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TEACHING CHILDREN WITH AUTISM APPROPRIATE PLAY IN UNSUPERVISED ENVIRONMENTS USING A SELF-MANAGEMENT TREATMENT PACKAGE

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The present study used a self-management treatment package to teach 3 children with autism, who exhibited inappropriate play behaviors, to play appropriately in the absence of a treatment provider. After self-management training, generalization and maintenance of the behavior change were assessed. Because of the detrimental effects of self-stimulation (arm flapping, spinning toys, twirling, etc.) on learning, the relationship between self-stimulatory behaviors and appropriate play was measured. Results indicated that the children learned to exhibit appropriate play skills in unsupervised settings, appropriate play skills generalized to new settings, and 2 of the children maintained their gains at 1-month follow-up. In addition, self-stimulatory behaviors decreased as appropriate play increased. Treatment implications of these findings are discussed.

DESCRIPTORS: autism, appropriate play, self-management

Over the years, researchers have employed a variety of treatment strategies to teach appropriate behaviors to children with autism (e.g., Schreibman, 1988). Thus, we now have a substantial arsenal of effective treatments from which a treatment provider can choose when working with these children. Although these treatment strategies can be effective and efficient, the fact remains that in most instances, behavior change requires the continued presence of the treatment provider. The reliance or dependence upon the treatment provider remains a limitation to the generality of treatment effects for these children. Optimally, these children would learn to provide their own treatment in unsupervised settings. The rapidly emerging technology of self-management provides a strategy for teaching such skills.

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Research with normally functioning individuals suggests that reliance on a therapist can be successfully reduced through the use of self-management programs (see review by Kopp, 1988). Self-management typically involves some or all the following components: self-evaluation of performance, self-monitoring, and self-delivery of reinforcement. Ideally, it includes training subjects to monitor their own behavior, and to continue to monitor and maintain appropriate behavior in the absence of a treatment provider. Although the use of self-management technology has been widely researched in individuals with normal levels of cognitive functioning (Kopp, 1988) as well as with some physically and mentally handicapped populations (e.g., see reviews by Browder & Shapiro, 1985, and O'Leary & Dubey, 1979), relatively little research has evaluated this technique with the autistic population.

Recently, researchers have taught individuals with autism (exhibiting mild to severe cognitive impairments) to use self-management to produce changes in their behavior. Sainato, Strain, Lefebvre, and Rapp (1990) increased the independent work skills of preschoolers with autism using a self-evaluation treatment package. Koegel and Koegel (1990) demonstrated that students with autism could apply self-management techniques to decrease rapidly their stereotypic (self-stimulatory) be-

havior. The results of these investigations suggest that self-management can be used for individuals with autism as a way to obtain treatment gains for long periods of time, while minimizing the presence of a treatment provider.

The advantages of self-management programs for working with handicapped children are substantial. Use of self-management programs may potentially minimize dependence on the presence of the teacher in educational settings (Burgio, Whitman, & Johnson, 1980; Sainato et al., 1990) and allows the teacher to spend less time in classroom management and discipline (e.g., O'Leary & Dubey, 1979). Similarly, increased independence may reduce parental stress associated with concerns regarding the management of the child's behavior (Koegel et al., in press).

Of crucial importance in the development of behavioral repertoires among children with autism is the generalization of these repertoires. One significant benefit of self-management training may be improved generalization and maintenance of behavior change (e.g., Fowler, 1984). Rhode, Morgan, and Young (1983) trained handicapped students to self-monitor their appropriate behavior in a therapy room, and this training generalized to their regular classrooms when the students used a significantly less intense version of the original self-management procedure. In the study by Koegel and Koegel (1990), appropriate behavior did not immediately generalize to new environments, but students retrained their own behavior in new environments when self-management materials (e.g., counting device, paper and pencil for monitoring) were introduced. These studies suggest that this technique enhances generalization by using intermittent supervision and delayed contingencies that have been shown to reduce the amount of supervision needed for treatment with autistic individuals (Dunlap & Johnson, 1985; Dunlap, Koegel, Johnson, & O'Neill, 1987).

However, to date, generalization to unsupervised environments has been limited and has not been accomplished in this population in the absence of self-management materials. One way to enhance generalization may be to fade the self-management materials from the training setting, so the materials do not become discriminative stimuli for exhibiting appropriate behavior (Dunlap & Johnson, 1985). Training students in self-management across multiple settings may increase generalization as well (Koegel, Koegel, Van Voy, & Ingham, 1988).

