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SOCIAL INFLUENCES ON "SELF-STIMULATORY" BEHAVIOR: ANALYSIS AND TREATMENT APPLICATION

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We tested the hypothesis that the "self-stimulatory" behaviors exhibited by some individuals may be socially mediated. Four developmentally disabled children who exhibited hand flapping and body rocking participated in a series of three experiments conducted to assess the influence of social variables on stereotyped behavior and to develop a treatment based on the assessment. Experiment 1 used an assessment procedure to determine the relative influences of social attention and task demands on stereotyped behavior. For all four children, hand flapping and body rocking increased when difficult academic tasks were introduced. Experiment 2 involved the use of a procedural time-out and demonstrated that removing task demands contingent on stereotyped behavior resulted in increased rates of hand flapping and body rocking. In Experiment 3, these results were used to develop a communication treatment that consisted of teaching the children to request assistance on the difficult tasks. This treatment resulted in significant reductions in self-stimulatory behavior. These results are consistent with the hypothesis that some forms of repetitive stereotyped behavior may come to serve social functions (e.g., escape from aversive situations). Teaching a functionally equivalent communicative alternative to escape-motivated stereotyped behavior can be an effective form of intervention for this problem.

DESCRIPTORS: self-stimulatory behavior, communication, developmentally disabled children, negative reinforcer, stereotyped behavior

Behaviors that are highly consistent and repetitive, and have no apparent adaptive function have been variously labeled *stereotyped* or *self-stimulatory* (Baumeister & Forehand, 1973; Berkson, 1967; Lovaas, Koegel, Simmons, & Long, 1973). Stereotyped behaviors take a variety of forms including repetitive body rocking, hand flapping, mouthing, and body posturing. It has been observed that up to two thirds of the persons with developmental disabilities living in institutions exhibit these behaviors (Berkson & Davenport, 1962). In general, stereotyped behaviors make up a large proportion of the behavioral repertoire of persons with severe developmental disabilities (Repp & Barton, 1980; Repp, Barton, & Gottlieb, 1983).

Clinical efforts have focused on these behaviors for a number of reasons. Stereotyped behavior can serve to stigmatize persons with severe handicaps who exhibit this behavior, and may inhibit efforts to integrate them into nonsegregated environments. Additionally, stereotyped behavior sometimes hinders efforts to educate and train the developmentally disabled. This behavior has been found to interfere with responses to auditory stimuli (Lovaas, Litrownik, & Mann, 1971), discrimination tasks (Koegel & Covert, 1972), attempts to teach play skills (Koegel, Firestone, Kramme, & Dunlap, 1974), and observational learning (Varni, Lovaas, Koegel, & Everett, 1979).

A number of response-contingent aversive procedures have been used to reduce stereotyped behavior in developmentally disabled populations, including electric shock (e.g., Baumeister & Forehand, 1972; Lovaas, Schaeffer, & Simmons, 1965), slaps to the hand (e.g., Koegel & Covert, 1972; Koegel et al., 1974), and physical restraint (e.g., Luiselli,

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Reisman, Helfen, & Pemberton, 1976). A variety of nonaversive interventions have also been used with this behavior, including differential reinforcement of other behavior (e.g., Repp, Deitz, & Deitz, 1976) and differential reinforcement of incompatible behavior (e.g., Favell, 1973). These procedures have been generally effective in reducing the stereotyped behavior of developmentally disabled persons (LaGrow & Repp, 1984).

Explanations for the maintenance of stereotyped behaviors have often centered on their ability to provide reinforcing sensory input. Thus, these behaviors continue to be exhibited because they provide sensory feedback to the individual. In support of this hypothesis, a number of studies have shown that allowing individuals to engage in stereotyped behavior is reinforcing (e.g., Hung, 1978; Wolery, 1978; Wolery, Kirk, & Gast, 1985). In addition, procedures to eliminate the presumed sensory feedback provided by the behavior have resulted in dramatic reductions in stereotyped behavior. In one study (Rincover, 1978), the auditory feedback provided by plate spinning was eliminated by carpeting the surface of a table. Following this manipulation, plate spinning by a child with autism was reduced. This procedure (termed sensory extinction) has effectively reduced the stereotyped behaviors of developmentally disabled persons (e.g., Aiken & Salzberg, 1984; Rincover, 1978; Rincover, Cook, Peoples, & Packard, 1979). Thus, there is growing evidence that the stereotyped behavior exhibited by most developmentally disabled persons is maintained by its sensory consequences (Lovaas, Newsom, & Hickman, 1987).

In the present investigation we attempted to demonstrate that the stereotyped "self-stimulatory" behaviors exhibited by some individuals may serve social functions. We observed that although most individuals who engage in behaviors such as body rocking and hand flapping appear to do so independent of the social environment, this is not true for all clients. This observation is related to recent work identifying the social nature of other forms of psychotic behavior (e.g., Carr & Durand, 1985b; Durand & Crimmins, 1987). To test a social motivation hypothesis of stereotyped behavior, two experiments were carried out to examine the role of social variables in the maintenance of self-stimulatory behavior in four developmentally disabled children. In a third experiment, we taught communicative responses that presumably served the same social function as the children's body rocking and hand flapping, in an effort to see whether such alternatives would compete with and reduce the problem behavior.

EXPERIMENT 1

Method

Subjects and Setting

The subjects were four developmentally disabled children enrolled in a special education day school. These children displayed some form of self-stimulatory behavior identified as problematic by their classroom teachers. Teachers were asked to refer children whose stereotyped and oppositional behavior occurred more frequently in task situations. Table 1 provides descriptive information on each subject.

