*EFFECTS OF A PROCEDURE DERIVED FROM THE
OVERCORRECTION PRINCIPLE ON MANIPULATED
AND NONMANIPULATED BEHAVIORS*

KAREN C. WELLS, REX FOREHAND,¹ KEVIN HICKEY,
AND KENNETH D. GREEN

UNIVERSITY OF GEORGIA

Positive practice overcorrection has been shown to be effective in reducing stereotypic self-stimulatory behaviors displayed by retarded and autistic individuals. In addition, the procedure also may increase the occurrence of appropriate behavior through intensive practice. In the present study, several stereotypic and one appropriate behavior (appropriate toy play) displayed by two autistic children were measured before and during treatment by a positive practice in appropriate toy play overcorrection procedure. Overcorrection was introduced for each of the targeted inappropriate behaviors in succession for both children. Results showed that overcorrection reduced all stereotypic behaviors displayed by both children. In addition, one subject displayed marked increases in the behavior practised during overcorrection, appropriate toy play, relative to its baseline rate of occurrence. The results indicate that for some individuals, overcorrection may be effective in teaching and motivating appropriate forms of behavior as well as in reducing stereotypy.

DESCRIPTORS: self-stimulation, overcorrection, play, prompt, food reinforcers, positive practice, multiple baseline, autistic children

Stereotyped and self-stimulatory behaviors are exhibited by many institutionalized and non-institutionalized individuals (Baumeister and Forehand, 1973). These behaviors, which consist of invariant motor acts or sequences of behavior, may be dangerous to an individual's health and safety (*e.g.*, head-banging, self-biting, and mouthing) and have been noted to interfere with individuals' positive interactions with their environments (*e.g.*, Koegel, Firestone, Kramme, and Dunlap, 1974; Lovaas, Litrownik, and Mann, 1971).

Recently, a procedure, positive practice overcorrection, has been introduced for use with individuals who engage in stereotypic behaviors. The procedure consists of: (a) a verbal warning to stop engaging in the stereotyped act; (b) physically stopping the self-stimulatory episode; (c) forced practice of appropriate forms of be-

havior; and (d) release from forced practice. According to its originators, positive practice overcorrection has two functions: first, to suppress stereotypic behavior and, second, to teach and motivate the occurrence of more appropriate forms of behavior (Azrin, Kaplan, and Foxx, 1973; Foxx and Azrin, 1973).

Several investigations have found overcorrection to be effective in accomplishing the first of its purposes (Azrin *et al.*, 1973; Doke and Epstein, 1975; Epstein, Doke, Sajwaj, Sorrell, and Rimmer, 1974; Foxx and Azrin, 1973). However, the effectiveness of overcorrection in teaching and motivating appropriate behavior has been less clear. Indeed, some investigators have reported negative side effects when overcorrection procedures were used to suppress stereotypy. Doke and Epstein (1975) reported a marked increase in inappropriate behaviors such as rocking, noise making, face slapping, and masturbation when threats to use overcorrection were administered for mouthing, a behavior previously treated by threats plus overcorrection. In addition, Rollings, Baumeister, and

¹Appreciation is expressed to Kathy Kirby, Kathryn Warlick, Keith McBurnett, and Janis Perlis for serving as observers. Reprints may be obtained from Rex Forehand, Psychology Department, University of Georgia, Athens, Georgia 30602.

Baumeister (1977) found that with one subject increases in stereotyped head nodding and self-hitting occurred when overcorrection was used to suppress body rocking. For a second subject, overcorrection for head-weaving was associated with an increase in undesirable "emotional" behaviors such as self-pinching, screaming, and self-scratching.

In contrast, Foxx and Azrin (1973) anecdotally reported positive side effects associated with the use of overcorrection to suppress self-stimulatory behavior. One subject "seemed much more alert and . . . her attention to various training tasks had increased" (p. 9). Another child "was much more responsive to adults and other children . . . when her mouthing had been eliminated" (p. 9). However, these conclusions are tenuous in the absence of data. Epstein *et al.* (1974) reported data showing increases in appropriate toy play when stereotyped hand movements were suppressed by a "hand" overcorrection procedure. However, none of these studies (Doke and Epstein, 1975; Epstein *et al.*, 1974; Foxx and Azrin, 1973; Rollings *et al.*, 1977) demonstrated an increase in the occurrence of behaviors actually practised during overcorrection.

