VISUALLY DISCRIMINATED BEHAVIOR IN A "BLIND" ADOLESCENT RETARDATE¹

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A 16-yr-old retarded male, diagnosed organically blind and treated by those around him as a blind person, was given practice in discriminating visual stimuli. After training, he responded with significantly better than chance accuracy in a choice situation in which stimuli were as small as 18 pt Futura Medium type. In addition, he was trained to look at the experimenter's eyes when instructed to do so. Control procedures revealed that it was the reinforcement contingency that functioned to establish and maintain eye contact. Eye contact with the experimenter generalized in a limited way to situations in which this behavior was not reinforced, though not to a neutral individual. When the boy was required to use visual cues to help himself in a cafeteria line, he soon emitted the necessary behaviors, where formerly he had been assisted by others. Resumption of assistance markedly decreased self-help, suggesting that continued use of any newly learned skills would depend on the response of the individuals in his environment. The boy also learned eating behavior that appeared to require the use of visual cues.

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Operant conditioning techniques have been used to establish a variety of behaviors, such as walking (Harris, Johnston, Kelley, and Wolf, 1964), speaking (Sherman, 1965; Flood and Stolz, 1967), and wearing glasses (Wolf, Risley, and Mees, 1964), that are important to the lives of the individuals involved. The present report describes the use of reinforcement procedures to establish visually discriminated behavior in an individual considered by those in daily contact with him to be organically blind.

To determine whether an individual can see, one must discover if he can respond differentially to visual cues alone. The most common test of ability to see is a verbal one: the

subject is asked to report particular visual stimuli in his environment. In some cases this test is inadequate, because the subject may report that he does not see when in fact he does. Such behavior is described as malingering, if it appears that the subject is "conscious" of emitting a false verbal report about his inability to see (Wolff and Lachman, 1938), or as functional or hysterical blindness, if the subject appears to be "deceiving himself without malice or design" (Yasuna, 1951).

A sighted person's verbal behavior about what he sees is manipulable in terms of its consequences, like any other sort of verbal behavior. Grosz and Zimmerman (1965) noted

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one patient's long history of receiving a wide variety of assistance, including welfare funds, as a result of reporting blindness. They suggested that his verbal reports were maintained by the wide variety of reinforcers contingent on them, and they demonstrated experimentally (Zimmerman and Grosz, 1966) that the subject "saw" or "didn't see", depending on scheduled social consequences.

Brady and Lind (1961), in earlier work with the same individual, were able to train him to respond discriminatively to visual stimuli. This behavior apparently generalized to non-laboratory situations, and the patient was discharged from the hospital. Grosz and Zimmerman (1965) found that within eight months after his discharge, however, the patient was again reporting that he could not see, presumably because the reinforcement contingencies in the environment were unchanged. None of the above-mentioned investigators attempted systematic modification of the response in the nonlaboratory environment of this subject.

Modification of the normal environment has been reported to eliminate functional blindness in one case (Wolpe, 1953) in which this was the only treatment attempted. Following Freudian principles, she advised the parents of a 4-yr-old "blind" girl how to modify their responses to the child in the home. Wolpe reported that the parents made a wide variety of changes in their interactions with the child, and that the child's visual problems disappeared within seven months.

Few attempts to train functionally blind individuals have been described in the literature, perhaps because functional blindness is a rare problem (Yasuna, 1951). In one informal review, however, "about half" of 19 patients with hysterical amblyopia were said to have improved vision after a short period of treatment with "patience and sympathy" (Yasuna, 1951). There is no indication whether the improvement generalized to situations other than the ophthalmologist's office. In some of these cases, further treatment with psychiatric techniques reportedly resulted in the development of "other manifestations of hysteria". In another report (Wolff and Lachman, 1938), two cases of functional blindness showed rapid and maintained recovery after short periods of special attention to the individuals. Both children involved had close

friends who had recently received much attention because of eye problems.

