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BEHAVIOR MODIFICATION TECHNIQUES USED  
ON AUTISTIC CHILDREN: A LITERATURE REVIEW

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## INTRODUCTION

The purpose of this paper is to give an overview of the application of behavior therapy techniques to the specific problems of the autistic child. The paper is divided into four sections. The first section consists of a brief introduction of autism and a review of learning theories used in behavior modification. The next section discusses self-stimulatory behavior and selective responding of the autistic child. The third section deals with specific behavior therapies used with specific problems. The last section summarizes the findings of this paper.

In 1943 Dr. Leo Kanner observed eleven children with a previously unrecognized condition. Four basic features separate these children from normal children. (Rutter, 1979) They are: (1) onset before the age of thirty months, (2) impaired social development for the child's intellectual level, (3) delayed and deviant language development for the child's intellectual level, and (4) stereotyped play patterns and "insistence on sameness." Dr. Kanner used the term "autism" to refer to this syndrome which is one of the most unusual and perplexing ever to afflict children.

The description of Laurie presented by Bettelheim (1967) is typical of the development and activities of an autistic child.

Laurie allegedly began talking at fifteen months, saying words like: "no more," "hot," "pick up," "bye-bye," . . . but she never addressed anyone by name, never said "mommy" or "daddy."

When Laurie was about two and a half, the young nursemaid left suddenly. She was replaced by an older woman . . . .

Within a few days the mother noticed a great change in Laurie. She stopped saying the few words she had known and all talking was replaced by peculiar clucking sounds. One day, after repeatedly making what sounded to the mother like loud animal-like noises, the mother became very angry, spanked her, and told her to be still. Laurie then stopped talking and has not spoken since.

Soon Laurie gave up bowel control. A while later began an even more severe withdrawal from the world, which by the age of six had reached such proportions that for long time periods she seemed blind, deaf and unable to move on her own. Most of the time she spent her days motionless . . . .

The only activities Laurie engaged in spontaneously were destructive. She ripped buttons off her clothes, tore sheets . . . she tore shag rugs to shreds or her blankets.

When spoken to, Laurie turned her face away. When annoyed or scolded, she simply stared at her hand or into empty space.

All medical and neurological examinations, including EEG, were negative. The diagnosis was infantile autism. (Bettelheim, 1967:96-97)

This description of Laurie may help the reader visualize the array of problems that parents and teachers face when they deal with an autistic child. But how does one deal with an autistic child? How does one teach this child to stop destructive behavior, go to the bathroom, communicate and socialize as other children do?

Many therapies have been tried on autistic children since 1943. One of the most successful is behavior modification. A brief review of learning theory, which is the basis of behavior modification, follows.

Behavior modification relies on reinforcement and punishment. Positive reinforcement is any event following a response which increases the chance of the response occurring again. Negative reinforcement is any event whose removal increases the chance of the response occurring again. Punishment, however, is any event following a response that

decreases the chance of the response occurring again.

Instrumental learning is a situation in which the subject is instrumental or active in responding which will produce the positive reinforcement. For example a child may say the word "mother" in order to receive some candy. Extinction is a condition in instrumental learning in which the positive reinforcement is withdrawn and the response decreases.

Punishment is used to reduce or eliminate a response. The unwanted response has been reinforced by instrumental learning (however, the reinforcement may remain unknown). Punishment must compete with this reinforcement and must be perceived by the subject as eliminating the strength of the reinforcement. Punishment is usually used when the reinforcement is unknown while extinction is used when the reinforcement is known.

Shaping is a method in behavior modification in which successive approximation to the desired behavior is used. By carefully manipulating the contingencies between a response and the reinforcement, one can mold or shape behavior. (Skinner, 1951) An example of this is giving a M and M to a child everytime he walks near a chair, then giving the candy only when he is in front of the chair, then only when sitting in the chair.

## SELECTIVE RESPONDING AND SELF-STIMULATION

This section on selective responding and self-stimulation of autistic children really deals with the attention of these people. It is very possible that during self-stimulatory behavior the autistic child can not learn any new behavior. It is also possible that autistic children can only attend to one stimulus at a time making normal learning in which several stimuli may be applied very difficult or impossible. Thus, before behavior therapy can be attempted these issues must be understood.

Self-stimulatory behavior in autistic children is defined as any behavior which is ritualistic, stereotyped and which does not produce any obvious social consequences for the child. The behavior might be gross as when the child rocks his body, jumps up and down, paces the room or flaps his arms; or the behavior may be more subtle as when the child moves his eyes by rolling or crossing them, stares out of the corners of his eyes or walks in a peculiar gate. The child may spin objects such as plates or coins. Or the child may emit certain tones for hours at a time. During this behavior the child seems to be in a trance and may not react to outside stimuli such as loud noises. (Lovaas, Litrownik and Mann (1971) tested the hypothesis that autistic children are less responsive to external stimulation while engaged in self-stimulatory behavior and the effects of varying the strength of reinforcement for other behaviors. They used four mute autistics, four

echolalic (repetition of sounds or words with no intention of communicating) autistics and four normal children.

The subjects were placed in an experimental room which was bare except for a chair placed against the wall opposite to a one way screen. A table with a Davis M and M dispenser was located just below the screen about five feet away from the subject. The subjects were trained by shaping to sit in the chair and when a tone sounded for two seconds to get up and receive an M and M. The chair was fitted with a device that started a timer simultaneously when the tone sounded and stopped when the child got off the chair. This time was termed as the subject's response latency. The training of the autistic children was done only when they were not engaged in self-stimulatory behavior. The subjects were tested at noon, before lunch and fed only a light breakfast.

Two observers were used who were familiar with the purpose of the experiment. It was correctly noted that the observers would have guessed the purpose because of the design of the experiment. The observers were to watch for certain behaviors designated as self-stimulatory and press a button that presented the tone after the behavior had been in progress for three to five seconds. The two observers had to be in agreement as to whether or not a behavior was self-stimulatory as each observer's button had to be pressed at the same time before the tone would be emitted. According to Lovaas the agreement was low, often only fifty percent.

The results are very interesting. Normal children exhibited a lot of self-stimulatory behavior (they were probably bored); however, there was no difference in response latency when they were engaged in

self-stimulatory behavior and when they weren't. The average response latency averaged about two seconds for the normal subjects with little variability. The mute autistics averaged two seconds when not engaged in self-stimulatory behavior, also with little variability from trial to trial. However, when engaged in self-stimulatory response, latency averaged five seconds and produced a lot of variability. The response latency ranged from one to thirty seconds for the subjects. It is interesting to note that the experiment could not differentiate the response latencies of normal and echolalic autistic children. The authors offer no explanation for this finding.

When the mean response latency of mute autistics is plotted over six sessions, Lovaas, Litrownik and Mann (1971) found that they decreased from five to three seconds when engaged in self-stimulation but stayed at about two seconds when the subjects were not engaged in this behavior. The authors felt that this decrease in time was due to the possibility that the M and M reinforcement began to compete with the reinforcement received in self-stimulation. The authors hypothesized that the amount of self-stimulation, in the experimental room, would vary with the reinforcing power of the experimental reinforcers available. They tested this by observing self-stimulation of mute autistic children in a neutral room that was the same as the experimental room except there was no M and M dispenser. Two observers, unfamiliar with the experiment, were trained to exceed 90% agreement in determining self-stimulatory behavior and recorded the behavior on an Esterline-Angus recorder.

Lovaas, Litrownik and Mann (1971) found that the amount of self-stimulation was much less in the experimental room than in the neutral

room. Lovaas also tested the notion that self-stimulatory behavior would vary with the strength of the reinforcer. The subjects were given fifteen minutes to eat as many M and M's as they wanted (one ate 350). They were then placed in the experimental room and observed. It was found that self-stimulatory behavior rose to the same level as in the neutral room.

