

## THE ELIMINATION OF AUTISTIC SELF-STIMULATORY BEHAVIOR BY OVERCORRECTION<sup>1</sup>

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No method is in general usage and of demonstrated effectiveness in eliminating the self-stimulatory behaviors of retardates and autistics. An Overcorrection rationale was used to develop such a method. The Overcorrection procedures consisted of a period of practice in the correct mode of the behavior contingent upon self-stimulatory behavior. The procedures were applied in a behavioral day-care program to three retarded children and one autistic child who exhibited object-mouthing, hand-mouthing, head-weaving and hand-clapping. For some behaviors, comparisons were made between the Overcorrection procedure and several alternative procedures, such as physical punishment by a slap, reinforcement for nonself-stimulatory behavior, a distasteful solution painted on the hand of a hand-mouther, and free reinforcement. The Overcorrection procedures eliminated the self-stimulatory behaviors of all four children in tutorial sessions and during the entire school day and were more effective than the alternative procedures in eliminating self-stimulation. The Overcorrection procedures appear to be rapid, enduring, and effective methods of eliminating self-stimulatory behavior.

Self-stimulatory behavior is a common problem of retarded and autistic individuals. Two thirds of the institutionalized retarded exhibit self-stimulatory behavior (Berkson and Davenport, 1962; Kaufman and Levitt, 1965); for the autistic child, self-stimulation is considered as one of the identifying characteristics (Rimland, 1964). Self-stimulatory behavior consists of repetitive, stereotyped behavior that has no apparent functional effects on the environment, examples of which are rocking, hand-waving, and head-weaving (Kaufman and Levitt, 1965; Berkson, 1967), mouthing or rubbing parts of one's body (Berkson and Mason, 1964; Hollis, 1965; Hutt and Hutt, 1965), and mouthing,

or spinning objects (Hutt and Hutt, 1965; Kaufman, 1967; Campbell, 1968; Lovaas, Litrownik, and Mann, 1971).

### *Reducing Self-Stimulatory Behavior*

Attempts to reduce or eliminate self-stimulatory behavior have met with limited degrees of success. Guess and Rutherford (1967) found that self-stimulatory behavior of retardates was reduced by about 50% during two conditions wherein objects were available to be manipulated. Mulhern and Baumeister (1969) reduced by about one-third the "rocking" behavior of two retardates by reinforcing the behavior of sitting still. Hollis (1968) conditioned a self-stimulating retardate to pull a ball under fixed-ratio reinforcement (FR 100). The self-stimulation was eliminated for the brief 10-min periods during ball-pulling but returned to its original rate under an extinction condition. Thorazine, in turn, eliminated rocking responses in the brief extinction period. In a study of two retardates, Baumeister and Forehand (1971) supported Hollis's (1968) finding that self-stimulation was eliminated during brief operant reinforcement sessions, but another report (Hollis,

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*unpublished*) showed that this displacement by operant reinforcement was not effective for three of six retardates. Davis, Sprague, and Werry (1969) found that another tranquilizer (Thoridazine) decreased by about one-third the self-stimulatory behavior of institutionalized retardates. The only example of complete and enduring suppression of self-stimulatory behavior has been achieved by physical punishment of autistic children in one instance by pain-shock (Lovaas, Schaeffer, and Simmons, 1965) and the other by slaps on the thigh (Bucher and Lovaas, 1968).

The above procedures do not seem to have received widespread usage, possibly because none of them has been demonstrated to be effective for long periods, or for many patients, or they have required very painful physical punishment. Self-stimulatory behavior continues as a major problem among retardates and autistic children. The need exists for a treatment that does not suffer from the above-noted limitations of degree, and durability of effectiveness as well as acceptability.

#### *An Alternative Method*

A recently developed procedure (Foxx and Azrin, 1972), designated as Overcorrection, holds promise as an effective, enduring, and acceptable method of eliminating self-stimulatory behavior. The procedure was used in treating the aggressive-disruptive behaviors of a brain-damaged patient and two retarded patients. The Overcorrection procedures reduced each deviant behavior to a near-zero level within two weeks and maintained this effect for several months with minimal supervision by institutional staff. Two additional applications have demonstrated the generality of the Overcorrection procedures, in one instance by extension to the problem of maintaining the appropriate eating behaviors of profoundly retarded adults (Surratt, *unpublished*), and in the other instance by extension to the toilet training of adult retardates (Azrin and Foxx, 1971).

The general rationale of the Overcorrection procedure is (1) to overcorrect the environmen-

tal effects of an inappropriate act, and (2) to require the disruptor intensively to practise overly correct forms of relevant behavior. The method of achieving the first objective of correcting the effects of the disruption is designated as Restitutional Overcorrection, and consists of requiring the disruptor to correct the consequences of his misbehavior by having him restore the situation to a state vastly improved from that which existed before the disruption. For example, an individual who overturned a table would be required both to restore the table to its correct position and to dust and wax the table. The method of achieving the second objective of practising correct behaviors is designated as Positive Practice Overcorrection. For example, the disruptor who overturned the table would also be required to straighten and dust all other tables and furniture in the room. This latter requirement teaches the disruptor the correct manner in which furniture should be treated. When no environmental disruption is created by the inappropriate act, the Restitutional Overcorrection procedure is not applicable and only the Positive Practice procedure could be used. Since self-stimulatory behavior often has no effect on the environment, the Positive Practice Overcorrection procedure would be used alone in those instances.

#### STUDY I

Punishment by a slap (Bucher and Lovaas, 1968) and reinforcement for non-self-stimulatory behavior (Mulhern and Baumeister, 1969) are two procedures that have been used to decrease self-stimulatory behavior. A third procedure, painting the thumb with a distasteful solution, has been in common usage to discourage thumb-sucking of normal children, which may be considered as self-stimulation. Klaber and Butterfield (1968) suggested that another possible method would be to provide the self-stimulator with frequent and pleasant social interaction. The present study compared the effectiveness of an Overcorrection procedure with these four



alternative procedures in eliminating self-stimulatory mouthing.

