

## Building Social Behavior in Autistic Children by Use of Electric Shock<sup>1</sup>

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Three experimental investigations were carried out on two five-year-old identical twins diagnosed as childhood schizophrenics by using painful electric shock in an attempt to modify their behaviors. Their autistic features were pronounced; they manifested no social responsiveness, speech, nor appropriate play with objects. They engaged in considerable self-stimulatory behavior, and in bizarre, repetitive bodily movements. They had not responded to traditional treatment efforts.

The studies show that it was possible to modify their behaviors by the use of electric shock. They learned to approach adults to avoid shock. Shock was effective in eliminating pathological behaviors, such as self-stimulation and tantrums. Affectionate and other social behaviors toward adults increased after adults had been associated with shock reduction.

Psychological or physical pain is perhaps as characteristic in human relationships as pleasure. The extensive presence of pain in everyday life may suggest that it is necessary for the establishment and maintenance of normal human interactions.

Despite the pervasiveness of pain in daily functioning, and its possible necessity for maintaining some behaviors, psychology and related professions have shied away from, and often condemned, the use of pain for therapeutic purposes. We agree with Solomon (1964) that such objections to the use of pain have a moral rather than a scientific basis. Recent research, as reviewed by Solomon, indicated that the scientific premises offered by psychologists for the

rejection of punishment are not tenable. Rather, punishment can be a very useful tool for effecting behavior change.

There are three ways pain can be used therapeutically. First, it can be used directly as punishment, i.e., it can be presented contingent upon certain undesirable behaviors, so as to suppress them. This is perhaps the most obvious use of pain. Second, pain can be removed or withheld contingent upon certain behaviors. That is, certain behaviors can be established and maintained because they terminate pain, or avoid it altogether. Escape and avoidance learning exemplify this. The third way in which pain can be used is the least well known, and perhaps the most intriguing. Any stimulus which is associated with or discriminative of pain reduction acquires positive reinforcing (rewarding) properties (Bijou and Baer, 1961), i.e., an organism will work to "obtain" those stimuli which have been associated with pain reduction. The action of such stimuli is analogous to that of stimuli whose positive reinforcing properties derive from primary positive reinforcers.

These three aspects of the use of pain can be illustrated by observations on parent-child relationships. The first two are ob-

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vious; a parent will punish his child to suppress specific behaviors, and his child will learn to behave so as to escape or avoid punishment. The third aspect of the use of pain is more subtle, but more typical. In this case, a parent "rescues" his child from discomfort. In reinforcement, theory terms, the parent becomes discriminative for the reduction or removal of negative reinforcers or noxious stimuli. During the first year of life many of the interactions a parent has with his children may be of this nature. An infant will fuss, cry, and give signs indicative of pain or distress many times during the day, whereupon most parents will pick him up and attempt to remove the discomfort. Such situations must contribute a basis for subsequent meaningful relationships between people; individuals are seen as important to each other if they have faced and worked through a stressful experience together. It may well be that much of a child's love for his parents develops in situations which pair parents with stress reductions. Later in life, the normal child does turn to his parent when he is frightened or hurt by nightmares, by threat of punishment from his peers, by fears of failure in school, and so on.

In view of these considerations, it was considered appropriate to investigate the usefulness of pain in modifying the behaviors of autistic children. Autistic children were selected for two reasons: (1) because they show no improvement with conventional psychiatric treatment; and (2) because they are largely unresponsive to everyday interpersonal events.

In the present study, pain was induced by means of an electrified grid on the floor upon which the children stood. The shock was turned on immediately following pathological behaviors. It was turned off or withheld when the children came to the adults who were present. Thus, these adults "saved" the children from a dangerous situation; they were the only "safe" objects in a painful environment.

#### STUDY 1

The objectives of Study 1 were (1) to train the children to avoid electric shock by

coming to *E* when so requested; (2) to slow the onset of self-stimulatory and tantrum behaviors by electric shock so as to decrease their frequency; and (3) to associate the word "no" with electric shock and its acquisition of behavior-suppressing properties.

