TEACHING DAILY LIVING SKILLS TO CHILDREN WITH AUTISM IN UNSUPERVISED SETTINGS THROUGH PICTORIAL SELF-MANAGEMENT

KAREN L. PIERCE AND LAURA SCHREIBMAN

UNIVERSITY OF CALIFORNIA, SAN DIEGO

We investigated the efficacy of pictorial self-management to teach daily living skills to 3 low-functioning children with autism. Stimulus and response generalization, stimulus control of self-management materials, and maintenance of behavior change were also assessed. Results showed that children with autism could successfully use pictures to manage their behavior in the absence of a treatment provider, generalize their behavior across settings and tasks, and maintain behaviors at follow-up. In addition, when compared to baseline, all children showed a substantial decrease in stereotypic behaviors. When picture order was manipulated in stimulus control probes, the children followed the new picture sequence, suggesting that the pictures were controlling their behavior. Further, a savings effect was demonstrated, in that 2 subjects reached criterion on second and third behaviors within less than 25% of original training time.

DESCRIPTORS: self-management, picture prompts, daily living skills, autism

A primary concern of parents of children with disabilities is the lack of autonomy in their offspring and resulting burden of care (e.g., Koegel et al., 1992). Thus, increased attention has focused on teaching these children behaviors such as daily living skills (e.g., getting dressed) that attenuate the burden on parents and caretakers. The need to develop effective strategies to teach these behaviors is even greater when dealing with severely disabled children with autism, because they are more likely to require a large amount of caretakers' time and energy, either to teach the behaviors or to perform them for the child.

Acting independently is valued and typically expected by our culture (O'Leary & Dubey, 1979). Thus, those acquiring independence early in life have more potential to thrive in both domestic and vocational settings. One technique that may facilitate the independent performance of daily living skills in children with autism is self-management.

Krantz and her colleagues found that children with autism could use photographic activity schedules in a self-management paradigm to change activities independently during a 1-hr free-time session (MacDuff, Krantz, & McClannahan, 1993) and during family activities (Krantz, MacDuff, & McClannahan, 1993). In an extension of this work, the present study was designed to incorporate traditional elements of self-management, including self-selection of reinforcers, self-monitoring of performance, self-evaluation of performance, and self-delivery of reinforcement using pictures as antecedent stimuli to teach daily living skills to children with autism. Specifically, the present investigation was designed to extend the existing work in this area in several ways.

First, whereas the majority of prior research investigating the use of pictures to guide behavior for individuals with disabilities has focused on adolescents or adults (e.g., Frank, Wacker, Berg, & McMahon, 1985; Johnson & Cuvo, 1981; Krantz et al., 1993; MacDuff et al., 1993; Nietupski, Clancy, & Christiansen, 1984; Sowers, Verdi, Bourbeau, & Sheehan, 1985; Thinesen & Bryan, 1981; Wacker & Berg, 1983, 1984), the current investigation focused exclusively on children with

autism. Second, the effectiveness of pictures for developing autonomy specifically in daily living skills and the extent of reliance on these pictures in children with autism were assessed (because true independence requires response in the absence of others). To date no picture-prompt strategy has combined all of the previously mentioned elements of self-management and produced complete autonomy (i.e., no caretaker within view).

Thus, the purposes of the present study were as follows: (a) to combine elements of a traditional self-management package using pictures; (b) to assess the effectiveness of picture prompts as a self-management tool with severely delayed children with autism in the absence of a treatment provider; (c) to assess the generalization of such a method across behaviors and settings; (d) to examine the extent of stimulus control of the pictures; (e) to investigate collateral behavior change by assessing changes in (nontarget) inappropriate behaviors; and (f) to assess maintenance of behavior change.

METHOD

Participants

Three boys with autism, diagnosed by agencies not associated with this research, participated. They attended classrooms for children with developmental disabilities and had been classified as moderately to severely retarded. All participants had limited expressive language skills and, according to parental report, all required constant supervision.

Jon, 8 years old, achieved a Peabody Picture Vocabulary Test (PPVT, Dunn & Dunn, 1981) standard score <20, age equivalent 2 years 2 months, and a Vineland Adaptive Behavior Composite (Sparrow, Balla, & Cicchetti, 1984) of 38. He was untestable on all other objective intellectual and language measures. He exhibited frequent noncompliance and made inappropriate loud screaming noises. He was completely nonverbal and communicated mostly through pointing and gestures.