To test the notion that overcorrection teaches and motivates the occurrence of appropriate behavior through the positive practice of that behavior during forced manual guidance, it seemed important to measure the occurrence of behaviors actually practised during overcorrection both before and after treatment. Wells, Forehand, and Hickey (*in press*) measured baseline levels of appropriate toy play displayed by two autistic children and utilized a positive practice overcorrection procedure that involved forced guidance in appropriate toy play (Doleys, Wells, Hobbs, Roberts, and Cartelli, 1976) to suppress stereotypic mouthing behavior. Increases in appropriate toy play were recorded for one of the children when overcorrection suppressed mouthing behavior. However, a consistent high level of toy play was not achieved because a second stereotyped behavior, inappro-

priate object manipulation, could occur throughout the study and appeared to interfere with appropriate play with toys. For the second child, no increases in appropriate toy play were noted when overcorrection was used to suppress mouthing behavior. Again, however, other stereotyped responses were free to occur.

The main purpose of the present study was to examine the effects and side effects of overcorrection by successively suppressing each of several stereotyped behaviors in the repertoire of two autistic children. It was hypothesized that as each stereotyped behavior was successively suppressed, correspondingly greater increases would occur in appropriate behavior practised during positive practice overcorrection.

A second aim of this study was to validate further the use of a positive practice in appropriate toy play overcorrection procedure (Doleys *et al.*, 1976; Wells *et al.*, *in press*). Though this procedure has never been utilized by the originators of overcorrection (Foxx and Azrin, 1973), several reasons can be given for its use in the present study. First, Koegel *et al.* (1974) noted that the presence or absence of appropriate toy play in psychotic children has been differentially associated with good or poor prognosis, and that most autistic children display little or no appropriate toy play. Any procedure that could increase this behavior would be of obvious merit. Second, the overcorrection principle (Azrin *et al.*, 1973) states that inappropriate behavior can be treated by required practice in appropriate behavior of the same topography whenever misbehavior occurs. Both children in the present study engaged in several high-rate inappropriate behaviors with toys (*e.g.*, mouthing, manipulating, and throwing toys) and rarely engaged in appropriate toy play. It appeared that appropriate toy play was a behavior of the same topography as the children's inappropriate behaviors, and one whose increased occurrence would have obvious benefits for the children. Therefore, an overcorrection procedure, positive practice in appropriate toy play, was tailored to the needs of the subjects.

METHOD

Subjects

Two 10-yr-old male noninstitutionalized children served as subjects. John and Tim were fraternal twins variously labelled severely emotionally disturbed in association with brain damage and severely mentally retarded in association with autism. Through the services of local mental health facilities, both children had learned feeding, toileting, and other self-care skills. At the time of this study, the children were enrolled in a school for the developmentally handicapped, where they had been observed to engage in excessive amounts of self-stimulatory behavior, including stereotypic object twirling, frequent mouthing of hands and objects, and hand flapping and shaking. Teachers at the school were concerned about the prevalence of these behaviors in class, as they often precluded appropriate interaction with educational or play materials. For example, when given a puzzle, the children would often mouth the puzzle parts or flip them into the air rather than play appropriately with them.

Both children were deficient in expressive language and were untestable in terms of IQ scores. Scores on the Vineland Social Maturity Scale revealed a Social Maturity Quotient of 38 for John and 33 for Tim. John was functioning in a more advanced educational class at school than his brother. In addition, teachers casually remarked that John was "more attentive" and "easier to work with" than Tim and "seemed to learn more quickly" than his brother. Five months before this study, John and Tim had served as subjects in an investigation of the effects of overcorrection (Wells *et al.*, *in press*).

Setting and Apparatus

The experiment was conducted in a (5 by 4.2 m) playroom. A small table and two child-sized chairs were located in the center of the room. Toys arranged on the table included puzzle boards and large cardboard puzzle parts. Other toys located on the floor included plastic

building blocks with holes in the middle through which plastic poles could be inserted, a large collection of Lincoln Logs, and a set of wooden building blocks. The research room was wired for sound and equipped with a large one-way mirror from behind which recordings and observations were made. Two experimenters were located in corners of the research room and administered the experimental procedures to the two children.