#### Method

*Subjects.* The studies were carried out on identical twins. They were five-years old when study was initiated and were diagnosed as schizophrenics. They evidenced no social responsiveness; they did not respond in any manner to speech nor did they speak; they did not recognize other or recognize adults even after isolation; they were not toilet trained; their handling of physical objects (toys, etc.) was inappropriate and stereotyped, being restricted to "rolling" and spinning. They were greatly involved in self-stimulatory behavior, spending 70 per cent of their day rocking, fondling themselves and moving hands and arms in repetitive, stereotyped manners. They engaged in a fair amount of tantrum behaviors, such as screaming, throwing objects, and hitting themselves.

It is important to note, in view of the medical and ethical reasons which might preclude the use of electric shock, that their future was precluded by institutionalization. They had been intensively treated in a residential setting by conventional psychiatric techniques for one year prior to the present study without any observable modification in their behaviors. This failure in treatment is consistent with reports of other similar cases with such children (Eisenberg, 1957; Brown, 1957), which have suggested that if a schizophrenic child does not have language and does not play appropriately with physical objects by the age of five, then he will not improve, despite intensive institutional psychiatric treatment, including psychotherapy, of the child and/or his family.

*Apparatus.* The research was conducted in a 12 × 12-foot experimental room with an adjacent observation room connected by one-way glass and sound equipment. The floor of the experimental room was covered by one-half inch metal tapes with adhesive backing (Scotch Tape). They were laid one-half inch apart so that when the child stepped on the floor he would have contact with at least two strips, thereby completing the circuit and receiving an electric shock. A 100-volt battery was wired to the strips of tape in the Harvard Inductorium. The shock was set at a level at which each of three *E*s standing on the floor agreed that it was definitely painful and frightening.

The Ss' behavior and the experimental events were recorded on an Esterline Angus pen recorder by procedures more fully described in an earlier paper (Lovaas *et al.*, 1965). The observer could reliably record both frequency and duration of several behaviors simultaneously on a panel of push-buttons. A given observer recorded at randomly selected periods.

*Pre-shock Sessions.* The Ss were placed barefoot in the experimental room with two Es, but were not shocked. There were two such pre-experimental sessions, each lasting for about 20 minutes. The Es would invite the Ss to "come here" about five times a minute, giving a total of approximately 100 trials per session. The observers recorded the amount of physical contact (defined as Ss touching E with his hands), self-stimulatory and tantrum behavior, the verbal command "come here," and positive responses to the command (coming to within one foot of E within five seconds).

*First Shock Sessions.* The two pre-experimental sessions were followed by three shock sessions distributed over three consecutive days during which Ss were trained, in an escape-avoidance paradigm, to avoid shock by responding to E's verbal command according to the pre-established criterion. In the escape phase of the training, consisting of fifty trials, the two Es faced each other, about three feet apart, with S standing (held, if necessary) between them so that he faced one of the Es, who would lean forward, stretch his arms out, and say "come here." At the same time shock was turned on and remained on until S moved in the direction of this E, or, if S had not moved within three seconds, until the second E pushed S in the direction of the inviting E. Either type of movement of S toward the inviting E immediately terminated the shock. The S had to walk alternately from one E to the other.

In the avoidance sessions which followed, shock was withheld provided S approached E within five seconds. If S did not start his approach to the inviting E within five seconds, or if he was not within one foot of E within seven seconds, the shock was turned on and the escape procedure was reinstated for that trial.

During these avoidance sessions Es gradually increased their distance from each other until they were standing at opposite sides of the room. At the same time they gradually decreased the number of cues signaling S to approach them. In the final trials, Es merely emitted the command "come here," without turning toward or otherwise signaling S.

Shock was also turned on if S at any time engaged in self-stimulatory and/or tantrum be-

haviors. Whenever possible, shock was administered at the onset of such behaviors. Shock was never given except on the feet; no shock was given if S touched the floor with other parts of his body. In order to keep S on his feet, shock was given for any behavior which might have enabled him to avoid shock, such as beginning to sit down, moving toward the window to climb on its ledge, etc.

*Extinction Sessions.* The three shock sessions were followed by eleven extinction sessions distributed over a ten-month period. These sessions were the same as those in the previous sessions, except that shock and the command "no" were never delivered during this period.