The authors propose that the existence of competing reinforcers is the reason for the noted response latency with auditory stimuli in mute autistic children. However, they admit that this is a simplistic hypothesis, and the real reason may be much more complicated. The authors admit that they do not understand why the study failed to discriminate between echolalic autistic children and normal children. Echolalic children generally learn faster than mute autistic children, and thus their self-stimulatory behavior may be different in some ways from that of mute autistic children. (Lovaas, Litrownik and Mann, 1971)

It seems from this study that mute autistic children take a significantly longer time to respond to auditory stimuli when engaged in self-stimulatory behavior than when they are not. However, this author is not really sure that it is practically significant. The children averaged two seconds to respond when not in self-stimulatory behavior and five seconds when engaged in the behavior. This difference of three seconds is significant but is so short that it may not be practical in learning. The authors never address this point.

A study performed by Koegel and Covert (1972) dealt directly with discrimination learning in autistic children when engaged in self-stimulatory behavior. The study focused on three questions. (1) Do

autistic children fail to acquire discriminations when engaged in self-stimulatory behavior? (2) Will acquisition of a discrimination be facilitated by suppression of self-stimulatory behavior? (3) Will self-stimulation decrease for an autistic child who acquires a discrimination without external suppression of self-stimulation?

The subjects were three mute autistic children between five and seven years old. They were placed in the experimental room which was furnished with a table which supported a Davis Universal Feeder and a chair. The feeder delivered candy by pressing a bar on its side. The children were supposed to press the bar during a positive stimulus interval which consisted of a ten second presentation of a visual and auditory stimulus. The visual stimulus was a red floodlight while the auditory stimulus was white noise. The subjects were supposed to press the bar during the ten second interval and would receive candy. No reinforcement was given for responding during the negative stimulus interval when the tone and light were not present. The negative stimulus intervals varied from 5 to 15 seconds. One correct trial was a bar press during the Sp interval and no press during the Sn interval. Two observers recorded self-stimulatory behavior and were found by the authors to be reliable.

In order to help the children, the experiment would induce the subject to press the lever during the positive stimulus interval five times. (This was done to eliminate a possible floor effect.) In the first experiment two of the children were observed for self-stimulatory behavior and correct trials. Then after a different amount of trials for the subject's suppression of self-stimulatory behavior was made possible

by loudly saying "No" to the child and if necessary, slapping the child.

The results show that with no suppression of self-stimulatory behavior learning was low. Subject 1 had 560 trials before suppression, and the percentage of correct trials was usually less than 40%. Subject 2 had 400 trials before suppression and had 0% correct trials most of the time. The mean occurrence of self-stimulatory behavior was 60% for subject 1 and 17% for subject 2.

By suppressing self-stimulatory behavior the subjects acquired 90% correct response after 320 more trials for subject 1 and 440 more trials for subject 2. It was also found that bar pressing was not incompatible with self-stimulatory behavior. The number of bar presses remained the same during suppression and non-suppression; however, the number of correct responses rose during suppression of self-stimulatory behavior.

Suppression was eliminated in order to observe the children again in self-stimulatory behavior. Subject 1's number of correct trials dropped to zero within 120 trials. Suppression was introduced and the percent of correct trials rose to 60% immediately. Subject 2 kept self-stimulatory to below 10% for 260 trials with 80% correct responses during the elimination of suppression. However, when he increased his self-stimulatory behavior, his percentage of correct trials fell to 10%.

In the second experiment the authors wanted to determine if by learning a discrimination without external suppression the percent of self-stimulation would decrease. An ABA design was used in which A was observation of self-stimulation and B referred to discrimination learning. The third autistic child was used and the B condition was the same as in the first experiment, including the five prompting trials at the beginning of each session.

In the first A condition the subject kept self-stimulation between 50 and 90% in each session which lasted ten minutes. With the ninth session began the B condition with discrimination training. The subject reduced self-stimulation to 18% on this trial and to zero by the eleventh session. The discrimination was learned (100% accuracy) by the fourteenth session in 240 trials. Self-stimulation again showed the familiar inverse relationship with discrimination learning. In the last A condition (with no discrimination learning) self-stimulation rose to the previous high levels. Thus, by introducing successful discrimination learning self-stimulation dropped dramatically on its own.

Koegel and Covert (1972) reached the following conclusions: (1) autistic children do not acquire discrimination while they are involved in self-stimulation, (2) suppression of self-stimulation produced an increase in correct responding, and (3) that successful discrimination was always associated with reduction in self-stimulatory behavior even without external suppression of self-stimulatory behavior.

The authors point out that they were using mute autistic children that were extremely regressed and that they may have achieved different results with less regressed subjects. This is very important since Lovaas, Litrownik and Mann (1917) found no difference in response latency between normal and echolalic children. This author feels that more research should be conducted to determine exactly what difference may exist between mute and echolalic autistics with respect to learning and self-stimulation.

Possibly the reinforcement received from self-stimulation competes with other external stimuli and thus learning does not take place, or it may be for some other reason. However, the practical use of these

studies is very important. Behavior modification relies on learning and the power of reinforcers. Thus, it seems that for mute autistics self-stimulatory behavior must be eliminated for successful modification. This may not be as critical for echolalics but without further evidence, it would be wise to err on the side of caution and eliminate their self-stimulatory behavior also.

The question of selective responding in autistic children will now be discussed. This subject is very important in behavior modification because it must be known how many and what types of cues autistic children pay attention to when they learn.

Lovaas, Schreibman, Koegel and Rehm (1971) conducted a study to determine how many and what types of stimuli to which autistic, mentally retarded and normal children respond. The subjects in the first group were four mute, one semi-mute and one echolalic autistic children (mean CA of 7.2 years). The second group were five mentally retarded children with a mean CA of 8 years and mean MA of 3.7 years. The third group consisted of five normal children with a mean CA of 6.4 years.

The experimental room was furnished with a chair, a table and a Davis Universal Feeder with a bar press on one side. Four cues were used. The visual stimulus consisted of a red floodlight. The auditory stimulus was a type of white noise. A tactile stimulus was air (20 MM of mercury) forced into a blood pressure cuff fastened to the subject's left calf. And a temporal cue consisted of presenting all of the cues for a five second interval every 20 seconds. The reinforcement schedule was FR4. The subjects were trained to respond with four bar presses during the positive stimulus (Sp) interval and not to respond during the 20

second negative stimulus (Sn) interval. After the subjects were adequately trained the testing began.

The subjects were given 10 test sessions, each session lasting 20-50 minutes with 36 correct responses. Training trials were interspersed to maintain the discrimination that had been learned with all stimulus. In the test trials single stimuli were presented in a random order. Temporal discrimination was tested by varying the Sn from 20 seconds to 10, 15, 25 and 30 seconds. Each stimuli was presented, on the average, seven times during each session.

The authors were interested in understanding which stimuli of the four presented were controlling the children's responding. The rate of responding was presented as a percentage derived from the number of actual responses to a given stimulus over the total number of opportunities to respond to that stimulus. There was no evidence that temporal discrimination was learned by any of the subjects so the authors did not include this stimulus in their discussion.

The authors split the amount of responding for the cues into three levels: high, medium or low for each subject. This was termed the level of responding. An analysis of variance determined significant interaction between diagnosis of the children and level of responding. There was no significant difference in the overall amount of responding by each group. A Newman - Keuls test determined that normal children responded to all three cues, retardates to two, and autistic children responded to one cue.

An interesting event that occurred with two of the autistic children was that the cue they responded to in the first test session dropped

while another cue became dominant. The authors used two other autistic children who did not respond to one cue at all and attempted to make this nonfunctional cue functional. They only gave the subjects reinforcement for responding to this cue and the subjects were able to acquire control with this training.

The normal subjects had almost no variability in their responding unlike the autistic group which showed great variability. Four of the normal subjects treated the single stimuli as separate from the complex stimuli (all cues presented at the same time); however, by the third or fourth session, they were able to respond to each cue at perfect levels.

The results of the retarded group evidence a large amount of variability but show these subjects as responding to two of the three cues. The authors again used two subjects from this group to successfully train nonfunctional cues.