Though the subject of the present investigation was reported to be organically, rather than functionally, blind, observation of his behavior led us to an attempt to demonstrate that he could see. A series of tests, involving reinforcement and fading procedures similar to those described by other investigators who have measured the sensory thresholds of retarded children (Meyerson and Michael, 1960; Lloyd, Spradlin, and Reid, 1968), demonstrated that the subject could indeed be trained to respond differentially to visual stimuli. No experimental analysis was performed to isolate what aspect of the training and testing procedures was responsible for generating the appropriate behavior. However, in a subsequent series of experiments the role of the response consequences was investigated. That series of experiments attempted to extend the training to other situations in which the subject had been making, at best, a minimal use of visual cues.

SUBJECT

Fred was an adolescent male, 16 yr old at the time of the study. He had been admitted to Kansas Neurological Institute 16 months before the study began because, he was aggressive and had been diagnosed as brain damaged with associated visual impairment. He was living on a ward for emotionally disturbed adolescent retarded boys.

One year before this study, Fred's Vineland score had been 4.5 yr, his social quotient in the low 30s. He was classified as moderately retarded. No other test scores were available. During the period of the study, he was receiving 200 mg Dilantin, 300 mg Mellaril (thioridazine), and 90 mg Phenobarbital daily.

Fred's records contained a variety of diagnoses of the nature and severity of his visual impairment. The admitting neurologist suggested that "prenatal brain damage and premature closure of certain sutures" had led to damage of the optic nerves, and probably to "an atrophy of the optic nerve" on both sides. However, the neurologist also reported that Fred's visual defect was "inconsistent. . . . He might see a very small object like a coin and then not be able to see a much larger object like a key ring."

However, several ophthalmological examinations at various times and by different doctors, the most recent occurring three months before this study, produced a consistent conclusion: Fred's eyes had only a very mild refractive error, one that normally would not require corrective lenses. Despite this evidence of mild handicap, Fred was treated as blind in the institution. He was taught to feel items in order to discriminate them, and for a year before the study had attended a half-hour class for the visually handicapped, five days a week. Further details on the specific nature of his visual difficulties follow.

LABORATORY TRAINING

GENERAL PROCEDURE

Laboratory training was conducted in Fred's private room on the ward, with the door and window closed. Fred and the experimenter sat facing each other across a small table. Most sessions were begun approximately half an hour after Fred had had lunch; on some days additional training was given before lunch. All training was conducted by the senior author, seven days a week, except for vacation or illness of Fred or the experimenter. Several different training and test procedures were generally conducted within any given day. The temporal relationship of the various procedures in this study can be inferred from the session numbers in text and figures, which refer to a single chronological series of sessions. The only sizable break in the experimental schedule was Fred's 10-day home visit between Sessions 39 and 40; this is noted in the figures. The experiment ended when Fred's parents took him home for an extended period of time.

Response Consequences

On most trials, the scheduled consequence for correct responses was praise accompanied by a sip of a soft drink; occasionally, milk, cookies, sweetened dry cereals, or candy were used. No difference in performance was detectable when sessions were conducted before lunch rather than afterwards, or when one of these consequences was substituted for another. Fred was allowed to select the type of food to be used during most sessions; and generally selected, on individual trials, from among two or three types of food available during that session.

TEST I: VISUAL DISCRIMINATION

Because of the inconsistent reports in Fred's records, and because he was generally considered to be organically blind, it was first necessary to determine if he could discriminate visual stimuli. To do this, Fred was presented a series of two-choice visual discrimination tasks. The correct choice between the members of a given pair of stimuli could be consistently determined only by means of visual cues, because the position of the correct stimulus was varied from side to side according to a Gellerman series (Gellerman, 1933).

Method

Stimuli. The two-choice visual discrimination task included the following pairs of stimuli: a blue triangle *versus* a red triangle, both 1 in. on a side; a triangle 1 in. on a side *versus* a triangle 0.25 in. on a side; equal sized blocks differing in color; and equal sized pieces of paper differing in color. The triangles were drawn with colored marker pen on white paper disks 7 in. in diameter.

