i.e., potential hazards) but did not describe behaviors necessary for their remediation; thus they differed from generic task analyses (e.g., O'Reilly & Cuvo, 1989), which describe behaviors. (b) Individualized task analyses, tailored to participant errors in the checklist phase, were used to prompt appropriate responding and were subsequently faded to transfer stimulus control to the natural environment. Previous research (e.g., Mooney, 1988) used individualized task analyses to fade prompts once the training criterion was achieved, but not as a procedure to train skills to criterion. Individualized task-analysis training is a less restrictive and more parsimonious instructional method than specific task-analysis training (e.g., O'Reilly & Cuvo, 1989). (c) Throughout this study, the instructor was absent from the training setting during trials. Participant performance was assessed only at the end of each trial using outcome checklists. The outcome checklists consisted of the mandatory outcomes of appropriate task performance. Results of this assessment were communicated verbally to the participant at the end of each trial. Thus, unsupervised responding and remote contingencies were incorporated to promote skill maintenance and generalization (Dunlap & Plienis, 1988). (d) Generalization to untrained potential hazards was assessed for each participant.

METHOD

Participants

Four clients receiving services at a private rehabilitation facility for adults with brain injuries participated. All resided in a supervised residential unit within the facility. Participants were included in the experiment if they met the following criteria: sufficient volitional motor control to perform the

targeted skills, a reading level of at least third grade, and deficient home hazard prevention skills as determined by their baseline scores.

Amanda was a 20-year-old female who was injured in a bicycle accident at the age of 12. She suffered from ataxia in the left arm, which inhibited fine motor skills. Amanda exhibited difficulties in organizing and learning new information and had WAIS-R verbal, performance, and full-scale scores of 78, 71, and 76, respectively.

Barbara was a 37-year-old female who was injured in an automobile accident at the age of 36. She had neuromotor deficits in the left upper and lower extremities. Barbara exhibited poor memory and organizational skills and had WAIS-R verbal, performance, and full-scale scores of 86, 63, and 75, respectively.

Cody was an 18-year-old male who was injured in a motorcycle accident at the age of 15. Neuromotor deficits included decreased upper extremity strength with oral apraxia evidenced by problems with volitional speech and nonspeech oral movements. Cody was reported to exhibit short-term verbal and nonverbal memory deficits. His WAIS-R verbal, performance, and full-scale scores were 81, 83, and 80, respectively.

Drew, a 19-year-old male, was injured in a car accident at the age of 18. He displayed normal neuromotor functioning but exhibited problem-solving deficits when confronted with novel situations. Drew's WAIS-R verbal, performance, and full-scaled scores were 93, 86, and 82, respectively.

Settings and Sessions

Training and testing occurred in a four-room community-based apartment. The living room (4 m by 6 m) contained a sofa, two chairs, a table, TV, and stereo. The bedroom (2 m by 3 m) contained a single bed, dressing table, bedside table, and closet. The kitchen (2 m by 3 m) contained a sink, counters, stove, refrigerator, microwave oven, cleaning materials stored in a box under the sink (e.g., dish detergent, paper towels, sponges), mop, broom, pail, kitchen utensils, and a clock. The bathroom (2 m by 2 m) contained a bathtub-shower unit, sink, mirror, and toilet. Sessions, 50 min long, were usually conducted 5 days a week, but on several occasions scheduling difficulties made it necessary to conduct multiple sessions on the same day. All sessions were conducted by the first author.

Task Analyses

Potential home hazards were identified initially by reviewing materials obtained from the National Safety Council (1980). Common preventable home hazards that most frequently result in injuries to adults were identified. Task analyses for each hazardous situation were developed by observing 2 nonhandicapped adults who were living independently while they remediated each of the hazards under simulated conditions. Four types of task analysis were developed for each hazard: specific, checklist, individualized, and outcome checklist.

The specific task analysis for each room included descriptions of hazardous situations and all behaviors necessary to remediate the hazards. Specific task analyses designed for the four rooms of the training apartment and the minimum reading levels of our participants are shown in Table 1.

The checklist consisted of written descriptions of hazardous situations without any process steps necessary to remediate such hazards. Four checklists were compiled, each consisting of the hazards in one room of the apartment. The checklists are presented in Table 2.

Individualized task analyses were used only when participants failed to remediate hazards using the checklist. An individualized task analysis consisted of the process steps (identified in the specific task analyses) necessary to remediate only those hazards that the participant failed to remediate in the checklist phase. Individualized task analyses were made simply by supplementing checklist items that were not remediated by the participant with the appropriate process steps from the specific task analysis. Table 3 shows an individualized task analysis for a participant who made errors on Step A of the living room hazards checklist. All process steps appear below the checklist item on which errors occurred.

Outcome checklists were used by the experimenter to evaluate remediation of hazards in each

Table 1
Specific Task Analyses for Remediating Hazards in Four Rooms

Kitchen

A. Grease on stove top.
   1. Get paper towels and appropriate cleaner from materials box under sink.
   2. With towels and cleaner, wipe grease from stove until no grease can be seen.
   3. Throw paper towels in trash and return cleaner to materials box.

B. Paper napkins on stove top.
   1. Remove paper from stove top.
   2. Place paper in trash.

C. Smoke detector beside stove.
   1. Remove smoke detector from cooking area.
   2. Get paper towel from materials box under sink.
   3. Wipe dust from smoke detector until no dust is visible.
   4. Press test button to make sure smoke detector is working.
   5. Place smoke detector near ceiling at least 15 ft from stove.