In the present investigation, we assessed the effects of a self-management treatment package on the acquisition, generalization, and maintenance of unsupervised appropriate play in children with autism. Appropriate play was chosen as the treatment target because lack of independent appropriate play is a primary behavioral deficit associated with this population (e.g., Schreibman, 1988). Recent research suggests that children with autism spend less time in spontaneous functional play than do normal children (Lewis & Boucher, 1988). Wehman (1977) stressed the importance of play skills in mentally handicapped individuals because of the role these skills play in adaptation to normal living environments. When supervised or instructed to play with toys appropriately, many children with autism engage in functional play at the same rate as normal children (Lewis & Boucher, 1988). However, with the removal of supervision, off-task and inappropriate behaviors (e.g., self-stimulation) typically return, and appropriate behaviors decrease (Marholin & Steinman, 1977). In addition, there is a specific reciprocal relationship between appropriate play and self-stimulation, such that the occurrence of self-stimulation is associated with a disruption of appropriate play (Koegel, Firestone, Kramme, & Dunlap, 1974).

Several researchers have attempted to teach appropriate play to children with autism (e.g., Coe, Matson, Fee, Manikam, & Linarello, 1990; Haring & Lovinger, 1989; Romanczyk, Diament, Goren, Trunell, & Harris, 1975; Santacarangelo, Dyer, & Luce, 1987; Schleien, Heyne, & Berken, 1988); however, very few have studied the maintenance of these behaviors in unsupervised settings. No research, to date, has applied a self-management treatment package to increase toy play in children with autism.

The purpose of the present investigation was to assess the effects of using a self-management treat-

Table 1
Child Characteristics

Child	Age	I.Q.[a]	Vineland[b]	Reason for referral	Language ability
Bruce	7	43	52	Mother complained of destructive and obsessive behavior with toys when unsupervised.	Able to use complete sentences. Engaged in some echolalia.
Justin	13	46	40	Engaged in severe psychotic verbal behavior and did not engage in play when unsupervised.	Able to use complete sentences. Engaged in severe echolalia.
Claire	12	65	56	Mother complained of severe psychotic verbal and self-stimulatory behavior.	Able to use complex language. No echolalia.

[a] Stanford-Binet Intelligence Scale (4th ed.).
[b] Socialization domain.

ment package that included differential reinforcement of appropriate play, prompts, self-monitoring, and self-delivery of reinforcement to teach 3 children with autism to play appropriately with toys in unsupervised settings. Specifically, we sought (a) to increase independent play skills using the self-management package, (b) to assess generalization of behavior to novel settings after the self-management materials were faded during training, (c) to assess maintenance of the behavior change after a 1-month follow-up period, and (d) to determine whether increases in appropriate play were associated with decreases in self-stimulatory behavior.

METHOD

Subjects

Subjects were 3 children with autism (2 male and 1 female) independently diagnosed by organizations not associated with this research. Diagnostic criteria for autistic disorder were those described by the *Diagnostic and Statistical Manual of Mental Disorders* (APA, 1987). All 3 children displayed little appropriate toy play without direct supervision and also exhibited some self-stimulatory behavior when playing with toys. Descriptions of individual subjects are provided in Table 1.

Measures

Four behavioral categories were selected for measurement: (a) self-stimulation, (b) appropriate play, (c) inappropriate behavior, and (d) other behavior. Complete definitions of these behaviors (and the instructions for recording) were determined for each child and each set of toys individually. Basic definitions are included below. Complete definitions for all children are available from the authors by request.

Appropriate play. Appropriate play was defined as the use of objects in the manner for which they were intended, where one response leads to or proceeds from another in the accomplishment of some project. Thus, appropriate play for each child was defined in terms of the toys available. For example, appropriate play with a toy spaceship included actions such as flying the spaceship, driving the ship on its wheels, rearranging the parts of the ship, opening and closing the doors of the ship, and moving the space figures around in the ship.

Inappropriate behavior. Inappropriate behavior was defined as any behavior not acceptable for a child to engage in while supervised or unsupervised. For example, throwing toys, jumping on furniture, sucking on body parts, or breaking toys was considered inappropriate. Although self-stimulation was included in measurements of inappropriate behavior, it was also scored separately to see the specific effects of training on those behaviors. Inappropriate behavior for each child was defined in terms of the toys available. For example, inappropriate play with a doll included mutilating or throwing the doll or arm flapping with the doll.

Self-stimulatory behavior. Self-stimulatory be-

havior is typically highly idiosyncratic, ranging from gazing to arm flapping. Some examples of self-stimulatory behavior for the children in this study included repetitive arm flapping, spinning, intense staring (a fixed, glassy-eyed look lasting more than 5 s), repetitive giggling, ritualistic lip movement accompanied by whistling sounds, and psychotic verbal behavior.

Other behavior. This category consisted of behaviors that could not be considered appropriate or inappropriate (e.g., sitting doing nothing). Some of these children failed to interact independently with toys without coaxing from a treatment provider. This scoring allowed us to determine whether inactivity, rather than inappropriate behavior per se, was a problem.