Howard, 9 years old, had a PPVT standard score of 32 and an age equivalent of 3 years 10 months. He received a score of 43 on the Stanford-Binet

and a Vineland Adaptive Composite score of 54. Receptive verbal skills were good, but expressive speech was limited to requests for foods and/or activities and frequent psychotic speech.

Robby was a 6-year-old boy, with a PPVT standard score <20, yielding an age equivalent of 2 years 4 months, a Vineland Adaptive Behavior Composite of 51, and a Stanford-Binet partial score of 48. He displayed expressive language deficits, frequent echolalia, and self-stimulatory hand flapping.

Settings, Materials, and Target Behaviors

Settings. The clinic training setting was a room (3.05 m by 3.05 m) containing a small rectangular table, two small chairs, and a bookshelf with several toys. A one-way mirror allowed covert observation and video taping. Clinic generalization measures were obtained in a room (2.4 m by 4.58 m) containing a couch, coffee table, a chair, and a one-way mirror. Home settings for each child were determined by target behavior (e.g., kitchen for setting table). Several toys (e.g., puppet, small car) were placed in each of the settings during all sessions to ensure that inappropriate behavior was not due to the lack of opportunity for other appropriate behavior. Training for Jon and Howard took place in the home setting, and training for Robby took place in the clinic setting. Generalization measures were obtained in both the clinic and home settings for Robby and in the home setting only for Jon and Howard. No training took place in any of these generalization settings.

Picture prompts. The picture stimuli were color prints (6 in. by 4 in.) of selected steps derived from a task analysis of the target behavior or of an object that would be used in the target behavior (e.g., a plate). Pictures were inserted into a photo book, and a small green felt dot was placed on the lower right hand corner of each page to make page turning easier. Each child had his own book for each task. The final page in each book contained a "Smiley face" sticker (2 in. by 4 in.) signifying completion of the task and the opportunity for self-reinforcement.

Table 1

Task Analyses and Pictorial Representations for the Target Behavior of Getting Dressed

Step	Behavioral description	Pictorial representation
1	remove pajama top	child with pajama top raised overhead; picture taken from waist up
2	retrieve shirt	shirt on the floor; no other objects in picture
3	put on shirt	none; above picture signifies this step
4	remove pajama pants	child with pajama pants pulled halfway down leg
5	retrieve pants	pants on the floor; no other objects in picture
6	put on pants	none; above picture signifies this step
7	retrieve socks	socks on the floor; no other objects in picture
8	put on socks	none; above picture signifies this step
9	retrieve shoes	shoes on the floor with one foot halfway inserted; no other objects in picture
10	put on shoes	none; above picture signifies this step

Target tasks. For each child three tasks were selected for training, based on parental concern about daily living skills that were not yet in the child's repertoire. Target tasks were setting the table, making lunch, and doing laundry for Jon; setting the table, making his bed, and making a drink for Howard; and getting dressed, setting the table, and making lunch for Robby. Number of pictures (i.e., steps) used for each task depended on practical constraints. For example, for setting the table, Robby's book contained seven pictures, and Jon's contained six. This difference was due to Jon's family's preference of not using spoons. A sample task analysis and corresponding pictorial representations are presented in Table 1.

Measures

All probes were videotaped and were subsequently scored via continuous 10-s intervals for on-task and inappropriate behaviors. Any functional interaction with the task materials (e.g., touching the clothing) was scored as on task. Behaviors such as arm flapping, climbing on furniture, and repetitive verbalizations were all scored as inappropriate. Performance could be scored as both on task and inappropriate for any given interval (e.g., engaging in echolalic speech while getting dressed). For each behavioral category, percentage occurrence was obtained by dividing the total number of occurrences by the total number of intervals and multiplying by 100%. All training sessions were timed by the therapist using a stopwatch. (Bathroom breaks, etc., were not included in training time data.) Approximately one half of all training sessions were also timed by an observer.

Interobserver Agreement

Interobserver agreement was obtained by having a second individual (naive to the purpose of the study) score one third of all baseline, posttreatment, and follow-up probes. Interobserver agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. Percentage of occurrence and nonoccurrence agreement was 100% for on-task behavior across all sessions for all children. Percentage of occurrence and nonoccurrence agreement for inappropriate behavior averaged 72% (range, 50% to 100%) and 82% (range, 67% to 100%); 82% (range, 55% to 100%) and 80% (range, 55% to 100%); and 73% (range, 30% to 100%) and 83% (range, 60% to 100%) for Jon, Howard, and Robby, respectively. Low agreement scores reflected in ranges are attributable to low frequencies of inappropriate behaviors at posttreatment. Reliability for total training time (to the nearest minute), task completion, and stimulus control probes (i.e., picture order changed and book removed) was 100% for all sessions and all children.

