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An Analysis of Observational Learning in Autistic and Normal Children[1]

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The present investigation studied observational learning in autistic children. Fifteen autistic and 15 normal children watched an adult model engage in a set of behaviors under specific verbal instructions. After observing this situation, the children were tested to determine what they had acquired through observation. The results showed that (1) the majority of the autistic and the youngest normal children acquired only some limited features of the observational situation and (2) chronological age was related to the amount of learning through observation in the normal children but not in the autistics. The deficit that the autistic children showed in observational learning may be related to a failure to discriminate or attend to the total stimulus input presented. Their failure in observational learning can be seen to contribute in a major way to the severely impoverished behavioral repertoires of these children.

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Bandura and Walters (1963) have postulated that virtually all learning phenomena accruing from direct experience may also take place on a "vicarious" basis through observing modeled behaviors and the resulting consequences for those behaviors. Observational learning, in this view, can occur through the mere observation of modeled behavior with the accompanying cognitive activities without explicit shaping through extrinsic reinforcement (Bandura, 1969, 1971). Other investigators (Baer, Peterson, & Sherman, 1967; Garcia, 1976; Hewett, 1965; Lovaas, Berberich, Perloff, & Schaeffer, 1966; Lovaas, Freitas, Nelson, & Whalen, 1967; Metz, 1965; Steinman, 1970) have examined observational learning from an explicit shaping and reinforcement of imitation paradigm. In these investigations, a behavior was considered imitative if it temporarily followed the modeled behavior, and if its topography was functionally controlled by the topography of the model's behavior (Baer et al., 1967). Thus imitation was defined as the establishment of a discrimination, whereby the child's response resembled its stimulus, that is, the model's response (Lovaas et al., 1967).

Observational learning can be seen to require the acquisition of behavioral topographies as well as the acquisition of stimulus functions. In other words, a child must learn specific behavioral topographies (e.g., how to behave) as well as discriminate the stimulus conditions that control the occurrence or nonoccurrence of the behavioral topographies (e.g., when to behave). Extended clinical observations on autistic children suggest an apparent failure of these children to learn by observing others (Lovaas, Koegel, Simmons, & Stevens-Long, 1973). This apparent failure to learn by observation may contribute in a major way to the behavioral impoverishment of these children.

Several investigators (Coates & Hartup, 1969; Liebert, Odom, Hill, & Huff, 1969; Rosenbaum, 1967) have demonstrated that observational learning improves with chronological age. However, these studies were concerned only with normal children. Given the preceding issues, the present investigation was designed to address the following questions through an analysis of the observational learning process: (1) What are the comparative abilities of autistic and young normal children in observational learning situations involving both the acquisition of behaviors and stimulus functions? (2) Does the amount of learning through observation vary with chronological age in autistic children? (3) What are some of the parameters that appear to prevent autistic children from learning through observation?

METHOD

Subjects

Two groups of children participated in the study. The first group consisted of 15 autistic children who ranged in age from 5 to 16 years, with a mean C.A.

of 10 years. These children had been diagnosed as autistic by agencies not associated with the experiment. Their behavioral retardation was profound in that 6 of the children were mute and the others exhibited echolalic speech. All the children had minimal receptive speech. They would obey simple commands, but all failed to respond appropriately to more complex demands involving abstract terms such as prepositions, pronouns, and time. There was also an absence of, or minimal presence of, social and self-help behaviors. All the children exhibited self-stimulatory behaviors (such as rocking, flapping, gazing).

The second group consisted of 15 normal children ranging in age from 1 to 6 years, with a mean C. A. of 3 years. The normal children were selected in the 1- to 6-year age range after reviewing the available literature on normal subject responding in an observational learning paradigm. Our purpose was to include children whose responding might be quite rudimentary or advanced and those whose responding would be in between. These children were obtained from a university day care center and from parents working at the university.

Setting

The basic facility consisted of a 3 X 3.7 m sound-attenuated experimental room, equipped with three chairs and a table. Figure 1 shows the general arrangement of the experimental room with a sample set of test stimuli in their usual position on the table. As can be seen, the child (C) was seated directly across the table from the model (M, a university student), and the teacher (T). Both the teacher and the model were adults. The choice of an adult model was based upon the fact that the majority of reinforcers provided for autistic children are from adults. Given Bandura's (1969) research on model prestige and saliency,