*The Second Shock Sessions.* Three additional sessions terminated Study 1. In the first of these, S was brought into the experimental room and given a two-second shock not contingent upon any behavior of S or E. This was the only shock given. In all other respects these final sessions were similar to the preceding extinction sessions.

*Procedure for Establishing and Testing "No" as a Secondary Negative Reinforcer.* During the first shock sessions, shock had been delivered contingent upon self-stimulatory and/or tantrum behaviors. Simultaneous with the onset of shock Es would say "no," thereby pairing the word "no" and shock. The test for any suppressing power which the word "no" had acquired during these pairings was carried out in the following manner. Prior to the shock sessions, Ss were trained to press a lever (wired to a cumulative recorder) for M & M candy on a fixed ratio 20 schedule. The sessions lasted for ten minutes daily. A stable rate of lever-pressing was achieved by the twelfth session, at which Es tested the word "no" for suppressing effects on the lever-pressing rate. The E delivered the "no" contingent upon lever-pressing toward the middle of each session, during three sessions prior to the shock sessions, and during three sessions subsequent to the shock sessions, i.e., after "no" had been paired with shock.

### Results and Discussion

Figure 1 gives the proportion of time Ss responded to Es' commands (proportion of Rs to Sps). As can be seen, in the two pre-shock sessions Ss did not respond to Es' commands. During the first three shock sessions (Shock I), Ss learned to respond to Es' requests within the prescribed time interval and thus avoided shock. This changed responsiveness of Ss to Es' requests was maintained for the subsequent

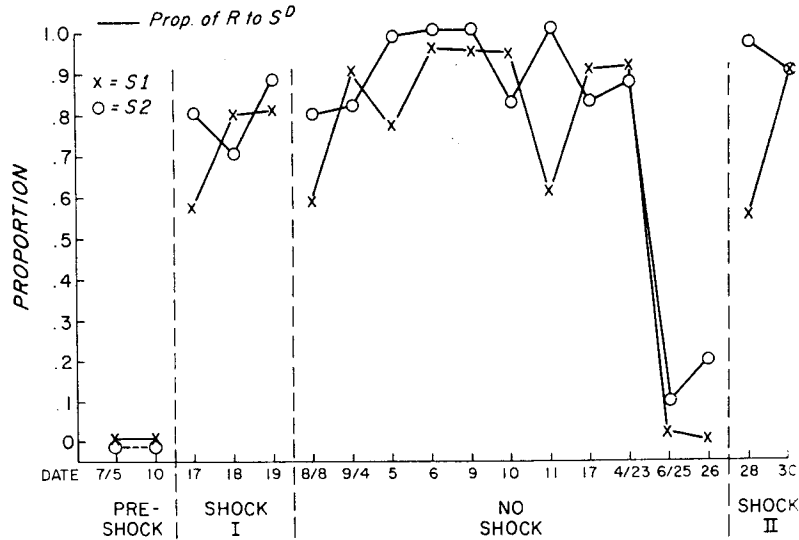


Fig. 1. Proportion of time Ss responded to E's commands—proportion of Rs to Sp.

nine months (no shock sessions). There was a relatively sudden decrease in Ss' responsiveness after nine months, i.e., the social behavior of coming to E extinguished. One non-contingent shock, however, immediately reinstated the social responsiveness (Shock II), suggesting that Ss responded to it as a discriminative stimulus for social behavior.

The data on Ss' pathological behaviors (self-stimulation and tantrums) and other

social behaviors (physical contacts) presented in Fig. 2. Prior to shock pathological behaviors occurred 65–85 per cent of the time; physical contacts were absent. Shock I suppressed the pathological behaviors immediately, and they remained suppressed during the following eleven months. In addition, social behaviors replaced pathological behaviors. This change was very durable (ten to eleven months), but did eventually extinguish. One non-cont