Design and Procedure

A multiple baseline probe design across behaviors, systematically replicated across 3 children, was

used (Barlow & Hersen, 1984). Three phases of posttreatment were used to assess generalization, stimulus control, and maintenance of target behavior.

Baseline. During baseline on all tasks, participants were simply told to complete the target behavior (e.g., "okay, Robby, get dressed"). In addition, on the first baseline trial for each behavior, the therapist directed the child's attention to the target materials (e.g., the clothes) by pointing. Baseline sessions lasted 5 min if no interaction with task materials occurred. Any attempts to engage in the behavior resulted in the continuation of the baseline session for 5 min after the last attempt. A maximum of three sessions was conducted daily, once or twice a week.

Training. Picture-prompt instruction consisted of three phases, with the criterion for advancement to the next phase dependent on 100% correct performance on the previous phase. To increase the likelihood of successful generalization, different training stimuli were used for each day of training (e.g., different plates). At no time during training did the therapist attempt to control inappropriate behaviors.

During Phase 1, the children were taught to discriminate pictures depicting steps in the target skill. Specifically, the child was shown three pictures from the pool of pictures for one task and asked to point to a specified object or action (e.g., "point to the plates"). This procedure was completed until all pictures from the pool for that task could be correctly identified. Verbal praise and small snack items were presented on a variable-ratio (VR) 3 schedule contingent upon correct responses.

During Phase 2, the children were taught to choose their own reinforcer, independently turn pages in a picture book, perform motor actions, and self-reinforce. At the beginning of each trial, the child was given a choice of a variety of edible items and small toys. The picture book that contained the first photo of a given task and a Smiley face on the second page was placed in front of the child and the therapist modeled opening the book. Verbal praise was given for all attempts. Once independent book opening was acquired, the ther-

apist said "point to" the object or action depicted in the first picture, followed by praise for correct identification and a verbal prompt to retrieve the object or imitate the action. If no response followed the verbal prompt within approximately 15 s, the therapist modeled all or part of the correct behavior. Once correct responding had been initiated by prompting and modeling, transfer of stimulus control from prompt to task-related stimuli was achieved by reinforcing successive approximations and delayed prompting (Steege, Wacker, & McMahon, 1987). Next, the therapist pointed to the green felt dot on the page while prompting the child to turn the page. Successful turning of the picture page was followed by a therapist response of "Smiley face! You are finished!" at which time the child was allowed to self-reinforce. Self-reinforcement was initially prompted gesturally; eventually, the Smiley face always occasioned independent self-reinforcement. This procedure was repeated until the child could successfully and independently engage in the behavior depicted by the first photo and self-reinforce for three consecutive trials, at which time the second picture in the task sequence was added. Each subsequent picture was chained using the above procedure. Progression to Phase 3 occurred when participants could independently complete all steps necessary (choose reinforcer, perform all steps, etc.) on three consecutive trials.

During Phase 3, the therapist's presence was faded. All fading was initially attempted by having the therapist intermittently leave for approximately 20 s, prefaced by a statement such as "Good work, Robby. I'll be back in a minute." Gradually, absence time increased to cover the duration of the task time. Because Jon failed to respond to this procedure, we faded the therapist's proximity to him until the therapist was out of view. Training was continued until successful fading of the therapist's presence with the child performing at 100% accuracy for three consecutive trials.