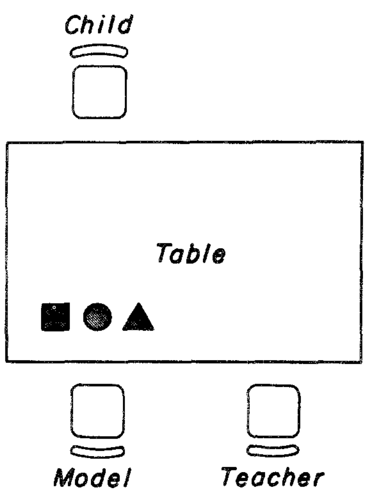

Fig. 1. The general arrangement of the experimental room with a sample pair of test stimuli in their usual position on the table. The child sat across the table from both the model and the teacher.

it seemed that an adult might provide the optimal conditions for observational learning with these children. Various toys were used for our test stimuli: four geometric figures, which included a purple square, a yellow square, a purple triangle, and a purple circle; and seven other toys, which included a dump truck, a football, a phone, a bucket, a shovel, and a toy corral. Two or more of these stimuli were placed on the table in front of the model, clearly visible to the child. Candy, which was used as reinforcement for the model, was also visible to the child at all times.

Procedure

The child was brought into the experimental room and seated in his chair. Most of the children would sit quietly in their chair. Those children who did not were taught to do so by socially reinforcing them for appropriate sitting and admonishing them with a loud "no" if they failed to return to their chair when asked to do so. Also, if the child engaged in nonverbal or verbal self-stimulatory behavior (Lovaas, Varni, Koegel, & Lorsch, 1977), he was admonished (again with a loud "no") for doing so since previous research (Lovaas, Litrownik, & Mann, 1971) demonstrated a general decrease in the autistic child's responsiveness to external stimulation when engaged in self-stimulatory behaviors. Finally, the child was prompted and reinforced for visually fixating on the model.

Once the child was clearly orienting toward the model, the teacher instructed the model to engage in a particular behavioral sequence involving the test stimuli. The model then performed the behavior and was reinforced with social approval and candy. The conditions for observation were selected to mimic the conditions in natural environments where children frequently perform the learned response in situations similar to those of the model, although these conditions typically present mirror images of what has been observed. Table I shows the complete list of modeled behaviors and teacher instructions (stimulus conditions). The sequence of tasks essentially followed the one shown in Table I, with the children who got six topography-instruction sets correct working from the geometric tasks. More than six geometric tasks were included due to chance correct responding by some children during the pretests.

Design

The experimental design consisted of three phases: (1) pretest trials during which the child was tested to determine whether he would perform the behaviors prior to observing the model engage in the behaviors; (2) observational trials where the child observed the teacher instruct the model, the model engage in the behavior, and the teacher then reinforce the model's correct performance; and

Table I. The Behavioral Topographies and Teacher's Instructions Appropriate for the Performance of Those Behaviors Employed in the Experiment

Teacher's instructions	Test stimuli arrangement	Modeled behavioral topographies
"Dump"	A dump truck with a small football in the dumping section	Grabbing the dumping section of the truck and lifting it up, thus dumping out the ball
"Truck"	A dump truck with a small football next to the truck	Placing the ball in the dumping section of the truck
"Corral"	A corral with a toy horse next to it	Placing the corral over the horse
"Phone"	A plastic phone	Taking the receiver off the hook
"Shovel"	A shovel next to a bucket	Placing the shovel in the bucket
"Square"	Three purple geometric figures, a square on the left, a circle in the middle, and a triangle on the right	Placing the square on top of the circle
"Triangle"	Same as "square"	Placing the triangle on top of the circle
"Septagon"	Same as "square," except that a yellow square was placed directly behind the purple square, i.e., the yellow square was placed on the table between *M* and the other three geometric figures	Placing the yellow square on top of the purple square
"Pentagon"	Same as "septagon"	Placing the circle on top of the yellow square
"Novagon"	Same as "septagon"	Placing the triangle on top of the yellow square
"Dexagon"	Same as "septagon"	Placing the purple square on top of the triangle
"Axagon"	Same as "septagon"	Placing the purple square on top of the yellow square
"Betagon"	Same as "septagon"	Placing the circle on top of the triangle

(3) posttest trials where the child was retested to determine his level of performance after the observational trials. The tests were structured so as to assess whether the child would perform a particular behavioral topography after hearing the instructions to perform the topography. The teacher's instructions during testing and observational trials consisted of idiosyncratic one-word utterances that were selected in an attempt to minimize the child's prior experience with the instructions and associated behavioral topographies.