Jim was an 11-year-old autistic boy who was echolalic but could speak with appropriate sentences if prompted. Jim's teacher described him as "frequently oppositional," often attempting to avoid classroom work. This avoidance took the form of body rocking, followed by self-injurious behavior (head and face hitting) and screaming if demands were not withdrawn. Ken was a 13-year-old autistic boy who could use complex sentences with moderate prompting by others, although he also engaged in bizarre speech. Ken exhibited excessive body rocking, especially when introduced to new tasks or routines.

The third subject, Bob, was a 7-year-old developmentally disabled boy who displayed frequent instances of echolalia and bizarre speech, but could also speak in appropriate sentences. Bob's hand flapping in class appeared to occur when he was given tasks that seemed to be boring or difficult. Len was an 11-year-old developmentally disabled child who could speak with appropriate sentences and was described as "helpful" in class. However,

Table 1
Subject Descriptions

Name	Descriptive information				
	Chronological age (months)	Mental age (months)	Language age (months)	DSM-III diagnosis	Behavior topography
Jim	135	42	46	Autism	body rocking
Ken	152	36	40	Autism	body rocking
Bob	87	60	51	Pervasive developmental disorder	hand flapping
Len	141	95	92	Pervasive developmental disorder	hand flapping

he exhibited disruptive hand flapping whenever difficult tasks were introduced.

All experimental sessions were carried out in a room adjacent to the children's classroom. The room contained a table and two chairs. The child was seated at one end of the table with the task materials in front of him. An experimenter sat at the table across from the child, and two research assistants observed and collected data through a one-way mirror.

Procedures and Design

The following procedures were adapted from Carr and Durand (1985a). Three experimental conditions (Baseline, Decreased Attention, Increased Task Difficulty) were introduced in an A-B-A-C-A-C-A-B-A design (Hersen & Barlow, 1976) to assess the influence of adult attention and difficult task demands on rocking and hand flapping. Each child participated in 10-min sessions of each condition, two or three sessions per day. When multiple sessions were run on the same day, there was a 5- to 10-min break between sessions. A preassessment phase was introduced to select task materials.

Preassessment. During all experimental conditions, each child was required to complete one of two academic tasks. The types of tasks used in these conditions (matching pictures and receptive labeling) were taken from the children's individual education plans. Task stimuli were selected from the pictures of the Peabody Picture Vocabulary Test (PPVT). We wanted two levels of difficulty for these tasks, easy and difficult. Thus, a pool of easy stimuli (i.e., those the children responded to correctly 100% of the time) were generated from the PPVT. Similarly, difficult items (i.e., those the children correctly identified only on a random basis) were taken from the PPVT. These pictures were combined with easy pictures to create a task on which each child would respond with approximately 25% correct answers. These stimuli constituted the difficult task.

During baseline, both a match-to-sample and a receptive labeling task were presented to the children. Because match-to-sample was the most commonly used task for developing independent work skills, we chose it to assess the effects of different levels of adult attention on the level of stereotyped behavior (i.e., comparing baseline with the Decreased Attention condition). Because vocabulary tasks typically generated many errors, we chose receptive labeling to assess the effects of task difficulty on the level of stereotyped behavior (i.e., comparing baseline with the Increased Task Difficulty condition). Therefore, match-to-sample was presented during the Decreased Attention condition, and receptive labeling was presented during the Increased Task Difficulty condition.

Baseline. During these sessions, each child was required to complete the match-to-sample task and the receptive labeling task. The two tasks were alternated, 5 min each, within each 10-min session. The task sequence was randomized across sessions. Recall that stimuli for these tasks consisted of pictures from the PPVT. Stimuli for the match-to-sample task were taken from a pool of approximately 100 cards (7.6 cm by 12.7 cm) on which the PPVT pictures were pasted. Each child was

given a stack of these cards and was asked to match them to several samples placed on the table. In the receptive labeling task, four PPVT pictures were pasted on each of approximately 100 cards (20 cm by 20 cm). The experimenter then asked the child to point to one of the pictures on the card (e.g., "Point to the brush").

Every third correct answer on the average was praised (e.g., "Good work!"), yielding a variable ratio 3 (VR3) schedule. The occasional incorrect answer was followed by the statement, "No, that's not right." The ratio of praise (VR3) was chosen to match the rates of praise in subsequent conditions (Decreased Attention and Increased Task Difficulty). Similarly, the presentation of commands to complete the tasks was paced (approximately once every 30 s) to match the rate in other conditions. This manipulation resulted in praise during one third of the 10-s scoring intervals (i.e., 20 out of 60 intervals) and commands during another, different one third (20 intervals). One hundred percent attention (i.e., some form of attention in each scoring interval) was accomplished by the addition of neutral comments (e.g., "It's a nice day out today") in the remaining one third of the intervals (i.e., 20 intervals). Subsequent experimental conditions were constructed by manipulating either task difficulty or level of adult attention without changing the number of praise statements, task demands, or comments. All instances of hand flapping and body rocking were ignored.

Decreased attention. During this condition, the students were presented with the match-to-sample task described previously. Stimuli were selected so that task performance would approximate 100% correct. All procedures were identical to those of baseline, except that adult attention was decreased. Specifically, praise, commands, and comments were again presented in one third of the recording intervals, but were now combined in the same 10-s interval. This resulted in two thirds of the intervals containing no adult attention and one third of the intervals containing a command, a praise statement, and a comment. Thus, during 20 out of every 30 s (i.e., two out of three recording intervals) the experimenter did not interact with the child.