D. Trash can beside stove.
   1. Place trash can at least 5 ft away from stove.

E. Drinking glasses at edge of kitchen counter.
   1. Place glasses at least 1 ft from edge of counter.

F. Broken glass on floor.
   1. Get broom and dustpan from broom closet.
   2. Sweep glass into dustpan until dustpan is full.
   3. Empty dustpan into trash.
   4. Repeat until no glass can be seen on floor.

G. Cleaner (poison) beside food in cabinet.
   1. Place cleaners at least 5 ft away from food.
   2. Place cleaners that are not in their proper containers in the trash.

Living Room

A. Ashtray full of cigarette butts and paper on table.
   1. Lift ashtray with paper and cigarette butts, making sure nothing falls from ashtray.
   2. Take ashtray into kitchen.
   3. Pour water into ashtray until paper and cigarette butts are soaked.
   4. Empty all contents of ashtray into trash.
   5. Rinse ashtray with water.
   6. Dry ashtray with paper towel.
   7. Return ashtray to table.

B. Half-smoked cigarette on edge of table.
   1. Pick up cigarette by the butt.
   2. Take cigarette into kitchen.
   3. Pour water on cigarette until it is soaked.
   4. Put cigarette in trash.

C. TV beside curtains.
   1. Unplug TV.
   2. Place TV at least 3 ft from all other furniture and walls.

D. Space heater beside curtains.
   1. Unplug space heater.
   2. Wait until space heater is cool enough to touch.
   3. Place space heater at least 3 ft from all curtains, furniture, and walls.

E. Trash can full of paper beside space heater.
   1. Place trash can at least 5 ft away from space heater.

F. Newspaper on floor.
   1. Place paper in trash can.

Table 1
(*Continued*)

G. Vacuum cleaner in middle of room with cord strewn across floor.
   1. Place vacuum cleaner by a wall.
   2. Wrap cord completely around handles on vacuum cleaner.

Bedroom

A. Space heater beside bed.
   1. Unplug space heater.
   2. Wait until space heater is cool enough to touch.
   3. Place space heater at least 3 ft from all furniture and walls.

B. Ashtray full of cigarette butts and paper on table.
   1. Lift ashtray with paper and cigarette butts, making sure nothing falls from ashtray.
   2. Take ashtray into kitchen.
   3. Pour water into ashtray until paper and cigarette butts are soaked.
   4. Empty all contents of ashtray into trash.
   5. Rinse ashtray with water.
   6. Dry ashtray with paper towel.
   7. Return ashtray to table.

C. Half-smoked cigarette on edge of table.
   1. Pick up cigarette by the butt.
   2. Take cigarette into kitchen.
   3. Pour water on cigarette until it is soaked.
   4. Put cigarette in trash.

D. Newspaper on floor.
   1. Place paper in trash can.

E. Drinking glass at edge of table.
   1. Place glass at least 1 ft from edge of table.

F. Broken glass on floor.
   1. Get broom and dustpan from broom closet.
   2. Sweep glass into dustpan until dustpan is full.
   3. Empty dustpan into trash.
   4. Repeat until no glass can be seen on floor.

G. Vacuum cleaner in middle of room with cord strewn across floor.
   1. Place vacuum cleaner by a wall.
   2. Wrap cord completely around handles on vacuum cleaner.

Bathroom

A. Bar of soap in bathtub.
   1. Pick up soap from bathtub floor.
   2. Place soap in soap dish by sink.

B. Hair dryer in bathroom.
   1. Make sure hands are dry.
   2. Unplug hair dryer.
   3. Remove hair dryer from bathroom.

C. Medicines without clear labels.
   1. Place medicines in trash.

D. Outdated medicines in medicine cabinet.
   1. Place medicines in trash.

E. Bathtub safety mat on floor of bathroom.
   1. Pick up mat from bathroom floor.
   2. Place safety mat on bottom of bathtub.

Table 2
Checklists of Hazardous Items in Four Rooms

Kitchen
- A. Grease on stove top.
- B. Paper napkins on stove top.
- C. Smoke detector beside stove.
- D. Trash can beside stove.
- E. Drinking glasses at edge of kitchen counter.
- F. Broken glass on floor.
- G. Cleaner (poison) beside food in cabinet.

Living Room
- A. Ashtray full of cigarette butts and paper on table.
- B. Half-smoked cigarette on edge of table.
- C. TV beside curtains.
- D. Space heater beside curtains.
- E. Trash can full of paper beside space heater.
- F. Newspaper on floor.
- G. Vacuum cleaner in middle of room with cord strewn across floor.

Bedroom
- A. Space heater beside bed.
- B. Ashtray full of cigarette butts and paper on table.
- C. Half-smoked cigarette on edge of table.
- D. Newspaper on floor.
- E. Drinking glass at edge of table.
- F. Broken glass on floor.
- G. Vacuum cleaner in middle of room with cord strewn across floor.

Bathroom
- A. Bar of soap in bathtub.
- B. Hair dryer in bathroom.
- C. Medicines without clear labels.
- D. Outdated medicines in medicine cabinet.
- E. Bathtub safety mat on floor of bathroom.

room. Four outcome checklists were developed, one for each room. This measurement assessed essential task outcomes after participants had completed the tasks and left the room. The outcome checklists were not used to observe participants' behaviors while they were responding. All outcome checklists are shown in Table 4.

Dependent measure. The number of items on the outcome checklist scored correct divided by the total number of items multiplied by 100% yielded a percentage correct score for each room, which served as the dependent measure.