Pretests. Initially, a pretest of 10 trials was administered to determine whether the child would perform a particular behavioral topography prior to observation after listening to the teacher instruction (this was highly improbable given the nature of the tasks). During the pretests, the child sat next to the teacher, facing the particular test stimuli on the table. The teacher gave a one-word instruction (e.g., "square"), waited 10 seconds for a response, then recorded the response as either correct or incorrect on a data sheet. No response was also recorded as incorrect. If the child did not respond correctly on any of these trials, then the behavioral topography and associated teacher instruction were included in the study for the child; if the child did respond correctly, then a new behavior-instruction task was selected and pretested. Six behavioral topography-instruction tasks were selected for each child.

Observational Trials. After the 10 pretest trials, the child sat in the observing chair across the table from the model and the teacher. During an observational trial, the teacher gave a particular one-word instruction to the model, the model responded correctly, and then was reinforced contingently with candy and social praise. A block of 20 observational trials was presented after all pretest trials. The number of observational trials varied from child to child, depending on the child's performance during the posttrials.

Posttests. After each block of 20 observational trials, the child was seated next to the teacher and received 1 posttest trial. Only 1 posttest trial was conducted in order to reduce the possibility that the child would learn the appropriate response through trial-and-error responding during testing (since reinforcement was contingent on correct responding). During these posttest trials, the teacher gave the one-word instruction to the child, waited 10 seconds, and then recorded the response as correct or incorrect. In the case of an incorrect response, the teacher also recorded what response the child emitted.

If the child did not reproduce the model's behavior, he was again seated across the table for another block of 20 observational trials. If he responded correctly, or after a minimum of 500 observational trials if he continued to respond incorrectly, then he was introduced to a new task. In order to avoid a possible contingency effect, the child was moved back across the table after each posttest trial regardless of correct or incorrect responding. One correct response at this phase was considered evidence that the child had acquired the modeled behavioral topography given the unique nature of the behavior. When the child acquired two or more behavioral topographies after observation, then the next phase of testing began.

During the previous posttest conditions, the child was essentially required only to reproduce the behavioral topography he had just observed the model emit. However, in order to assess adequately whether the child had discriminated the appropriate teacher instructions (stimulus conditions) for each behavior topography, it was necessary to alternate randomly the teacher's instructions after two or more behaviors were learned. For instance, when the teacher said, "Dump," the child would have to dump the ball out of the truck to be correct. However, when the teacher said, "Phone," now the child was required to take the receiver off the hook. The teacher continued randomly to present these instructions (e.g., "Dump" and "Phone") for 10 trials, or until the child responded incorrectly for a particular instruction. If the child responded incorrectly to one of these instructions, then he was exposed to additional observational trials where the teacher instructed the model. This was done in an attempt to minimize any learning that could take place during testing. If the child responded correctly on 10 consecutive trials, it was inferred that he had acquired the discrimination. He then observed another behavior-instruction task and was subsequently tested for acquisition of a three-stimulus discrimination. In this manner, up to six behavioral topographies and their accompanying instructions were randomly presented to those children who continued to respond correctly on all posttest trials.

Reliability

At random points during the study, an observer recorded the child's responses in addition to the teacher's recordings. These recordings included whether the response was correct or incorrect, and what was the actual response emitted by the child when he was incorrect. Reliability was computed by dividing the number of trials for which the teacher and the model agreed by the total number of trials (agreements plus disagreements), times 100. Agreement on scoring correct and incorrect responses and what responses did occur during test trials was always 100%.

RESULTS

The various tasks had been selected so that all the children performed at 0% correct on the pretests. The posttests for the acquisition of the modeled behavioral topographies are presented in Figure 2. The bar graphs represent the mean number of behaviors acquired by each age group, while the individual

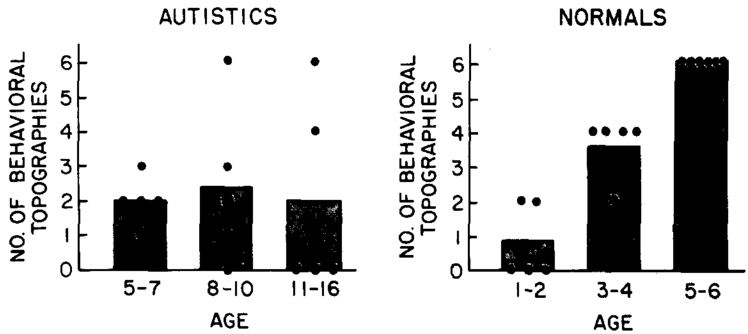

Fig. 2. Test results for the acquisition of modeled behavioral topographies. The bar graphs represent the mean number of topographies acquired by each age group, while the individual data points represent the number of topographies acquired by each child per group.