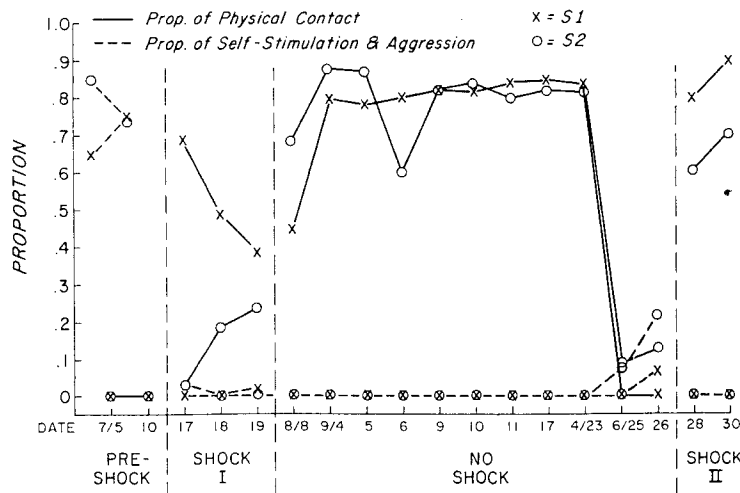


Fig. 2. Proportion of self-stimulation and tantrums (pathological behaviors) and physical contact (social behavior).

gent shock reinstated the social responsiveness and suppressed the pathological behaviors.

The data on the acquisition of "no" as a negative reinforcer are presented in Fig. 3.

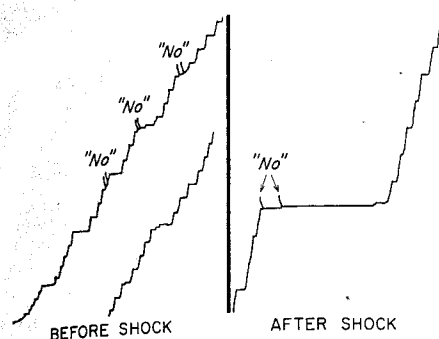


FIG. 3. Lever-pressing for candy as cumulative response curves: effect of "no" on lever-pressings by S1 before and after "no" was paired with shock.

The records of bar-pressing for candy are presented as cumulative curves. The word "no" was presented contingent upon a bar-pressing response three sessions before and three sessions subsequent to shock, i.e., before and after the pairing of "no" with shock. The cumulative curves of the session immediately preceding and the session following shock to S1 is presented. The curves for the other sessions, both for S1 and S2, show the same effects. It is apparent upon inspection of Fig. 3 that the word "no" had no effect upon S1's performance prior to its pairing with shock, but that after such pairing it suppressed the bar-pressing response.

Observations of Ss' behaviors in the experimental room indicated that the shock training had a generalized effect; it altered several behaviors which were not recorded. Some of these changes took place within minutes after the Ss had been introduced to shock. In particular, they seemed more alert, affectionate, and seeking of E's company. And surprisingly, during successful shock avoidance they appeared happy. These alterations in behavior were only partially generalized to the environment outside the experimental room. The changes in behaviors outside were most noticeable

during the first fourteen days of the shock training, after which Ss apparently discriminated between situations in which they would be shocked and those in which they would not. According to their nurse's notes, certain behaviors, such as Ss' responsiveness to "come here" and "no" were maintained for several months, while others, such as physical contact, soon extinguished.

These observations formed the basis for the subsequent two studies. In Study 2 a more objective assessment of the changes in Ss' affectionate behavior toward adults was made, and a technique for extending these effects from the experimental room to the ward was explored. In Study 3 a test was made of any reinforcing power adults might have acquired as a function of their association with the termination of shock.

## STUDY 2

Study 2 involved two observations. One attempted to assess changes in Ss' affectionate behavior to E who invited them to kiss and hug him. The other observation was conducted by nurses who rated Ss on behavior change in seven areas (given below). Both observations incorporated measures of transfer of behavior changes to new situations brought about by the use of the remote control shock apparatus. Both observations were conducted immediately following the completion of Study 1.

*The "Kiss and Hug" Observations.* These observations consisted of six daily sessions. Three of the sessions (3, 5, and 6) are referred to as shock-relevant sessions. Sessions 3 and 5 were conducted in the experimental room where Ss had received shock during avoidance training. Three sessions (1, 2, and 4) are labeled control sessions. They took place in a room sufficiently different from the experimental room to minimize generalization of the shock effect. The last shock-relevant session (session 6) was conducted to test the changes produced by remotely controlled shock. This session was conducted in the same room as the previous control sessions. However, immediately preceding the session Ss received five shock-escape trials, similar to those of Study 1. The shock was delivered from a Lee-

Lectronic Trainer.<sup>2</sup> The *S* wore the eight-ounce receiver (about the size of a cigarette pack) strapped on his back with a belt. Shock was delivered at "medium" level over two electrodes strapped to *S*'s buttock.