Reliability of Data Recording

Throughout the investigation, one third of each child's sessions was scored by two observers, one of whom was naive with respect to the purpose of the study. Behavior during pretreatment, posttreatment, and follow-up measures was videotaped in 10-min probes while the child was unsupervised. During treatment the entire session was coded. All experimental and generalization sessions were videotaped and scored for appropriate play, inappropriate behavior, self-stimulatory behavior, and other behavior (e.g., sitting) via continuous 10-s interval recording. Each observer recorded the one type of behavior that occurred most often during each 10-s interval. Only one behavior was scored during each 10-s interval. The experimenter generally scored the child's behavior in vivo, and the second observer scored behavior that had been videotaped.

Interobserver agreement was calculated by dividing the total number of agreements by the total number of agreements plus disagreements and then multiplying by 100. Interobserver agreement was calculated for each of the behaviors individually. Reliability of data recording averaged 92% (range, 62% to 100%) for appropriate play, 90% (range, 62% to 100%) for inappropriate behaviors, 94% (range, 73% to 100%) for self-stimulation, and 93% (range, 83% to 100%) for other behaviors. Reliability of data recording for generalization toys averaged 99% (range, 95% to 100%).

Settings

For Bruce and Justin, training took place in two clinic settings. The first was a small room (3.05 m by 3.05 m) containing a small table, two chairs, and shelves that held several toys. The second setting was room (3.05 m by 4.58 m) containing a small couch, a large table, and two chairs. Generalization measures were taken in two additional settings. The first (the clinic generalization setting) was a large room (2.44 m by 4.58 m) containing a couch, a coffee table, and two end tables. The children saw this room only during baseline and generalization measures; no training took place here. The second generalization setting was the home. For Bruce the measure was taken in a small den, and for Justin the measure was taken in his bedroom. No training took place in the home for these children.

Claire was trained in her bedroom at home. Probes were taken in this room as well as in the clinic generalization room mentioned above. All training procedures were otherwise identical with those for the other 2 children.

Materials

Three training toys and two generalization toys were used for each child. Prior to baseline, we determined that each child could play appropriately with each of the five toys. Toys in which the children expressed interest during free play were used. Some toys were chosen because the children had specific problems engaging in appropriate play with them. See Table 2 for a complete list of the toys used for each child.

The measurement device used during self-management training was a repeat chronograph alarm wristwatch (Innovative Time, Model Q700BRN) that indicated the end of the set time intervals. Performance was recorded by each child after each interval on a piece of paper (8.5 in. by 11 in.; 120.32 cm by 27.94 cm) containing one or two boxes. The child used a pencil to fill in a box after

Table 2
Toys for Each Child

Child	Training toys	Generalization toys
Bruce	Cabbage Patch® baby doll and accessories Toy rocket ship with interchangeable parts and astronaut figures 40-piece puzzle	Sesame Street® Grover puppet Lego® blocks
Justin	Lights Alive® game and game pieces 15-piece puzzle Sesame Street® Oscar the Grouch game	*Go Dog Go* by P. D. Eastman Lego® blocks
Claire	Book of crossword puzzles and games 60-piece puzzle Barbie and the Rockers Colorforms® set	*Frog and Toad are Friends* by Arnold Lobel Set of stickers and magic markers

each interval that contained only appropriate behaviors.

Experimental Design

We used a single-subject multiple baseline design across subjects (Hersen & Barlow, 1976). Measures were obtained for each child before, during, and after treatment and at a 1-month follow-up.

Baseline

Baseline measures were obtained in 10-min segments over several days (with a minimum of 3 days per subject) while the children were alone with the five specified toys. The experimenter observed the subjects through a one-way mirror. Subjects were simply told to "go play" until the experimenter returned. During baseline sessions, the children did not receive any feedback from the experimenter about their activity, engaged in any type of behavior they desired (except, of course, behavior that might be dangerous), and had free access to the toys.

Treatment

Discrimination training. After baselines of varying lengths were obtained, self-management training began in accordance with the training manual by Koegel, Koegel, and Parks (1990). Each subject received training twice a week for 1 hr per day. First, each child was asked to distinguish between the appropriate and inappropriate use of each training toy. This was done by having the experimenter model both sets of behavior (appropriate and inappropriate) and reinforce correct identifications. For example, to demonstrate appropriate play, the experimenter used one of the toys appropriately, such as a puzzle, and asked the child, "Is this right?" To illustrate inappropriate behavior, the experimenter demonstrated a behavior the child was known to do often (e.g., spinning a puzzle piece or throwing it) and asked the child, "Is this right?" The experimenter then asked the child to give his or her own example of appropriate and inappropriate behaviors to ensure that the child understood that his or her own actions were the ones to be monitored. Discrimination training took place for 1 hr on the first day of training; each child learned the discrimination in this time.