data points represent the number of behaviors acquired by each child per group. The figure shows the relationship between age and acquisition to be very close in the normal children. While most of the children in the 1- to 2-year-old group did not acquire the tasks, all the children in the 5- to 6-year-old group were successful in acquiring each of the behavioral topographies, with the children in the 3- to 4-year-old group demonstrating acquisition on a continuum somewhere between the younger and older groups. The autistic children acquired behaviors to a degree similar to that of the younger normal children, but no relationship between age and acquisition was apparent in the autistic group. Interestingly, the three oldest autistic children (ages 15, 16, and 16) did the poorest. It is also significant to note that two of the autistic children did acquire all six possible behavioral topographies, and over half acquired some of the behavioral topographies.

In order for the child to be tested for the acquisition of the appropriate teacher instruction for each behavioral topography, it was necessary that he correctly perform at least two behaviors, which were subsequently presented in a random manner. The results of these tests are presented in Figure 3. Those children who did not perform the minimum of two behaviors were included in Figure 3 since observational learning was considered on a continuum, with failure at the preliminary stages precluding success at the later stages on the continuum.

The bar graphs represent the mean number of teacher instructions correctly discriminated by each age group during testing, while the individual data points represent the number of teacher instructions discriminated by each child in the group. As Figure 3 shows, the relationship between age and acquisition was very clear in the normals. While most of the children in the 1- to 2-year-old group did not appear to learn the instructions, all of the children in the 5- to

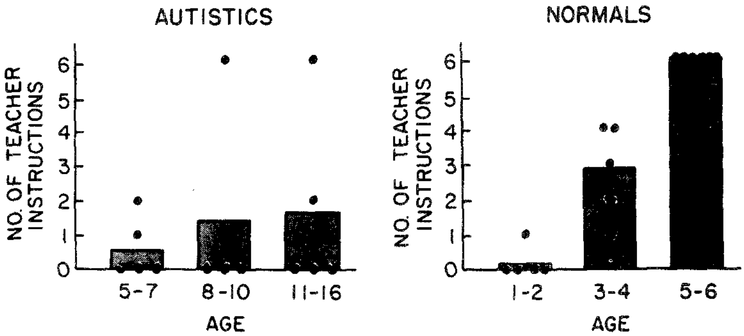

Fig. 3. Test results for the discrimination of the teacher's instructions. The bar graphs represent the mean number of teacher instructions discriminated by each age group, while the individual data points represent the number of teacher instructions discriminated by each child per group.

6-year-old group correctly performed all six of the discrimination tasks. Again, the autistics tended to perform like the younger normal children. No relationship between age and acquisition was apparent in the autistic group.

Some Descriptions of Individual Responding

Most of the autistic children gave no indication that they had observed the various modeled behavioral topographies. Six of the autistic children (Blake, Laurie, Lori, Jimmy, Frankie, and Taylor) apparently discriminated aspects of the modeled behaviors. Their performances are summarized in Table II. For example, Frankie, on the "square" task (placing the square on top of the circle), did not respond at all on pretest trials, but during posttest trials would consistently pick up and hold the square in midair, even after 1,000 observational trials.

A brief description of two autistic children who represent two different levels of functioning provides a further illustration of individual responding. Shelby was typical of those children who did not acquire much information through observation. Even though Shelby was exposed to 1,000 observational trials of the "truck" task, he did not correctly perform the "truck" topography on any of the posttests. The notion that he was not motivated to perform seems unlikely since he consistently responded in some manner on all posttest trials, in spite of no apparent reinforcement. It appeared that he simply did not acquire any information through observation. Cliff represents those autistic children who acquired some information through observation. Cliff reproduced both the "dump" and the "corral" topographies after watching only 40 observational trials each, but did not respond correctly on the random alternations of these topographies and their accompanying teacher instructions, even after 700 ob-

Table II. Description of Results for Those Autistic Children Who Emitted Partially Correct Behavioral Topographies