Interscorer Agreement

The items on the outcome checklist were scored independently by a secondary observer, a graduate student in behavior analysis. Before the experiment, the secondary observer was trained by the first author as follows: The first author performed each of the tasks to a predetermined criterion (recorded on the outcome checklist); the secondary observer then entered the room and scored the tasks. For example, grease was scored as being removed from the stove top correctly if there was no visible grease on the stove top and the paper towels used to remove grease were in the trash. Paper napkins were scored as being removed from the stove top correctly if the napkins that had been placed on the stove top at the beginning of the trial were placed in the trash (see kitchen outcome checklist, Table 4). Fol-

Table 3
Example of Individualized Task Analysis for the Living Room (for Errors on Checklist Item A)

- A. Ashtray full of cigarette butts and paper on table.
  1. Lift ashtray with paper and cigarette butts, making sure nothing falls from ashtray.
  2. Take ashtray into kitchen.
  3. Pour water into ashtray until paper and cigarette butts are soaked.
  4. Empty all contents of ashtray into trash can.
  5. Rinse ashtray with water.
  6. Dry ashtray with paper towel.
  7. Return ashtray to table.
- B. Half-smoked cigarette on edge of table.
- C. TV beside curtains.
- D. Trash can beside space heater.
- E. Space heater beside furniture.
- F. Newspaper on floor.
- G. Vacuum cleaner in middle of room with cord strewn across floor.

Table 4
Outcome Checklists for Hazards in Four Rooms

Kitchen	
A.	Grease removed from stove top and in trash.
B.	Paper napkins removed from stove top and in trash.
C.	Smoke detector placed at least 15 ft from stove.
D.	Trash can placed at least 3 ft from stove.
E.	Drinking glasses at least 1 ft from edge of kitchen counter.
F.	All broken glass removed from floor and in trash.
G.	Cleaner and food beside it are in trash.
Living Room	
A.	Cigarette butts and paper are soaked with water and in trash.
B.	Half-smoked cigarette is soaked with water and in trash.
C.	TV is at least 3 ft from all furniture and walls.
D.	Space heater is at least 3 ft from all furniture and walls.
E.	Trash can is at least 3 ft from space heater.
F.	Newspaper is in trash.
G.	Vacuum cleaner is unplugged and placed beside a wall with the cord completely wrapped around the handles.
Bedroom	
A.	Space heater is at least 3 ft from all furniture and walls.
B.	Cigarette butts and paper are soaked with water and in trash.
C.	Half-smoked cigarette is soaked with water and in trash.
D.	Newspaper is in trash.
E.	Drinking glass is at least 1 ft from edge of table.
F.	All broken glass is removed from floor and in trash.
G.	Vacuum cleaner is unplugged and placed beside a wall with the cord completely wrapped around the handles.
Bathroom	
A.	Bar of soap is removed from bathtub floor and placed in soap container beside sink.
B.	Hair dryer is removed from bathroom.
C.	Medicine containers without clear labels are in trash.
D.	Outdated medicines are in trash.
E.	Bathtub safety mat is placed correctly in bathtub.

lowing these practice trials, scorers compared their data and discussed discrepancies. The procedure was repeated until the secondary observer's scoring was in 100% agreement with the first author's in all four rooms on two consecutive trials.

Interscorer agreement was computed for number of items scored correct by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. Interscorer agreement was assessed in 23% of all experimental sessions, including all rooms and participants. Mean interscorer agreement was 92%, with a range of 60% to 100%.

Experimental Design

Experimental control was demonstrated with a variation of the multiple probe technique (Horner & Baer, 1978) across rooms and participants with baseline, checklist, and individualized task-analysis phases implemented in each room. All 4 participants were involved in the study concurrently. One baseline assessment was conducted initially in all rooms for all participants, and continuous baseline assessments (referred to hereafter as "true baseline") were conducted in the first training room (kitchen) for Amanda. Once stability was achieved, baseline assessments were conducted in the three remaining rooms for Amanda and in all rooms for Barbara, Cody, and Drew. At this point the checklist training condition for Training Room 1 (kitchen) and true baseline assessment for Training Room 2 (living room) were implemented with Amanda. True baseline assessment for Training Room 1 (living room) with Barbara also began at this point.

Phase changes were conducted in a similar manner across the remaining training rooms, participants, and conditions.

Training occurred in three of the four rooms for each participant. The fourth room was used to assess generalization of trained skills. Some types of hazards were common to more than one room, such as objects on the floor that could cause injury or falls, combustible materials located close to sources of heat, and electric appliances in unsafe arrangements. These similarities made generalization to untrained situations possible. Additionally, the training procedures taught participants to respond to several exemplars of home hazards by systematically checking a room and correcting any hazardous situations. Therefore, generalization to untrained exemplars was possible, and probes conducted in untrained situations assessed whether and when such generalization was demonstrated by each participant. Generalization was assessed in a different room for each participant (e.g., the bedroom for Amanda, the bathroom for Barbara) under baseline conditions (i.e., participants had no access to written checklists or task analyses).

Conditions and Procedures

Training was conducted individually and participants progressed at their own pace during each trial. The criterion for mastery of hazard remediation skills for each room was a score of 100% on the outcome checklist for that room on three consecutive trials.

Before each trial the experimenter altered the environment in the relevant rooms to simulate the targeted hazards without creating actual serious risk for the participants. In the kitchen the experimenter placed cold grease on the stove top, paper napkins on the stove top, a trash can containing paper 1 ft from the stove, a smoke detector 1 ft from the stove, two plastic drinking glasses at the edge of the kitchen counter, pieces of a broken plastic glass on the kitchen floor, and two soda bottles labeled "poison" beside food under the sink.