Measurement and Reliability

The children were observed together, typically four days a week, in the context of a 30-min free-play session. A time-sampling technique (Bijou, Peterson, and Ault, 1968) was utilized whereby the occurrence or nonoccurrence of target and nontarget behaviors was recorded in alternating 10-sec intervals; *i.e.*, 10-sec observation intervals alternated with 10-sec record intervals. Through this method, data were collected during 90, 10-sec intervals per session. Auditory stimuli delivered by means of a tape recorder cued the beginning of each 10-sec interval.

Before experimental sessions began, four undergraduate observers watched the children in a nonexperimental situation and practised recording the target behaviors until a training criterion of at least 85% agreement was reached. During the experiment, one of the four observers recorded each session and his/her recordings were used as the primary source of data. Reliability measures were obtained during randomly selected sessions by having two observers simultaneously record the target and nontarget behaviors displayed by each child.

The recorded target behaviors (those behaviors for which overcorrection occurred) were defined in the following manner:

- (1) *Inappropriate object manipulation*—
 - (a) Rotating a puzzle part or puzzle board on one finger.
 - (b) Flipping a toy or toy part in front of the eyes or into the air.

- (c) Throwing or tossing any toy or toy part against a wall or onto the floor.
- (2) *Mouthing*—any finger, hand, toy or object contact with the lips or mouth.
- (3) *Inappropriate hand movements*—
 - (a) Hand flapping or shaking.
 - (b) Repetitive clapping.
 - (c) "Fanning" movements with the fingers.
- (4) *Other inappropriate behaviors*—This catch-all category included several low-frequency behaviors:
 - (a) Masturbation—any hands-in-pants behavior.
 - (b) Inappropriate foot movements—running or hopping around the room or jumping up and down in place.
 - (c) Inappropriate vocalizations—screaming or giggling.
 - (d) Body rocking—moving the body forward and backward or side to side while seated.

Side effects of overcorrection were assessed through the monitoring of appropriate toy play displayed by each child. This behavior category included:

- (a) Placing puzzle parts onto the puzzle board while visually attending to the puzzle board.
- (b) Stacking the wooden blocks on top of one another or placing them side by side on the floor.
- (c) Placing any of the parts of the Lincoln Log set in their appropriate positions or stacking the logs on top of each other or side by side.
- (d) Stacking the plastic building blocks and poles.

The percentage of intervals that each child engaged in the five behaviors was calculated by dividing the number of recorded occurrences by the total number of intervals and multiplying by 100. Intervals spent in overcorrection episodes were excluded from these calculations since no recordings were made during these intervals.

Reliability was assessed during 21% of the sessions, with at least one check (range one to four) in each experimental condition. Percentage agreement was calculated by dividing the number of agreements of occurrence of each of the five behaviors across all sessions by the total number of intervals in which either observer scored an occurrence. For an agreement to occur, each observer had to record the same behavior in the same 10-sec interval.

Experimental Conditions

The children were observed in the context of a free-play situation across all experimental conditions. They were allowed to interact together or alone with the assortment of toys placed on the floor or table of the research room. The experimenters were seated in corners of the room and interacted with the children only during treatment periods.

Baseline. During baseline conditions for a particular behavior, no responses were made by the experimenters to the occurrence of that behavior.

Overcorrection. A positive practice overcorrection procedure, such as the one used by Doleys, Wells, Hobbs, Roberts, and Cartelli (1976), was employed to engage the subjects in appropriate interaction with toys. The procedure involved manual guidance in appropriate toy play contingent on any occurrence of the four target behaviors. Positive practice was preceded by a verbal warning ("John (Tim), Stop that!"). The experimenter then approached the child, physically stopped the inappropriate response, and then manually guided the child through 2.5 min of appropriate play with the toy involved in the inappropriate response. If the inappropriate response did not involve a toy, the experimenter arbitrarily chose a toy for practice in appropriate play. If the child independently engaged in appropriate toy play during the 2.5-min period, manual guidance was faded out. However, the experimenter continued to "shadow" the subjects hands with his/her own. If any behavior

other than appropriate toy play occurred during the "shadowing", manual guidance was reapplied for the remainder of the 2.5-min period. Thus, only by engaging in positive practice of appropriate toy play could the child avoid forced manual guidance. Aggressive behavior (kicking, crying, or fighting) during manual guidance was ignored by the experimenters as much as possible. The child was released at the end of 2.5 min regardless of the occurrence of aggressive/escape or appropriate positive practice behaviors occurring at that time.