Self-management implementation. Following discrimination training, the children learned to self-manage their own behavior. The children were trained to use the chronograph alarm wristwatch to cue the time interval, after which reinforcement was available if the interval consisted entirely of appropriate play. The children chose either to wear the watch or to place it on the floor near the monitoring sheets.

Based on baseline measurements, an initial interval was chosen in which the child was likely to have a high percentage of success (this initial interval varied across subjects from 30 s for Bruce to 60 s for Claire). Over the course of training, the specific interval varied from 30 s to 10 min, ac-

cording to the individual child's ability and the point in training that he or she had reached. The experimenter set the specific interval at the beginning of each session. The children learned that if they played appropriately and made a check mark in a specified box on the paper, they would be allowed to obtain reinforcement and to continue to play with the toy they had chosen. Reinforcers consisted of food items (e.g., potato chip), stickers, soda, and access to toys. If inappropriate behavior occurred (regardless of whether self-monitoring was correct or not), the child did not receive tangible reinforcement and the experimenter removed the toy that was used inappropriately. The experimenter then asked the child to choose a new toy until he or she engaged in appropriate play for an entire interval. However, if the child did self-monitor correctly during a segment that contained inappropriate behavior, the experimenter praised the child for correct monitoring (cf. Koegel & Koegel, 1990).

During the training sessions, the children were allowed to play with several toys other than the training toys (i.e., the child was permitted to play with more than the three toys included in the baseline measurement) in an effort to enhance motivation and generalization across toys. The generalization toys were never available during training.

Once the child maintained high levels of appropriate play during the current interval, interval lengths were increased gradually (e.g., by 30 s to 2 min each session). At this time the child was given more control over obtaining reinforcement independently. A tray containing food and stickers was placed in the room with the child and the child began to retrieve his or her own reinforcer at the end of each interval. After the child could self-monitor correctly 85% of the time (without prompting), the child was required to play appropriately for two consecutive intervals (i.e., the child filled two boxes) before taking a reinforcer from the tray.

Fading the experimenter's presence. After the child consistently played appropriately for 20 min (i.e., two 10-min intervals), the experimenter began leaving the room. Initially the experimenter left for 30-s intervals while an observer watched the subject from behind a one-way mirror (or on a television monitor for Claire). The experimenter then returned to the room and asked the child, "Did you play right while I was gone?" If the child had played correctly *and* had correctly self-monitored (by answering the experimenter's question), he or she received verbal praise and the interval continued. If the child played incorrectly, the experimenter gave a verbal reprimand and the interval started again. The consequences for correct verbal self-monitoring were the same as during the first part of the training phase, except that no tangible reinforcement was available until the child completed two 10-min intervals. In addition to the verbal self-monitoring required when the experimenter returned, the child was expected to fill in the box only after the entire 10-min interval. The experimenter gradually increased the time that the child played alone in the room until he or she remained unsupervised for the two consecutive 10-min segments. Fading the experimenter from the room generally required three to four sessions.

Removing self-management materials. Finally, the self-management materials (the watch and the monitoring sheet) were removed from the room. The experimenter told the child, "Today I am going to hold your watch and papers for you." Then, the child was asked to play correctly until the experimenter returned. The experimenter observed the child through a one-way mirror or on a television monitor throughout the interval. After a 10-min interval passed, the experimenter returned to the room and asked the child, "Did you play right while I was gone?" Verbal praise was given for appropriate play and correct verbal self-monitoring. Only after two such intervals would the child receive tangible reinforcement from the experimenter. After the first interval without the self-management materials, the child was asked to play correctly until the experimenter returned. No mention was made of the self-management materials in following sessions. After this point, all self-monitoring was done verbally.

Posttreatment. After removing both the experimenter's presence and the self-management ma-

terials, video probes of the child playing alone were obtained. Posttraining measurements were identical to the baseline probes (i.e., no self-management materials were present), and were scored on 10-s intervals based on the previously described criteria.

Follow-up. Follow-up measures were obtained 1 month after the final measurements were taken. Follow-up measurements were identical to the baseline probes with one exception. For the first follow-up probe, a stranger (not associated with the self-management training) brought the child into the session.

Generalization across settings. Generalization measures were obtained in the clinic generalization setting and in the home (when applicable). Generalization measures were conducted according to the procedures for all other baseline measures. Generalization probes were taken during baseline, posttreatment, and follow-up.

Generalization of behavior to new toys. Baseline, posttreatment, and follow-up sessions were also scored for generalization of behavior to the two generalization toys.

RESULTS

Results for the 3 children are shown in Figure 1. Inappropriate behavior was not plotted because it represented the inverse of appropriate play. Also, because the category for other behavior did not add significant information, these data are not presented.