#### METHOD

##### *Subjects*

Barbara was an 8-yr-old severely retarded girl enrolled as an outpatient in a day-care intensive learning program. Her retardation was diagnosed as being congenital or genetic. Her Vineland Social Quotient was 23 with an equivalent age assignment of 1.4 yr. Barbara continuously mouthed objects by picking them up and touching them to her mouth or placing them inside her mouth. If the object was too heavy to lift, she would sit or stand beside it and mouth it with her lips, mouth, and tongue.

Wilma was a 7-yr-old severely retarded girl also enrolled in the day-care program. Her Vineland Social Quotient was 28 with an equivalent age assignment of 1.9. Her retardation was diagnosed as familial. Wilma continuously mouthed her hand.

##### *Experimental Design*

The design allowed within-subject comparison of the five procedures. When one of the procedures substantially decreased the level of self-stimulation, the Free Reinforcement condition was reinstated to provide a more uniform "baseline" before applying the next treatment procedure. This return to the Free Reinforcement procedure constituted a return to baseline and ensured that each treatment procedure was imposed on a level of self-stimulatory behavior that was comparable to that preceding every other treatment procedure, thereby controlling in part for order effects.

Barbara received the procedures in the following sequence: (1) Free reinforcement, (2) reinforcement for non-mouthing, (3) punishment by a slap, (4) Free reinforcement, and (5) Overcorrection. The sequence of procedures for Wilma was: (1) Free reinforcement, (2) distasteful solution, (3) punishment by a slap, (4) reinforcement for non-mouthing, and (5) Overcorrection.

##### *Recording and Reliability*

Tutorial instruction was conducted in a soundproof room containing two one-way vision windows on opposite sides of the room. Self-stimulatory mouthing was recorded in the 15-min tutorial sessions through the one-way glass by an observer who operated a switch connected to an electro-magnetic counter to record each instance of mouthing within successive 1-min intervals. Mouthing was defined as oral contact with any object other than food. A mouthing response was recorded as an instance of uninterrupted contact of that object with the mouth. Reliability was assessed during one session in each procedure by two independent observers, one at each observation window; one of the observers was not aware of the nature of the study. Per cent agreement was obtained by dividing the number of intervals in which the two observers agreed by the total number of intervals in which observations were made, times 100. The interobserver agreement was 95% or greater during each of the sessions in which reliability was assessed. Reliability and validity was assessed informally by the unannounced and frequent direct observations by the experimenters.

##### *Procedure*

Two tutorial sessions were conducted daily for each child in the soundproof classroom. The tutorial sessions were conducted at the same time each day by the same teacher. The purpose of the session was to teach the child the names of several toys displayed on a table. The child and the teacher were seated at the table. The teacher presented a toy, named the toy, and directed the child to play with the toy appropriately, e.g.: "Barbara, hold the dolly". When the child discarded the toy, the teacher directed her to play with another. Hutt and Hutt (1965) used a similar situation as the context for studying self-stimulation. Five procedures were used. One of the children's parents was required to be present

during at least part of each procedure in order to keep them fully informed.

- (1) *Free reinforcement*: The teacher gave the child a piece of candy or sugar-coated cereal accompanied by verbal praise. These were given by the teacher at irregular intervals averaging 1 min apart on cue from a timer and independent of the child's behavior.
- (2) *Reinforcement for non-mouthing*: The child was given edibles and praise whenever 10 sec elapsed without mouthing. Ten seconds was selected as the duration because that duration of non-mouthing occurred frequently during baseline.
- (3) *Punishment procedure*: The child was slapped once on the thigh when she mouthed. The slap was sufficiently severe to cause overt distress and was characterized by the parent in each case as the method of last resort they used in controlling the child at home.
- (4) *Distasteful solution*: The child's hand was painted at the start of the class with a commercially bottled solution (Thum: Num Specialty Co., Inc., Pittsburgh, Pa.) used to discourage the thumb-sucking of normal children.
- (5) *Overcorrection*: Mouthing of objects or parts of one's body results in exposure to potentially harmful microorganisms through the unhygienic oral contact. The Restitutorial Overcorrection rationale suggests that this possibility of self-infection be eliminated. In a previous report (Foxx and Azrin, 1972), an Oral Hygiene procedure that accomplished this objective was used effectively in combination with other overcorrection procedures to eliminate the physical attacks by biting of a mentally retarded adult female and a brain damaged adult female. The Oral Hygiene procedure was to tell the

child, "No" in a firm voice, to brush her gums and teeth with a toothbrush that had been partially immersed in a container filled with an oral antiseptic (mouthwash) and to wipe her outer lips with a washcloth that had been dampened with the antiseptic. Periodically during the 2-min training period, the child was encouraged (by verbal instructions and tickling of the tongue) to expectorate the cleansing solution into a sterile cup. After each administration of the Oral Hygiene procedure, the toothbrush and washcloth were rinsed in water and then soaked in fresh antiseptic.

#### RESULTS AND DISCUSSION

Figure 1 shows the self-stimulatory mouthings of both children under each of the treatment procedures. The absolute frequency of mouthings was high for both children, over 100 times per hour for several of the treatments. The least effective treatments were the Free Reinforcement procedure and the procedure that reinforced non-mouthing. The most effective treatment for the children was the Overcorrective Oral Hygiene procedure, which reduced the self-stimulatory mouthings to zero. Intermediate in effectiveness, were the other two treatments. Punishment by slaps reduced the self-stimulatory mouthing to a low level of about four per hour for one child but increased the mouthings for the other child who exhibited a strong negative emotional reaction upon being slapped and typically reacted by reinserting her hand in her mouth. The treatment that provided a distasteful solution reduced the self-stimulatory mouthings to an intermediate level of about 50 mouthings per hour for the one child who received that treatment. The data in Figure 1 are for the last three sessions of each procedure. The ordinal differences between procedures as stated above were the same when the data were analyzed in terms of the first three or four sessions under