Each child was taught to continue to match the cards during the intervals of no attention. This allowed the experimenter to praise the child for approximately every third correct response, while keeping the number of command statements equivalent to baseline. Therefore, the amount of attention provided to each child was rearranged so that although the number of praise statements, commands, and comments were equivalent to baseline, there were now relatively long periods of time between instances of attention (i.e., 20 s). Previous work has demonstrated that this manipulation results in increased rates of behavior presumably maintained by adult attention (Carr & Durand, 1985a; Durand & Crimmins, in press).

Increased task difficulty. These sessions were run as in baseline, except that stimuli were selected to produce a difficult task. The presentation of praise, commands, and comments was made as described in baseline. Now, however, the receptive labeling task was introduced with stimuli that were preassessed to produce approximately 25% correct responses. Incorrect responses were followed by feedback from the experimenter (e.g., "No, that's not correct!"), and the presentation of the next trial.

Response Definitions and Observer Agreement

Child behaviors (hand flapping, body rocking, and academic responses) and experimenter behaviors (praise, commands, comments) were both recorded. Experimenter behaviors were monitored to ensure the integrity of the independent variable manipulation. All responses were recorded using a continuous 10-s interval procedure. Hand flapping was defined as any repetitive (i.e., more than two times) rapid movement of the hand away from the body with the fingers outstretched. Body rocking was defined as any continuous back-and-forth movement of the torso, repeated two or more times within a 10-s recording interval.

Correct responses for the receptive labeling task were scored if the child pointed to the picture labeled by the experimenter. An incorrect response was scored if the child pointed to a different picture or failed to respond within 10 s. Correct responses for the match-to-sample task were scored if the

child placed a copy of a picture on an appropriate sample. Incorrect responses were scored if the child placed a picture on a nonmatching sample picture, or if the child did not respond within 10 s.

Praise was defined as any form of verbal approval (e.g., "That's right!"). Commands were defined as any task-related request made by the experimenter (e.g., "Point to the brush" or "Match this"). Comments were defined as any descriptive remarks made by the experimenter (e.g., "There sure are a lot of pictures!").

Observer agreement was assessed during 100% of the sessions by trained undergraduate observers. Training was conducted prior to this study until observers reached a criterion of 75% agreement on all responses with the standard observer (an undergraduate with prior observer experience). Observer records were compared on an interval-by-interval basis. Agreement scores were computed as the number of agreements divided by the number of agreements plus disagreements. The mean occurrence agreement score was 80% or higher for all subjects and response categories (range, 80% to 100%). The mean nonoccurrence agreement score was 74% or higher for all subjects and response categories (range, 74% to 100%).

Results and Discussion

Independent Variable Manipulation

In the following discussion, group averages are reported; however, individual data are consistent with the group means and may be obtained from the authors.

The data on task performance were consistent with our attempts to establish an easy task for the baseline and Decreased Attention conditions (i.e., approximately 100% correct responses) and a difficult task for the Increased Task Difficulty condition (i.e., approximately 25% correct responses). The mean percent correct during baseline was 95.9% (range, 93% to 100%), for Decreased Attention 92.9% (range, 85% to 100%), and for Increased Task Difficulty 26.3% (range, 21% to 32%).

Mean percentage of intervals involving praise was 33.6% (32.9% to 34.0%) for baseline, 34.6% (33.8% to 36.2%) for Increased Task Difficulty, and 33.5% (32.9% to 34.1%) for Decreased Attention. Mean percentage of intervals involving commands was 32.9% (31.6% to 34.6%) for baseline, 32.4% (30.6% to 34.0%) for Increased Task Difficulty, and 33.5% (31.6% to 34.6%) for Decreased Attention. Mean percentage of intervals involving comments was 32.8% (31.2% to 33.9%) for baseline, 33.0% (31.0% to 34.8%) for Increased Task Difficulty, and 34.4% (34.0% to 34.9%) for Decreased Attention. Finally, the mean percentage of intervals involving no experimenter response (i.e., no recorded instance of praise, commands, or comments) was 1.0% (0.9% to 1.1%) for baseline, 1.1% (0.6% to 1.4%) for Increased Task Difficulty, and 67.4% (65.2% to 68.3%) for Decreased Attention. Thus, the data for experimenter attention were consistent with our efforts to program a 33% level of praise, commands, and comments across all conditions as well as to combine these forms of attention during the Decreased Attention condition such that approximately two thirds of the intervals in that condition contained no experimenter attention.

Body Rocking and Hand Flapping

Figure 1 illustrates the effects of the manipulation of experimenter attention and task difficulty on body rocking and hand flapping. (Note that the ordinates for Figure 1 differ across children.) Data on body rocking and hand flapping were equivalent for the two tasks presented in baseline, so these data are combined under baseline in Figure 1. The data suggest that for each subject, body rocking or hand flapping was unaffected by reduced rates of adult attention, but increased when more difficult task materials were introduced. The mean rate of body rocking for Jim was 7.5% during baseline, 6.8% during Decreased Attention, and 31.3% during Increased Task Difficulty. Body rocking for Ken averaged 0%, 0.3%, and 10.7% for baseline, Decreased Attention, and Increased Task Difficulty, respectively. Similarly, Bob's hand flapping averaged 2.3%, 5.5.%, and 28.6%, and Len's hand flapping averaged 2.7%, 3.8%, and 20.7% for baseline, Decreased Attention, and Increased Task Difficulty.