Lovaas, Schreibman, Koegel and Rehm (1971) were able to show that normal children respond to three cues, retardates to two cues and autistic children to one cue in a learning situation. They also showed that non-functional cues could be made functional. The authors thus termed this responding as stimulus overselectivity.

The authors point out that they may have gotten different results if they had not used an autistic group that was as regressed as these were. They also point out that the learning situation that they used was weak and left many things unclear.

Lovaas, Schreibman, Koegel, and Rehm (1971) believe that the acquisition of language, intellectual behavior, etc. is based on the prior acquisition of conditioned reinforcers. They feel that these conditioned

reinforcers acquire strength by simultaneous presentation of primary ones, thus a stimulus complex. These situations are most apparent with classical and operant conditioning in which the response and reinforcement occur very close together. Thus, autistic children respond to only one stimulus out of several and never fully become conditioned to respond.

Lovaas and Schreibman (1971) in a later experiment focused on just two stimuli to determine stimulus overselectivity in autistic children. They used two stimuli because they were concerned that the autistic child might be "flooded" by the three cues and only selected one even though he may really be able to handle two cues.

Lovaas and Schreibman (1971) used nine autistic children with a mean C.A. of 10.2 years. Seven of these subjects were initially mute. Six normal children with a mean C.A. of 6.8 years were also used. No retarded children were used. The experimental room was similar to the one used in the previous experiment. The two stimuli were a visual stimulus consisting of a red floodlight and an auditory cue consisting of a tape of white noise.

The subjects were trained to press the lever on the Davis Universal Feeder to get candy during the complex stimulus situation and not during the negative stimulus (Sn) period that ranged from 20 to 25 seconds. The subjects were trained on an FR-4 reinforcement schedule. Each session lasted 20-50 minutes which required the subject to obtain 36 reinforcements.

The autistic subjects received ten test sessions while the normal subjects received two test sessions where they showed 90% or better

responding to each cue. In the test trials single stimuli were presented in a random order and were interspersed with training trials in which both stimuli were presented. Thus, each subject was presented with the auditory cue, the visual cue, and the complex cue consisting of both auditory and visual stimuli. The subjects received 120 test trials on each stimulus over the ten sessions.

The normal subjects showed very little variability and showed high levels of learning. Only one normal child did not respond to the single cues. She apparently was treating the complex stimuli as different from the single stimulus.

The autistic subjects showed great variability in responding. Only two autistic subjects were able to respond to all of the stimuli at least 60% of the time. The autistic subjects showed that they do only respond to one cue. The authors were able to train the nonfunctional cue of one of the subjects to make it functional.

Thus, it seems that autistic children do only respond to one cue. This overselectivity is not due to an impairment in any one sense; modality since a nonfunctional cue can be made functional, and the overselectivity was not due to "flooding" by three cues.

This author would like to have seen how retarded subjects would do in this experiment. Lovaas, Schreibman, Koegel, and Rehm (1971) did find that retarded subjects responded to two cues but the results seemed variable and uncertain.

The implications of these studies are very important for behavior modification. Autistic children only respond to one cue. However, normal learning experiences involve several stimuli. And in fact, when trying

to aid children, it is usually thought that by giving extra cues this will make learning easier. For autistic children these extra cues may actually make it more difficult to learn.

The stimulus overselectivity whether by blocking or overshadowing of different cues may be the reason for the great variability and sporadic nature of learning in autistic children.

There are several generalizations that can be made from this section on self-stimulation and selective responding in autistic children. First, in order to use behavior modification it will be necessary to lessen or eliminate self-stimulatory behavior. And, second, we must realize that autistic children are only able to respond to one cue or stimulus. Thus when training these children, we should make the learning situations as simple as possible. Generalizations from one situation to another will be difficult because the cues that the child was originally responding to may not be present. In this case we should determine what cue the child is responding to and use it in all situations applicable.

## BEHAVIOR MODIFICATION TECHNIQUES

This section will deal with the actual behavior modification techniques and their effectiveness in dealing with autistic children. First will be presented several articles that discuss specific techniques used to treat two children. This author will then review an article that uses operant conditioning to teach speech to an autistic child. Several articles that deal with the effects and side effects of harsh punishment on autistic children will be presented. Finally an overview of the success of twenty autistic children that were treated over several years is reviewed.

Wolf and Risley (1963) used operant conditioning to help with several behavior problems that Dicky, 3 1/2 years old, had. At the age of two Dicky needed to wear glasses if he was ever to see. He had eating, sleeping and severe tantrum problems. He was self-destructive, banging his head, slapping his face, pulling his hair and scratching his face.

Wolf and Risley (1963) decided to place Dicky in a childrens' hospital and work with him there. The authors first started working on Dicky's temper tantrums. They used a procedure known as time-out which is basically the removal from all positive reinforcement as an aversive stimulus. In Dicky's case he was placed in his room with the door closed contingent upon each tantrum. After the tantrum subsided he was let back into the regular ward. After three months of treatment Dicky began having frequent tantrums lasting less than five minutes. The

authors imposed a ten minute minimum for staying in the room.

Figure 1 shows a cumulative record with the frequency of time-out. The authors have labeled six points A through F which indicate the changes occurring with more frequent contact with his family. At (a) Dicky's parents made their first visit. An attendant instructed them how to handle Dicky. At (b) the father put Dicky to bed on the ward for the first time. At (c) Dicky started wearing his glasses. (d) shows when his mother first put him to bed. At (e) Dicky spend his first night at home. (f) shows when Dicky spent his second night at home. Severe tantrums reduced to zero and minor tantrums occurred only occasionally after two months.

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Insert Figure 1 Here

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A similar method that was used with the tantrums was used to keep Dicky in bed at night. He was put in bed each night and the door was left open. If he got up, he was told to go back and the door was closed. It was opened after a short time. Figure 1 shows each door closing on a cumulative graph. Point (a) shows when Dicky's father first put him to bed on the ward. (b) shows when his mother put him to bed. At (c) and (d) the parents shut the door. And at (e) Dicky spent his first night at home.

Shaping was used to entice Dicky to wear his classes. Dicky would pick up the glasses but would wear them in inappropriate ways. Thus bars were put on the glasses to guide them over his head so they would fit like a cap.

The authors worked all day with Dicky using bites of breakfast and lunch as the reinforcer. Not until the afternoon, and Dicky had had little to eat, did the authors make progress. They used ice cream as

the reinforcer, which seemed to be very powerful.

The authors did not reinforce inappropriate wearing of the glasses, only correct wearing of them. Dicky began wearing his glasses more and more and being able to see clearly began having a reinforcing effect. The therapists began switching reinforcers from food to the contingency of wearing glasses for a walk, etc. If he removed his glasses, the activity was ended.

Two weeks after Dicky began wearing his glasses he started throwing them. Time-out was used by placing him in his room for ten minutes. This behavior subsided after five days. The authors reversed this procedure by eliminating time-out and the behavior increased. This was again controlled with time-out.

Verbal training was begun with Dicky who was echolalic. Bites of breakfast and lunch were used as reinforcers. Pictures were used as the stimulus and an attendant would say, "This is a cat, now say cat." Dicky was reinforced for first mimicking the attendant and then saying 'cat' when just the picture was presented. After Dicky mastered 10 pictures in three weeks, the authors taught him to name objects and then answer questions. Gradually approval was substituted for food reinforcers.

A follow-up and extension on Dicky was conducted by Wolf and Risley (1967). Dicky, five then, and his parents were hoping to put him in a special school when he was seven. Thus, the authors were asked to prepare Dicky for school.

Wolf and Risley (1967) enrolled Dicky in a preschool laboratory so that his behavior with teachers could be observed. They noted that

he was fine when left alone, but he would have temper tantrums when the teachers asked him to do something. The teachers designed a room to put Dicky in as a time-out procedure. This reduced the tantrums to zero in three days. One should remember that it took over 100 time-out stays to originally reduce Dicky's tantrum behavior. Thus, the procedure did generalize from his earlier treatment.

Dicky began pinching some of the other children. The teacher taught Dicky how to pat someone hoping this substitute behavior would eliminate pinching. It did not and time-out was used. Pinching was thus eliminated.