Reinforcement. During the last nine days of the experiment, social and edible reinforcers were delivered to both subjects for appropriate toy play. Reinforcement occurred for John after 30 sec of continuous appropriate toy play. The experimenter approached John, praised him for playing with the toys, and gave him a small bite of graham cracker. For Tim, social praise and bites of graham cracker were scheduled to occur after 5 sec of appropriate toy play during the first four days of this period. During the last five days of this period, a verbal prompt ("Tim, play with the _____.") was added, and reinforcers were delivered after 10 sec of continuous appropriate toy play.²

Experimental Design

A multiple-baseline-across-subjects design was used to evaluate the effects and side effects of overcorrection. Four target behaviors were treated in succession and treatment for each behavior was introduced first for John and then for Tim. The following experimental phases were used:

- (1) Initial baseline: six sessions for John and 10 sessions for Tim.

- (2) Overcorrection for inappropriate object manipulation: 14 days for John (Sessions 7 to 20) and 15 days for Tim (Sessions 11 to 25).
- (3) Overcorrection for inappropriate object manipulation and mouthing: 10 days for John (Sessions 21 to 30) and eight days for Tim (Sessions 26 to 33).
- (4) Overcorrection for inappropriate object manipulation, mouthing, and inappropriate hand movements: seven days for John (Sessions 31 to 37) and seven days for Tim (Sessions 34 to 40).
- (5) Overcorrection for inappropriate object manipulation, mouthing, inappropriate hand movements, and other inappropriate behaviors: seven days for John (Sessions 38 to 44) and four days for Tim (Sessions 41 to 44).
- (6) Overcorrection for inappropriate object manipulation, mouthing, inappropriate hand movements and other inappropriate behaviors and reinforcement for appropriate toy play: nine days for John (Sessions 45 to 53), and nine days for Tim (Sessions 45 to 53). During the last five days of this period (Sessions 49 to 53), verbal prompts (defined above) were also delivered to Tim.

RESULTS

Reliability was: 93% for inappropriate object manipulation, 90% for mouthing behavior, 88% for inappropriate hand movements, 88% for other inappropriate behaviors, 97% for appropriate toy play, and 100% for initiation of overcorrection.

Figure 1 presents percentages of occurrence of all behaviors displayed by both children throughout the study. Abrupt reductions from baseline were noted in John's and Tim's inappropriate manipulation, mouthing behavior, inappropriate hand movements, and other inappropriate behaviors when overcorrection was introduced for these behaviors. Table 1 presents the frequency of overcorrections imposed on

²Fox and Azrin (1973) have suggested that once stereotyped behaviors have been eliminated by overcorrection, caregivers should provide an environment that will ensure a high frequency of positive reinforcement for outward directed appropriate behaviors. Consequently, the reinforcement condition was added to the experimental procedure primarily for clinical purposes following the overcorrection condition.

Fig. 1. Per cent occurrence of inappropriate object manipulation, mouthing, hand movements, and other behaviors. The dashed line indicates when overcorrection procedures were introduced for each behavior. Per cent occurrence of appropriate toy play is presented on the last two axes. Beginning in Session 45 (see arrow), reinforcement was introduced for appropriate toy play for both subjects and in Session 49 (see asterisk), verbal prompts to play were introduced to Tim.

each subject for each behavior in each phase. Examination of these data indicate that a reduction in the use of overcorrection occurred across phases for each behavior.