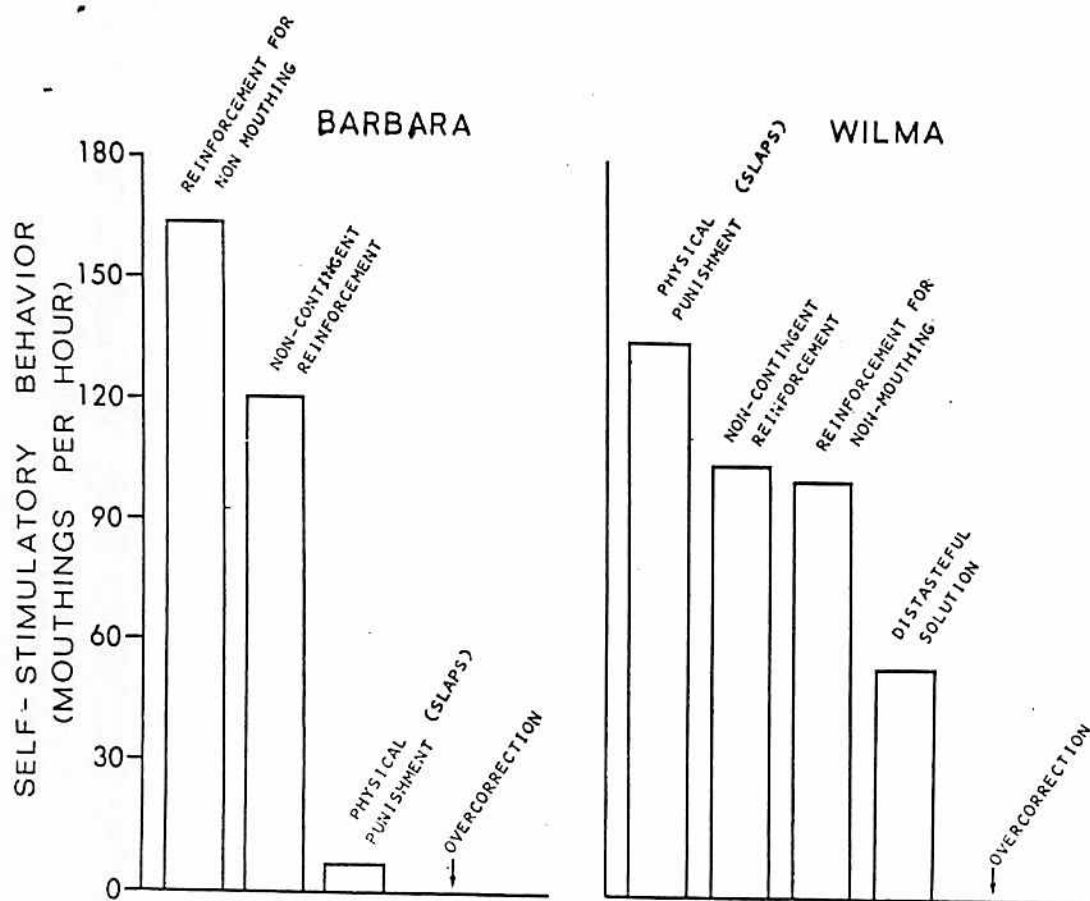


Fig. 1. Barbara: The effect of four procedures, reinforcement for non-mouthing, free reinforcement, physical punishment (slaps), and Overcorrection on the rate of self-stimulatory object-mouthing of a severely retarded child. Each bar represents the mean number of self-stimulatory mouthings during the last three sessions of each condition. Wilma: The effect of five procedures, physical punishment (slaps), free reinforcement, reinforcement for non-mouthing, painting the hand with a distasteful solution, and Overcorrection on the rate of self-stimulatory hand-mouthing of a severely retarded child. Each bar represents the mean number of self-stimulatory mouthings during the last three sessions of each condition.

each procedure. (The detailed session-to-session changes are presented elsewhere, Foxx, *unpublished*).

## STUDY II

Study I showed that the Overcorrection treatment procedure was extremely effective in eliminating self-stimulatory mouthing during brief 15-min sessions. Two major questions still remain unanswered in evaluating the Overcorrection procedure as a general technique for treating self-stimulatory behavior. A first question is whether Overcorrection procedures would also be effective with self-stimulatory behaviors

other than mouthing. The second question is whether the Overcorrection treatment procedure could eliminate self-stimulation throughout the school day; none of the previous studies demonstrated elimination of self-stimulation throughout a major part of the day. The present study was designed to answer both of these questions.

## METHOD

### Subjects

Four children, two of whom, Wilma and Barbara, had served in Study I, were used. The two new children were Tricia and Mike, both of whom were also enrolled in the same day-care



program as the other two. Tricia was an 8-yr-old severely retarded girl. Her Vineland Social Quotient was 35 with an equivalent age assignment of 2.8 yr. Her retardation was diagnosed as microcephaly. Tricia had several disabilities including a congenital heart condition, a deformed leg, and blindness in one eye. Tricia had difficulty learning as a result of her stereotyped behavior of constantly turning her head in a wide arc from side to side. It was almost impossible to gain her attention during these head-weaving episodes.

Mike was a 7-yr-old boy diagnosed as autistic by three different treatment facilities. He displayed many of the classic autistic behaviors, notably hand-clapping, in which he engaged almost continuously. Similarly, he had strong taste preferences, was withdrawn, had only slight and disorganized speech, avoided eye contact, and was so socially unresponsive as to appear to be deaf.

#### *Experimental Design*

Study II was conducted in a large playroom during the children's entire 6-hr stay at the day-care program and contained three procedures: (1) A Baseline Control Procedure, (2) the Overcorrection Procedure, and (3) a maintenance procedure consisting of a verbal warning. The sequence of the procedures for the three retarded children was: Baseline-Overcorrection-Baseline-Overcorrection-Verbal Warning. The procedural sequence for the autistic child was Baseline-Overcorrection-Verbal Warning. The initial baseline recording was conducted for at least five days for each child. The initial Overcorrection condition was in effect for at least 20 days for each child. For the three retarded children, three months were allowed to elapse, during which no attention was given to self-stimulatory behavior and no records were kept. The second baseline recording period lasted for three days. The second Overcorrection period lasted at least 12 days for each child. The final procedure (Verbal Warning procedure) lasted for at least 33 days.