Instructions. Before the first trial in a given session with a particular pair of stimuli, Fred was shown the positive stimulus and told: "This is the right one. Look at it. Now do you see it? Point to the right one." The experimenter did not proceed until Fred had pointed to the correct stimulus. On each discrimination trial, two stimuli were presented with instructions such as: "Point to the right one", or "Where's the right one at?" (using the words often used by Fred).

Response consequences. When Fred pointed to the correct stimulus, the experimenter said, "That's right", "You're doing great", or some such comment, and handed him a marble. Fred then dropped the marble in a paper cup, and was given a bit of food in exchange. In all sessions, the ratio of marbles to food was 1 to 1.

If Fred pointed to the incorrect stimulus, the experimenter said "No", or "That's not it". Often, Fred was then allowed to point to the correct stimulus, after which the experimenter said: "Yes, but you have to get it the first time to get the cookie" (or whatever was being used), and then withdrew both stimuli.

Between trials, the experimenter recorded whether Fred had chosen the correct stimulus. The duration of the session was timed with a

stopwatch. The number of trials per session varied from 10, early in training, to 188 in Session 10. The training extended from Session 1 through Session 14.

Results

Over the first five sessions, Fred's discriminations were at chance level on a variety of stimulus pairs, including both papers and blocks of identical size differing only in color. Beginning in Session 5, a series of stimuli was introduced in an attempt to shape responding to the cue of color. In this session, Fred was given a discrimination task which could be solved using either visual or tactile cues: a yellow piece of paper 1 in. by 2 in. was correct, a red paper 1 in. by 3.8 in. was incorrect. Fred was allowed to touch these stimuli. He chose correctly on only 12 of 30 trials.

In Session 6, a similar task was presented in which the incorrect stimulus was a red paper 2 in. by 4 in., while the correct stimulus was again a yellow paper 1 in. by 2 in. Fred performed at 100% accuracy on the last nine of 28 trials. In subsequent sessions of this shaping procedure, the red paper was made gradually closer in size to the yellow, until the two were identical. After the first two stimulus pairs in the shaping series, he was not permitted to touch these or any subsequent test stimuli, but was instructed to point to them. According to the binomial test the proportion of correct responses to the shaping stimuli was significantly different from chance (50%) at $p < 0.05$ for the third and the last stimulus pairs in this series, and $p < 0.01$ for the fourth and fifth pairs (Siegel, 1956).

When the papers and blocks of identical size differing only in color were reintroduced in Sessions 9 and 13, Fred's responses to these stimulus pairs were no longer on a random basis. The proportion correct was significantly different from chance (50%) at $p < 0.05$ for the second stimulus pair, and at $p < 0.01$ for the other three pairs used. Figure 1 presents this acquisition of responding to the cue of color.

As training progressed, Fred also responded at better than chance level on pairs of stimuli in which relative size was the correct cue, for example, choosing correctly on 27 of 30 trials ($p < 0.01$) when the correct stimulus was a 0.25-in. triangle, the incorrect, a 1-in. triangle, in Session 14.

Fig. 1. Visual discrimination training: acquisition of correct responding in two-choice discrimination tasks when stimuli differ only in color. Shaping tasks were stimulus pairs of which the members differed in size as well as in color. The numbers by the data points give the number of trials on which each percentage is based. In most sessions, several pairs of stimuli were used; each stimulus pair used within a given session is reported separately in the figure. After Session 6, all proportions are significantly different from chance (50%) at $p < 0.05$ or better.

Discussion

Fred's terminal performance on the two-choice discrimination tasks was consistently better than could be expected on the basis of random guessing. Because the requirement that he point to the stimuli eliminated the possibility of his responding in terms of tactile cues, we concluded that Fred was able to respond differentially on the basis of visual cues alone.

The design of these tests did not permit analysis of how much of the improvement in Fred's performance may be attributed to (a) the use of pairs of stimuli that gradually approached each other in size, (b) the simple effect of continued training in the two-choice discrimination task, or (c) the scheduled consequences of food and praise. However, the tests up to this point were intended only to determine if Fred was capable of seeing.

TEST II: VISUAL ACUITY

Once it had been determined that Fred could respond to relatively large visual cues, we next decided to find out how well he could respond to small visual details. This series of tests was of particular interest because Fred had been described as having "an obviously extreme impairment of visual acuity" by a neurological examiner.