Toilet training was now introduced. During the first three weeks he wet his pants four times. Each time he was led to the bathroom. One time he produced a trace and was rewarded with an M and M. More was soon produced and he was given ice cream. This method was effective and soon food was discontinued as a reinforcer and replaced with praise.

The authors stated that Dicky's socialization increased the following year, and he began asking questions and commenting. He went on to a special education class in a public school and was reading at the primary level.

These two studies on Dicky are quite amazing. The child made a great deal of progress during his three years of treatment. However, this author has doubts as to whether the child was really autistic. The authors never conclusively state that he was. The methods used are sound and demonstrate some operant conditioning techniques.

Nordquist and Wahler (1973) used operant conditioning techniques on a four year old autistic child in a natural setting. The authors

wanted to get away from treating a child in the usual experimental way using specially built mechanisms and unnatural stimuli. They also wanted to train the parents to treat the child which they felt would be as effective, more natural and less expensive for the parents. Also, generalization from the clinic to the environment would not be necessary.

Joey was four years old and diagnosed as autistic. He engaged in self-stimulatory and self-destructive behavior and would attack his younger sister.

Joey was to be trained in the laboratory and then in his home. His parents were also instructed on how to work with Joey at the clinic.

Phase I of treatment consisted of first reducing tantrums and ritual behavior. Time-out was used and the parents removed Joey to his room for at least ten minutes contingent upon undesirable behavior.

Language training began by using imitation training procedures. It was thought that by first training Joey to imitate non-verbal behaviors, verbal acquisition would be increased. Nordquist and Wahler (1973) describe the procedure as follows:

After instructing Joey to 'watch me. Do this,' the mother (or father) would present the cue, then give the materials to the boy and say, 'OK. Now you do it.' During the first several sessions, any gross approximation to the parents' behavior was reinforced with social approval. Gradually, the parents were instructed to withhold approval until better approximations were produced. This 'shaping' procedure was consistently used for all new model stimuli throughout the study . . . . Gradually, the prompts were faded until Joey produced the response on his own.

Assessments on Phase I were made during Joey's clinic visits. He was placed in a play room and observed while his parents gave him various commands. Both nonverbal and verbal imitations were observed.

The assessment of Phase I determined that Joey's behavior was variable and that parental reinforcement was not powerful. Phase II began now and the authors thought that T.V. viewing might be a good reinforcer.

Phase III was undertaken after it was discovered that T.V. viewing was also not a good reinforcer. The authors discovered that Joey loved to copy things so they decided to let Joey write as a reinforcer. This was found to be very effective.

Figure 2 represents the changes in the percent of occurrence of rituals, crying, compliance, nonverbal imitation and verbal imitation over a two-year period. Joey's behavior varied a great deal and the authors feel that this was due to the weak reinforcers for which Joey did not want to work. At session 79 writing was used as the reinforcer. The suppression of rituals and crying is associated with increases in appropriate behaviors. It also seems that verbal imitation learning was facilitated by non-verbal imitation learning. Joey was shifted from letters to words and to sentences with only small and brief performance decrements. When treatment was discontinued at various times, all five behaviors reversed directions.

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Insert Figure 2 Here

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Nordquist and Wahler (1973) feel that the results of this study suggest that parents can be taught to be effective therapists with autistic children. The techniques used were chosen for their ability to be used in the home environment and were effective. They felt that by using this naturalistic technique professionals can put together

treatment packages for use by parents and spend time improving their techniques. This type of treatment will require a great deal of time from the parents. The authors also found that powerful reinforcers must be used and found in the home environment.

This study is a very good example of the practical application of behavior modification. This author is, however, cautious about generalizing the findings of this experiment. The child's success is too good. Though essentially mute, he is able to copy words. This indicates more intelligence than many autistic children have. The authors may have chosen this child because of the good possibility of success with him. But one can see how a naturalistic treatment of a child is possible and in this sense the study is very good.

Hewett (1965) used operant conditioning to teach speech to an autistic child named Peter. Peter, 4 1/2 years old, was diagnosed as autistic and essentially mute. He loved gadgets and had a high degree of motor coordination. Peter was found to be highly distractable but loved candy.

A special booth was constructed for teaching Peter. The booth had two sections joined by a movable shutter which the teacher could raise or lower. The teacher sat in one half and Peter in the other. The only light came from the teacher's side and when the shutter was lowered, Peter had no light. There was a shelf in front of Peter and a ball drop device with a dim light above it. The teacher could release a ball which dropped into a cup in front of Peter. Peter could drop the ball in a box which rang a bell and the teacher would raise the shutter.

When the shutter was raised, the teacher could provide positive reinforcement such as candy, music, a ride on the revolving chair Peter

sat in, color cartoons and a Bingo type game. When the shutter was closed, Peter was in a time-out technique. Peter had to work to avoid this isolation, and if he did not respond in five seconds, the shutter was dropped.

Peter was taught in four phases. The first phase was an introduction to the booth. Reinforcement was getting bitefuls of lunch. Within a week Peter was very proficient at dropping the ball in the cup to get a mouthful of food. Then Peter was only given food when he established eye contact with the teacher. He learned this also very quickly.

Phase two then began. This phase consisted of social imitation. It was felt that this would be the best way for Peter to achieve language. Peter was able to learn to clap his hands, place both hands on his face and touch any part of his face in imitation to the teacher. A variety of reinforcers were used, and if he did not respond in five seconds, the shutter was closed. This phase lasted one month.

Phase three consisted of speech training. Peter had emitted random vocalizations throughout the first two phases and had spontaneously hummed some of the music that had been used as reinforcement. Candy had not been used until now as the teachers did not want its reinforcing effect to wear off before this phase. It was now used and was placed behind a window so that Peter could see it. The teacher could then flip it to Peter if he responded appropriately. Humming some of the music was trained and Peter was a little slow at imitating this. Soon, however, he was responding appropriately.

Peter had vocalized a sound that sounded like e-oo. The teacher would produce this sound and Peter was expected to respond for candy.

Successive approximation was used to produce the word 'go'. Peter was able to say the word in two days. However, four days later Peter refused. With each failure to respond the authors imposed a cumulative five second penalty of isolation. This time Peter was in a time-out condition for quite a while. On the eighth day Peter again started responding and 'go' was again established. This resistance did not occur again.

Hewett (1965) was concerned that by teaching a new word the first word might be forgotten. They decided to review the word 'go' while training him to say 'my'. Successive approximation was again used and was successful. This produced an echolalic condition in which Peter was trying to repeat every word the teacher said. He developed a vocabulary of 32 different words.

Photographs of Peter and his family were taken and of Peter doing various activities such as drinking, eating, etc.

Hewett (1965) taught Peter how to answer questions by a question and answer technique with fading. Peter was taught to imitate the teacher saying "how are you, fine." The teacher would fade the question out by speaking softly and stressing the answer. Peter was able to pay less attention to the question and would finally respond correctly to two questions.

Phase four which was really a part of phase three was a transfer of Peter's new words to his environment. Peter was in a hospital ward during all phases and the nurses were trained to demand that Peter use his acquired language. Peter had to use the word 'go' to go into the dining room or outside and to use 'my' before he could obtain a desired

object. Later as his vocabulary increased, he had to say "I want" and the object. He was able to learn words, in this way, that were not introduced in the teaching booth.

Peter's parents were not involved in the training up until now. His parents were asked to observe Peter in his booth and to observe the training sessions. The parents then began to train Peter themselves. A noticeable event occurred at this time. Peter had been willing to leave his parents without batting an eye when he was first brought to the clinic. However, when his parents started teaching him, he would cry when they left. He was becoming more human with his feelings. Peter went to the clinic for eight months while in phase four as an outpatient. His vocabulary grew to 150 words, and he wanted to continue learning when treatment ended. He was placed in a private kindergarten and was doing well.

