

*INCREASING SPONTANEOUS PLAY BY SUPPRESSING
SELF-STIMULATION IN AUTISTIC CHILDREN¹*

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Appropriate play with toys was studied in two autistic children with high occurrences of self-stimulatory behavior. Each child participated in the experimental sessions in an A-B-A design, where "A" refers to baseline sessions and "B" refers to self-stimulation suppression sessions. It was found that: (a) during the baseline sessions, the children exhibited low levels of play and high levels of self-stimulatory behavior; (b) the per cent of unreinforced, spontaneous, appropriate play increased when self-stimulatory behavior was suppressed; and (c) when the suppression of self-stimulation was discontinued, the per cent of self-stimulation and that of appropriate play approached their presuppression levels. These results seem particularly significant because they identify a set of conditions under which spontaneous appropriate behavior, uncommon in autistic children, occurs at an increased level.

The relative presence or absence of appropriate play in psychotic children has been differentially associated with good or poor prognoses. In a re-evaluation of children worked with earlier, Brown (1960) found that the most significant difference between those who progressed most and those who progressed least was that those in the best group tended to play with toys and those in the worst group tended not to. Most autistic children display little or no appropriate play. That is, when such children are left alone in a playroom full of toys, it is uncommon for them to engage in play behavior (*cf.* Lovaas, Koegel, Simmons, and Long, 1973).

Instead of playing appropriately with toys, autistic children frequently engage in self-stimulatory behaviors. For example, instead of moving a toy truck appropriately along the ground, the child might turn the truck upside down and repetitively spin the wheels for hours at a time. Or, the child might ignore the truck completely and sit in a corner of the room rhythmically rocking his body back and forth for hours at a time. Such self-stimulatory behaviors (which have been defined as highly idiosyncratic, stereotyped responses that appear to provide the performer with sensory input but have no obvious social consequences (Hutt, Hutt, Lee, and Ounstead, 1965; Lovaas, 1967) have been shown to interfere with appropriate behavior in autistic children. For example, autistic children who were trained to approach a dispenser for candy reinforcers at the sound of a tone showed much longer latencies when engaged in self-stimulatory behavior (Lovaas, Litrownik, and Mann, 1971). In another study, Koegel and Covert (1972) demonstrated that autistic children who failed to learn a discrimination when allowed to engage in self-stimulation acquired the discrimination when their self-stimulation was suppressed. Risley (1968) also

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reported results that suggested that when self-stimulation is suppressed, the rates of non-manipulated appropriate behaviors may increase.

A change in the rate of one or more non-manipulated behaviors concurrent with a change in the rate of a manipulated behavior has also been observed in a number of other experimental situations with other subject populations (Buell, Stoddard, Harris, and Baer, 1968; Lovaas and Simmons, 1969; Sajwaj, Twardosz, and Burke, 1972; Wahler, 1969; Wahler, Sperling, Thomas, and Teeter, 1970). Such studies on behavioral covariation, along with the demonstrated interference caused by unrestrained self-stimulation, suggest that suppression of self-stimulation may be a way to increase spontaneous appropriate play. Although other studies have investigated increases in appropriate play as a function of providing external positive reinforcement (Hamblin, Buckholdt, Ferritor, Kozloff, and Blackwell, 1971; Kozloff, 1973; Lovaas, Freitas, Nelson, and Whalen, 1967), there have been no experimental investigations of the conditions under which such behavior might occur without external reinforcement.

The present study, therefore, focused on an analysis of the relationship of self-stimulation to spontaneous appropriate toy play in autistic children. The question asked was, what effect will the suppression of self-stimulation, without any other manipulation of the children's behavior, have on the level of their spontaneous appropriate play with toys?

METHOD

Subjects

Two autistic children, an 8-yr-old boy and a 6-yr-old girl, both diagnosed autistic by agencies not associated with this study, served as subjects. Neither child had any appropriate language skills. Although both children engaged in high levels of self-stimulatory behavior, that of the boy was less intense (*i.e.*, fewer self-stimulatory responses were made simultaneously) and was more easily observable than that of the girl.

Both children displayed low baseline frequencies of appropriate play with toys.