Method

Procedure. The procedure was essentially the same as in Test I: pairs of stimuli in a Gellerman series, food and praise for correct responses, and correction followed by withdrawal of the stimuli after incorrect responses. As in Test I, the experimenter recorded responses. The procedure here differed from that in Test I in the following ways: (a) in Sessions 21 through 24, two marbles had to be accumulated before they could be exchanged for food (in all other sessions the ratio of marbles to food was 1 to 1), and (b) after Session 24, the correction procedure was eliminated. Incorrect choices were then followed by the withdrawal of both stimuli and by a 10-sec pause period during which the experimenter neither looked at Fred nor answered his remarks, except to say occasionally: "I won't talk to you. You got the wrong one." The pause period was timed with the stopwatch.

Fred was instructed to sit so that the stimuli were approximately 14 in. from his eyes. If he moved closer, he was told to sit up.

The visual acuity training extended from Session 18 through the end of the study, Session 62. A typical session lasted 60 trials, although a few sessions were terminated sooner because of other demands on Fred's time. On the other hand, a number of sessions begun in the morning were continued after a break for Fred's lunch, so that nearly a third of the visual acuity training sessions lasted more than 100 trials, and as many as 205 trials were run in a single day.

Stimuli. The stimuli were upper case letters of the alphabet, each printed on a separate 3-in. by 5-in. white card. The largest letters were hand drawn, approximately 1-in. high and 0.5-in. wide. All other stimuli were from a standard type face, Futura Medium, a sans serif type. At various times during training, the subject was presented with 72 pt, 48 pt, 36 pt, 24 pt, 18 pt, and 12 pt letters (news-papers are characteristically printed in 8 pt type). Both letters in a given pair were always of the same size type.

The correct stimulus was *E*. Incorrect stimuli were 10 other letters, chosen arbitrarily, with somewhat different sets of letters for each stimulus size. Some letters appeared more frequently than others. The order of presentation

of the incorrect letters was arbitrary, and varied frequently.

Instructions. As before, Fred was instructed to "pick the right one", or, sometimes, "the right picture". Though Fred knew that the stimuli were letters of the alphabet, no attempt was made to teach him the correct verbal label for any of the letters.

Results and Discussion

After training, Fred was able to discriminate an *E* consistently from various other letters when the stimuli were as small as 18 pt type. He discriminated each of the Futura Medium type sizes, except 12 pt, at about 90% accuracy in at least one session of at least 30 trials. Except for the 12 pt stimuli, the proportion correct in the last session with each stimulus size was significantly different from chance (50%) at $p < 0.01$. In each case, the immediately preceding proportions did not differ greatly from the last one, so no bias is assumed in the selection of the final point for statistical evaluation. Within the limits of this experiment, Fred could not be trained to discriminate 12 pt letters at better than chance accuracy.

As each smaller stimulus pair was introduced, Fred, who had been discriminating the next larger size stimulus well, again began performing at chance level. After Session 42, whenever it became apparent that discrimination was poor on a particular stimulus size, larger stimuli were reintroduced until a high proportion of success was again achieved, at which time testing was resumed with the smaller stimuli. Figure 2 presents the data for the visual acuity training trials. In this figure, the shifts from one stimulus size to another can be determined from the relative placement of data points.

Under the present test conditions, Fred evidenced enough visual acuity to enable him to be trained to read books prepared for the partially sighted. This test, like the preceding one, did not include an experimental evaluation of the various aspects of the procedure, so it was not possible to determine whether the improvement Fred showed at each stimulus size was a function of the particular programming employed or of prolonged training with that stimulus size. It is even possible that after continued training with 12 pt stimuli Fred would eventually have been able to discriminate these at better than chance level.

Fig. 2. Visual acuity training: two-choice discrimination task. The numbers near the data points give the number of trials on which those percentages are based. The final proportion for each stimulus size except 12 pt is significantly different from chance (50%) at $p < 0.01$.