In order to minimize the effects of a particular observer's recording bias, two observers alternated in recording *S*'s behavior. Each observer recorded at least one shock session. The sessions lasted for six minutes each. Every five seconds *E* would face *S*, hold him by the waist with outstretched arms, bow his head toward *S*, and state "hug me" or "kiss me." The *E* would alternate his requests ("hug me," "kiss me") every minute. The observer recorded (1) embrace (*S* placing his arms around *E*'s neck), (2) hug and kiss (*S* hugging *E* cheek to cheek or kissing him on the mouth), (3) active physical withdrawal by *S* from *E* when held by the waist, and (4) *E*'s requests.

### Results

Since *S*'s behaviors on the test were virtually identical, their behaviors were averaged. The data are presented in Fig. 4.

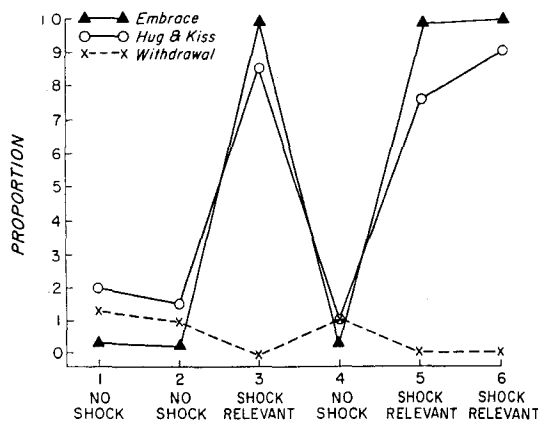


FIG. 4. Social reactions of *S*s as a function of shock presentations. The "no shock" sessions (1,2,4) were run in a room where *S*s had not been shocked. ["Shock" sessions (3,5) were conducted in a room in which *S*s had received shock-avoidance training. The last "shock" session (6) was conducted in the same room as the "no shock" sessions, but *S*s had received remote controlled shock.]

<sup>2</sup> Lee Supply Co., Tucson, Arizona.

During the control sessions (sessions 1, 2, and 4) the proportion of time that *S* embraced, or hugged and kissed *E* was extremely low. Rather, they withdrew from him. During the shock-relevant sessions (sessions 3, 5, and 6) *S*'s behavior changed markedly toward increased affection. In a situation where they had received shock-avoidance training they responded with affection to *E* and did not withdraw from him. The fact that this affectionate behavior maintained itself in session 6 demonstrates that the remotely controlled shock can produce transfer of behavior change to a wide variety of situations.

*Nurses' Ratings.* The nurses' ratings were initiated at the completion of the "kiss and hug" sessions. Four nurses who were familiar with *S*s but unfamiliar with the experiment, and did not know that shock had been used, were asked to complete a rating scale pertaining to seven behaviors: (1) dependency on adults, (2) responsiveness to adults, (3) affection seeking, (4) pathological behaviors, (5) happiness and contentment, (6) anxiety and fear, and (7) overall clinical improvement. The scale was comprised of nine points, with the midpoint indicating no change. The nurses were asked to indicate whether they considered *S* to have changed (increased or decreased) in any of these behaviors as compared to *S*'s behaviors the preceding day or morning. The ratings were obtained under two conditions: (1) an experimental condition in which *S*, wearing the remote control unit on his belt underneath his clothing, was introduced to the nurses who "casually" interacted with him for ten minutes. *S* was not shocked while with the nurses, but he had been given a one-second, non-contingent shock immediately prior to his interaction with the nurses; (2) a control condition which was run in the same manner as the experimental condition, except that *S* had no shock prior to the ratings.

The nurses rated changes in *S*s under both conditions. They were not counterbalanced. The ratings from the control condition were subtracted from the ratings based on the experimental conditions. The difference shows an increase in the rating

of all behaviors following the shock treatment, except for pathological behaviors and happiness-contentment, which both decreased. Only the ratings on dependency and affection seeking behaviors increased more than one point.