Posttreatment and generalization probes. During these probes, as in baseline, participants were told to complete the task (e.g., "Jon, set the table"). Three posttreatment probes in the training setting were taken for each child, spaced across 1
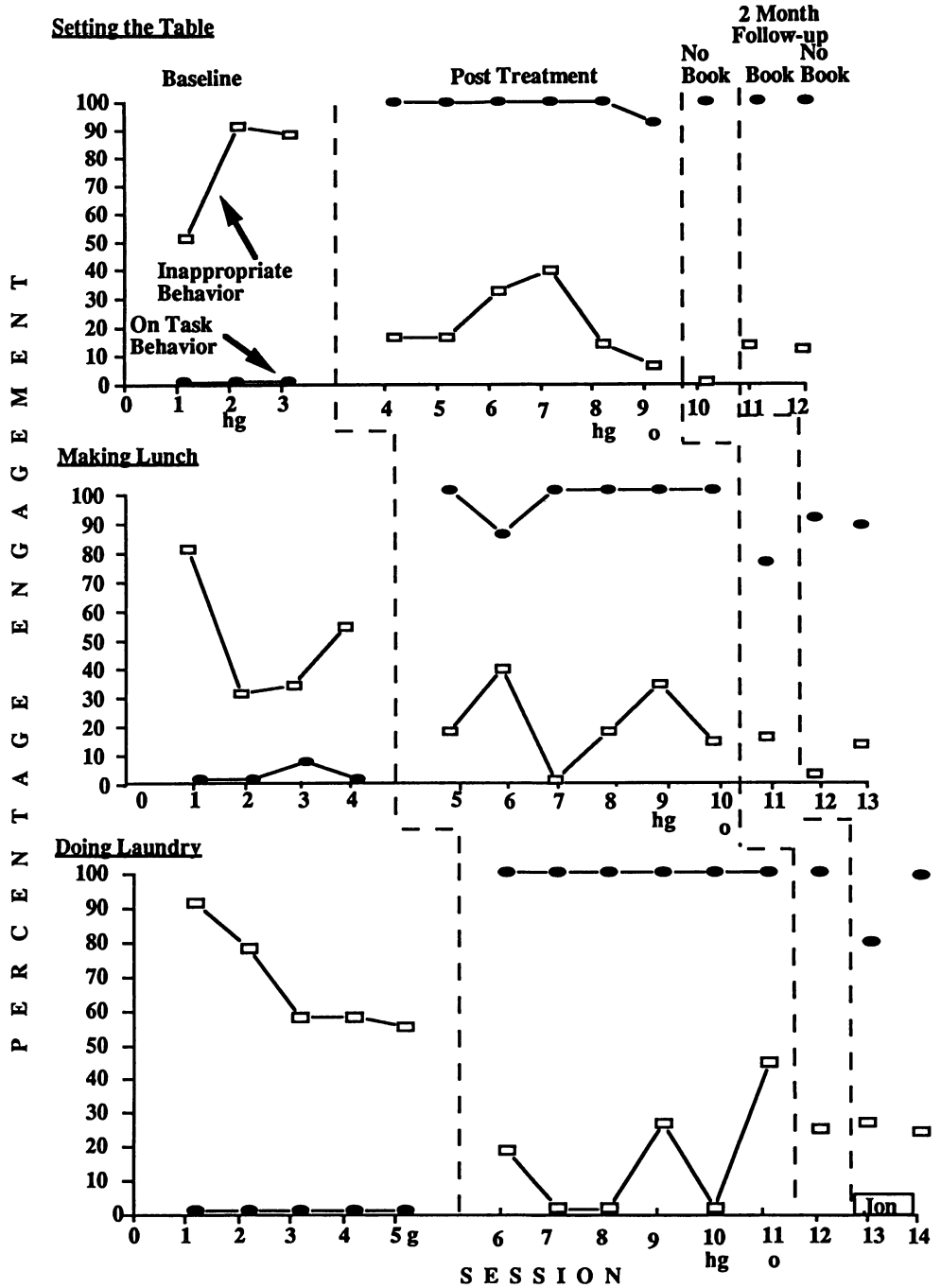
Figure 1. The percentage of 10-s intervals that contained on-task and inappropriate behavior during baseline