This article suggests that successful speech acquisition can be taught to autistic children. The teaching booth was a very ingenious idea and worked well for this child. It may not work for other children, however, since Peter was exceptional in that he loved gadgets. The methods for generalization of language were very effective. And the transition from the experimenter as teacher to the parents as teachers was quite smooth. This author feels that this experiment is a good example of the creative use of reinforcers and punishment and operant conditioning technique as a whole.

Some studies that deal with severe punishment will now be discussed. Lovaas, Schaeffer, and Simmons (1965) used electric shock on five year old twins to build social behavior. The authors attempted to

associate pain with some type of pain reduction stimulus which would then become positively reinforcing.

The authors used a 12 x 12 foot room with metal tape placed on the floor. The tape was placed in such a way that a child's barefeet would connect a circuit so she would be shocked.

To get baseline behavior the children were individually placed in the room and asked to come to the experimenter five times a minute. The shock sessions then began. To avoid the shock the child had to approach within one foot of the experimenter within five seconds after a command was issued. This was done to train avoidance behavior. Shock and the word 'No' were given at the onset of tantrums and self-stimulatory behavior. Eleven extinction trials over ten months were then done. Finally two non-contingent shocks were given.

The subjects had also been trained to press a lever for M and M's. The testing of 'no' as a secondary negative reinforcer was done by saying the word to see how much bar pressing was suppressed before and after pairing with shock.

Lovaas, Schaeffer and Simmons (1965) found that the children did not respond in the pre-shock condition. They did learn to respond in the 3 shock sessions. And during extinction the subjects responded for nine months then suddenly the behaviors extinguished for both subjects. The authors acknowledge the drop but do not discuss it. The non-contingent shock reinstated high response rates. The word 'No' had no effect on bar pressing prior to shock but was very effective after shock. This generalization had taken place. Self-stimulation dropped to zero and then rose dramatically when the responding to the experimenters extinguished.

Again, the authors offer no explanation for this sudden rise in behavior.

The second part of the experiment was employed to assess possible affect changes in the children. Two observations were made. The first was the response of the children to the invitation to hug and kiss the experimenter. This was done in six sessions lasting six minutes each. Sessions 3, 5, and 6 were shock relevant in that the room was the same one the subjects were originally shocked in. Sessions 1, 2, and 4 were control sessions performed in a different room. The children were shocked in session 6. Two nurses recorded 4 behaviors. Hugging and kissing was found to occur more in the shock relevant sessions than in the control session.

The second observations were made by four nurses who recorded seven behaviors on a like scale. First the children were given a non-contingent shock and observed for ten minutes. Then they were again observed with no shock. The authors found little difference in the children's affect.

The third part of the experiment was performed to determine the degree to which the association of an adult with shock reduction would establish the adult as a positive secondary reinforcer for the subjects. The children were trained to press a lever to receive an M and M and a five second exposure to the experimenter in a 4 x 4 foot room with a movable screen. Nine experimental sessions followed in which no M and M was given and shock was given before the 2nd, 7th, and 9th sessions. The experimenter would then comfort the child after each shock. The results indicate a large increase in the rate of lever pressing in the experimental condition. It was felt that social and desirable behaviors

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were increased by the pairing of comforting with the experimenters.

The authors concluded from these studies that the increase of social behavior to the experimenters was due to pairing the experimenter to shock reduction. They also felt that the experiment did not generalize well, and the effects of shock were short lived. Contrary to what some of the nurses recorded the authors conclude that the children seemed happier after shock reduction.

Breger (1965) wrote a comment on this study by Lovaas, Schaeffer and Simmons (1965). Breger (1965) points out that the previous authors interchange the words autism and schizophrenia in describing the children. The diagnosis is important since an autistic child does not react or learn like any other child.

Breger (1965) comments on the generalization of learning and in autistic children. He talks about Rimland's theories that "in early infantile autism stimuli are apprehended but not comprehended." Thus, they use repetitive speech without meaning and use repetitive behavior patterns. Breger (1965) says that the generalization that did occur was because the experimental condition was so similar to the control condition.

Breger (1965) felt that Lovaas, Schaeffer and Simmons (1965) conclusion that ". . . the most therapeutic use of shock will not be primarily in the suppression of specific responses or the shaping of behavior through escape-avoidance training. Rather, it would seem more efficient as a way of establishing social reinforcers . . ." is inconsistent with the results. Breger (1965) said that the generalization was small and short lived and that this learning process may have been too much for the children.

Breger (1965) gets at some very good points. However, this author feels that the generalization can be made by autistic children. The previous studies reviewed have demonstrated that complicated events were learned and generalized. Lovaas, Schaeffer and Simmons (1965) article presents cumulative graphs that are very confusing, unstandardized and misleading. Time-out procedures may have also worked as well as the shock and should have been tried first.

A study performed by Risley (1968) assessed the effects and side effects of shock and other forms of punishment on a deviant child. The subject was a 6 year old girl that was hyperactive and exhibited bizarre behavior. She showed no verbal or non-verbal imitative behavior. And she climbed anything anywhere ". . . her body bore multiple scars from past falls; her front teeth were missing, having been left imbedded in a 2 x 4 inch molding from which she had fallen while climbing outside the second story of her house . . . ."

Time-out was used by the mother in the house to attempt to eliminate climbing behavior. This was found to be ineffective. In the clinic the author attempted to have the child make eye contact so that imitative training could begin. Milk was used as a reinforcer. The experimenter shaped sitting in a chair and then reinforced the child for looking at the milk which was in a small cup. Slowly the cup was moved towards the experimenter's face and then eye contact was reinforced.

During this time there was nothing in the room for the subject to climb on. The author wanted to determine if climbing would increase if an incompatible such as eye contact was reinforced. A bookcase was brought in and climbing immediately increased. Thus, incompatible behaviors did not work.

Risley (1968) decided to use an electric cow prod to shock the child contingent on climbing on the bookcase. The experimenter would shout 'No' and shock the child on the leg.

Figure 3 shows a cumulative record of the child's climbing behavior. A avoidance behavior was learned in that the child would jump off the bookcase when 'No' was said. Thus the experimenter shocked the child irrespective of if she was on the bookcase. Climbing was eliminated after this. At the child's house, however, climbing remained the same.

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Insert Figure 3 Here

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The child was observed a pre-session time in which the experimenter was out of the room. Climbing occurred, thus the experimenter was the discriminating stimulus. The dotted line on Figure 3 indicates the preessions. At preession 65 the experimenter entered the room and shocked the child. Climbing fell dramatically. A side effect of not climbing on the bookcase was climbing on the chair. This behavior was eliminated by shock and no other side effect was seen.

Eye contact was still being reinforced and was found to increase when climbing decreased and vice versa. This increase was due to the child looking at the experimenter more while in the chair and not due to an increase in time spent in the chair.

Shock was now used in the home. The mother carried the shock apparatus with her and within four days climbing had reduced from 29 to 2 episodes a day. Spanking was tried in place of shock and was a very unpleasant event.

The author sought another form of punishment. They trained the child to sit in a chair and if she moved she was shocked. This method

was used in the home by forcing the child to sit in a chair if she began climbing. This was not as effective as shock but did work.

The experimenter then taught the child to clap her hands in imitation to him. He reinforced the child to bring her hands together with successively stronger force until she was clapping with him. Autistic rocking was thought to interfere with this behavior.

Autistic rocking was eliminated by shaking the child which produced a startle reflex in the child which was enough to suppress the behavior. Clapping now increased from 10% to 75% within several hours. Seven other imitative behaviors were now learned without any problems.

The authors conclude that since they could not determine what was maintaining climbing and time-out did not work, shock was used and found to be effective. Symptom substitution did occur but when the alternative behavior was eliminated, no other substitutions occurred. Suppression of other behaviors did not occur.

Avoidance of shock but not the experimenter occurred. His presence could suppress climbing. When climbing and autistic rocking were eliminated, new behaviors were learned. The authors felt that shock was justified as the child was dangerous and ordinary methods failed to reduce climbing.