Setting

Each child was seated in a 1.7- by 3-m room in front of a 0.6-m high table upon which three toys were placed. The toys for the first child were: (1) a mimeographed coloring book page and two crayons; (2) a *Playskool Play Tiles Kit*, which consisted of a plastic pegboard into which plastic tiles could be placed; and (3) a *Playskool Parquetry Blocks* set, which consisted of a paper printed with differently colored geometric shapes onto which correspondingly shaped and colored wooden blocks could be placed to duplicate the printed pattern. The toys for the second child were: (1) a mimeographed coloring book page and two crayons; (2) a *Playskool Miniature Post Office Mailbox* into which geometrically shaped objects could be placed and from which the objects could be removed; and (3) a *Busy Surprise Box*, which the child could operate to make one of five plastic animal heads pop up by making an appropriate response with one of five corresponding mechanisms. To ensure that the appropriate play responses for these toys were present in a child's behavioral repertoire, 15 min to 1 hr per day of pretraining was conducted with each child on each of the toys. In this pretraining, conducted by therapists not involved in the present study, the appropriate play responses were shaped and reinforced using food reinforcers and praise by the therapist; no punishment was delivered during pretraining. This pretraining (requiring fewer than five sessions on each toy) was concluded when the child was able to make at least one appropriate play response with that toy.

Procedure

All experimental sessions for each child lasted 5 min, with two to six sessions conducted per day, four to five days a week. The child was brought into the experimental room, seated at the table before the session began, and allowed a 30- to 60-sec period to adapt to the setting

before the timed session began. Two experimenters were present throughout each session in all conditions of the experiment: one seated at the child's left, the other at the child's right. In addition, at least one observer, seated across the room in front of the child, recorded data during each session.

Self-stimulatory behavior. Self-stimulatory behavior was defined individually for each child because each child's self-stimulation was highly idiosyncratic, ranging from behaviors as subtle as saliva swishing to others as obvious as body rocking. Detailed lists of the self-stimulatory behaviors (based upon definitions provided by Branigan and Humphries, 1972; Hutt and

Table 1 (continued)

9. hands vigorously and repetitively rubbing clothes
10. hands vigorously and repetitively rubbing objects
11. hand flapping in air
12. hand wringing (hands alternately rubbing and clutching each other)
13. finger contortions (tight sustained flexions)
14. tapping fingers against part of body or an object
15. tapping whole hand against part of body or object
16. mouthing of objects (holding nonedible objects in contact with the mouth)
17. rocking (moving the trunk at the hips rhythmically back and forth or from side to side)
18. head weaving (moving head from side to side in a figure-eight pattern)
19. body contortions (sustained flexions or extensions of the torso)
20. repetitive vocalizations (excluding recognizable words)
21. teeth clicking (audibly and rapidly closing teeth together)
22. tongue rolling and clicking
23. audible saliva swishing in mouth
24. repetitive tapping feet on floor
25. repetitive tapping toes inside shoes (visible through canvas tennis shoes)
26. leg contortions (tight sustained flexions)
27. repetitive knocking knees against each other
28. repetitive knocking ankles against each other
29. tensing legs and suspending feet off the ground
30. head shaking (rapid small movements from side to side)
31. tensing whole body and shaking

Table 1

Complete list of self-stimulatory responses for Subject 1 and Subject 2.

Subject 1

1. eye crossing
2. finger manipulations (moving the hands with continuous flexion and extension)
3. repetitive vocalizations (excluding recognizable words)
4. feet contortions (tight sustained flexions)
5. leg contortions (tight sustained flexions)
6. rhythmic manipulation of objects (repeatedly rubbing, rotating, or tapping objects with fingers)
7. grimacing (corners of mouth drawn out and down, revealing the upper set of teeth)
8. staring or gazing (a fixed glassy-eyed look lasting more than 3 sec)
9. hands repetitively rubbing mouth
10. hands repetitively rubbing face
11. mouthing of objects (holding nonedible objects in contact with the mouth)
12. locking hands behind head
13. hands pressing on or twisting ears

Subject 2

1. staring or gazing (a fixed glassy-eyed look lasting more than 3 sec)
2. grimacing (corners of mouth drawn out and down, revealing the upper set of teeth)
3. hand waving vertically or horizontally with fingers outstretched in front of eyes
4. hands vigorously and repetitively rubbing eyes
5. hands vigorously and repetitively rubbing nose
6. hands vigorously and repetitively rubbing mouth
7. hands vigorously and repetitively rubbing ears
8. hands vigorously and repetitively rubbing hair

Hutt, 1970; Smith and Connolly, 1972) of both children are presented in Table 1.

Appropriate play. Appropriate play for each child was defined in terms of the toys available. Complete lists of the responses defined as appropriate play for each child are presented in Table 2.

Design. Each child participated in the experimental sessions in an A-B-A design, where "A" refers to baseline sessions and "B" refers to self-stimulation suppression sessions. To ensure that the length of the conditions was not a relevant variable, each of the conditions for the second child included more sessions than the corresponding condition for the first child. During baseline

Table 2

Complete list of appropriate play responses for Child 1 and Child 2.