and posttreatment probes for Jon. Generalization probes are denoted on the abscissa: Home generalization probes are denoted by an "hg," generalization probes at a peer's home are denoted by a "g," and the probe in which picture order was changed is denoted by an "o." All other probes were taken in the training setting.
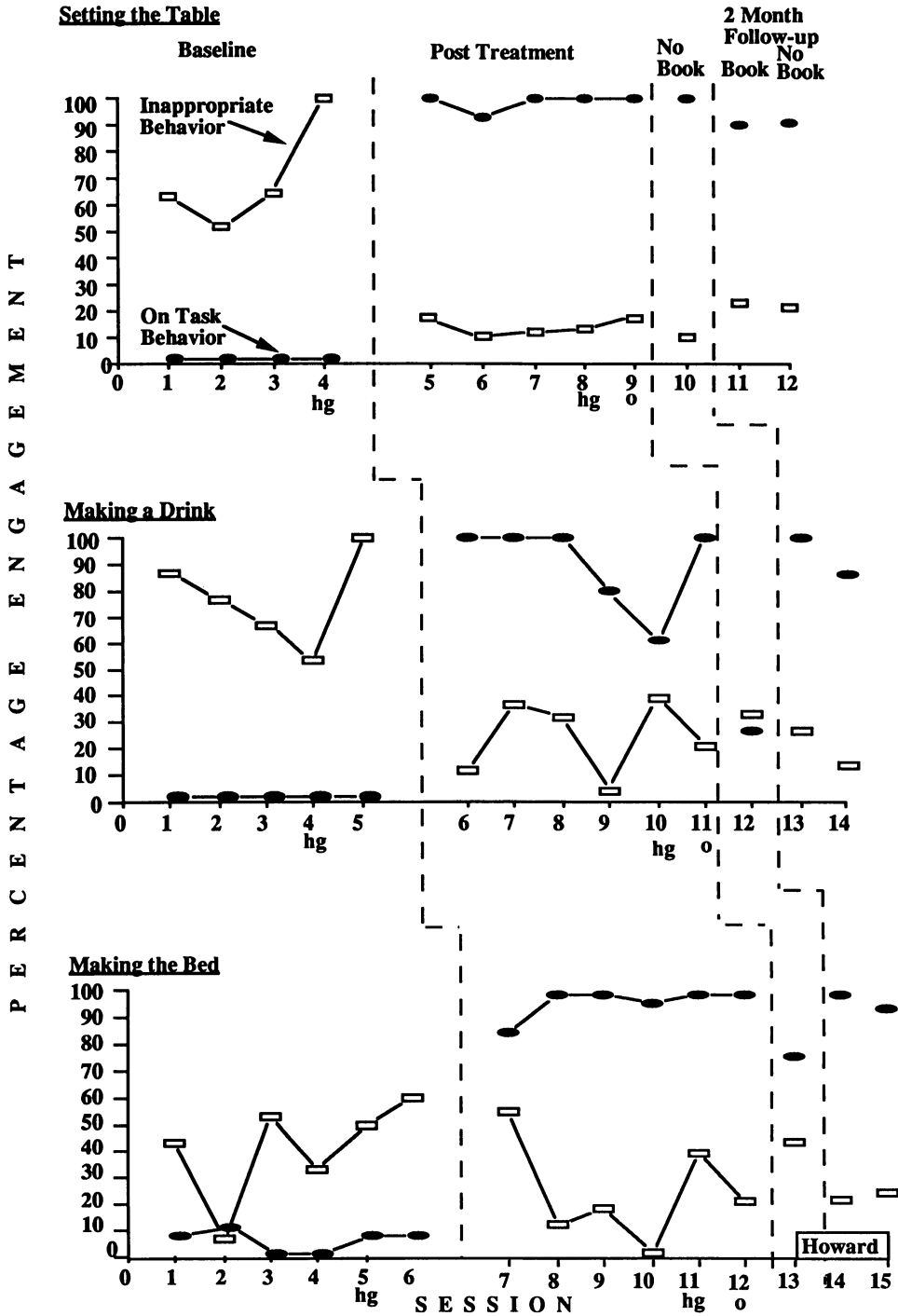