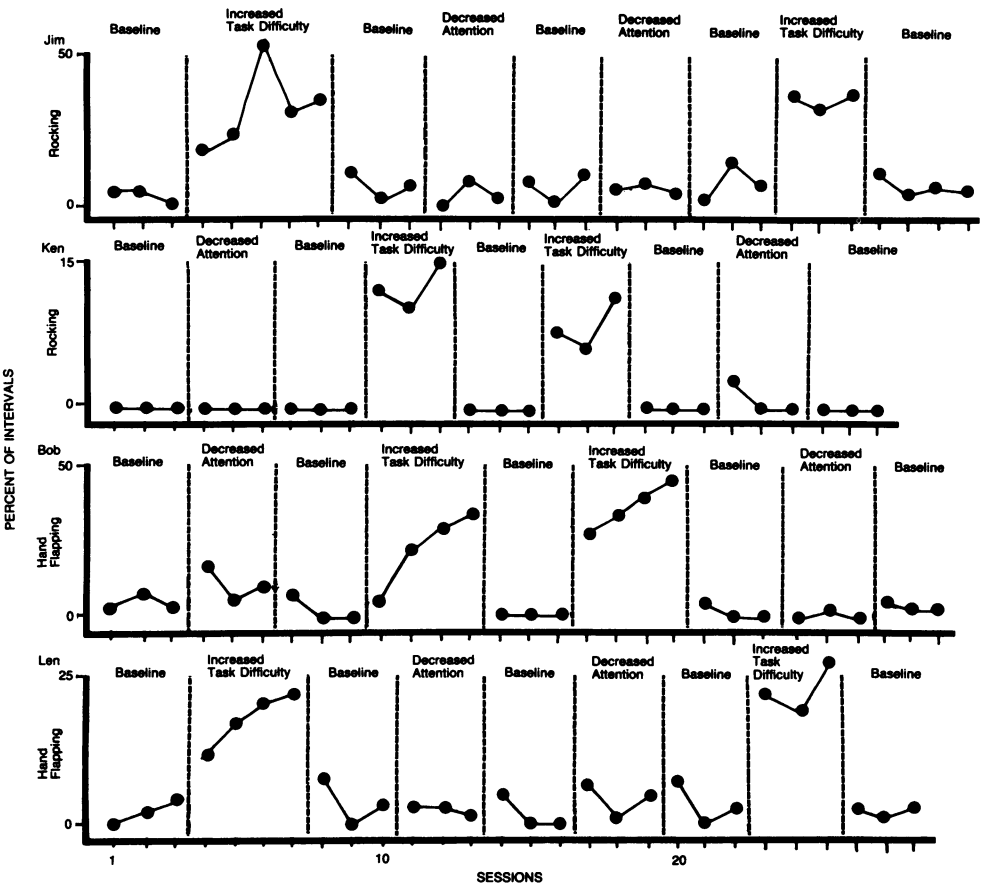

Figure 1. Percentage of intervals of body rocking and hand flapping during Experiment 1 as a function of the three experimental conditions.

The data from Experiment 1 suggest that difficult task materials were discriminative for the stereotyped self-stimulatory behavior exhibited by these subjects. Decreasing levels of experimenter attention had no effect on body rocking and hand flapping when compared to baseline. However, introducing previously assessed difficult task stimuli resulted in reliable increases in these behaviors. These results are consistent with the notion that the variables maintaining body rocking and hand flapping may involve escape from task demands. Anecdotal reports from teachers indicated that they responded to these behaviors by ignoring them or removing the child from the ongoing activities. These activities and the data from this study suggest that the children may have learned to escape aversive task demands by engaging in body rocking and hand flapping. Experiment 2 was designed to test this hypothesis further.

EXPERIMENT 2

METHOD

Subjects and Setting

The subjects and setting were the same as in Experiment 1.

Procedures and Design

In this experiment we further tested the hypothesis that the body rocking and hand flapping exhibited by our subjects were being maintained by escape from task demands. During a time-out condition, the experimenter removed the task materials and turned away from the student for 10 s,

contingent on body rocking or hand flapping. If these behaviors were maintained by their sensory consequences, then it would be expected that there would be no change in the subject's behavior because the time-out would not affect the sensory feedback provided by the behavior. If adult attention was maintaining these behaviors, then they would presumably decrease over time because attention would be removed contingent upon body rocking and hand flapping. However, if an escape hypothesis is correct, time-out would signal the removal of task demands and stereotyped behavior should increase as a result of a negative reinforcement process. Two experimental conditions were introduced to test these predictions, following procedures adapted from Durand and Crimmins (1987).

A baseline condition was constructed that was identical to the Increased Task Difficulty condition of Experiment 1. This condition served as a comparison with the time-out condition that was introduced later. Praise, commands, and comments were programmed in 33% of the recording intervals, and the difficult stimulus materials identified in the preassessment were used as the receptive task. Body rocking and hand flapping were ignored in this condition.

Time-out involved the same procedures as in baseline, except that now the experimenter provided a consequence for each occurrence of body rocking and hand flapping. Immediately following each instance of a targeted behavior, the experimenter removed the task materials from the table and turned away from the child for approximately 10 s. Following this 10-s time-out, the task materials were replaced and the session was resumed. Ten-minute sessions of baseline and time-out were introduced in an A-B-A-B-A design (Hersen & Barlow, 1976). Data collection and observer agreement procedures were conducted as in Experiment 1.