Child 1

1. making a distinct line or curve on the paper with a crayon
2. placing a tile in the pegboard
3. matching a block to its printed representation, with at least 50% of the block overlapping the picture

Child 2

1. making a distinct line or curve on the paper with a crayon
 2. placing a plastic object into the appropriately shaped slot in the mailbox or retrieving it from the compartment in the bottom of the mailbox
 3. manipulating the appropriate mechanism (lever, button, dial, switch, handle) to make one of five animal heads pop up, or pushing the head piece back down to reset the toy.
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sessions, the child was allowed to engage in self-stimulation; in the suppression sessions, self-stimulatory responses were punished by one or both of the experimenters sharply saying "No!" and briskly slapping or briefly holding (immobilizing) the part of the child's body with which the response was being performed. To ensure that all self-stimulatory responses were punished on a continuous schedule, one experimenter suppressed self-stimulation from the waist up and the other from the waist down.

In order to analyze the relationship of self-stimulation to appropriate play, the occurrence of each child's self-stimulation and appropriate play was recorded for all conditions using a time-sample method. For the first 3 sec of each 10-sec interval in the session, one or two observers recorded the child's behavior. If any self-stimulation or appropriate play occurred during the interval, a check mark was placed in the corresponding column.

To aid in the analyses of these data, two additional columns were included on the checklist. (1) In order to assess the effect of punishment delivered during the suppression condition, the occurrence of punishment during the time samples was recorded. (2) For randomly chosen sessions in the suppression conditions, the (co-

idental) simultaneous occurrence of punishment and appropriate play was recorded. As with the recording of self-stimulation and play, if either of these events occurred during a 3-sec time-sample interval, a check was made in the appropriate column on the data sheet.

Reliability. Reliability of the recordings for each behavior was assessed according to the following procedure. Two observers independently recorded the occurrence of each behavior during 16 reliability sessions throughout the experiment for the first child and 31 reliability sessions throughout the experiment for the second child. At least three such sessions were randomly chosen in each condition for the first child, and at least six sessions were randomly chosen in each condition for the second child. Reliability was then computed separately for the occurrences and nonoccurrences of each behavior. Per cent agreement was calculated by dividing the number of agreements by the greater number of instances recorded by either observer in each session. An agreement for occurrences was defined as both observers recording an occurrence of a behavior for a given time-sample interval. Similarly, for nonoccurrences, an agreement was defined as both observers recording a nonoccurrence of a given behavior for a given time-sample interval. All per cent agreements calculated for the occurrence and nonoccurrence of each behavior were at least 80%.

RESULTS

Data for both children, showing the baseline, suppression, and reversal sessions are presented in Figure 1. The sessions are plotted in groups of threes along the abscissa. The ordinate shows the per cent occurrence of self-stimulation and appropriate play. The first child had eight baseline sessions before suppression of self-stimulatory behavior; the second child had 44 sessions before suppression. During these baseline sessions, the per cent occurrence of self-stimulatory behavior of the first child was constant at 100%. During these same sessions, his per cent occur-