Figure 2 presents percentages of change from the preceding phase in all untreated behaviors when overcorrection was introduced for the target behavior. Percentage changes in a negative direction from a preceding phase (y) for any particular phase (x) represented a decrease in behavior and were calculated by the formula

$$\frac{\text{mean (phase y)} - \text{mean (phase x)}}{\text{mean (phase y)}} \times 100.$$

Percentage changes in a positive direction from a preceding phase (y) for any particular phase (x) represented an increase in behavior and were calculated by the formula

$$\frac{\text{mean (phase x)} - \text{mean (phase y)}}{100 - \text{mean (phase y)}} \times 100.$$

As can be seen in Figure 2, Section A, large percentage changes in the mean rate of John's nonmanipulated behaviors occurred in Phase 2 when overcorrection was introduced for inappropriate object manipulation. Mouthing behav-

Table 1

Number of overcorrections for each behavior of each subject in each phase.

	<i>Object Manipulation</i>	<i>Mouth-ing</i>	<i>Hand Move-ments</i>	<i>Other Behav-iors</i>
Phase 2				
John	45	—	—	—
Tim	21	—	—	—
Phase 3				
John	12	19	—	—
Tim	5	9	—	—
Phase 4				
John	5	3	2	—
Tim	0	0	15	—
Phase 5				
John	3	5	1	5
Tim	0	1	2	11
Phase 6				
John	3	1	2	3
Tim	1	0	2	8

Fig. 2. Percentage changes in nonmanipulated behaviors (relative to the preceding phase) when overcorrection was introduced for object manipulation (A); object manipulation and mouthing (B); object manipulation, mouthing, and hand movements (C); and object manipulation, mouthing, hand movements, and other behaviors (D).

ior, inappropriate hand movements, and other inappropriate behaviors decreased relative to their Phase 1 (baseline) rates of occurrence, while appropriate toy play increased. Smaller percentage changes in nonmanipulated inappropriate behaviors occurred in Phases 3 and 4, while appropriate toy play continued to increase in these phases (See Sections B and C). In Phase

5, appropriate toy play decreased slightly in rate of occurrence relative to Phase 4 (see Section D).

Smaller percentage changes in nonmanipulated behaviors occurred for Tim than for John, and these changes were often in the opposite direction. For example, when overcorrection was introduced for Tim's inappropriate object ma-

nipulation in Phase 2, inappropriate hand movements and other inappropriate behaviors increased relative to their Phase 1 (baseline) rates of occurrence. At the same time, mouthing and appropriate toy play were essentially unchanged (see Section A of Figure 2). Relative to Phase 2, inappropriate hand movements decreased in mean rate of occurrence in Phase 3 when mouthing was suppressed (see Section B). However, the mean rate of occurrence of other inappropriate behaviors increased slightly in this phase (see Section B) and, relative to Phase 3, continued to increase in Phase 4 (see Section C). Appropriate toy play increased only slightly from Phase 4 to Phase 5 when overcorrection was occurring for all target behaviors (see Section D).

Regarding the reinforcement condition (Phase 6, Sessions 45 to 53), John's appropriate play behavior, which had decreased in the previous phase, returned to a high rate of occurrence (see Figure 1). For Tim, the delivery of praise and edibles was not immediately effective in increasing the occurrence of appropriate toy play. Beginning on the fifth day of the phase, verbal prompts were introduced. Appropriate toy play displayed by Tim increased immediately and continued to increase across the last sessions of the phase (see Figure 1).

DISCUSSION

A procedure derived from the overcorrection principle reduced the stereotyped behavior displayed by two autistic children. The results showed that a brief application of positive practice in appropriate toy play eliminated four topographically different behaviors displayed by each child.

Previous research has demonstrated that changes in the rate of occurrence of a manipulated behavior may be associated with a change in rate of occurrence of one or more nonmanipulated behaviors (Koegel *et al.*, 1974; Wahler, 1975). In the present study, the reduction of targeted stereotypic behaviors displayed by John

was generally associated with reductions in the percentage occurrence of nonmanipulated inappropriate behaviors across phases. In contrast, the reduction by overcorrection of targeted stereotypic behaviors displayed by Tim was generally associated with increases of a small magnitude in nonmanipulated behaviors. As Wahler (1975) so succinctly remarked, the question of why behavior covariation occurs is unanswered. However, the fact that twins who live in the same home and attend the same school exhibited different patterns of change in nonmanipulated behaviors when stereotypy was suppressed by overcorrection suggests that patterns of behavioral covariation may be highly idiosyncratic.