Child	Experimental task	Pretest	Posttests
Lori	"Corral"	No responding to test stimuli	After 120 observational trials, no correct responding to "corral"; after 140 observational trials, she put the horse in the corral; after 320 observational trials, she correctly performed the "corral" task.
Laurie	"Phone"	No responding to test stimuli	After 180 observational trials, no correct responding to "phone"; after 200 observational trials, she touched the dial of the phone and continued to do so on all subsequent posttests.
Frankie	"Square"	No responding to test stimuli	After 1,000 observational trials, he continued to only pick up the square and hold it in midair.
	"Triangle"	No responding to test stimuli	After 500 observational trials, he continued to only pick up the triangle and hold it in midair.
Blake	"Corral"	Performed "dump" task	After 720 observational trials, he either continued to put the horse in the corral or picked up the corral, moved it to the other side of the horse, and then back to its original position.
Jimmy	"Corral"	Played with the dump truck	After 1,220 observational trials, he continued only to put the horse in the corral.
Taylor	"Dump"	Echoed word "dump"	After 720 observational trials, he continued only to place his hand on the ball in the truck.

servational trials. In Cliff's case, it appeared that he did not discriminate or attend to the teacher's verbal instructions but did imitate the model's nonverbal behavior.

DISCUSSION

The results for the normal children replicated earlier findings (e.g., Coates & Hartup, 1969; Liebert et al., 1969; Rosenbaum, 1967), which demonstrated that normal children acquire more information through observation progressively with chronological age. Thus the consistency of the normal control group's data with previous research suggests a high degree of validity with respect to the present investigation's observational learning paradigm and tasks. The autistic children's chronological age did not appear to be a factor in determining how much information these children acquired through observation. The majority of the autistic children, regardless of age, responded similarly to the youngest group of normal children.

The findings are consistent with experimental evidence that demonstrates that autistic children do not learn new behaviors through observation unless they receive intensive training to do so (e.g., Hewett, 1965; Lovaas et al., 1966; Metz, 1965; Varni & Everett, in press). This inability to acquire new information through observation may contribute to the autistic child's severely impoverished behavioral repertoires. Undoubtedly, many of the subtle and complex behavioral patterns demonstrated by normal children are learned by observing various social interactions; children who do not learn in this manner might be expected to demonstrate a comparatively lower level of functioning. As the present findings showed, it is sometimes difficult to predict what autistic children will learn through observation. That is, the autistic children's responding appeared to be very idiosyncratic considering what they had observed. Such performance may be related to previous work by the authors and their associates on stimulus overselectivity, or extreme selective responding (Koegel & Wilhelm, 1973; Lovaas & Schreibman, 1971; Lovaas, Schreibman, Koegel, & Rehm, 1971; Reynolds, Newsom, & Lovaas, 1974).

The research conducted on stimulus overselectivity suggests that autistic children have difficulty in responding to more than one stimulus cue at a time. That is, when presented with a stimulus complex, autistic children appear to respond to only a very limited portion of the total stimulus complex. A further investigation by Schreibman and Lovaas (1973) suggested that the autistic child's failure to emit appropriate social behavior may be a function of stimulus overselectivity. In addition to social behavior, studies have now related overselectivity to deficiencies in children's ability to learn with prompt (extra guiding) stimuli (Koegel & Rincover, 1976), difficulty in acquiring speech (Lovaas, Schreibman, Koegel, & Rehm, 1971), and failures to generalize treatment gains across settings (Koegel & Rincover, 1977; Rincover & Koegel, 1975). It seems that the findings on stimulus overselectivity may, in fact, provide a parsimonious explanation of the way in which autistic children learn or fail to learn through observation of their environment. The concept of stimulus selectivity may also account for the difficulties in observational learning shown by the younger normal children. Eims (1969), Koegel and Schreibman (1977), Schover and Newsom (1976), and Schreibman, Koegel, and Craig (1977) have discussed the fact that young normal children also show more selective responding to their environment than do older children and adults. Since the majority of the autistic children responded like the youngest normal group, this suggests that the observational learning deficit might represent a development lag, especially in consideration of evidence demonstrating that when normal children are compared on selective attention tasks, the younger do worse, with performance improving with increasing age (cf. Ross, 1976). Ross (1976) and Hale and Piper (1973) have directly related selective responding to the possible failure of young normal children to learn through incidental observation. Thus the results of the present investigation support the notion that observational learning is a developmental phenomenon and that the concept of selective responding may be directly related to observational learning in both normal and autistic children.

Previous research suggested that the deficit in observational learning demonstrated by autistic children was mainly due to motivational factors (Baer et al., 1967; Hewett, 1965; Lovaas et al., 1967; Metz, 1965). The major finding in the present study indicates that stimulus overselectivity is an additional contributing factor to the observational learning deficit. If so, then a potential treatment for this deficit may be found in the approach developed by Koegel and Schreibman (1977) to remediate overselective responding in autistic children. Whether or not a treatment package consisting of reinforcement and overselectivity remediation training will be successful in teaching autistic children to learn through observation remains an empirical question.

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