#### *Recording and Reliability*

Self-stimulatory mouthing was defined in the same manner as in Study I. Self-stimulatory head-weaving episodes were defined as the head moving from side to side in a wide sweep. Self-stimulatory clapping was defined as an audible sound produced by slapping the hands together. Self-stimulatory behavior was recorded by an assigned observer. For the three children who exhibited non-audible self-stimulation (mouthings, head-weaving) a time-sample recording was used; the observer recorded every 15 min whether or not the self-stimulation occurred during a 1-min observation period. For the audible clapping behavior, the observer recorded each instance of clapping within successive 1-min intervals. For one day selected at random from each of the five conditions, a second observer was present. Per cent agreement was obtained by dividing the number of time samples in which the observers agreed by the total number of observed time samples, times 100. Inter-observer agreement was above 96% for the time-sample recordings and 94% for clapping episodes.

#### *Baseline-Reinforcement of Outward-directed Activities*

A day-care behavioral program (9:00 a.m.—3:00 p.m.) that provided frequent reinforcement for appropriate outward-directed behaviors was in effect throughout the study. A high ratio of teachers to children (1 to 3) enabled the teachers to provide the children with frequent instruction in constructive behaviors.

#### *Overcorrection Procedure*

The Overcorrection procedures described below were administered immediately for the self-stimulatory behavior and were preceded by a verbal command (warning) to the child to discontinue that behavior.

(a) *Mouthing.* The Overcorrection procedure for the self-stimulatory mouthing of Wilma and

Barbara was identical to that described in Study I and consisted of the Overcorrective Oral Hygiene procedure.

(b) *Head-weaving*. Randomly weaving one's head from side to side is non-functional behavior because the behavior is independent of external control. Since head-weaving creates no environmental disruption, a Restitutional Overcorrection procedure is not applicable as a treatment. The Positive Practice Overcorrection rationale, however, could be used to teach and motivate the head-weaver to hold her head in a sustained orientation (not moving) and to move only for functional reasons, *i.e.*, when instructed to do so. This Overcorrective Functional Movement training procedure would thereby be educative because the individual would be learning specific movements to specific directions, such as up, down, left or right.

Any time that Tricia began head-weaving, she was immediately given Functional Movement Training for 5 min. In beginning the training, the teacher used her hands to restrain Tricia's head. The teacher then instructed Tricia to move her head in one of three positions, up, down, or straight by stating, for example: "Tricia, head up". If Tricia did not immediately move her head in the desired direction, the teacher manually guided Tricia's head. Eventually, Tricia should respond to the verbal instructions alone in order to avoid the trainer's guidance as in conditioned avoidance (Azrin, Holz, and Hake, 1962). Tricia was required to hold her head stationary for 15 sec, at the end of which another instruction was given. If Tricia moved her head during the 15-sec period, the trainer immediately restrained her head. As Tricia began following the directions, the teacher faded out the manual guidance, but continued to "shadow" Tricia's head with her hands. The instructions were given randomly to ensure that Tricia was learning each individual instruction and not a sequence of instructions.

(c) *Hand-clapping*. Repetitive clapping is similar to head-weaving in that no environmental disruption is created. The Positive Practice Over-

correction rationale was again used to develop a Functional Movement training procedure. The Functional Movement training procedure would teach and motivate the hand-clapper to hold his hands stationary and to move them only for functional reasons, *i.e.*, when instructed to do so.

Any time that Mike began clapping, he was immediately given Functional Movement Training for 5 min. The training was similar to Tricia's except that Mike was instructed to move his hands in one of five positions: above his head, straight out in front of him, into his pockets, held together and held behind his back by the teacher stating, for example: "Put your hands in your pockets". The teacher manually guided Mike's hands whenever he failed to respond to an instruction. Mike was required to hold his hands in the position for 15 sec, at the end of which another instruction was given. As Mike began following the directions, the teacher faded out the manual guidance but remained ready to provide guidance by "shadowing" Mike's hands with her hands. The instructions were presented in a random sequence to ensure that he was learning each individual instruction, rather than a sequence of instructions.

#### *Verbal Warning*

After the self-stimulatory behavior had been absent for many days, a verbal warning procedure was instituted that was intended to approximate the circumstances existing in the child's natural environment. If the child self-stimulated, she was told to stop engaging in that behavior. The Overcorrection training was administered only if the child failed to stop or if she emitted an additional self-stimulatory behavior during the remainder of the morning or afternoon session. Thus, the children could self-stimulate once in the morning and afternoon without receiving the Overcorrection training. Hopefully, the verbal warning would now be sufficient after the long history of the association of the warning with the Overcorrection training.

## RESULTS

Figures 2, 3, 4, and 5 show the per cent of time spent in self-stimulation for each of the four children. All four children were self-stimulating over 80% of the time during the initial baseline despite the high ratio of teachers to students and the continuing availability of positive reinforcement for outward-directed behaviors. When the Overcorrection procedure was introduced, the self-stimulatory behaviors were decreased by half or more within four days, and were further reduced to a near-zero level within 10 days, after which self-stimulation virtually ceased. For three of the children (Figures 2, 3, 4) reintroduction of the baseline recording after three months without attention to self-stimulation found the children self-stimulating more than 40% of the time. When

the Overcorrection was reintroduced, self-stimulation decreased within three days to a zero level for all three children. Self-stimulation was near zero during the verbal warning procedure that followed the Overcorrection condition. When a new teacher was brought in during the Overcorrection conditions (see arrows in Figures 3 and 4) the children "tested" the new teacher by self-stimulating on that day only. For one child (Figure 4), the self-stimulation was reduced only about 50% by the sixth day of Overcorrection. When the training period was increased from 5 min to 20 min on Day 27 (see first arrow) self-stimulation decreased to a near-zero level within four days. Once the self-stimulation was eliminated, the elimination continued even when the 20-min duration was reduced to a 2-min duration (see second arrow, Day 37). In the second Overcorrection period,