Figure 2. The percentage of 10-s intervals that contained on-task and inappropriate behavior during baseline and posttreatment probes for Howard. Details as in Figure 1.
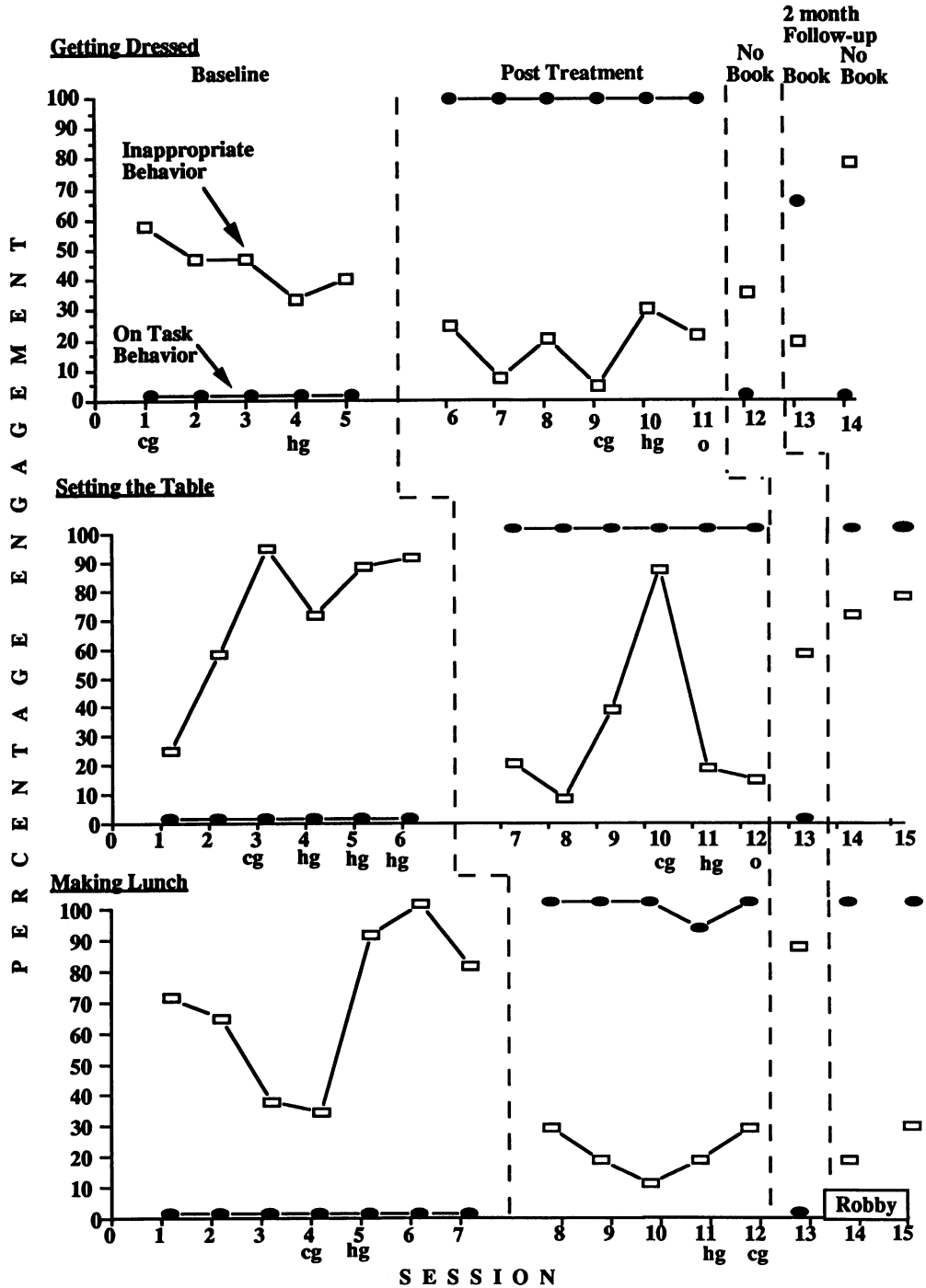
Figure 3. The percentage of 10-s intervals that contained on-task and inappropriate behavior during baseline and posttreatment probes for Robby. "cg" denotes clinic generalization probes; other details as in Figure 1.