Baseline data for Bruce were variable, but showed little or no appropriate play. With self-management training, appropriate behaviors increased to above-baseline levels, averaging 82% across training sessions. Posttreatment measures were taken after the fading of both the experimenter and the self-management materials. For Bruce, the increase in appropriate behavior was maintained, averaging 88%. Behavior changes also were maintained in the clinic generalization room and the home setting.

Follow-up measures showed a decrease in appropriate play to 40% and an increase in inappropriate behavior. A stranger introduced the first follow-up probe, and the experimenter introduced the second. After a 45-min training session, appropriate play increased to 80%. In two of the follow-up sessions (indicated by an asterisk in Figure 1), new toys were added to the room to enhance motivation. Bruce maintained appropriate play in the generalization settings, and inappropriate play decreased again to less than 10% after the training session. Self-stimulatory behaviors alone averaged 13% at baseline, 3% during posttreatment measures, 5% across all follow-up sessions, and 4% in the follow-up generalization probes.

Justin also exhibited an increase in appropriate play (see Figure 1) with self-management training. During baseline assessments, his average level of appropriate play was only 14%. During training sessions, his level of appropriate play was more variable than either of the other children, but also increased and averaged 80%. The amount of appropriate play remained high during posttreatment measures as well, in both training and generalization settings, averaging over 90%. During follow-up, appropriate play remained very high even during the sessions in which a stranger introduced the probe and in generalization settings. Justin engaged in self-stimulation 13% of the time before training, 2% of the time during posttreatment measures, and 3% of the time during follow-up.

A similar effect was demonstrated with Claire (see Figure 1). The data points in Figure 1 in which appropriate play approached 50% (Sessions 1 through 3) were taken with the experimenter in the room with the child for filming purposes. For the remaining sessions, the experimenter left the room during assessments. At this time, appropriate play decreased. With the introduction of self-management training, the amount of appropriate play increased dramatically to 96% and remained stable during fading sessions. Behavior changes were maintained during posttreatment measures in all settings and during follow-up assessments, including the generalization setting and the probe taken by an unfamiliar experimenter. Self-stimulation alone for Claire dropped dramatically with the introduction of self-management procedures, from 66% at baseline to 4% during training, 3% during posttreatment measures, and 2% during follow-up.