In the living room the experimenter placed an ashtray filled with paper and cigarette butts on the coffee table, a half-smoked extinguished cigarette at the edge of the coffee table, a TV touching the curtains, an unplugged space heater 1 ft from the curtains, a trash can containing paper 1 ft from the space heater, pieces of newspaper scattered on the floor, and a vacuum cleaner plugged in with its cord strewn across the floor.

In the bedroom the experimenter placed an unplugged space heater 1 ft from the bed, an ashtray full of cigarette butts and paper on the bed table, a half-smoked extinguished cigarette at the edge of the bed table, pieces of newspaper strewn over the floor, a plastic drinking glass on the edge of the bed table, pieces of a broken plastic glass on the bedroom floor, and a vacuum cleaner plugged in with its cord strewn across the floor.

In the bathroom the experimenter placed a bar of soap on the bathtub floor, an unplugged hair dryer 1 ft from the bathtub, medicine containers without clear labels in the medicine cabinet, outdated medicines (labels on the container stated that the medication was safe for use up to a date prior to experiment) in the medicine cabinet, and bathtub safety mat on the bathroom floor.

Baseline

Prior to the first baseline trial, participants were told that they would be tested on how well they could identify and fix potential hazards in the home. They were told that any cleaning materials they would need were in the kitchen; the experimenter pointed to those materials. Participants were then told, "Let's see how well you can find and fix potential hazards in this room. When you have finished leave the room and tell me that you have finished." The experimenter left the room and returned to evaluate with the outcome checklist only when the participant was finished and had left the setting. The participant proceeded through each room in the same manner. No consequences were delivered during baseline trials.

Prospective participants whose initial baseline score was at least 50% correct in any of the four rooms were released from the experiment. Participants who received scores of less than 50% on all

four rooms proceeded to checklist training after scores stabilized in the true baseline phase.

Checklist Training

First, participants were given the four written checklists and asked to read them orally to ensure that they could read the text sufficiently well. Reading errors that would affect performance adversely were corrected. Participants were asked to repeat this task until no substantive reading errors occurred.

Participants were asked to remediate the hazards in each room using the written checklists as prompts. For this and all subsequent training conditions, participants received the following instruction: "Read a step. Do what it says, and then check off the step you did with the pencil." Checking off items not only ensured that participants attended to the textual stimuli but also served a potential self-monitoring function. If a participant failed to check off items, corrective feedback was provided at the end of each trial (e.g., "It seems that you did not check off each step. Please check off the steps as you go along.").

The experimenter was not present in the rooms while the participant performed the tasks. When the participant left the room and indicated that he or she had completed the tasks, the experimenter entered the room and evaluated hazard remediation using the outcome checklist and then provided feedback to the participant on each item of the checklist sequentially. Praise was provided for hazards that were corrected, and nonspecific feedback was provided for incomplete tasks. For example, if the participant did not wipe all grease off the stove, nonspecific feedback took the form, "You did not clean the stove top adequately. There is grease on the stove top." The experimenter pointed to the written checklist item(s) on which the error(s) occurred. If the participant scored 100% correct on three consecutive trials in any of the training rooms, their performance was probed under baseline conditions. If performance stabilized at less than 100% correct in any of the training rooms, individualized task analysis training was implemented for that training room.

Individualized Task-Analysis Training

Each participant who required this training was given a written individualized task analysis as described above and illustrated in Table 3. Use of the individualized task analysis was explained verbally. For example, the participant was told, "You performed these items correctly (the experimenter pointed to the checklist items without their process steps printed underneath). The checklist items with the numbered steps underneath are the items on which you made errors (the experimenter pointed to the checklist items with printed process items underneath). You can use these guidelines to perform the tasks with no errors." The participant was asked to read the individualized task analyses; reading errors were corrected in the same manner as in the checklist training condition.

Participants were then asked to remediate hazards in a training room using the individualized task analysis and were reminded to check off steps as they proceeded. Again, once the participants indicated that they were finished, the experimenter entered the room and evaluated hazard remediation using the outcome checklist. Following the evaluation, the experimenter delivered praise for correct hazard remediation and specific corrective feedback on items not remediated correctly. For example, if the ashtray was full of cigarette butts and paper, the experimenter gave specific feedback, such as, "You did not clean the ashtray adequately. There are cigarette butts and paper in the ashtray. You need to take the ashtray to the kitchen without spilling it. Put the ashtray under the faucet and pour water into it until the paper and cigarette butts are completely soaked. Then empty the ashtray into the trash, rinse it, dry it, and replace it on the table in the living room." The experimenter pointed to the numbered process steps on the individualized task analysis on which errors occurred (e.g., Steps 1 to 7 under Item A in Table 3).

If the participant made a novel error on a checklist item that was not supplemented with individualized task-analysis steps, the experimenter provided specific feedback on the error(s). The individualized task analysis was revised for the next

trial to include written process steps on the checklist items on which errors occurred in the preceding training trial. When participants scored 100% correct on three trials with the individualized task analysis, their performance was probed with the checklist as described previously. Participants who scored 100% correct on the checklist probe completed a baseline probe in the same training room. Participants who did not score 100% on the checklist or baseline probe again received individualized task-analysis training. After a score of 100% was attained in the second individualized task-analysis training condition for that room, the checklist and baseline probes were readministered.

Follow-Up

Follow-up testing was conducted under baseline conditions (i.e., no checklists or task analyses) in the three training rooms and the generalization room with 3 participants 1 week and 1 month after training. Cody was not available for testing at the 1-month follow-up.