Occurrence agreement data for all experimenter and child responses exceeded 80% (range, 83% to 100%). Nonoccurrence agreement data for all experimenter and child responses exceeded 78% (79% to 100%). Individual data were consistent with these mean aggregates.

Results and Discussion

The task performance data illustrate our success in introducing difficult task stimuli during each condition. The mean percent correct during baseline was 25.5% (17% to 40%) and 25.1% (15% to 35%) during time-out. Data on praise, commands, and comments during time-out are reported only during the period of time in which task materials were presented. No experimenter responses occurred during the time-out period. Mean percentage of praise was 34.0% (32.4% to 36.0%) during baseline and 34.6% (33.1% to 35.6%) during time-out. Mean percentage of commands was 31.6% (29.6% to 34.2%) during baseline and 32.6% (31.0% to 33.1%) during time-out. Mean percentage of comments was 33.9% (32.0% to 34.9%) during baseline and 32.3% (31.0% to 33.9%) during time-out. Both conditions were equivalent in terms of task performance and experimenter attention.

Figure 2 depicts the percentage of intervals of body rocking and hand flapping as a function of the two experimental conditions. (Note that the ordinates in Figure 2 differ across children.) Mean percentage of body rocking for Jim was 26.0% (17% to 33%) during baseline and 79.3% (63% to 92%) during time-out. Ken's data showed 9.8% (2% to 17%) for baseline and 63.3% (50% to 75%) for time-out. Rates of Bob's hand flapping were 24.1% (13% to 43%) for baseline and 41.8% (38% to 53%) for time-out. Len's hand flapping averaged 10.6% (2% to 25%) for baseline and 28.1% (13% to 38%) for time-out. In each case, time-out was associated with increased rates of the stereotyped behaviors.

We further analyzed the data on body rocking and hand flapping during the time-out condition. We compared the rate of these behaviors for the time-out period (i.e., the time during which the experimenter was turned away and no task demands were presented), and the time-in period (i.e., the time during which the experimenter was presenting the difficult task material). The students spent an average of 53.1% of the recording intervals in time-out. However, 87.5% of the recorded body rocking and hand flapping occurred during time-

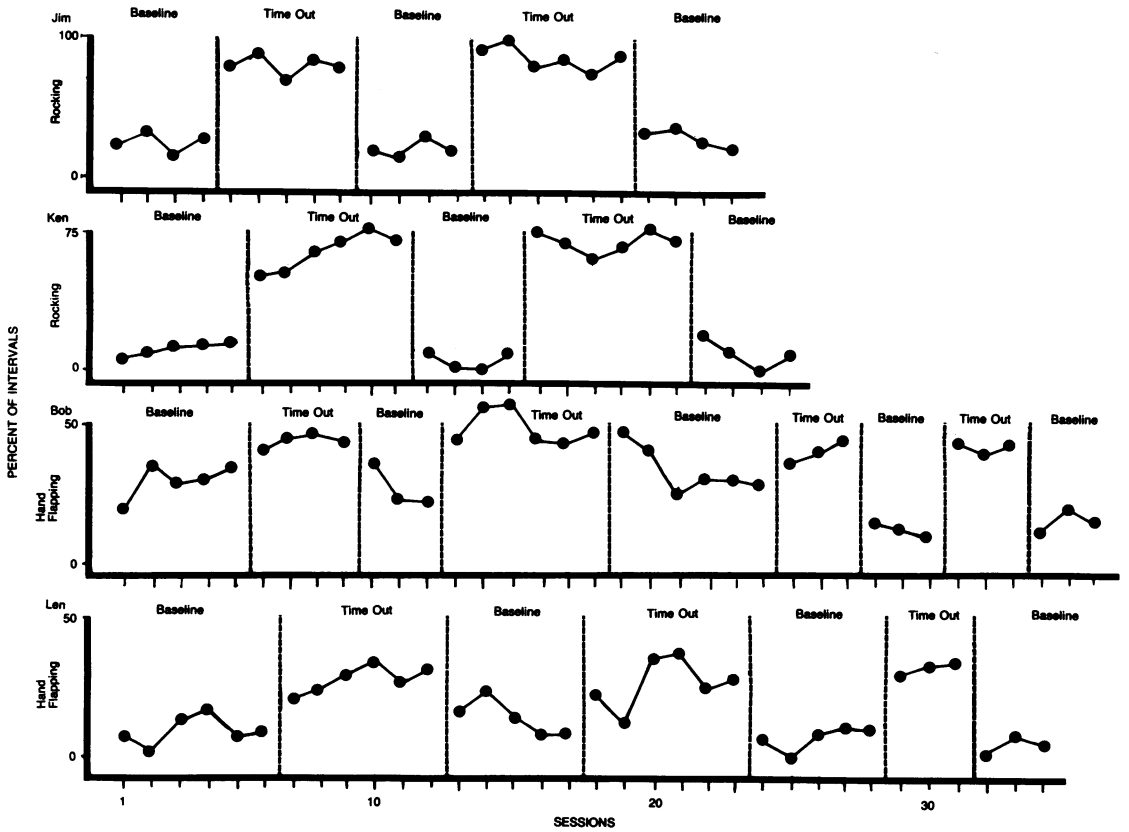

Figure 2. Percentage of intervals of body rocking and hand flapping during Experiment 2 during baseline and a time-out condition (10-s contingent removal of task materials).

in periods and only 12.5% occurred during time-out. The students engaged in the majority of their stereotyped behaviors during work periods, and rarely exhibited these behaviors when task demands were removed. Figure 2 therefore underestimates the effect of the time-out intervention because it includes the period in which no demands were present. These data further support an escape hypothesis.