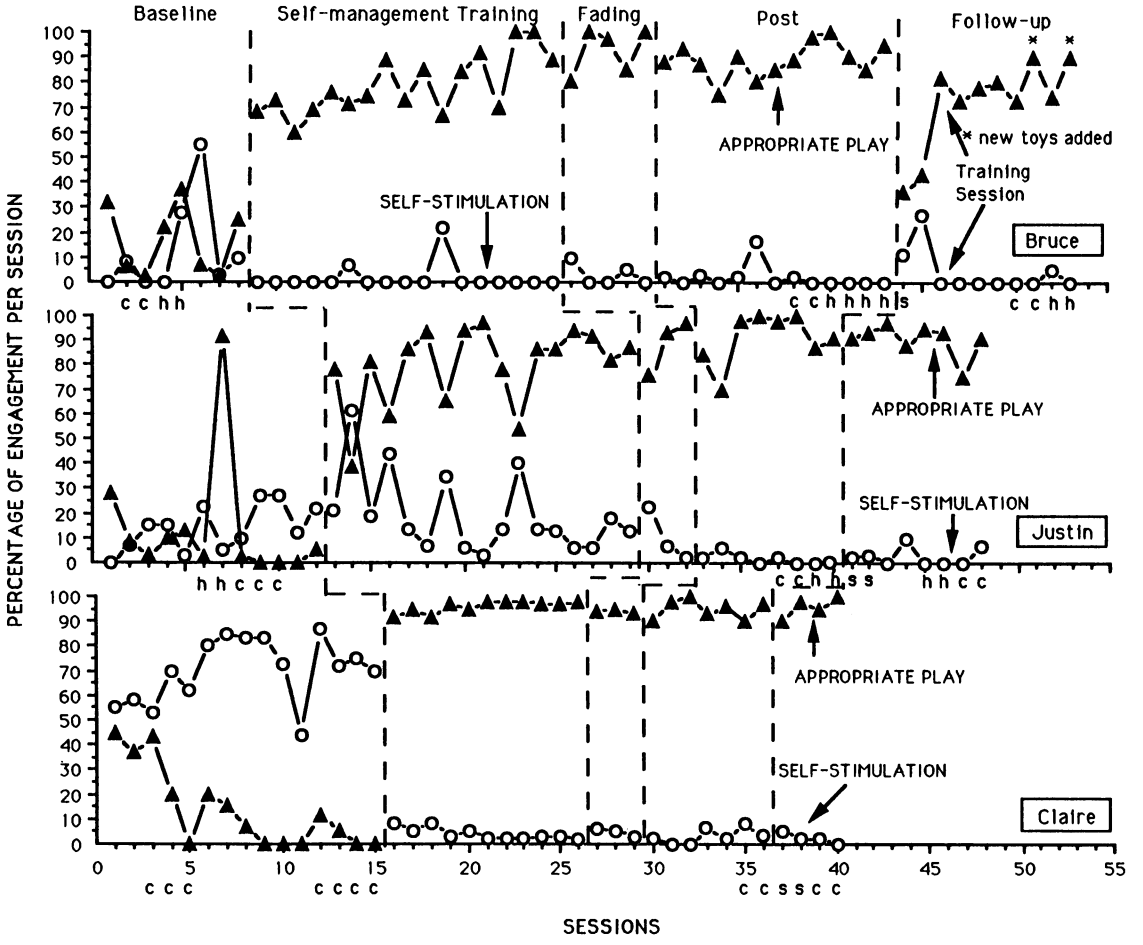

Figure 1. The percentage of 10-s intervals containing appropriate play and self-stimulatory behavior during baseline, self-management training, fading, posttreatment, and 1-month follow-up conditions. The baseline, posttreatment, and follow-up probes show the child's behavior in the absence of a treatment provider. Generalization probes are noted on the abscissa, clinic generalization probes are noted by "c," home probes are noted by "h," and probes that were introduced by a stranger are noted by "s." All other probes were taken during training.

Use of generalization toys. The children differed in their use of generalization toys throughout the conditions. Bruce used the generalization toys an average of 41% during baseline. Appropriate use of these toys was recorded during 33% of this time, and inappropriate or self-stimulatory behavior averaged 47% of this time (20% of the time Bruce was holding the toy but engaging in other behavior). After training, Bruce used the generalization toys an average of 60% of the time (92% appropriate, 5% inappropriate). One month after training, he used the toys 23% of the time (74% appropriate, 18% inappropriate). After his booster training session, he used the generalization toys an average of 20% of the time (90% appropriate, 7% inappropriate). Justin did not play with the generalization toys at all during baseline. During posttraining assessments, he played with the generalization toys 9% of the time, using them appropriately 100% of that time. During follow-up probes, he played with generalization toys an average of 19% of the total time (87% appropriate, 14% inappropriate or self-stimulatory behavior). Claire did not play with the generalization toys at all during any of the assessments.

Accuracy of self-monitoring. Accuracy of self-

monitoring varied for each child and is presented in Figure 2. Generally, the children learned to monitor correctly within a short period of time. The children incorrectly reported engaging in inappropriate behavior when they had been engaging in appropriate play on only three occasions (see Figure 2). All children had difficulty monitoring inappropriate behavior during very long intervals. That is, they accurately reported their inappropriate behavior about half of the time in which they had opportunities to report inappropriate behavior. The opportunities to report inappropriate behavior, however, became rare as their play improved. Errors in reporting did not affect their engagement in appropriate play or their generalization. These results are consistent with those of other researchers (e.g., Koegel et al., 1988). By the end of the self-management training (during fading sessions), Bruce self-monitored accurately 90% of the time, Justin self-monitored accurately 84% of the time, and Claire self-monitored accurately 85% of the time.