This study shows that the punishment was very situationally specific. The author did not indicate how long the effects of shock on suppression of behaviors would last. The author was using milk as a reinforcer which was probably a weak reinforcer and had Risley (1968) found another more powerful reinforcer, he may not have had to use the shock. However, we do see that shock did work very fast in suppressing

undesirable behaviors. It is situational, though, and thus does not generalize well.

Lovaas, Koegel, Simmons and Long (1973) treated twenty autistic children over a period of seven years. Half of the children were mute, while the other half were echolalic.

The authors first reduced self-stimulatory behavior by (1) using time-out, (2) using contingent aversive stimulation such as a slap, and (3) reinforcing incompatible behavior such as sitting in a chair.

Lovaas, Koegel, Simmons and Long (1973) then began using operant conditioning to teach the children language. Verbal imitation was established in five steps. First reinforcement was given for any vocalization. Next they established temporal discrimination by reinforcing only vocalizations that were emitted within a five second period after the therapist made a vocalization. Thirdly, reinforcement was only given when the child made vocalizations similar to the therapist's. Next after one sound could reliably be emitted, a second sound was introduced. These sounds would be presented in a random order to be discriminated. And finally a third sound was introduced which required even more discrimination. For those children that were echolalic they attempted to make speech meaningful by teaching them names of food, objects, etc.

The authors assessed the effects of their training by using a multiple-response recording and by measuring the changes in the children's Stanford-Binet and Vineland Social Maturity scores.

The multiple-response recording worked by defining certain behaviors which are both normal and abnormal. An observer who records their frequency and duration on a button-panel which is connected to a computer for fast analysis of frequency, duration and interaction of the

various behaviors. The five behaviors that were chosen were: (1) Self-Stimulation, (2) Echolalic Speech, (3) Appropriate Speech, (4) Social Non-Verbal Behavior, and (5) Appropriate Play. The reliability of the observers using this device was high averaging 80% agreement.

The authors were interested to see how much of the training would generalize to different situations. Thus, the children were observed in a room other than the experimental room with an unfamiliar adult. The room contained toys, crayons, etc. The children were observed for sessions lasting 35 minutes with three conditions. In the first condition, called the Alone condition, the child was observed by himself in the room. In the second condition, called the Attending condition, an unfamiliar adult was present and initiated no interaction unless the child initiated some sort of interaction. In the third condition, the Inviting condition, the adult invited the children to play, gave some simple commands, and asked simple questions.

Of the 20 children multiple-response recordings were only taken on 13 due to complications. These 13 children were treated in four groups. The first group in 1964 was Pam, Ricky, Billy and Chuck. Recordings were made once a month for 14 months. The second group in 1965 was Jose, Michael and Taylor. The treatment of these children was a replication of the first group and received 12 months of treatment. The children in both groups were inpatient and follow-up studies were done between two and four years after treatment. The third group in 1968 was Leslie, Tito and Seth. They were the first out-patients to have the multiple-response recordings taken. They were measured before treatment, one year after treatment began, and a follow-up one year later.

The fourth group in 1969 was Kevin F., Ann and James. They were also out-patients and were measured before, after one year of treatment, and a follow-up two years later.

The first and second group received 8 hours of treatment six days a week. Groups 3 and 4 were treated as outpatients and their parents were trained as therapists.

Figure 4 represents the group averages on the 13 children of which five were mute and 8 were echolalic. The change for the group as a whole is represented as the Total. One can see from this graph that inappropriate behaviors decreased while appropriate behaviors increased. The reason why echolalic behavior decreased by only a small amount was that the mute autistics were increasing in echolalia. The children showed four times as much appropriate verbal and non-verbal behavior after treatment and twice as much appropriate play. There were no exceptions to this.

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Insert Figure 4 Here

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Figure 5 represents monthly assessments of Group 1 (Rick, Pam, Billy, and Chuck). Rick and Pam, both being echolalic, are on the left side while Billy and Chuck, both mute, are on the right side. One can see that appropriate behaviors increase while non-appropriate ones decrease. Billy and Chuck show an increase in echolalia until they begin to be rewarded for appropriate verbal behavior. At this time echolalia then drops.

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Insert Figure 5 Here

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In breaking down the averages of Figure 5 into the separate conditions of Inviting and Attending, it was found that both social non-verbal and verbal behavior were higher during the Inviting than Attending condition. This was expected.

Group 2, which replicated the procedures used for Group 1, found essentially the same results as Group 1. Groups 3 and 4 although treated as out-patients with the parents as therapists had results similar to Groups 1 and 2.

The 13 children were seen in follow-up sessions ranging from one to four years. The authors split these children into two groups: those who were discharged to a state hospital and those who remained with their parents.

Figure 6 shows the percent occurrence of behaviors for those that remained with their parents (P) and those that were institutionalized (I) with before (B), after (A), and follow-up (F) measures. It appears that those who were discharged to institutions lost what they had gained in treatment. However, those that remained with their parents either stayed where they were at the end of treatment or made further gains.

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Insert Figure 6 Here

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Most of the institutions only gave custodial care and made few attempts to limit tantrums, etc. Pam and Rick, who were both institutionalized, regressed to levels even below what they were when they began the program. Both these children were placed back in the program and their behaviors improved dramatically.

IQ scores on 19 of the 20 children showed that most were untestable before treatment and after treatment most were functioning in the mildly to moderately retarded level. It was felt that elimination of interfering behaviors caused the major gains in the scores.

The children scored a mean of 48 before treatment on the Vineland Social Maturity Scale. After treatment the mean was 71 again thought to be due to the reduction of undesirable behaviors. All of the children improved on both the Vineland and IQ scales.

Lovaas, Koegel, Simmons and Long (1973) felt that they were very successful at suppressing self-destructive behavior. They found that the suppression was very situational but had no trouble in applying the treatment to other environments. They feel they made large strides in teaching the children appropriate speech and they found these gains did generalize. The authors also found that parents tend to make the best therapists and unless the behavior therapy was to continue the children would quickly regress.

This article is an extensive look at treatment of autistic children over a seven year period. The authors were correct in changing their treatment to use the parents as therapists. A great deal of time and care went into assessing the reliability and validity of the measures that were used. The multiple-response recording, in this author's opinion, is a very effective way of measuring the behavioral changes of autistic children.

## CONCLUSION

Some interesting findings and important implications have emerged from the research reviewed in this paper. Earlier, the results of research on self-stimulation and selective responding were summarized. It was concluded that self-stimulation would have to be reduced or eliminated if learning was to take place. It was stated that autistic children seem to be overselective when responding to stimuli. This meant that generalization would be difficult and it may be better to have the child respond to only one cue.

The research reviewed in the behavior modification section suggest that these points are valid. In each study it was found that self-stimulation had to be reduced before any other behavior was to be learned.

Several techniques were found to be effective in reducing and eliminating self-stimulatory behavior. One of the easiest and most effective was time-out which was an aversive stimulus. Basically, it consisted of removing the child to a room by himself in which all positive reinforcement was now withdrawn.

Another method for suppressing self-stimulation was reinforcement for an incompatible behavior with self-stimulation. It was found that this method was not very successful.

The third method was that of using shock. This method was found effective but is also the most controversial. It should only be used as a last resort if at all.

Selective responding was also found by the experimenters. They had problems with having the children generalize their behavior from one situation to another. Thus, they were responding to situational cues, and if anything was different, they could not respond.

Generalization was handled in a number of ways. One of the best ways that helps with generalization and reduces cost is to use the parents as therapists. Therapists can train parents how to deal with their child. Then the parents can use the techniques in their home.

Another way was to use reinforcers that could be used in the laboratory as well as at home. In this way the child only had to pay attention to one reinforcement.

By far the best technique for generalization was simply a naturalist method. Using this technique the things learned at the clinic were also instituted in the home. The same punishments and reinforcers were used to make the transition from the clinic to the house.

One of the most important things in teaching an autistic child behaviors is to find a powerful reinforcer. It was shown that if the reinforcer was not powerful, the child had a hard time learning. It also seems that these reinforcers will be different for each child. Candy worked for several children, though.