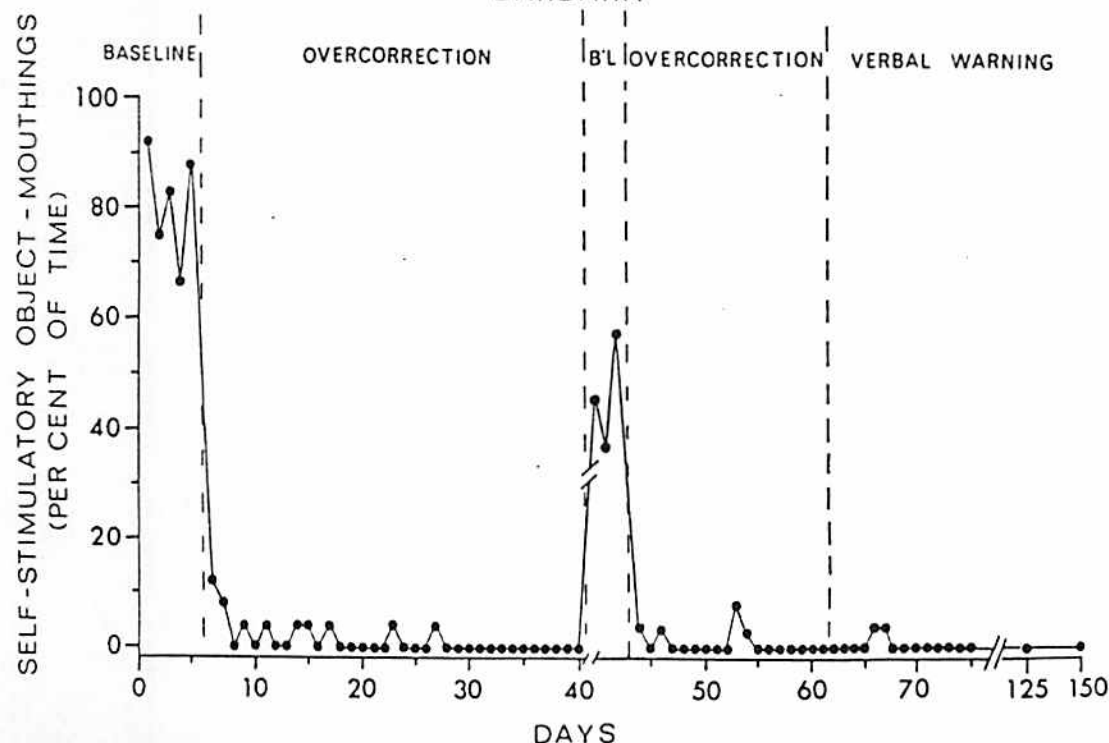
OBJECT - MOUTHING  
BARBARA

Fig. 2. The effect of the Overcorrective Oral Hygiene and Verbal Warning procedures on the self-stimulatory object-mouthing of a severely retarded child. The ordinate is labelled in terms of the per cent of time samples in which mouthings were observed. The first slash marks on the abscissa indicate a three-month period. During the baseline periods, no contingencies were in effect for mouthing.



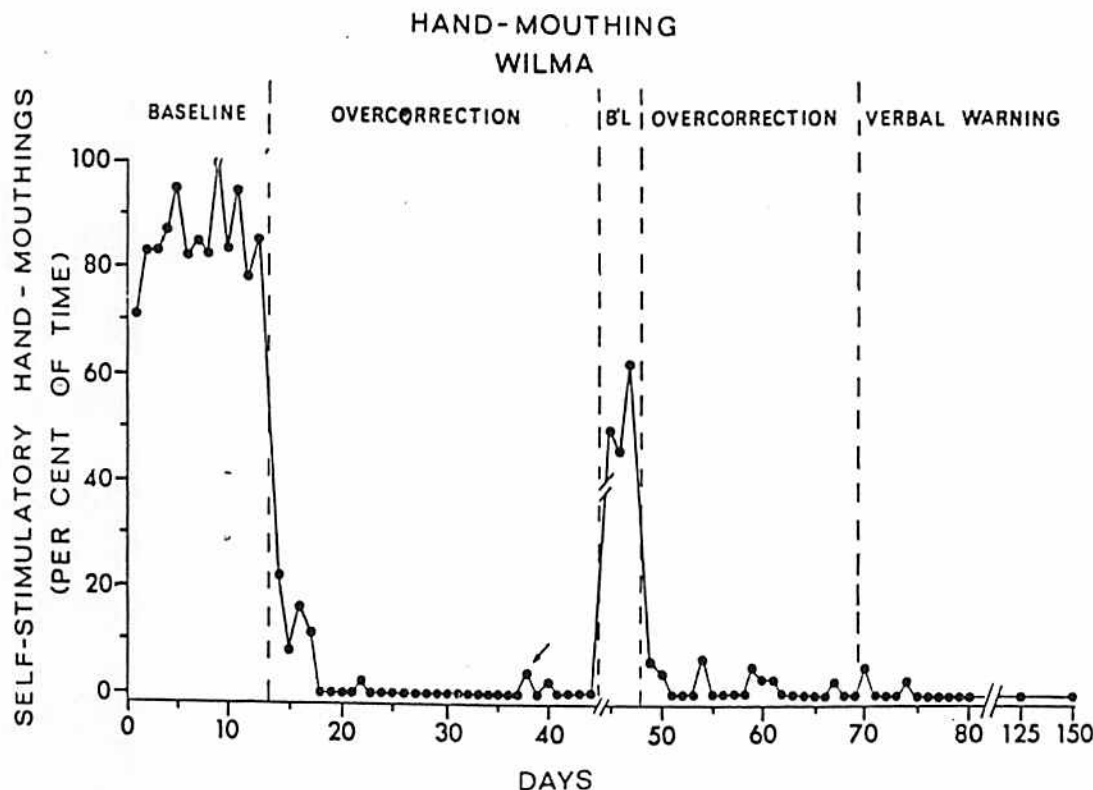


Fig. 3. The effect of the Overcorrective Oral Hygiene and Verbal Warning procedures on the self-stimulatory hand-mouthing of a severely retarded child. The ordinate is labelled in terms of the per cent of time samples in which mouthings were observed. The first slash marks on the abscissa indicate a three-month period. During the baseline periods, no contingencies were in effect for mouthing. The arrow (Day 38) indicates the introduction of a new teacher.