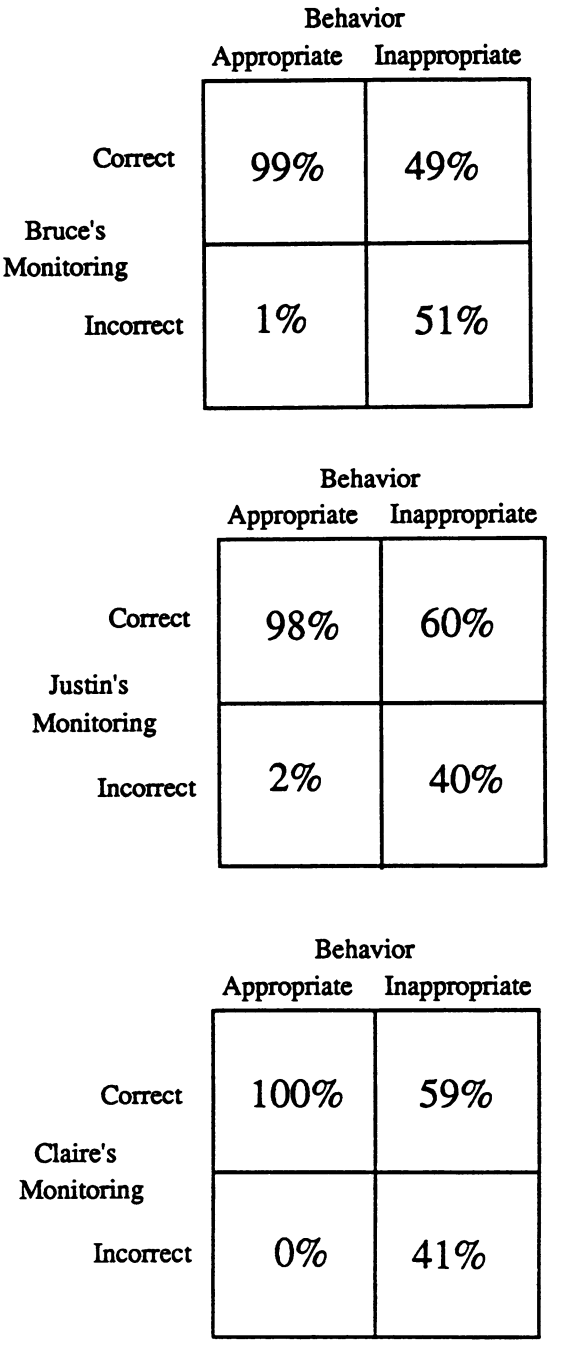

Figure 2. Accuracy of self-monitoring.

DISCUSSION

This experiment assessed the feasibility of training children with autism to use a treatment package containing a self-management component to increase their own appropriate play and to maintain appropriate play in unsupervised settings. Prior to intervention, the children who participated in this study did not play appropriately in unsupervised settings. With the introduction of the self-management treatment package, appropriate play increased. The children maintained these increases during unsupervised posttreatment measures as well as across generalization settings and toys. Two of the 3 children maintained high levels of appropriate play without further training 1 month after the last training session. Bruce recovered after one booster training session. As appropriate behaviors increased, inappropriate behaviors, including self-stimulation, decreased. These results indicate that children with autism can maintain appropriate play behaviors, and that a treatment package including self-management can serve as an effective means of increasing these behaviors in unsupervised settings. The finding of generalization of appropriate play to unsupervised settings is significant because to date only one study (Santacarangelo et al., 1987) has assessed such generalization with children with au-

tism, and that study did not employ self-management.

The present study also provided evidence that generalization may be achieved without retraining. Koegel and Koegel (1990) did not find this generalization effect when they taught children with autism to reduce stereotypic behaviors using self-management techniques. One possible reason for this difference is that in the Koegel and Koegel study, the self-management materials were never systematically faded from the training environment. It is possible that because the subjects in the present study were taught to self-manage without their equipment in the training setting, they more readily generalized to new environments that did not contain this equipment. Other self-management studies have also included some form of retraining in new settings, possibly because of the discriminative effects of the self-monitoring materials (Browder & Shapiro, 1985).

A second explanation for the children's generalization could be the nature of the task itself. Toy play may have become reinforcing to the children. If this is the case, the natural contingencies for appropriate toy play may have been strong enough to account for the children's generalized responding. Another explanation for the generalization of these children's behavior is the fact they were trained either in two clinic settings or in the home. For instance, the children trained in the two clinic settings may have benefited from the multiple settings by relying less on specific discriminative stimuli related only to one setting. Claire, trained in the home, may simply have learned from past experience to generalize skills learned in the home to other settings. More data are needed to clarify whether or not this generalization effect is due to environment, fading of self-management materials, or a function of the type of behavior the children learned.

Generalization of appropriate behavior to new toys not used during training also occurred for those children who used the generalization toys. Applying multiple exemplars and not limiting the children to specific toys may have increased generalization by decreasing the chances that particular toys would become discriminative for appropriate play (Stokes & Baer, 1977). Some generalization to new experimenters also occurred.

The data indicated that for 2 of the 3 children, appropriate behaviors in unsupervised settings were maintained 1 month after self-management training ended. This is encouraging in that self-management could be used for many children in long-term situations without retraining.

As the children's appropriate play behaviors increased, self-stimulatory behaviors decreased dramatically. It is possible that the decrease in self-stimulation was a result of the increase in appropriate play. Self-stimulatory behaviors may have decreased because of their physical incompatibility with appropriate play. This is not, however, the case for either Justin or Claire, each of whom could engage in self-stimulation (e.g., psychotic verbal behavior) while engaging in appropriate play. Another possible interpretation of these results is that the play behaviors served as an alternative source of sensory stimulation for the children (Koegel et al., 1974; Rincover, 1978). The combination of monitoring their own behavior (thereby attending more actively to their own actions), the sensory stimulation acquired through toy play, and the differential reinforcement of new appropriate behaviors could account for the decrease in self-stimulation. Whatever the reason(s), the results are particularly encouraging, because the occurrence of self-stimulation can inhibit learning and make the children less responsive to their environment (Koegel & Covert, 1972; Lovaas, Litrownik, & Mann, 1971).