### STUDY 3

Study 3 showed the degree to which the association of an adult with shock reduction (contingent upon an approach response of the children) would establish the adult as a positive secondary reinforcer for the children. Increased resistance to extinction of a lever-pressing response producing the sight of the adult was used to measure the acquired reinforcing power of the adult.

The study was conducted in two parts. The first part constituted a "pretraining" phase. During this period the children were trained to press a lever to receive M & Ms and simultaneously see *E*'s face. Once this response was acquired, extinction of the response was begun by removing the candy reinforcement, *S* being exposed only to *E*'s face. The second part of the study constituted a test of the reinforcing power *E* had acquired as a result of having been associated with shock reduction. This association occurred when, immediately preceding several of the extinction sessions of the lever-press, *Ss* were trained to come to *E* to escape shock. The change in rate of responding to obtain a view of *E* during these sessions was used as a measure of *E*'s acquired reinforcing power.

#### Method

Study 3 was initiated after the completion of Study 2. It was conducted in an enclosed cubicle, four feet square, in which *E* and *S* sat separated by a removable screen. A lever protruded from a box at *S*'s side. Lever-pressings were recorded on a cumulative recorder. An observer (O) looking through a one-way screen recorded the following behaviors of *S* as they occurred: (1) vocalizations (any sound emitted by *S*), and (2) standing on the chair or ledge in the booth. The latter measures were taken in a manner similar to that described

in Study 1. These additional measures were obtained in an attempt to check on the possibility that an eventual increase in lever-pressing for *E* might be due to a conceivable "energizing" effect of shock, rather than to the secondary reinforcing power associated with shock reduction. This rationale will be discussed more fully below.

The first ten were labeled *pre-training* sessions. In each, a fifteen-minute acquisition preceded a twenty minute extinction of the lever-pressing response. During acquisition *S* received a small piece of candy and a five-second exposure to *E* (the screen was removed momentarily, placing *E*'s face within *S*'s view) on a fixed ratio 10 schedule. During extinction, *S* received only the five-second exposure to *E* on the same schedule as before. Both *Ss* reached a stable rate of about 500 responses during the first acquisition session.

The ten pre-training sessions were followed for *S1* by nine *experimental* sessions. In these experimental sessions *S* never received candy. The sessions consisted only of a twenty-minute extinction period. An *S*'s performance during the last extinction session of pre-training, labeled Session 1 in Fig. 5, served as a measure of the pre-experimental rate of lever-pressing. Electric shock was administered before the 2nd, 7th, and 9th experimental sessions, as follows: *S* was placed facing *E* in the room outside the cubicle. Shock was administered for two to four seconds, at which point *E* would tell *S* to "come here." *S* would invariably approach *E* and shock would be terminated. The *E* would then comfort *S* (fondle and stroke him) for one minute. This procedure was repeated four times. Immediately following this procedure, *S* was placed within his cubicle. *E* would repeat *S*'s name every five seconds. On the fixed ratio 10 schedule, the screen would open and *E* would praise *S* ("good boy") and stroke him.

The experimental treatment of *S2* was identical to that of *S1* with the following exceptions: (1) *S2* received only seven experimental sessions; (2) shock preceded session 2, 6, and 8; (3) *E* did not call *S2*'s name while he was in the cubicle; and (4)

*E* was only visually exposed to *S2* (*E* did not stroke or praise *S2*).

### Results and Discussion

The *Ss*' lever-pressing behavior is presented in Fig. 5 as cumulative curves. The

or ledge, are presented in Table 1. The entries in the column labeled *O1* can be compared to those in column *O2*. These data indicate that there was a high degree of agreement between the two observers rating amount of vocalizations of *Ss*. The