The most effective technique for teaching new behaviors was shaping or successive approximation. This technique involves reinforcement for behaviors that are successively closer to the desired behavior. It can be used to teach the child how to wear glasses and how to talk.

In order to teach the child language most experimenters agreed that imitative non-verbal behavior should be taught first. It was thought that if the child could learn to imitate non-verbal behaviors, the imitating verbal behaviors would be easier.

Shaping was usually used to teach these non-verbal and verbal behaviors. And it was found that echolalic children were able to learn faster than mute autistic children. It seems like a good idea to withhold food or a walk until the child speaks. In this way generalization will begin to take place.

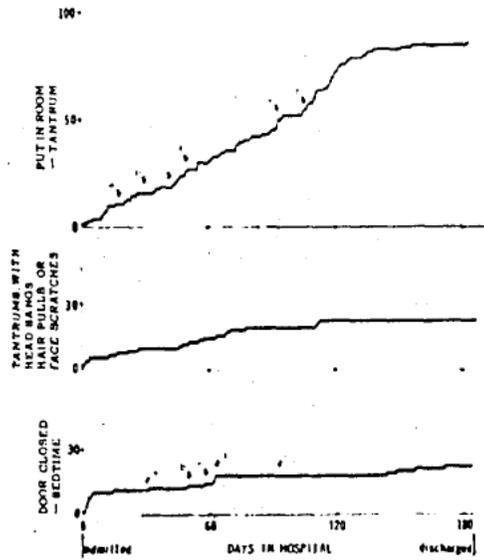
It was also found that unless the behavior modification techniques are continued in the home or institution, the learned behaviors will soon extinguish. Thus, if a child is placed in an institution in which he only receives traditional treatment, he will probably regress and exhibit more autistic behaviors.

My recommendation for treatment of an autistic child would be as follows:

1. Train the parents to be therapists.
2. Use time-out to reduce self-stimulatory behavior.
3. Use a strong reinforcer that can be found at a house.
4. Produce non-verbal imitative behavior using successive approximation.
5. Produce verbal behavior using successive approximation.
6. Generalize these new behaviors by making walks, food, etc. contingent upon using language.

One of the problems with autistic children is their great variability in learning new behaviors. What will work for one child may not work for another. Some children may never be able to talk; others may be able to

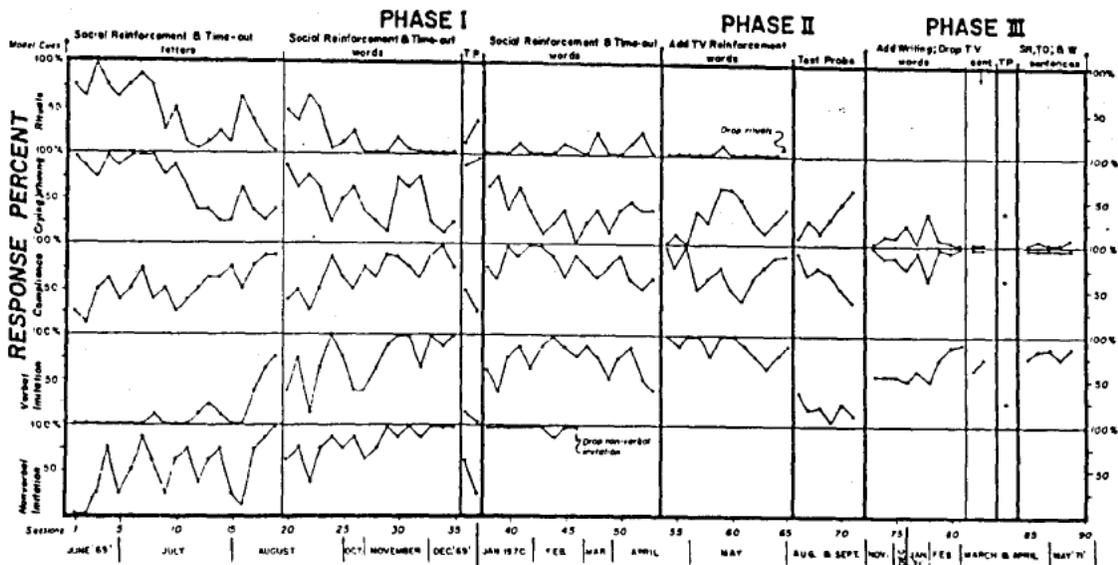
go on to school. The only way that these people will ever accomplish anything is by being patient and always showing love for the child. It takes a great deal of time to treat an autistic child, but these children are not hopeless, just in a world by themselves. These techniques can help bring them into a world full of love.



Three cumulative records showing the effects of extinction and mild punishment (time-out from positive reinforcement) upon the tantrums, severe self-destructive episodes, and bedtime problems of a hospitalized pre-school autistic boy.

Figure 1

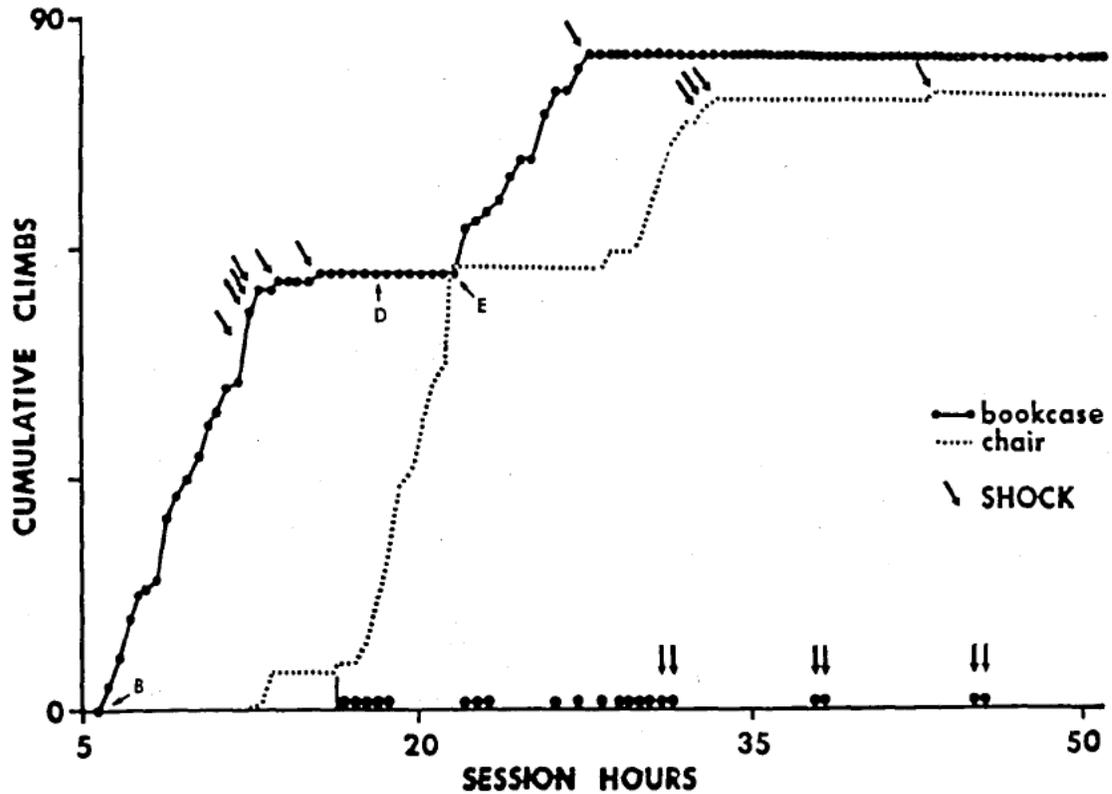
Note: From Wolf and Risley (1964)



Per cent of Rituals, Crying and Whining, Compliance, Non-Verbal Imitation and Verbal Imitation recorded during 30-min treatment sessions conducted initially in a clinic (Sessions 1 to 65) and later in the home (Sessions 66 to 90). Reinforcement contingencies are temporarily discontinued during the Test Probe sessions. Changes in verbal model cues are also indicated; *i.e.*, letters to words (Session 20) and words to sentences (Session 82).