To obtain some informal social validation of our treatment effects, the parents were asked for their impressions of the children's behavior change. These parental reports indicated that all the children were perceived to have improved play behaviors while unsupervised at home. Bruce's mother said his play behavior increased dramatically from pretreatment levels. She gave examples of spontaneous appropriate play (e.g., building with Lego® blocks) and a decrease in his obsessive behavior with some toys. Justin's mother indicated she had noticed an increase in appropriate play at home. He now played

with crayons and paper quietly and exhibited his finished work to his family. Claire's mother indicated that Claire's behavior was usually better than before training, but sometimes she would resume self-stimulatory verbal behaviors when left alone for too long a period. Claire's appropriate behavior thus seemed to be under the stimulus control of the experimenter, although some generalization to her mother was evident because less frequent reminders were needed to keep the child on task.

The self-management procedures were relatively unobtrusive during the children's play. Children generally took about 30 s to mark their monitoring sheets and obtain reinforcement. In the early stages of training, when the intervals were very short (30 s to 2 min), the procedure did affect play slightly; however, the children did not get upset or behave in a noncompliant manner during the self-monitoring procedures. The procedure was less intrusive as the interval lengths increased.

One of the limitations of the present study is that it was not possible to separate the effects of contingent reinforcement and prompting from the effects of self-management procedures alone (i.e., self-monitoring, self-reinforcement). Thus one might argue that the self-management procedures did not add to the effectiveness of the differential reinforcement and/or prompts. This problem of separating self-management from other factors of treatment plagues the self-management literature (Baer, 1984; O'Leary & Dubey, 1979). However, previous research lends support to the argument that the self-management component increased our package's effectiveness, particularly with regard to the children's increases in appropriate play in unsupervised environments. Santacarangelo et al. (1987) found that using differential reinforcement of toy play alone did not increase appropriate unsupervised play in children with autism. Romanczyk et al. (1975) reported the positive effects of contingent reinforcement on toy play in supervised settings, yet noted rapid extinction of the behavior when the treatment was removed. Singh and Millichamp (1987) found that verbal prompts increased the independent play of developmentally disabled adults, but that prompts were needed to sustain the play behavior in all posttraining sessions. In a direct comparison of reinforcement delivered by a treatment provider versus self-delivery of reinforcement, Horner, Lahren, Schwartz, O'Neill, and Hunter (1979) found that self-delivery of reinforcers was more effective than supervisor-delivered reinforcers in increasing production in a sheltered workshop setting. Koegel and Koegel (1990) effected extended reduction of stereotypic behavior in children with autism using self-management along with reinforcement for appropriate behavior. When 1 subject was exposed to a reversal consisting of the withdrawal of the self-management materials, treatment effects were lost and the stereotypic behavior increased, suggesting the self-management component was important in the maintenance of the behavior change. Sainato et al. (1990) provided data indicating that increases in independent work skills of preschool children with autism, established via self-evaluation and reinforcement, were maintained after the withdrawal of reinforcement and continued presence of self-evaluation. Thus, although the design of the present study does not permit analysis of the effects of individual package components, existing literature supports the likelihood that the self-management component was important in the overall effectiveness of the intervention.

Although previous research may support the positive treatment effects of the self-management components over differential reinforcement alone, future research should directly assess such efforts. In the present investigation, earlier probes with and without the self-management materials might have provided information regarding the extent to which these materials were necessary or functional in assisting the children to maintain their appropriate play.

However, even if it were the case that self-monitoring and self-reinforcement were not *more* effective than differential reinforcement alone, there is another very important reason to pursue self-management techniques. Self-monitoring and self-reinforcement do not require the presence of a treatment provider (i.e., in unsupervised settings). This feature not only bodes well for the future inde-

pendence of the student but frees the time of treatment providers to engage in other activities, which may include teaching or supervising other students or leisure time for the parent (e.g., Fowler, 1984; O'Leary & Dubey, 1979; Sainato et al., 1990). When one considers the tremendous demands such a handicapped child places on a parent, for example, it is likely that some of the burden of child treatment might be lifted as the child becomes more independent by providing his or her own treatment.

This study provides an extension of previous studies designed to teach self-management skills to children with autism (Koegel & Koegel, 1990). The results indicate that relatively low-functioning children with autism also can benefit from a treatment package that includes self-management techniques to change a relatively complex behavior. This type of training procedure may help to integrate these children into the community by increasing their independence (Russo & Koegel, 1977). Another advantage to this procedure is that it provides a relatively easy way for children with autism to become involved in their own treatment, which may serve to enhance motivation and responsivity (O'Neill, 1987). Self-management training can be implemented and maintained quite easily, is beneficial for the students, and is directly applicable to both home and clinic environments.

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