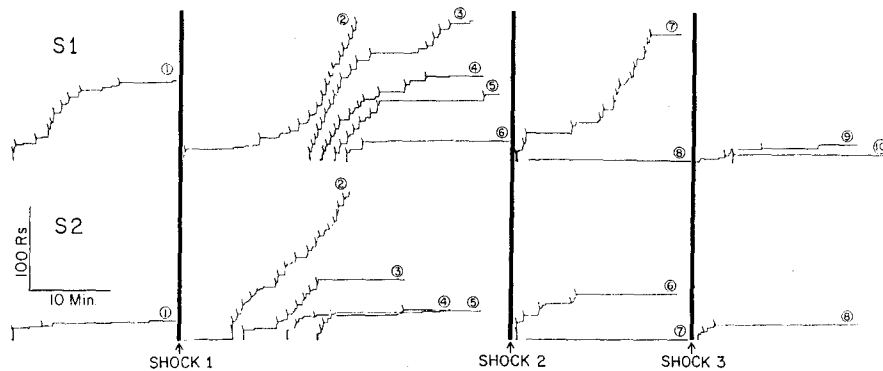


FIG. 5. The *Ss*' lever-pressing behavior for *E* as function of *E*'s association with shock reduction. [Curve labelled "1" is the last extinction curve from the pretraining. Shock preceded sessions 2, 6, and 8 for *S1*, and sessions 2, 6, and 8 for *S2*. The upward moving hatchmarks on the curves indicate occasions at which *E* was visually presented to *S1*.

last extinction curve from the pre-training is labeled one. This curve gives the rate of lever-pressing in the last extinction session preceding *E*'s association with shock reduction. The upward moving hatchmarks on the curves show the occasions on which *E* was visually presented to *S*. The heavy vertical lines labeled shock, show shock-escape training preceding sessions 2, 7, and 9 for *S1*, and sessions 2, 6, and 8 for *S2*.

There was a substantial increase in rate of lever-pressing accompanying shock-escape training for both *Ss*. The curves also show the extinction of this response. The extinction is apparent in the falling rate between shock sessions (e.g., sessions 2 through 6 for *S1* show a gradual decrease in rate of responding). A similar extinction is also manifested over the various shock sessions, i.e., the highest rate was observed after the first shock training, the next highest after the second shock training, and so on. The *Ss*' performances were very systematic and orderly.

Data based on the two additional measures, vocalization and standing on the chair

*O2*'s ratings were based on tape recording taken from *Ss* while in the booth. It was physically impossible to have a second assess the reliability of *O1*'s ratings of climbing. However, because of the ease of recording such behavior it was judged unnecessary to check on its reliability. The agreement between *O*s on vocalizations was judged adequate for the purposes of this study.

If the increase in lever-pressing behavior was correlated with an increase in the two additional behaviors, then it might not be that shock-escape training had led to an increase in behavior toward people *per se*. Rather, it might have led to an "arousal" of many behaviors, asocial as well as social. As Table 1 shows, the two additional measures showed no systematic relationship to the shock-escape sessions for *S2*. In the case of *S1* there is some possibility of suppression of vocalization and climbing subsequent to shock-escape sessions (sessions 7, and 9). It is unlikely, then, that shock-escape training involving other people can be viewed simply as activating many



TABLE 1  
PER CENT OF TOTAL TIME ENGAGED IN VOCALIZATION AND CLIMBING

Session	Shock	S1			S2		
		Vocal.		Climb.	Vocal.		Climb.
		01	02	01	01	02	01
1		49		0	27		96
2	S1 and S2	19	19	0	27		0
3		47		0	20		20
4		25		32	23		0
5		18		65	26	29	0
6	S2	22	23	97	22		0
7	S1	22	23	33	23	23	0
8	S2	22		83	22		0
9	S1	11		0			
10		13		75			

haviors; rather, such training selectively raised behavior which yielded a social consequence.

Thus it is concluded that this increase in behavior toward *E* subsequent to shock-escape training came about because *E* was paired with shock reduction, thereby acquiring reinforcing powers. This conceptualization is consistent with the findings of Studies 1 and 2, both of which demonstrated an increase in social and affectionate behaviors. The findings are similar to those reported by Risley (1964) who observed an increase in acceptable social behavior (eye-to-eye contact) in an autistic child to whom *E* had administered electric shock for suppression of behaviors dangerous to the child. The data are also consistent with the results of studies by Mowrer and Aiken (1954) and Smith and Buchanen (1954) on animals which demonstrated that stimuli which are discriminative for shock reduction take on secondary positive reinforcing properties. It is to be noted, however, that the data from the studies reported here also fit a number of other conceptual frameworks.