the training was given for 20 min during the first three days and was then decreased to 2 min on Day 51 (see third arrow) since head-weaving had been decreased to zero.

Figure 6 is a stylized representation of the children's self-stimulatory behavior, the Overcorrection procedure for that behavior, and the children's appearance after training.

During the Overcorrection conditions, Barbara often approached objects as if to mouth them as she had in the past, but stopped suddenly, looked around and then pulled vigorously away from the object. She often picked toys up, moved the toy toward her mouth, then pulled them away without mouthing them. Barbara's teacher reported that Barbara seemed much more alert and that her attention to various training tasks had increased. Barbara's mother reported that mouthing had increased at

home. After the mother was instructed to implement the training procedure at home, she reported that mouthing was now very rare.

Wilma's mother reported that Wilma was much more responsive to adults and other children during the training conditions when her hand-mouthing had been eliminated. Wilma's mother was instructed to use the procedure in her home; she reported that hand-mouthing had been eliminated.

Tricia was extremely compliant, passively allowing her head to be guided during the first six days of training when the training duration was but 5 min. When training was increased to 20 min, however, she began displaying emotional behaviors such as crying. This emotional behavior suggested that in this instance, the increased effort requirement was more motivating, *i.e.*, negatively reinforcing. After three days

of the increased effort requirement, Tricia ceased exhibiting any emotional behaviors and began moving her head when instructed to do so, rather than awaiting the physical guidance. The elimination of head-weaving dramatically increased Tricia's attention to teaching materials. As a result, Tricia "tested" high enough to be placed in a county special education class for the trainable retarded. Tricia's new teacher was instructed in the Overcorrection and Verbal Warning procedures. To date, the teacher reports that aside from the need for an occasional warning, head-weaving is virtually absent.

Although Mike's hand-clapping had been

eliminated during the entire school day, his parents reported that clapping occurred almost continuously at home. A day-care teacher was dispatched to Mike's home to instruct his parents in the Functional Movement Training Procedure. In a one-day baseline period, the teacher and Mike's parents observed him hand-clapping over 90% of the time. The next day, the parents instituted Functional Movement Training. Within two days, hand-clapping had decreased to a zero level. At this time, the Verbal Warning procedure was instituted. Frequent visits to Mike's home by the teacher and the parents' verbal reports have continually substantiated

#### HEAD-WEAVING TRICIA

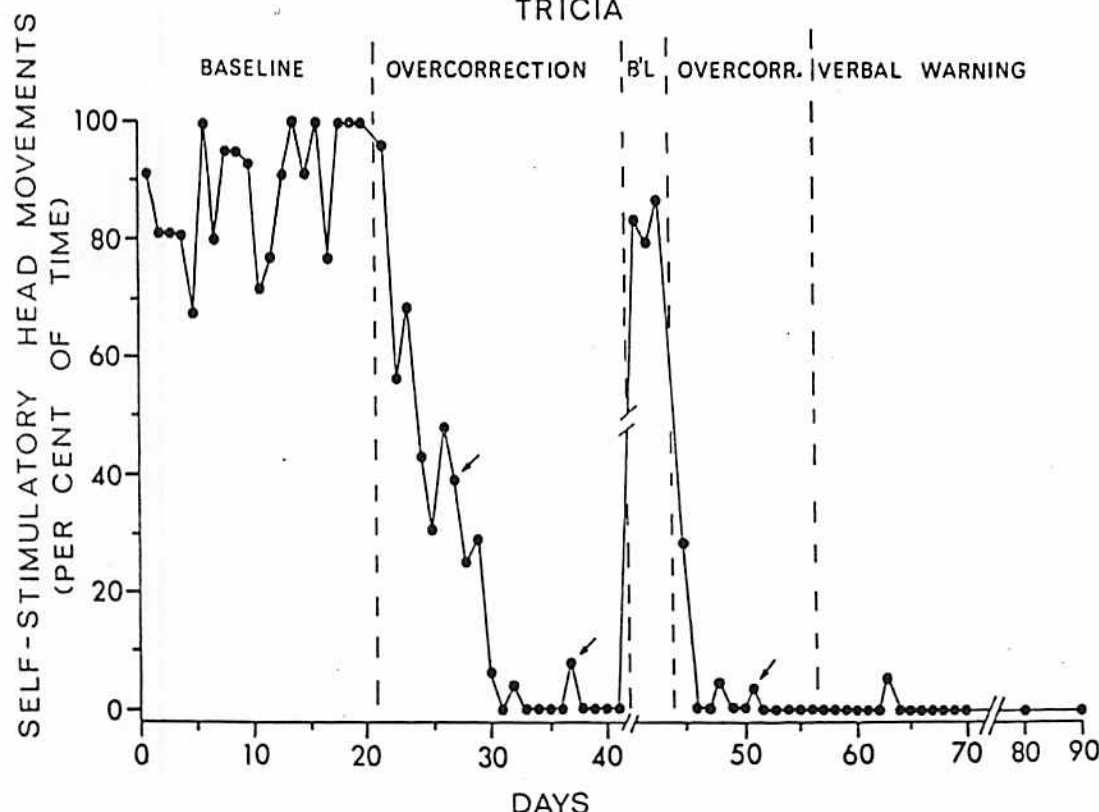


Fig. 4. The effect of the Overcorrective Functional Movement Training and Verbal Warning procedures on the self-stimulatory head-weaving of a severely retarded child. The ordinate is labelled in terms of the per cent of time samples in which head-weaving was observed. The first slash marks on the abscissa indicate a three-month period. During the baseline periods, no contingencies were in effect for head weaving. The first arrow (Day 27) indicates where the duration of Functional Movement Training was extended to 20 min. The second arrow (Day 37) indicates the introduction of a new teacher to serve as the Functional Movement Trainer and reduction of the Functional Movement Training to 2 min. The third arrow (Day 51) indicates where the duration of Functional Movement Training was reduced to 2 min during the second Functional Movement Training condition.