RESULTS

Figures 1 through 4 show the results for each participant in each of the four rooms, with the generalization test room at the bottom of each graph. Dates are shown on the x axes of these graphs to convey the temporal relationships among events in this study, which were essential to the experimental design.

No participant remediated more than 40% of potential hazards in any room during the initial baseline assessment. The written checklist with generic instructor feedback following trials resulted in improved responding for all participants in all training rooms. Barbara (Figure 2) improved from 15% during baseline assessment to criterion performance (i.e., 100% correct responding on three consecutive trials) on potential hazards in the living room. Drew (Figure 4) achieved criterion responding with checklist training alone in the bathroom and kitchen.

Individualized task-analysis training with specific instructor feedback following trials resulted in rapid improvement to criterion levels in all cases. For example, in the living room, Amanda improved from 57% correct responding in the checklist condition to 100% correct responding on the first individualized task-analysis trial (Figure 1). When criterion performance was demonstrated, written prompts and instructor feedback were faded successfully (from individualized task-analysis training with specific instructor feedback following trials, to checklist training with generic instructor feedback following trials, to baseline conditions) until responding was controlled by the hazards alone in all rooms for Amanda, Barbara, and Drew (Figures 1, 2, and 4). For Cody (Figure 3), individualized task-analysis training with specific instructor feedback was reinstated to restore criterion responding during fading in the living room.

Generalization of remediation skills to potential hazards in the untrained rooms occurred to some degree for all participants. Barbara and Cody (Figures 2 and 3) made the least improvement (0 to 20% and 0 to 28%, respectively) in the generalization rooms. Amanda improved from 0 to 71% of potential hazards remediated in the generalization room (bedroom), and Drew (Figure 4) improved from 28% to 100% of potential hazards remediated in the untrained room (living room).

Trained skills maintained at 100% correct responding for Amanda, Barbara, and Drew at the 1-week follow-up (see Figures 1, 2, and 4). Cody did not maintain criterion responding for potential hazards in the living room 1 week after training (Figure 3). Amanda and Drew (Figures 1 and 4) maintained criterion responding on all trained skills at the 1-month follow-up. Barbara (Figure 2) failed to maintain criterion responding for potential hazards in the kitchen. Cody was unavailable for 1-month follow-up assessments.

DISCUSSION

Results showed that the use of self-administered checklists and individualized task analyses as prompts, self-monitoring, and instructor feedback only at the end of trials enabled 4 individuals with

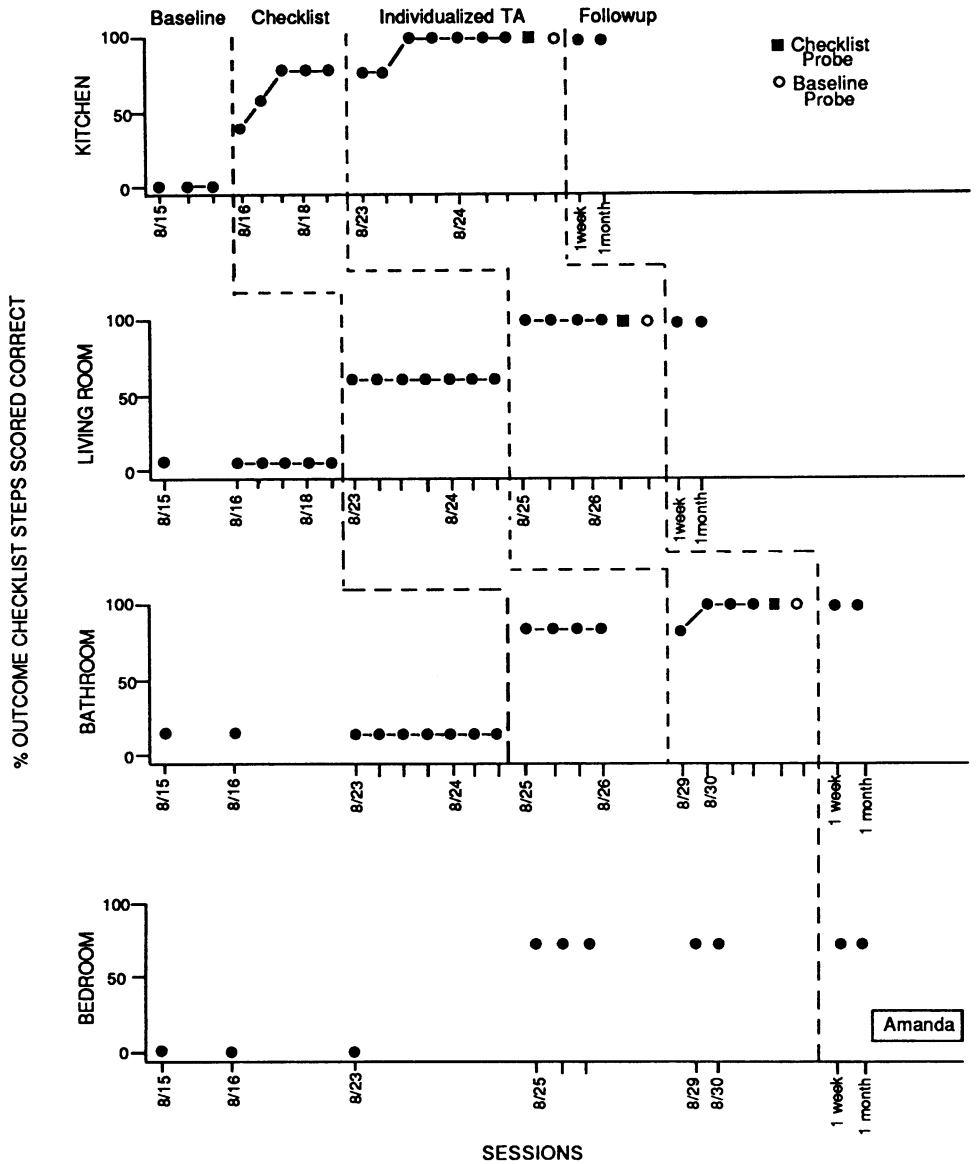

Figure 1. Percentage of outcome checklist items scored correct in all rooms for Amanda. Undated sessions were conducted on the date just preceding them on the *x* axis.