The only purpose of these first two tests was to demonstrate that Fred was not blind. Having demonstrated this, we then felt justified in assuming that he might be able to respond to other attempts to modify his behavior with respect to visual cues. The function of the consequences for his behavior is experimentally evaluated in the studies that follow. In any case, Test II demonstrated that Fred was able to respond discriminatively to far smaller aspects of visual stimuli than had been thought possible.

EXPERIMENT I: EYE CONTACT

Several reports in Fred's medical history records commented on his inability to focus his eyes on those of a person looking at him. The following observations are typical: "Eye focus and adjustment are very poor (he usually rolls his eyeballs upwards when asked to look straight at a person's face) He resisted efforts to look at the examiner face to face He will hardly ever face this examiner." This experiment was designed to train Fred to focus on another's eyes. A control procedure was used to evaluate the function of the reinforcement contingency.

Method

Response measurement. It is difficult to assess directly the reliability of a person's judgment of eye contact between himself and another person. An indirect assessment was made in Risley's (1968) study; the amount of time the subject spent looking at the experimenter's face was measured by an observer behind a one-way mirror. This observer's measurements of duration correlated highly with the experimenter's records of the number of eye contacts. In the present experiment, several observers independently agreed that the appearance of Fred's eyes was distinctively different when he was and was not looking at one's eyes. Before training, his eyeballs normally were rolled far upwards or to the side, so that chiefly the whites were showing. When looking at a person's eyes, the pupils of his eyes were centered between his lids, and little white could be seen. As several persons who knew Fred agreed that these two classes of response were easily discriminable, the judgment of the experimenter was accepted as sufficient evidence of the occurrence of the behavior.

An eye contact response was defined as an

orienting of the subject's eyes toward the experimenter's eyes. Even the briefest glance was originally recorded as a response. However, the topography requirements of a correct response were systematically changed in the succeeding stages of the experiment as described below.

Reinforcer. For this experiment, the reinforcer was a sip of liquid, usually a soft drink, but occasionally milk. Correct responses were always followed by verbal praise from the experimenter, such as "That's right", or "Good". An inappropriate response was followed by "No", and, after the initial seven training sessions, a 10-sec pause period.

Procedure

Shaping eye contact. On the first day of this type of training, the experimenter said: "Fred, look at me", while she held a cup containing a sip of soft drink close to her eyes. At first, Fred received the drink and verbal praise for a glance at the cup. On the eighth trial, he looked at the experimenter's eyes and a reinforcer was given for that. After the tenth trial, when told "Look at me", he consistently looked at the experimenter's eyes. As the session progressed, the cup was hidden in the experimenter's hand, though still held at eye level. Two looks were then required before the soft drink was given, while each correct response continued to be followed by verbal praise.

As training continued, a marble was substituted for the cup, the marble was then held near the experimenter's eyes but concealed, and finally nothing was held next to her eyes. In addition, the number of eye contacts following instructions to look was gradually raised to between eight and 10 before Fred was given the soft drink. After seven sessions of this shaping procedure, Fred would look briefly at the experimenter several seconds after being instructed to do so, though often only after a number of such instructions. About 15 reinforcers were given in connection with this procedure in each of the seven sessions involved. This initial shaping procedure is similar to that reported by Risley (1968).

Shaping latency. To decrease the latency of eye contact, the following procedure was introduced in Session 16: Fred was instructed at the beginning of each session: "When I say 'Look at me', you look at me as soon as you

can." Correct responses were praised and reinforced with a sip of liquid; responses of too long a latency or non-responses within the time limit were followed with "No, too slow", and a 10-sec pause. Initially Fred was required to look once briefly at the experimenter within 5 sec. After the first 30 trials of Session 16, the requirements were gradually increased, so that by Session 19 Fred was required to look at the experimenter within 3 sec of the instruction, and then to look twice more before the reinforcer was delivered. After the first eye contact, the experimenter said: "That's it", after the second, "That's it", and after the third, "Good, here's the coke". This procedure resulted in Fred's looking at the experimenter briefly several times within 3 sec of being instructed to look.