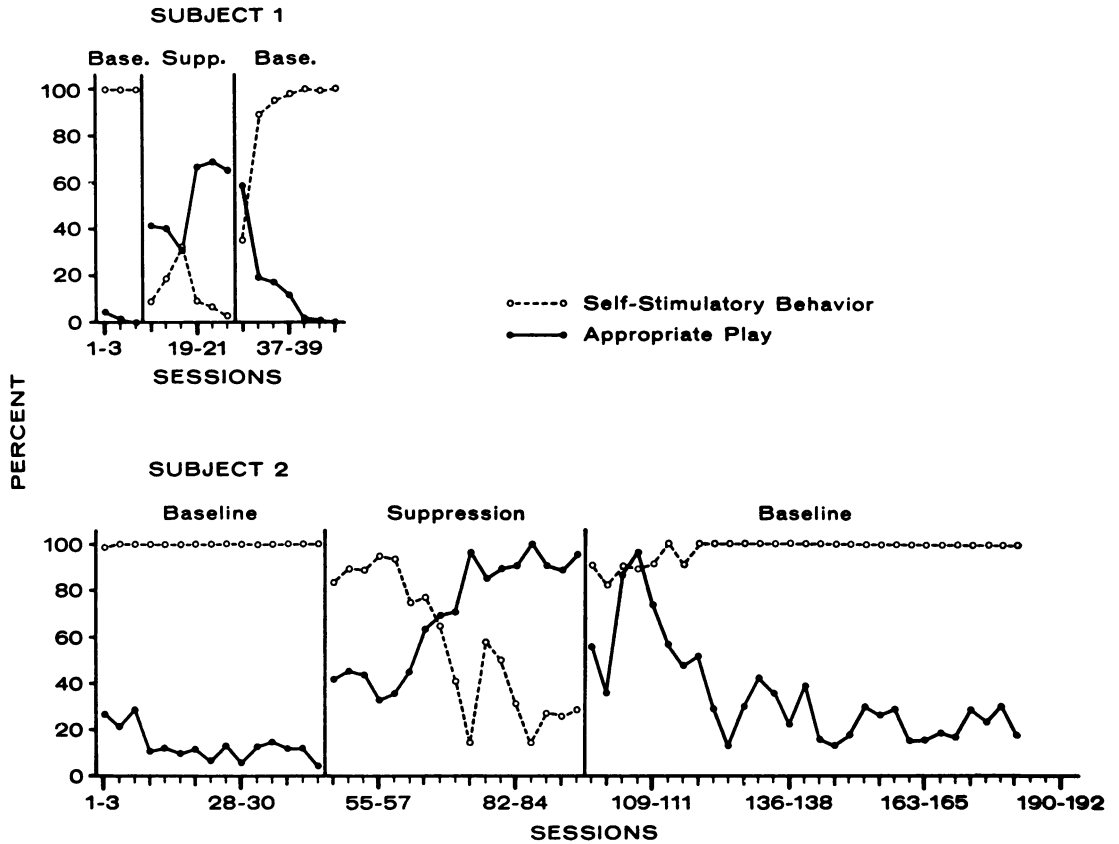


Fig. 1. Per cent of time-sample intervals in which self-stimulatory and appropriate play behaviors occurred during (a) baseline, (b) suppression of self-stimulation conditions, and (c) reversal.

rence of appropriate play ranged between 0% and 15% for individual sessions, averaging 2%. The per cent occurrence of self-stimulation of the second child varied between 97% and 100%, averaging 99.9%. Her per cent occurrence of appropriate play ranged between 0% and 36% in individual sessions, averaging 13% throughout the baseline condition.

After onset of the suppression condition, the level of self-stimulation decreased and that of spontaneous appropriate play rose for both children. Eighteen suppression sessions were conducted with the first child; 50 sessions with the second. The per cent of time-sample intervals in which a self-stimulatory behavior occurred for the first child dropped to below 10%, while the per cent of intervals in which play occurred rose to above 65%. The second child's level of self-stimulation decreased to a low of 13% in Ses-

sions 75 and 87, while her level of appropriate play rose to consistently above 85% for the last 24 sessions of this condition. The drop in the second child's level of self-stimulation was more gradual and less complete than the drop in the first child's self-stimulation. This may be because the second child initially engaged in many more self-stimulatory responses than did the first.

Punishment and appropriate play. In order to assess whether or not the children were avoiding punishment by playing with the toys, instances of the simultaneous occurrence of appropriate play and (coincidental) punishment of self-stimulatory behaviors were recorded. For the first child, the per cent of simultaneous punishment and appropriate play varied from 4% to 14% of the occurrences of appropriate play, averaging 8%. The per cent of simultaneous punishment and play for the second child ranged

from 23% to 47% of the total appropriate play responses, averaging 33%. These results show that a considerable number of play responses met with punishment as a result of this coincidental occurrence with self-stimulatory behavior. That is, the children did not completely avoid punishment by playing with the toys.

Reversal condition. When the suppression of self-stimulation was discontinued, the level of self-stimulatory responding rose for both children, with a concurrent decrease in their level of appropriate play behavior. Twenty-one sessions were conducted with the first child, 88 sessions with the second. Within 11 sessions, the first child's levels of self-stimulation and appropriate play returned to their presuppression levels. The level of self-stimulation of the second child returned to its presuppression level after 20 sessions; her level of appropriate play approached the presuppression level in the second half of the reversal condition.

In summary, the results show that: (1) the subjects exhibited little appropriate play when they were allowed to engage in self-stimulatory behavior; (2) the frequency of unreinforced, spontaneous, appropriate play increased when self-stimulatory behavior was suppressed; and (3) when the suppression of self-stimulation was discontinued, the per cent of self-stimulation and that of appropriate play approached their presuppression levels.

DISCUSSION

The appropriate play behavior of two autistic children, who evidenced high percentages of self-stimulatory behavior and low percentages of appropriate play, was recorded during a baseline period and when the self-stimulatory behavior was suppressed. The results showed that the level of appropriate play rose significantly when the self-stimulation was suppressed, and remained at a high level without external reinforcement as long as self-stimulation was suppressed.