These data indicate that the body rocking and hand flapping exhibited by the students were maintained by escape. Because task difficulty, praise, commands, and comments were equivalent across conditions, the increases in body rocking and hand flapping could be attributed to the contingent removal of task demands. Presumably, task demands serve as aversive stimuli for these children. Therefore, removing task demands functioned as a negative reinforcer for these behaviors. These findings, in combination with the results of Experiment 1, strongly support an escape hypothesis. It appears that the stereotyped self-stimulatory behaviors of some individuals may take on social functions (e.g., terminating aversive stimuli).

EXPERIMENT 3

Method

Subjects and Setting

The subjects and setting were the same as in Experiments 1 and 2.

Procedures and Design

In this experiment, an intervention for hand flapping and body rocking was designed based on information from the previous experiments. Spe-

cifically, if stereotyped behavior served to escape or avoid difficult task demands, then providing a means for reducing task difficulty should make escape responses (stereotyped behavior) unnecessary and therefore result in reduced body rocking and hand flapping. We sought to test this approach to treatment by teaching the students a communicative alternative (i.e., the phrase "Help me").

Experiment 3 employed a multiple baseline across subjects design (Hersen & Barlow, 1976). Baseline for each child involved the same procedures as in the baseline condition described for Experiment 2. The difficult task stimuli were again presented in the context of the receptive labeling task such that performance approximated 25% correct. One form of experimenter attention (i.e., praise, commands, or comments) was presented in each 10-s recording interval. Instances of body rocking and hand flapping were ignored.

Following baseline, each student was taught to say the words "Help me" whenever he incorrectly responded to a task-related request. Training proceeded in the following manner (for a more detailed description, see Durand & Kishi, in press). During all phases of training, the difficult task materials were placed in front of the student. Initial response training began with the presentation of the task. When the student incorrectly responded to a question, the experimenter provided feedback (i.e., "No, that's not correct") and a prompt to imitate the communicative phrase (i.e., "Say, help me"). This continued until the student could correctly imitate the correct response ("Help me"). The prompt, "Say," was then faded and delayed until the student could respond with "Help me" following negative feedback from the experimenter. Thus, training was complete when the child made an incorrect response, the experimenter said "No, that's not correct" and the child responded with the phrase "Help me." The criterion for unprompted responses was 10 in a row before training was complete. All assistance-seeking responses ("Help me") made by the child were followed by task-related prompts from the experimenter (e.g., "The bird is the animal with feathers"). No praise statements or tangible consequences were provided for assistance-seeking responses. Training time varied for each student and averaged 73 min (range, 20 to 145 min).

Following the successful training of the assistance-seeking communicative response, each student was again presented with 10-min sessions of the difficult task. This condition, treatment, was identical to baseline except that the newly acquired assistance-seeking responses were followed by teacher assistance. This presumably resulted in an easier task and was therefore predicted to reduce rates of escape-maintained behavior. Body rocking and hand flapping were again ignored as in baseline.

Data collection and observer agreement procedures were carried out as in Experiments 1 and 2. In addition, instances of the assistance-seeking phrase were recorded for each student on the same 10-s interval basis. Occurrence agreement data for all experimenter and child responses exceeded 80% (range, 85% to 100%). Nonoccurrence agreement data for all experimenter and child responses also exceeded 80% (82% to 100%). Individual data were consistent with these means.

Results and Discussion

As in the previous experiments, task performance approximating 25% correct was achieved through the introduction of the difficult task stimuli. The mean percent correct during baseline was 21.3% (10% to 35%) and 23.2% (10% to 40%) for treatment. Mean percentage of praise was 32.4% (30.6% to 34.2%) for baseline and 33.5% (32.0% to 34.9%) for treatment. Similarly, the mean percentage of commands was 34.1% (32.4% to 35.7%) for baseline and 32.5% (31.0% to 34.9%) for treatment, and the mean percentage of comments was 33.3% (32.0% to 34.5%) for baseline and 31.8% (30.0% to 33.9%) for treatment. Again, both conditions were equivalent in percent correct task performance and in rates of experimenter attention.

Prior to training, no instances of the assistance-seeking phrase were recorded. Following training, this phrase was recorded in an average of 23.1% of the intervals. Mean percentage of assistance-seeking responses was 20.9% (10% to 38%) for