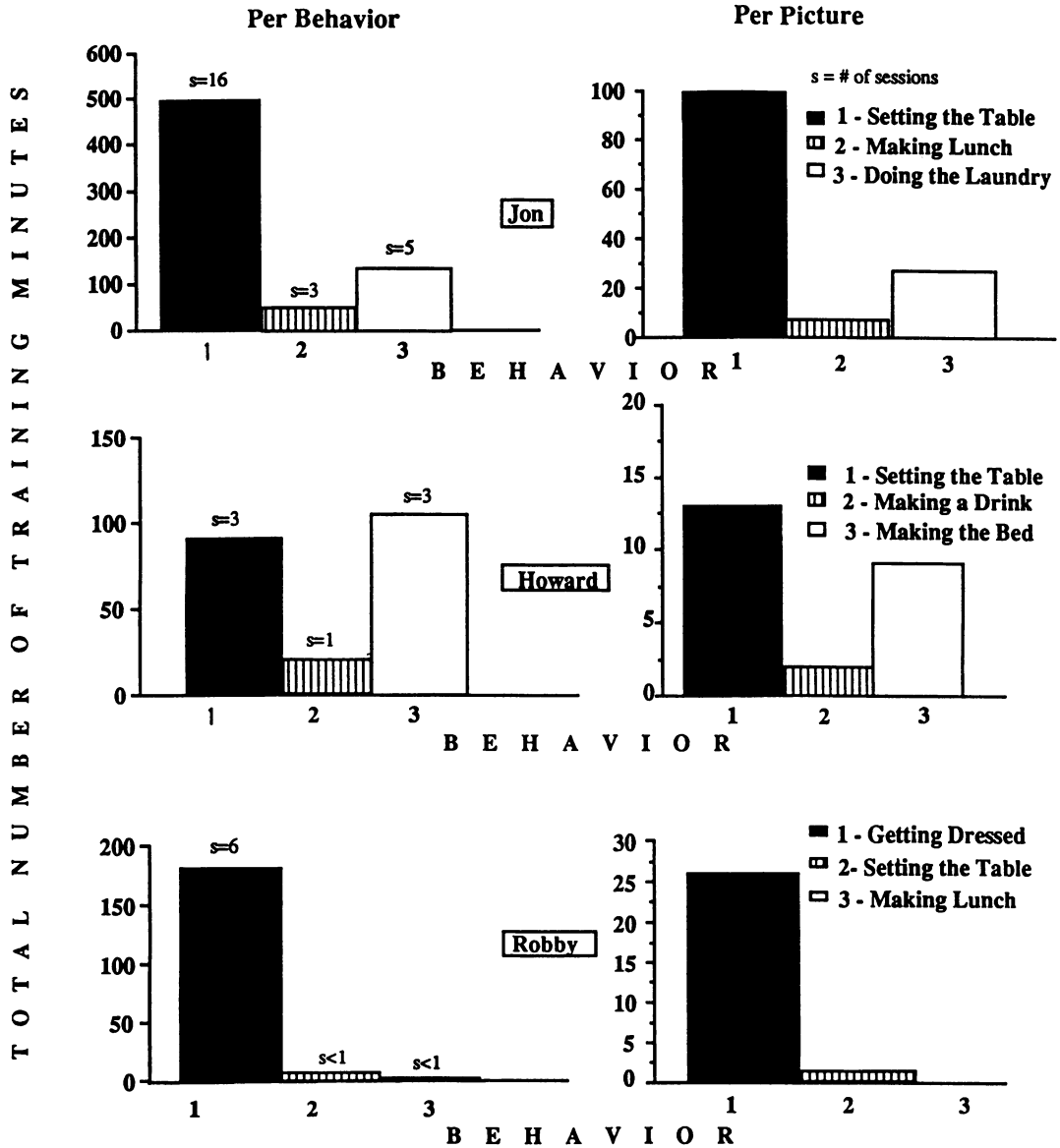**Per Behavior**   **Per Picture**

Figure 4.   Total amount of training time required to reach criterion for each target behavior for all children; data are displayed per task and per picture.

or 2 days. Generalization probes were videotaped in the home, clinic, or both settings, depending on the child. Generalization probes were conducted at both baseline and posttreatment.

Stimulus control probes. To assess whether responding was controlled by individual pictures as opposed to only the initial picture (i.e., the child chained the entire sequence and only the first picture remained functional), one posttreatment probe involved switching two pictures in the trained sequence. For example, prompts for putting on pants and putting on socks were reversed. The second stimulus control probe was a reversal to baseline, at which time the picture book was not made available and participants were asked to perform the task.

Follow-up. Follow-up measures were obtained 2 months after posttreatment probes in the training setting and were identical to posttreatment probes.

RESULTS

Results for all children are shown in Figures 1, 2, and 3. On-task behavior and inappropriate behavior are plotted for baseline, posttreatment, and follow-up probes. In order for a task to be scored as completed, the following behaviors must have occurred: self-selection of reinforcer, correct self-monitoring (i.e., turning page after completion of step), and self-reinforcement. The final posttreatment probe was always a reversal to baseline (i.e., no book).

On-task behavior was stable at approximately 0%, and inappropriate behavior was typically high during baseline for all 3 children. During posttreatment, inappropriate behavior decreased and on-task behavior increased to high levels, often 100%, for all 3 children. With one exception (Howard, making a drink), all children performed the behavior in the generalization setting. At a 2-month follow-up probe with the picture book, all children completed the tasks, although there was some variability in performance. Performances during no-book probes were variable. For example, Robby failed to engage in any on-task behavior without the book at posttreatment, but he completed two of three behaviors at follow-up without the book.

Training Time

The amount of training time necessary to reach criterion (i.e., immediately preceding posttreatment) for all children is shown in Figure 4 and includes time necessary per task and per picture. Both training time per task and per picture were assessed to ensure that a potential savings effect across tasks was not due to a smaller number of pictures in the second and third tasks. Substantial savings effects were seen in most cases.