One qualification concerning the choice of subjects should be imposed on these data: both

children engaged in extremely high percentages of self-stimulation. It is possible that different results might have been obtained with children less involved in self-stimulation.

There are several possible interpretations of the results. First, one might suspect that the results were the direct effect of punishment. Some studies have suggested that the delivery of punishment *per se* may cause an increase in certain behaviors (Lovaas, Schaeffer, and Simmons, 1965). However, in the present study it does not seem likely that the delivery of punishment alone (independent of its contingent relation to self-stimulation) could have caused the increase in appropriate play. For both children, the decreasing occurrence of self-stimulation and, therefore, of punishment during the suppression condition coincided with a stable or increasing level of appropriate play. This relationship suggests that punishment *per se* was not responsible for the increased level of appropriate play.

Second, one might suspect that the punishment maintained the appropriate play behavior as an avoidance response: that is, that the children made appropriate play responses in order to avoid the punishment being delivered by the experimenters. Since it was the self-stimulatory behavior, not the absence of appropriate play behavior that was being punished, the postulated avoidance behavior would actually be superstitious responding. However, data taken during the suppression sessions show that such an effect is unlikely. In the sessions in which the level of the simultaneous occurrence of appropriate play and the punishment of self-stimulation was recorded, the level of such simultaneous occurrences for the first child varied between 4% and 14% of the play responses, and for the second child ranged between 23% and 47%. These data indicate that, if play were assumed to be an avoidance response, it was only marginally effective in that the play failed to avoid punishment for these percentages of its occurrence. On the other hand, for a percentage of the sessions, both children made neither appropriate play nor self-stimulatory responses. The average per cent

of nonoccurrence of either behavior for the first child was 43% (range: 10% to 70%). There was a decreasing trend in these data, with the percentages for the last 10 sessions consistently below 40%. The average per cent of nonoccurrence of either behavior for the second child was 3% (range: 0% to 13%). These percentages remained fairly constant throughout the suppression condition. In these instances, the children avoided punishment without making appropriate play responses. Appropriate play responses were, therefore, not only insufficient as avoidance responses, but they were also unnecessary for the avoidance of punishment. Given the limitations imposed by these data, it is unlikely that the appropriate play functioned, even superstitiously, as an avoidance response. The results, then, make it seem unlikely that the rise in appropriate play was a function of the use of punishment, *per se*.

It is possible, however, that the rise in play was a result of the decrease in self-stimulation. It might be argued that play was low during the baseline because certain of the play responses were physically incompatible with certain of the self-stimulatory responses. Then, eliminating the self-stimulatory behavior might permit some additional time for the children to play. This, however, does not explain why the children would play during this time, as opposed to doing something else, or not doing anything at all.

It is, however, still possible that the decrease in self-stimulation affected the level of spontaneous appropriate play. Lovaas *et al.* (1971) and Risley (1968) have argued that self-stimulatory behavior may be functionally (rather than physically) incompatible with the occurrence of certain appropriate behaviors. Thus, they have suggested that it may be functionally necessary to suppress the self-stimulation in order to see an increase in play. Similarly, one could say that the present results may be an instance of behavioral covariation, in that when one response (self-stimulation) was manipulated, another non-manipulated response (appropriate play) also changed. Similar results in the covariation of

other behaviors in other environments have been reported by Brethower and Reynolds (1962), Buell *et al.* (1968), Lovaas and Simmons (1969), Reynolds (1963), Sajwaj *et al.* (1972), Wahler (1969), and Wahler *et al.* (1970).

However, appropriate play and self-stimulation still appear to be somewhat atypical behaviors, in that both behaviors occurred at high levels for extended periods of time without external reinforcement. This sustained, nonreinforced responding suggests that such behaviors might be reinforcing in themselves. Ferris and Newsom (*unpublished*) and Rincover, Newsom, and Carr (*unpublished*) have provided data to support this conclusion, showing that self-stimulatory behavior can act as a sensory reinforcer. These results are also consistent with Berlyne's (1960) theory that organisms will seek out an optimal level of sensory stimulation. Thus, when the self-stimulatory behavior was suppressed, it is possible that the children may have increased their level of play behavior in order to regain the previous level of sensory input.

Functionally, the present results indicate that little if any appropriate play of an autistic child with high-level self-stimulatory behavior will be spontaneously emitted except when self-stimulation is suppressed. These results seem particularly significant because they identify a set of conditions under which spontaneous appropriate behavior, uncommon in autistic children (Lovaas *et al.*, 1973), occurs at an increased level. However, further study is needed to apply this finding in a more naturalistic setting, and to develop a method of maintaining the increased level of play more permanently.

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