Figure 2

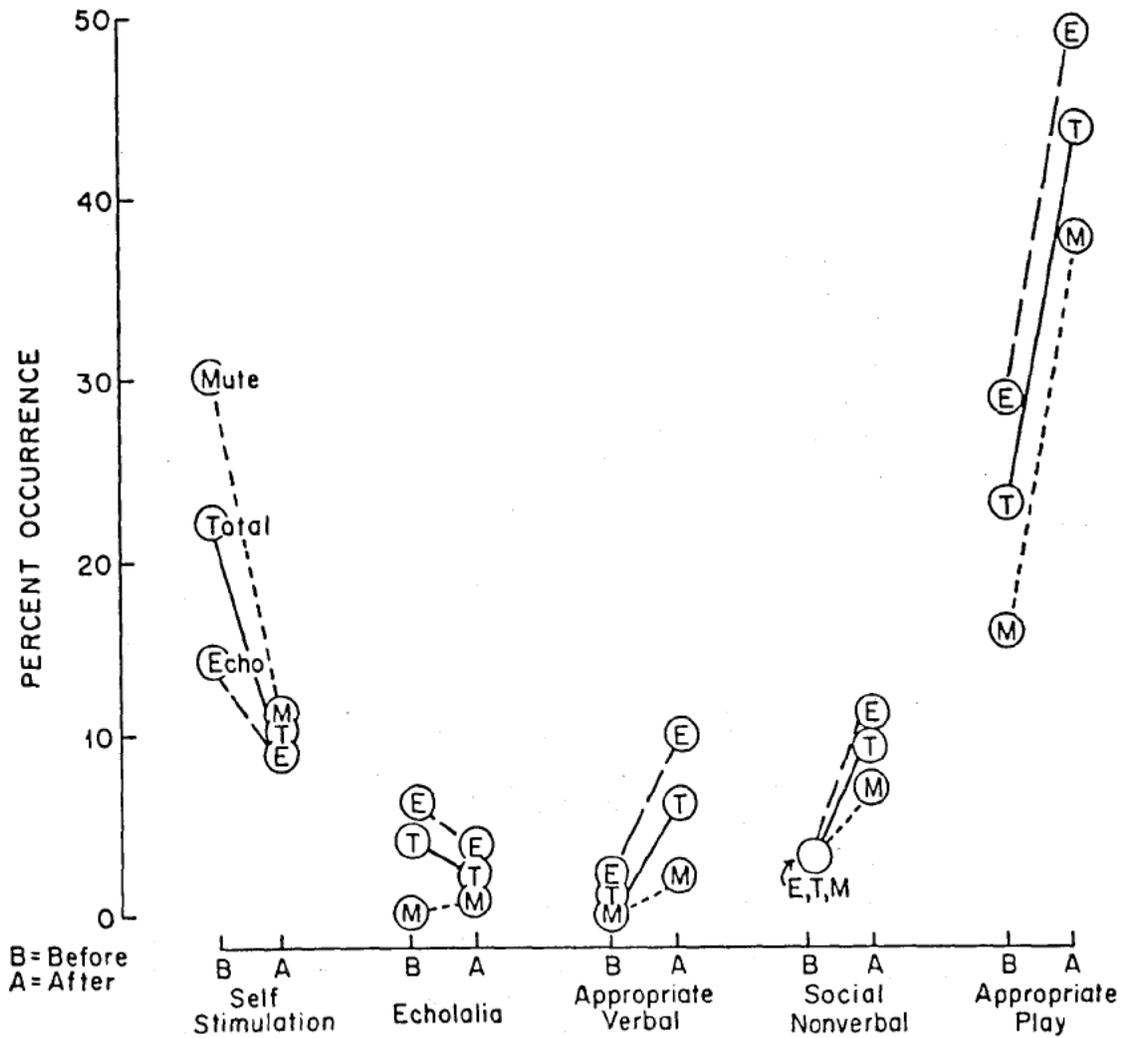
Note: From Nordquist and Wahler (1973)



A cumulative graph of the rates of S's climbing on the bookcase and standing on her chair. Each dot on the top line represents one session. Heavy arrows indicate where each behavior was punished with electric shock. At B the bookcase was placed in the experimental room. Beginning at D the shock device was not brought into the experimental room. At E a small stool was placed in front of the bookcase. Beginning at the short vertical line above the X-axis S was placed in the room alone for 5 min before each session. The dots above the X-axis indicate instances of climbing on the bookcase in these periods.

Figure 3

Note: From Risley (1968)

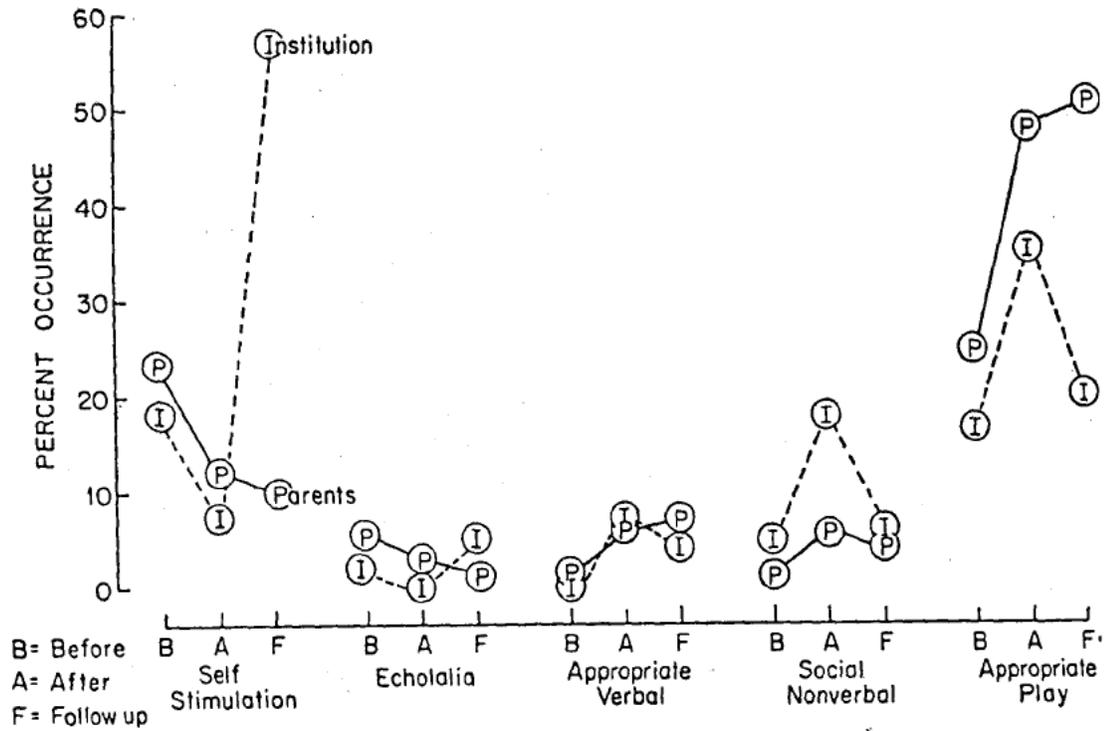


Before (B) and After (A) multiple-response measures averaged over all conditions for the four groups. Per cent occurrence of each behavior is plotted on the ordinate. "E" refers to the average results for the echolalic children, "M" to the average results for the mute children, and "T" to the average results for the total group.

Figure 4

Note: From Lovaas, Koegel and Simmons (1973)





Multiple response follow-up measures. Per cent occurrence of the various behaviors is plotted on the ordinate for Before (B) and After (A) treatment, and for the latest follow-up (F) measures. "I" refers to the average results for the four children who were institutionalized, and "P" refers to the average results for the nine children who were discharged to their parents' care. Per cent occurrence of the behaviors is presented on the ordinate.

Figure 6

Note: From Lovaas, Koegel and Simmons (1973)

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