Stimulus Control

All children finished all tasks completely and accurately at both posttreatment and follow-up while using the picture book (with the exception of Robby putting his shirt on backwards twice). On average, all children followed the novel picture sequence when the picture order was changed. Both Jon and Howard attempted to complete the behaviors without the book during follow-up and posttreatment, but they omitted several steps in its absence. Robby did not complete any of the behaviors at posttreatment without the book, but he completed two of three behaviors without the book at follow-up.

DISCUSSION

The present study was designed to investigate the efficacy of using pictures in a self-management treatment package for teaching and maintaining daily living skills in children with autism. Before the introduction of pictorial self-management, parents performed all of the target behaviors for the children. With the introduction of the pictorial self-management package, engagement in these daily living behaviors increased and inappropriate behavior decreased. All children successfully completed all tasks, in all settings, in the absence of a treatment provider. The present study extends past findings in the following ways: (a) The effectiveness of pictures was assessed with young, low-functioning children with autism; and (b) picture prompts were shown to be effective for self-managing behavior in the complete absence of supervision.

Prior research with picture prompts either fails to mention the presence or absence of an adult or specifically states that an adult was present in the room when pictorial self-management occurred (e.g., Johnson & Cuvo, 1981; MacDuff et al., 1993; Wacker & Berg, 1983, 1984). Due to the nature of many of the tasks investigated in prior experiments (e.g., workshop activities, Wacker & Berg, 1983, 1984), it is quite reasonable that an adult be present during posttraining assessments, because

adults would normally be present in such locations. However, the mere physical proximity of others, particularly others associated with training, may have contributed to the success of prior experiments. Results of the present study suggest that children with autism can successfully manage their own behavior in a completely independent manner.

Generalization across tasks and across settings was achieved with little or no additional training. Thus, there was a savings effect across tasks for 2 of the 3 children (e.g., Robby required 3 hr to learn his first task and less than 1 min to learn his third). Thus, results conform to those of prior studies, which also suggest that picture prompts are successful at producing generalization across settings and tasks (e.g., Wacker & Berg, 1983). Successful generalization may have been achieved because different stimuli were used for each session; thus, training was provided on multiple exemplars (Stokes & Baer, 1977). In addition, training multiple exemplars may have also contributed to the children's successful completion of the tasks in the absence of the picture book.

Consistent with other research reports (Koegel & Koegel, 1990; Krantz et al., 1993; MacDuff et al., 1993; Stahmer & Schreibman, 1992), findings of the present study suggest that teaching children with autism to manage their behavior may contribute to a reduction in inappropriate behaviors. This decrease cannot be attributed to the fact that because the child could not perform the desired behavior during baseline (e.g., could not get dressed yet), they had nothing else to do except act inappropriately. The children had alternative appropriate behaviors available (e.g., toy play). It is also unlikely that the decrease was solely the result of any incompatibility between using the pictures and engaging in inappropriate behaviors, given that over 75% of inappropriate behaviors exhibited by 1 child were verbal.

Findings of the present study also showed that during posttreatment probes the pictures were, in fact, controlling the behavior of Robby and Howard. During the final posttreatment probe when the picture book was not available, Robby did not engage in any of the target behaviors and Howard only partially completed or failed to complete the tasks. Even when the order of the pictures was presented in a novel sequence, the children generally followed the new picture order. This reliance on the picture stimuli has positive aspects, implying that the picture book can be modified to meet the demands of the environment and the advancement of the individual.

It is not entirely clear from this research if the picture prompts were necessary for task completion or if they instead served as discriminative stimuli for reinforcement for task completion. This issue could be addressed by implementing a posttraining probe in which only a cover photo followed by the cue for task completion (e.g., Smiley face) is presented.

One aspect of pictorial self-management that has both positive and negative features is the fact that some children may remain reliant on picture books for guiding their behavior. Robby, for example, did not get dressed without the book at both posttreatment and follow-up. In addition, although Jon and Howard attempted to complete the behaviors at posttreatment and at follow-up without the book, occasional steps were omitted. However, once particular behaviors became routine, fading of the picture books was relatively easy, as evidenced by the fact that all children could complete at least two of the three tasks at follow-up without the book. This finding is positive, because it implies that stimulus control may be easily transferred from the self-management materials to the environment.

The benefits of pictorial self-management are many; the picture book is small, is readily transported to novel settings, and may be easily faded. Our findings suggest that once children become familiar with using pictorial self-management, additional behaviors can be taught with relatively little time and effort for caretakers. Perhaps the biggest contribution of pictorial self-management is the decrease in parental burden; a child once dependent on parents for all domestic support may now be significantly more self-sufficient.

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