brain injuries to identify and remediate potential hazards in a kitchen, living room, bedroom, and bathroom. The trainer was not present to provide direct instruction while participants responded during training trials. As in the study by O'Reilly and Cuvo (1989), these participants achieved criterion responding rapidly with written prompts and delayed feedback. Transfer of stimulus control to natural conditions was also achieved rapidly with few errors by fading the written task analyses and instructor feedback.

Previous research has shown that persons with mental retardation are capable of reacting to potential emergencies and threats to self (Jones & Thornton, 1987; Risley & Cuvo, 1980). The present study extends the literature on safety skills by demonstrating that individuals with brain injuries are capable of learning to identify and remediate

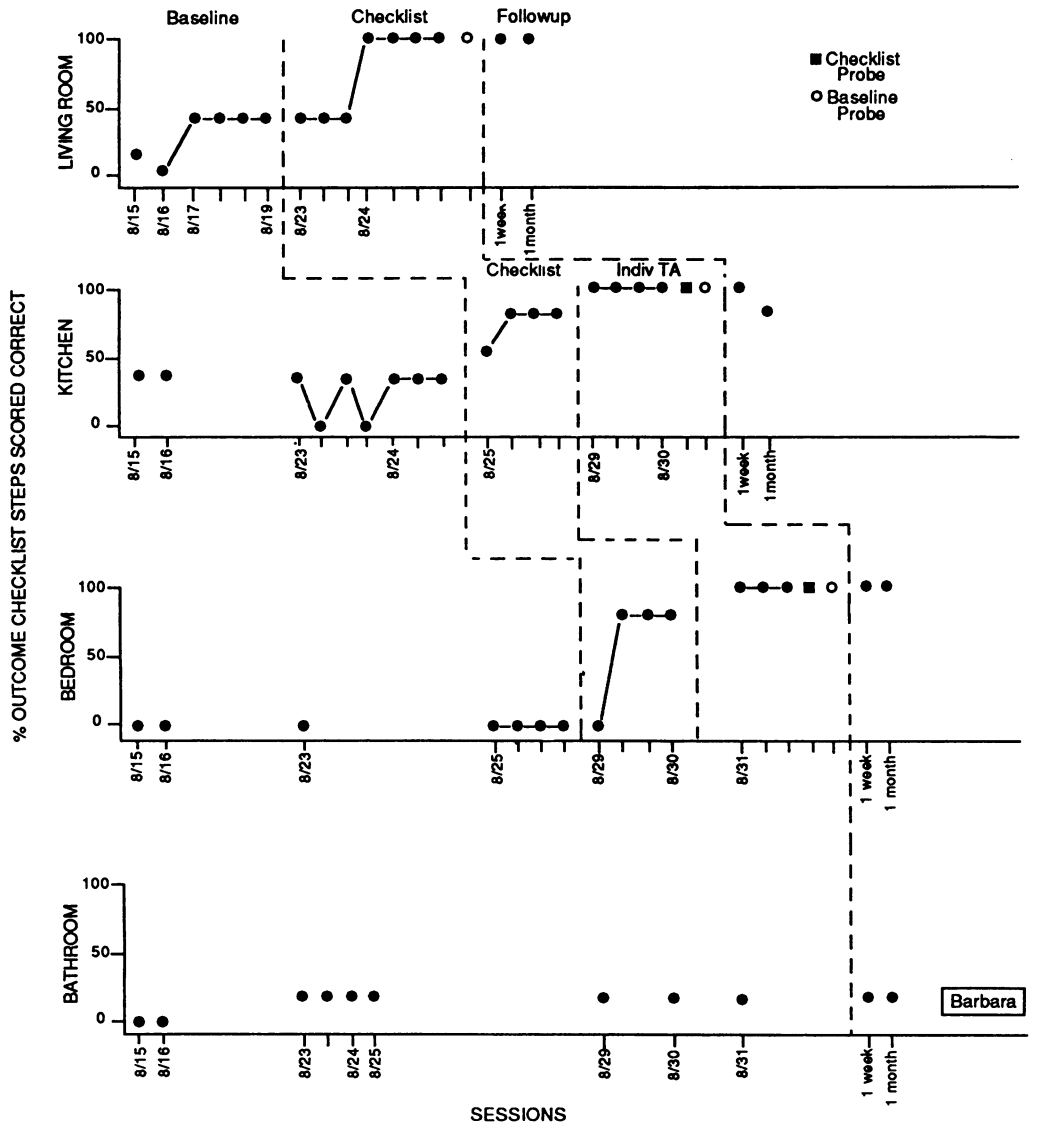

Figure 2. Percentage of outcome checklist items scored correct in all rooms for Barbara. Undated sessions were conducted on the date just preceding them on the x axis.