The differential effectiveness of positive practice overcorrection in increasing appropriate toy play by the two children was also puzzling. For John, overcorrection treatment immediately resulted in substantial increases in toy play, which were maintained throughout the entire study. For Tim, increases in appropriate toy play did not occur as a result of positive practice overcorrection alone, but required the addition of a verbal prompt plus reinforcement for play behavior. These results suggest that for some children, overcorrection may be sufficient to teach and motivate the increased occurrence of appropriate behaviors practised during manual guidance. For others, it would appear that caregivers must provide an environment that will ensure a high frequency of positive reinforcement for outward-directed activity, as Foxx and Azrin (1973) suggested.

The argument could be raised that appropriate toy play displayed by John did not occur as a direct result of positive practice overcorrection, but as a result of the suppression of stereotypic behavior. Indeed, Koegel *et al.* (1974) demonstrated a functional covariation between stereotypic behavior and appropriate toy play such that a reduction in all forms of stereotypic behavior by briskly slapping or briefly immobilizing the body part involved in the stereotypic response resulted in increases in appropriate toy

play. However, in that study, training in appropriate toy play occurred before initiation of the experimental procedures to ensure that appropriate play responses were present in the child's behavioral repertoire. In the present study, no such prior training occurred, although both subjects had been exposed to a positive practice in appropriate toy play overcorrection procedure in a study five months earlier. In addition, the appropriate play responses exhibited by John throughout the present study resembled those that had been guided by the experimenter during forced manual guidance, suggesting that these behaviors had been learned during overcorrection episodes. These data suggest that the positive practice overcorrection procedure taught and motivated the increased occurrence of appropriate toy play by John.

REFERENCES

- Azrin, N. H., Kaplan, S. J., and Foxx, R. M. Autism reversal: Eliminating stereotyped self-stimulation of retarded individuals. *American Journal of Mental Deficiency*, 1973, 78, 241-248.
- Baumeister, A. A. and Forehand, R. Stereotyped acts. In N. R. Ellis (Ed), *International review of research in mental retardation*, Vol. 6, New York: Academic Press, 1973. Pp. 55-96.
- Bijou, S. W., Peterson, R. F., and Ault, M. H. A method to integrate descriptive and experimental field studies at the level of data and empirical concepts. *Journal of Applied Behavior Analysis*, 1968, 1, 175-191.
- Doke, L. A. and Epstein, L. H. Oral overcorrection: Side effects and extended applications. *Journal of Experimental Child Psychology*, 1975, 20, 496-511.
- Doleys, D. M., Wells, K. C., Hobbs, S. A., Roberts, M., and Cartelli, L. The effects of social punishment on noncompliance: a comparison with time-out and positive practice. *Journal of Applied Behavior Analysis*, 1976, 9, 471-482.
- Epstein, L. H., Doke, L. A., Sajwaj, T., Sorrell, S., and Rimmer B. Generality and side effects of overcorrection. *Journal of Applied Behavior Analysis*, 1974, 7, 385-390.
- Foxx, R. M. and Azrin, N. H. The elimination of autistic self-stimulatory behavior by overcorrection. *Journal of Applied Behavior Analysis*, 1973, 6, 1-14.
- Koegel, R. L., Firestone, P. B., Kramme, K. W., and Dunlap, G. Increasing spontaneous play by suppressing self-stimulation in autistic children. *Journal of Applied Behavior Analysis*, 1974, 7, 521-528.
- Lovaas, O. I., Litrownik, A., and Mann, R. Response latencies to auditory stimuli in autistic children engaged in self-stimulatory behavior. *Behaviour Research and Therapy*, 1971, 9, 39-49.
- Rollings, J. P., Baumeister, A. A., and Baumeister, A. A. The use of overcorrection procedures to eliminate the stereotyped behaviors of retarded individuals: An analysis of collateral behaviors and generalization of suppressive effects. *Behavior Modification*, 1977, 1, 29-46.
- Wahler, R. G. Some structural aspects of deviant child behavior. *Journal of Applied Behavior Analysis*, 1975, 8, 27-42.
- Wells, K. C., Forehand, R., and Hickey, K. Effects of a verbal warning and overcorrection on stereotyped and appropriate behaviors. *Journal of Abnormal Child Psychology*, (in press).

Received 21 July 1976.

(Final acceptance 23 March 1977.)