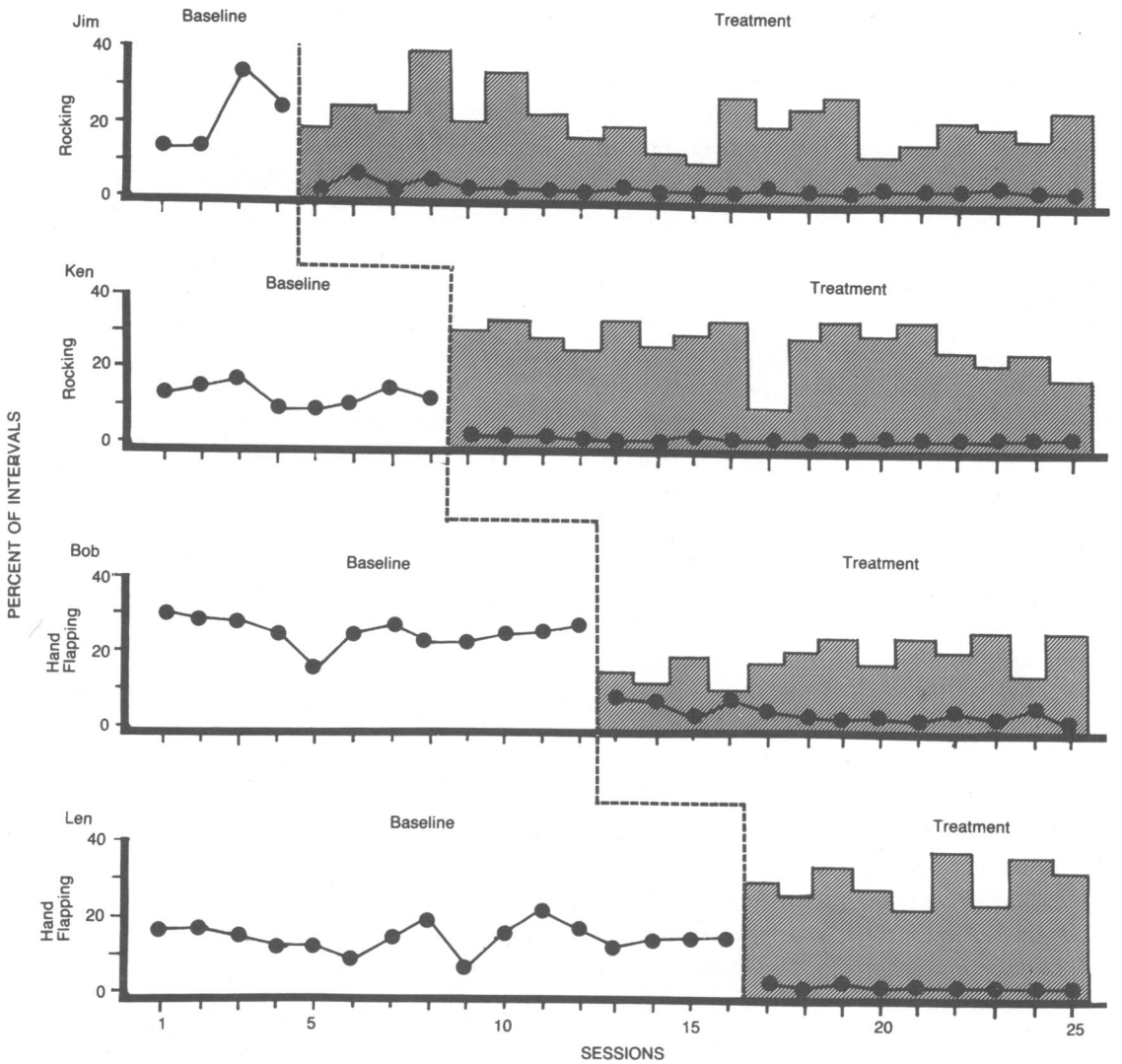

Figure 3. Percentage of intervals of stereotyped behavior during baseline and following communication training. The shaded areas represent the rate of the subjects' use of the phrase "Help me."

Jim, 27.8% (8% to 35%) for Ken, 17.8% (10% to 23%) for Bob, and 26.1% (20% to 37%) for Len. Session-by-session communicative response data are depicted in the shaded portions of Figure 3.

Substantial reductions in body rocking and hand flapping were recorded for the students as a function of the communication treatment. Figure 3 illustrates the data for these behaviors during baseline and treatment. The mean percentage of body rocking for Jim was 21.5% (13% to 25%) for baseline and 1.2% (0% to 7%) for treatment. Body rocking for Ken averaged 12.1% (8% to 17%) for baseline and 0.5% (0% to 2%) for treatment. The mean percentage of hand flapping for Bob was 24.7% (15% to 30%) during baseline and 3.8% (0% to 8%) during treatment. Finally, Len's hand flapping averaged 14.8% (7% to 20%) during baseline and declined to 0.4% (0% to 2%) during treatment.

The communicative responses presumably served the same function as the stereotyped behaviors; that is, both served to reduce the aversiveness of the demand situation (stereotyped behavior by allow-

ing the child to escape the task and communication by making the task easier). The phrase "Help me" was exhibited following training and was maintained by teacher assistance. In addition, the introduction of this alternative phrase coincided with reductions in the body rocking and hand flapping exhibited by the students. As demonstrated in previous research (Carr & Durand, 1985a; Durand & Crimmins, 1987), these findings can be explained as being the result of providing a functional alternative and not because of any physical incompatibility between the two responses (i.e., both stereotyped behavior and communication could occur at the same time).

GENERAL DISCUSSION

The stereotyped self-stimulatory behavior exhibited by some developmentally disabled persons may serve social functions. For each of the students in the present study, stereotyped behavior (a) increased as a function of increasing task demands, (b) increased when task materials were contingently removed, (c) was infrequent during periods of no demands or easy demands, and (d) decreased when an alternative communicative response was taught. These findings are incompatible with a sensory reinforcement explanation, and point to the role of negative reinforcement in the maintenance of stereotyped behavior.

These behaviors may at one time have been maintained by their sensory consequences, a fact that is consistent with the clinical literature in developmental disabilities (e.g., Berkson, 1983; Romanczyk, Kistner, & Plienis, 1982), as well as research on normal child development (e.g., Thelen, 1981). We suggest, however, that the social environment of some individuals serves to negatively reinforce stereotyped behavior by removing aversive demands contingent on the performance of that behavior. Anecdotal reports from the students' teachers indicated that the teachers frequently withdrew academic demands as a consequence for body rocking and hand flapping. This appears to have resulted in behaviors that now functioned to remove task demands, although at an earlier time they may have functioned primarily to provide sensory input. These data are consistent with earlier research that suggests that the motivation of behavior may change over time (Carr, 1977). For example, one study (Carr & McDowell, 1980) demonstrated that self-injury, initially maintained by organic factors, was at a later time maintained by social attention. Similarly, a second study (Durand, 1982) documented that self-injury maintained by its sensory consequences could later serve to escape aversive situations. The present study parallels these findings by suggesting that some stereotyped behavior may initially be maintained by its sensory consequences, yet, because of the cumulative impact of social contingencies, the same behavior may at a later time be maintained by negative reinforcement.