potential hazards in the home. The utility of the procedures used in this study may be limited, however, to a subset of the brain-injured population. The participants in this study functioned relatively well, did not have severe physical limitations, and could read at a third-grade level. Whether this approach would be effective for more severely impaired participants remains to be explored. The importance of tailoring written prompts of any kind to participants' reading skills is obvious, as is the need for direct assessment to ensure that participants can read the written prompts for a particular task. If vocabulary and phrase length can be matched to verified reading abilities, the use of written task analyses or checklists should be applicable to brain-injured and developmentally disabled persons with both lower and higher reading skills than the participants in this study. Using written prompts to guide one's own behavior is common among normally functioning adults. Effective methods for

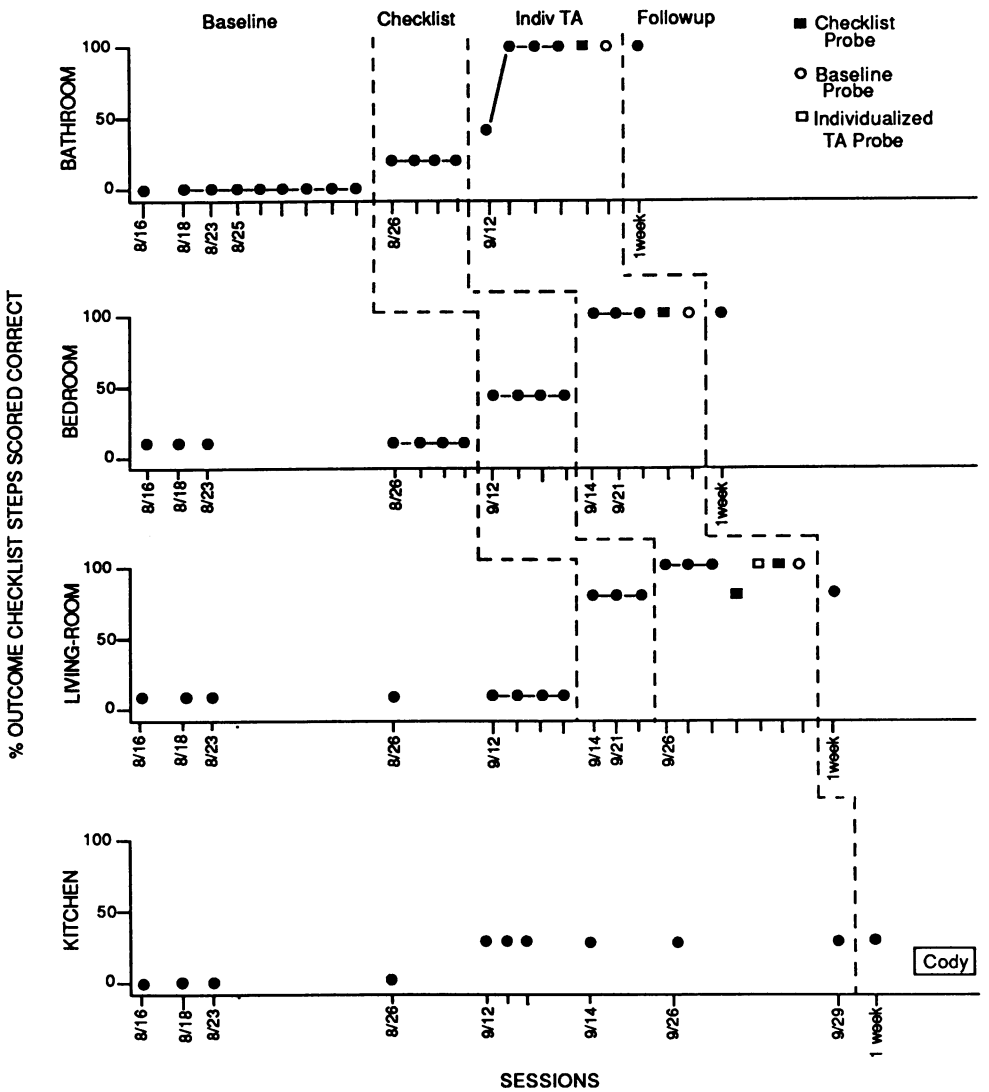

Figure 3. Percentage of outcome checklist items scored correct in all rooms for Cody. Undated sessions were conducted on the date just preceding them on the x axis.

teaching people with brain injuries or developmental disabilities to use written prompts are needed to foster independence in various skill areas.

We did not examine whether the home hazard remediation skills taught in the training apartment were demonstrated in participants' own residences. Rather, our question was simply whether self-administered written prompts would be sufficient to produce the required behaviors, thus providing an efficient and potentially cost-effective method for teaching such skills. Issues to be addressed in future studies include the extent to which skills taught by this method in an analogue situation generalize to actual home environments, and whether the approach will be effective with disabled individuals who live independently but have not acted to protect themselves from home hazards.