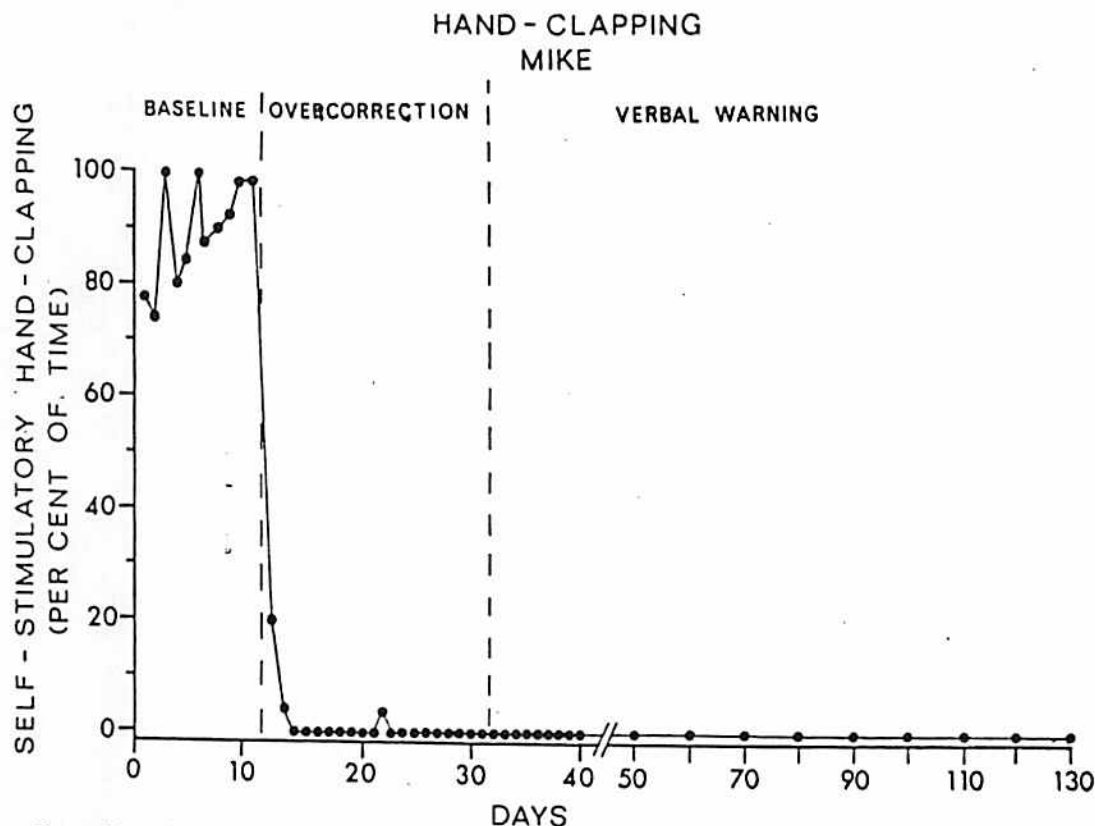


Fig. 5. The effect of the Overcorrective Functional Movement Training and Verbal Warning procedures on the self-stimulatory hand-clapping of an autistic boy. The ordinate is labelled in terms of the per cent of time samples in which hand-clapping was observed. During the baseline period, no contingencies were in effect for hand-clapping.

that clapping is now very rare. For the other children, no formal procedure was instituted to evaluate independently the parents' reports.

#### DISCUSSION

The Overcorrection procedure appears to be a very effective and general method of eliminating self-stimulatory behavior. The results showed that Overcorrection procedures reduced self-stimulation substantially on the first day, and to a near-zero level by the end of 10 days and sometimes sooner. Complete elimination was achieved for all four children. The treatment was effective for the autistic child as well as for the retarded children. The treatment was effective for several different and common types of self-stimulation: head-weaving, object-mouthing, hand-clapping, and hand-mouthing and appears adaptable to the other types. A normal

verbal reprimand followed by an occasional application of the Overcorrection procedure was sufficient to maintain the therapeutic effect. The Overcorrection procedure was effective even though the pathological behaviors had high initial frequency, the children having spent about 90% of their time in self-stimulation.

No other method of treating self-stimulation appears to possess the combined degree, and generality, of effectiveness as does the Overcorrection procedure. As was noted above (see Introduction), drugs, food reinforcement, enhanced environmental stimulation, pain-shock, and strengthening of competing behaviors have been used to reduce self-stimulation. However, none of these methods has yet been demonstrated to produce the combination of effects seen in the present use of the Overcorrection method: immediacy, completeness and permanence of



## PRE-TREATMENT    OVERCORRECTION    POST-TREATMENT

HEAD  
WEAVINGHAND  
CLAPPING

## MOUTHING



Fig. 6. The behavior of three children is shown during the pre-treatment, Overcorrection, and post-treatment phases of the study. The retarded girl at the top of the figure is shown: (1) weaving her head randomly from side to side, (2) receiving Overcorrective Functional Movement Training during which she moved her head only when instructed to do so, and (3) not head-weaving following training. The autistic boy pictured in the middle of the figure is shown: (1) repetitively clapping his hands, (2) receiving Overcorrective Functional Movement Training during which he moved his hands only when instructed to do so, and (3) functionally using his hands after clapping had been eliminated. The retarded girl at the bottom of the figure is shown: (1) mouthing a toy car, (2) receiving the Overcorrective Oral Hygiene procedure during which her mouth was cleansed with an oral antiseptic, and (3) playing appropriately with the toy car after object-mouthing had been eliminated.