An apparent limitation in these data pertains to the highly situational and often short-lived nature of the effects of shock. This had definite drawbacks when one considers the therapeutic implications of shock. It is considered, however, that the effects of

shock can be made much more durable and general by making the situation in which shock is delivered less discriminable from situations in which it is not. The purpose of the present studies was to explore certain aspects of shock for possible therapeutic use. Therefore, only the minimal amount of shock considered necessary for observing reliable behavior changes was employed. It is quite possible that the children's responsiveness to adults would have been drastically reduced if shock had been employed too frequently. It is worth making the point explicitly: a certain use of shock can, as in these studies, contribute toward beneficial, even therapeutic, effects; but it does not at all follow that a more widespread use of the same techniques in each case will lead to even better outcomes. Indeed, the reverse may be true. Recent studies with schizophrenic children in our laboratory have shown, tentatively, that non-contingent shock facilitates performance of a well-learned task; however, such shock interferes with learning during early stages of the acquisition of new behaviors.

Certain more generalized effects of shock training, even though not recorded objectively, were noticed by *E*s and ward staff. First of all, *S*s had to be trained (shaped) to come to *E* to escape shock. When shock was first presented to *S*2, for example, he remained immobile, even though adults

were in the immediate vicinity (there was no way in which Ss could have "known" that Es presented the shock). This immobility when hurt is consistent with observations of Ss when they were hurt in the play-yard, e.g., by another child. But after Ss had been trained to avoid shock successfully in the experimental room, their nurses' notes state that Ss would come to the nurses when hurt in other settings.

Es had expected considerable expression of fear by Ss when they were shocked. Such fearful behavior was present only in the beginning of training. On the other hand, once Ss had been trained to avoid shock, they often smiled and laughed, and gave other signs of happiness or comfort. For example, they would "mold" or "cup" to E's body as small infants do with parents. Such behaviors were unobserved prior to these experiments. Perhaps avoidance of pain generated contentment.

In their day-to-day living, extremely regressed schizophrenic children such as these Ss rarely show signs of fear or anxiety. The staff who dealt with these children in their usual environments expressed concern about the children's lack of worry or anxiety. There are probably several reasons why children such as these fail to demonstrate anxiety. It is possible that their social and emotional development has been so curtailed and limited that they are unaffected by the fear-eliciting situations acting upon a normal child. For example, they do not appear to be afraid of intellectual or social inadequacies, nor are they known to experience nightmares. Furthermore, by the age of three or four, like normal children, these children appear less bothered by physiological stimuli, and unlike the small infant, are rather free of physiological discomforts. Finally, when these children are brought to treatment, for example in a residential setting, there is much effort made to make their existence maximally comfortable.

If it is the case, as most writers on psychological treatment have stated, that the person's experience of discomfort is a basic condition for improvement, then perhaps the failure of severely retarded schizo-

phrenic children to improve in treatment can be attributed partly to their failure to fulfill this hypothesized basic condition of anxiety or fear. This was one of the considerations which formed the basis for the present studies on electric shock. It is important to note that the choice of electric shock was made after several alternatives for the inducement of pain or fear were tested and found wanting. For example, in the early work with these children we employed loud noise. Even at noise levels well above 100 decibels we found that the children remained unperturbed particularly after the first two or three presentations.

It seems likely that the most therapeutic use of shock will not lie primarily in the suppression of specific responses or the shaping of behavior through escape-avoidance training. Rather, it would seem more efficient to use shock reduction as a way of establishing social reinforcers, i.e., as a way of making adults meaningful in the sense of becoming rewarding to the child. The failure of autistic children to acquire social reinforcers has been hypothesized as basic to their inadequate behavioral development (Ferster, 1961). Once social stimuli acquire reinforcing properties, one of the basic conditions for the acquisition of social behaviors has been met. A more complete argument supporting this thesis has been presented elsewhere (Lovaas *et al.*, 1964). A basic question, then, is whether it is necessary to employ shock in accomplishing such an end or whether less drastic methods might not suffice. In a previous study (Lovaas *et al.*, 1964) autistic children did acquire social reinforcers on the basis of food delivery. However, the necessary conditions for the acquisition of social reinforcers by the use of food were both time-consuming and laborious, and by no means as simple as the conditions which were necessary when we employed shock reduction.

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