Generalization to untrained potential hazards occurred to some degree for all participants, with 1 participant (Drew) achieving criterion responding to all potential hazards in the generalization room without explicit training. The participants who

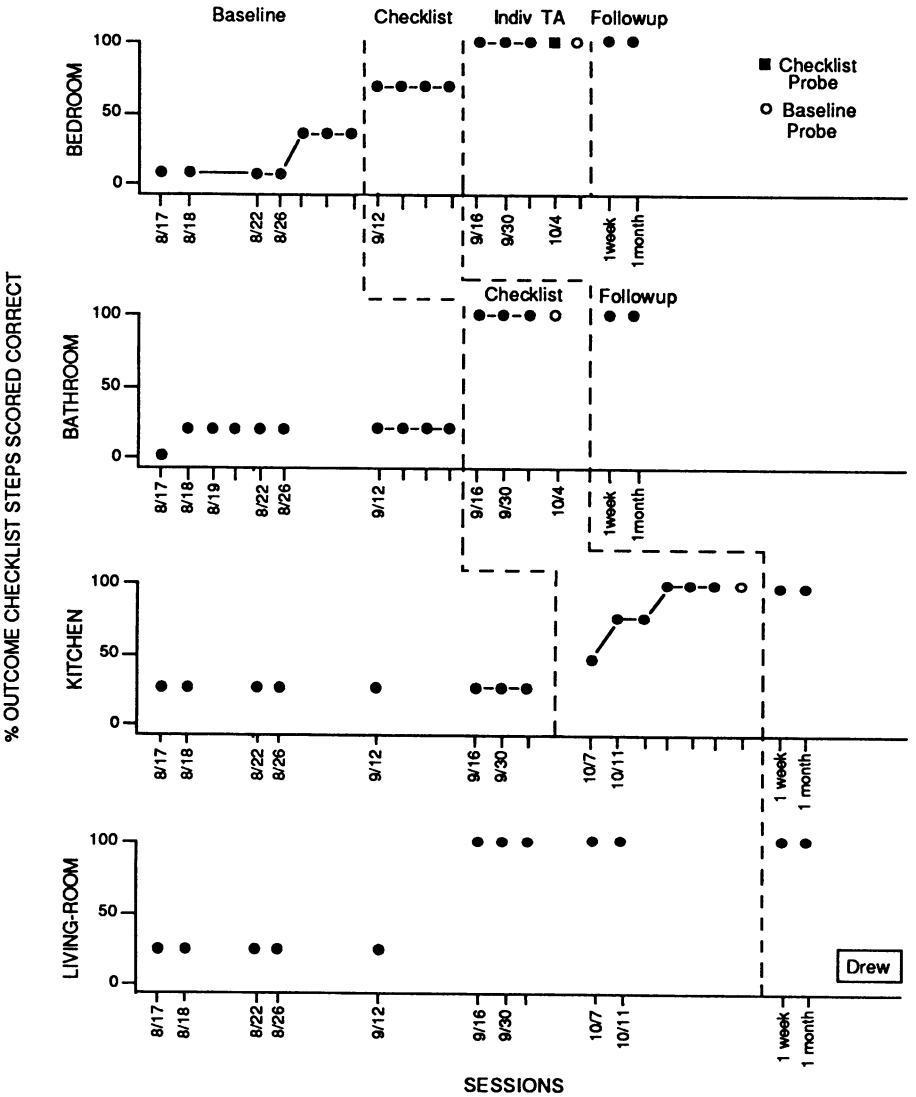

Figure 4. Percentage of outcome checklist items scored correct in all rooms for Drew. Undated sessions were conducted on the date just preceding them on the *x* axis.

demonstrated the greatest generalization (Barbara and Drew) were assessed in the bedroom and living room, respectively. The stimulus dimensions and response requirements to remediate the potential hazards in these two rooms were quite similar (see Table 2). Notably, correct responding did not increase in the generalization rooms for Amanda and Drew until they had begun individualized task-analysis training in the living room and bedroom, respectively. For Barbara and Cody, generalization of hazard remediation skills was not as successful. This may be due in part to the relative lack of similarity among potential hazards in the training rooms and the generalization rooms for these 2 participants. On the other hand, no evidence of generalization between the living room and bedroom, which had several hazards in common, was demonstrated by these 2 participants; performance improved only when training was introduced in those rooms.

No remedial training was introduced in the generalization rooms for participants who did not

achieve criterion responding on all potential hazards. In practice, intervention should continue until all hazards are corrected with 100% accuracy, because less than complete remediation in a natural situation could leave the individual at some risk. All participants in this study were subsequently required to undergo safety skills training prior to placement in the community. This training involved a review of the skills learned in this study and mastery of the skills not demonstrated during our generalization probes. Further research should assess whether individuals with brain injuries can use written prompts without instructor feedback at the end of trials to perform new tasks if generalization does not occur under baseline conditions.

The general approach described here is a practical one that can be applied with relative ease to a variety of training objectives in a wide range of settings. An initial investment of staff time is required to develop and validate specific task analyses and checklists and to assess participants' entry skills. After specific task analyses have been written, however, it is not difficult to derive generic task analyses and outcome checklists from them. Individualized written task analyses can then be constructed as needed simply by "cutting and pasting" process steps from the specific task analyses onto the checklists or generic task analyses. Of course, further revisions should be made to accommodate individual participants' characteristics and needs, but once a basic catalogue of specific task analyses has been developed there would seem to be little need for direct care staff to write task analyses or checklists for individual participants entirely "from scratch." With participants who can read, considerable staff time can be saved by giving participants written prompts that they can use to guide their own performance, in contrast to typical staff-intensive training procedures.

Other applications of stimulus-control procedures with individuals who have suffered brain injuries bear investigating. For example, written checklists could provide age-appropriate nonstigmatizing permanent prompts in situations in which prompt fading does not result in transfer to naturally occurring stimuli. Other skill-maintenance techniques (e.g., self-reinforcement) should also be evaluated. Independent living and vocational task training research conducted with individuals with different types of brain injuries will be important for isolating variables involved in acquisition, maintenance, and generalization of skills with subgroups of this population.

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