reduction, as well as applicability to several types of self-stimulation, and to autistic as well as retarded individuals. The present findings directly support the superiority of the Overcorrection method. In direct comparisons with other methods used on the same retarded children to eliminate mouthing, the Overcorrection method was substantially more effective than free reinforcement (social and nutritive), reinforcement (again social and nutritive) of competing behaviors, punishment by a physical slap, and unpleasant taste (for mouthing), or an enriched physical environment (reinforcement of constructive behaviors). Physical punishment by a slap seems to be the closest alternative to the Overcorrection method but was found to be less effective in a direct comparison between the two in the present study. It should be noted, however, that previous reports of punishment by pain-shock (Lovaas, *et al.*, 1965) and by a physical blow (Bucher and Lovaas, 1968) have involved autistic rather than retarded children, and that severe types of self-stimulation such as self-mutilation have, as yet, been treated effectively only by severe pain-shock (Bucher and Lovaas, 1968). In any case, one major difference between the Overcorrection procedure and very painful physical punishment procedures that will remain and may be of decisive importance in selecting between the procedures, is the personal attitude of the therapist regarding the use of very painful punishments, such as pain-shock or physical blows, *versus* a mild punishment such as Overcorrection.

An understanding of the reasons for the effectiveness of the Overcorrection method seems possible if one examines the essential nature of this phenomenon of pathological self-stimulation. From a reinforcement orientation, profound retardates can be considered to suffer from a deficit of functional (reinforced) behaviors directed toward their physical and social environment because of their intellectual, physical, and perceptual deficits, which probably cause such behaviors to be extinguished or punished. Autistic children, by definition of autism as self-

directed, similarly receive little reinforcement from outward-directed activities, presumably because of emotional, physical, or other non-intellectual factors. For both retardates and autistics, the process can be considered as self-perpetuating. Self-stimulation can be considered as reinforcing (Lovaas, *et al.*, 1971). This reinforced self-stimulation should, therefore, attain progressively greater strength and frequency, thereby reducing still further the opportunities for successful outward-directed conduct. A treatment strategy from this orientation would be: (1) to decrease the duration of reinforcement that is intrinsic to a given instance of stimulating oneself, (2) to prevent further practice and consequent strengthening of the self-stimulatory behaviors, (3) to arrange annoying (aversive) consequences for each instance of self-stimulation, (4) to teach outward-directed activities, (5) to provide an environment that will ensure a high frequency of positive reinforcement for continuing outward-directed activities, (6) to alter qualitatively the tactile, proprioceptive, visual, gustatory, or other sensations that result from self-stimulation and presumably account for its reinforcing value, (7) to provide negative reinforcement (removal of annoyance) as well as positive reinforcement for outward-directed behaviors since the positive mode presumably is not sufficient. The Overcorrection techniques achieve these objectives: (1) the duration of reinforcement for each self-stimulation episode is brief because the teacher immediately interrupts each instance observed. (2) Further practice of the self-stimulatory behavior is physically prevented by the teacher while she manually guides the child during the 2- to 20-min period of Overcorrection. (3) Annoying consequences for the self-stimulation results from the physical effort required and the annoyance at being manually guided. (4) Teaching of the outward-directed activities is accomplished directly by the manual guidance and instructions. (5) The enriched day-school provides the continuing availability of positive reinforcement for outward-directed activities. (6) The qualitative changes

in the physical sensation from self-stimulation are achieved by requiring movements, postures, and gustatory experiences that are opposite or different from those naturally occurring from self-stimulation. (7) Negative reinforcement for the outward-directed activities results when the child moves spontaneously or attends to the teacher, thereby eliminating the annoyance of being manually guided. The present conceptual view of pathological self-stimulation is that a gross imbalance has occurred in reinforcement for self-directed *versus* outward-directed activities. The Overcorrection method can be considered as a method of reversing this imbalance in favor of outward-directed activities.

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in numerous instances, however, it is not possible to establish a causal relationship between the two factors. In some cases, the association is purely coincidental, while in others it may be a result of a common cause. The following are some of the more common causes of the association between the two factors:

1. **Common Cause:** In many cases, the association between the two factors is a result of a common cause. For example, the association between smoking and lung cancer is a result of the common cause of smoking. The common cause is the factor that is responsible for the occurrence of both factors.

2. **Confounding:** In some cases, the association between the two factors is a result of confounding. Confounding occurs when a third factor is associated with both of the factors being studied. For example, the association between smoking and lung cancer is confounded by the factor of age. Age is associated with both smoking and lung cancer, and therefore, the association between smoking and lung cancer is confounded by age.

3. **Reverse Causation:** In some cases, the association between the two factors is a result of reverse causation. Reverse causation occurs when the factor being studied is the cause of the other factor. For example, the association between lung cancer and smoking is a result of reverse causation. Lung cancer is the cause of smoking, and therefore, the association between lung cancer and smoking is a result of reverse causation.

4. **Selection Bias:** In some cases, the association between the two factors is a result of selection bias. Selection bias occurs when the factors being studied are selected in a way that is biased. For example, the association between smoking and lung cancer is a result of selection bias. The factors being studied are selected in a way that is biased, and therefore, the association between smoking and lung cancer is a result of selection bias.

5. **Measurement Error:** In some cases, the association between the two factors is a result of measurement error. Measurement error occurs when the factors being studied are measured in a way that is biased. For example, the association between smoking and lung cancer is a result of measurement error. The factors being studied are measured in a way that is biased, and therefore, the association between smoking and lung cancer is a result of measurement error.

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