The experimental manipulations of this study were conducted outside of the students' classrooms and, therefore, possibly limited the generalizability of these findings to more natural settings. However, the assessment and treatment procedures used here have been validated with other students in more natural settings. The assessment procedures have been predictive of teacher's ratings of the variables maintaining problematic behavior (Durand & Crimmins, in press) and also predict interaction patterns with staff in school and residential settings (Durand, 1986). Functional communication training has been successfully applied in a variety of settings including classrooms (Durand & Carr, 1983) and in group homes (Durand & Kishi, in press). The data in this study are therefore presented with some confidence that they are applicable to a variety of settings.

It is important to note that the selection of subjects for this study was not random. We observed that the stereotyped behaviors exhibited by these students appeared to occur most frequently in specific situations (e.g., with the introduction of new tasks), and that they engaged in other problematic behavior that also served to escape aversive situations. Thus, we are not positing that all individuals who engage in these behaviors do so for social reasons. However, recent work has suggested that a significant number of developmentally disabled

persons appear to engage in frequent escape-maintained behavior (e.g, Carr & Newsom, 1985; Carr, Newsom, & Binkoff, 1976, 1980; Durand, 1982; Romanczyk, Colletti, & Plotkin, 1980; Weeks & Gaylord-Ross, 1981). It is conceivable, therefore, that behaviors that are considered to be self-stimulatory by virtue of their topography (e.g., rocking back and forth) may be maintained by social consequences such as the removal of demands. And, it is probable that the stereotyped behaviors exhibited by other individuals have come to function as a means of obtaining other extrinsic reinforcers (e.g., adult attention, tangible consequences). Any conceptualization of stereotyped behaviors must therefore incorporate possible social influences in addition to sensory influences.

Additional support for our finding of socially mediated stereotyped behavior comes from previous work with behaviors such as body rocking. For example, in a series of studies by Baumeister and Forehand (Baumeister & Forehand, 1971; Forehand & Baumeister,1970, 1971), it was found that introducing aversive situations leads to increases in rates of body rocking. These authors interpreted their findings as support for a "frustration" hypothesis. In other words, aversive stimuli produce "an increment in motivation or emotionality which leads to an increment in the dominant response in a particular situation" (Forehand & Baumeister, 1971, p. 35). An alternative explanation of their data is that body rocking historically served as a means of escaping or avoiding aversive situations, and was thus exhibited at high rates when the clients were again presented with aversive stimuli. It is also significant that following repeated presentation of aversives (with no opportunity to escape), rates of body rocking decreased. This process resembles the phenomenon of "escape extinction" (Catania, 1968, p. 187) and further supports an escape hypothesis.

Our investigation calls into question the use of the term *self-stimulatory* when describing repetitive stereotyped behavior. In considering how to label such motor behavior in developmentally disabled persons, a more useful approach might be to adopt functional labels (Durand, 1986). *Self-stimulatory,* for example, should be assigned to behaviors that are demonstrated to be maintained by sensory consequences. In contrast, those behaviors that are shown to be maintained by negative reinforcement (as in the present study) should be referred to as *escape* or *escape-maintained* behaviors. Analogously, behaviors maintained by influences such as social attention or tangible consequences should be so designated. This terminology might eliminate some confusion, and may contribute to the design of more effective treatments.

Along these lines, there are important treatment implications suggested by this investigation. Experiment 3 demonstrated that teaching alternative assistance-seeking responses successfully reduced stereotyped behavior. This would not have been predicted had these behaviors been maintained by their sensory consequences. In addition, time-out was predictably ineffective in reducing these escape-maintained behaviors. This finding would not have been expected if other social influences (e.g., social attention) were controlling body rocking and hand flapping. Designing treatment for stereotyped behaviors must therefore include a consideration of the functional significance of these behaviors.

The data from Experiment 3 might lead one to conclude that although the students' stereotyped behavior was reduced as a function of the intervention, there was no improvement in task performance. If the students did not learn as a result of requesting and receiving assistance, then teaching students to request assistance would be of limited educational value because it would function only to allow students to escape challenging tasks. However, the students in this study appeared to learn new labels following the introduction of functional communication training. Although the percentage of correct responses on the task remained stable, this was a result of replacing any picture that the student correctly labeled twice in a row with a new unfamiliar picture. No picture replacements were made during baseline, although we did replace an average of 45 pictures for each student during treatment. The assistance-seeking response therefore appeared to be a very adaptive response for these students.

Results of the intervention study replicate and extend the teaching of alternative communicative responses as a treatment for problematic behavior. Previous research has demonstrated the usefulness of this approach in reducing such behaviors as aggression, self-injury, and tantrums (Carr & Durand, 1985a; Durand & Kishi, in press), as well as psychotic speech (Durand & Crimmins, 1987). Our current research involves the evaluation of this form of treatment over time (maintenance) and across stimulus conditions (generalization). We anticipate that this type of communication treatment will be a useful addition to current techniques for reducing problem behaviors.

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