Training eye contact. To increase the duration of eye contact, Fred was required to continue looking at the experimenter for 3 sec after meeting the latency criterion, which, beginning with these sessions, was kept at 2 sec. At the beginning of each session, he was instructed: "When I say 'Look at me', you look at me as soon as you can, and keep on looking." On each trial, the experimenter said: "Look at me". When Fred did, he was told, "Good, keep looking", and 3 sec later, "Very good. Here's the coke". If he did not meet the latency requirement, he was told: "No, too slow", and a 10-sec pause followed. If he did not maintain his gaze, he was told: "No, you looked away", and a 10-sec pause followed.

This procedure was used from Session 20 through Session 42. The training was usually conducted immediately after the first 60 trials on the two-choice discrimination problems; it took approximately 6 or 12 min, depending on whether approximately 25 or 50 instructions to look were given. The experimenter recorded whether or not each of Fred's looks had met the latency and the duration criteria.

Eye contact during sentences. In this procedure, Fred was required to meet the 2-sec latency criterion and to maintain his gaze on the experimenter's eyes while emitting a short sentence in response to a question from the experimenter. This procedure was introduced in Session 43 without explanation. The experimenter said: "Look at me." When Fred had met the latency criterion, she immediately asked a question requiring a sentence answer. If Fred maintained his gaze while speaking,

the response was reinforced; if he did not, he was told: "No, you looked away", and a 10-sec pause followed. Approximately 50 trials were run each session from Session 43 through Session 54, and in Sessions 61 and 62, taking approximately 7.5 min each day. The experimenter recorded whether or not the latency and the duration criteria were met.

Reinforcement of other behaviors (DRO). This procedure was employed from Session 55 through Session 60, after which reinforcement for eye contact was reinstated for the final two sessions of the experiment. In the DRO procedure, Fred was told: "Look at me." Whether he did or not, he was asked a question. If he maintained his gaze while answering, he was told: "You kept looking", and after the data for that trial had been recorded, the next trial was initiated. If he did not maintain his gaze while answering the question, he was told: "Good. Here's the coke", and given the reward. The experimenter recorded whether the latency and duration criteria had been met, and whether Fred was given a reinforcer. Each session lasted about 33 trials.

Results

When the reinforcement contingency required Fred to look at the experimenter soon after the instructions, and then, later, to maintain this look, he was able to perform this response. The initial data from the shaping procedure are described in the Procedure section above and not repeated here.

Training eye contact. Fred was able to maintain his gaze on the experimenter's eyes for 3 sec on 74% of the trials during reinforcement training. He showed an initial improvement in the shaping period as the criteria for reinforcement became increasingly strict, but his performance changed little when conditions were constant. The data for the final four sessions of shaping and for the training sessions are presented in the left side of Fig. 3. The 10-day home visit was followed by essentially no change in performance.

When Fred was required to maintain his gaze while emitting a short sentence, the proportion of maintained looks decreased markedly, averaging 43% over the 12 training sessions with this procedure (see Fig. 3).

Reinforcement of other behaviors (DRO) resulted in Fred's looking at the experimenter

Fig. 3. Eye contact training. The criteria that responses had to meet to be classified as correct are described in the text.

considerably less than at any other time during this training. When reinforcement for eye contact during sentences was reinstated in the last two sessions, Fred immediately resumed looking at the experimenter, and the proportion of maintained looks approximated that in the final sessions of eye contact-contingent reinforcement following the emission of short sentences (see Fig. 3).

Discussion

This experiment demonstrated that Fred could learn to look directly at another person when the reinforcement contingencies supported such behavior. These findings agree with those of Risley (1968), who showed that he could increase the frequency of brief eye contacts with his subject.

The present experiment showed that the topography of the response could be changed as well: the latency of eye contact after instructions decreased and the duration of the contact increased. Further, the abrupt and marked decrease in looking at the experimenter, which occurred when behaviors other than looking were systematically reinforced, and the rapid recovery when the contingency was reinstated, showed that it was the reinforcement contingency that functioned to alter Fred's looking behavior, rather than some other factor such as acquaintance with the experimenter, increased ease in the experimental situation, or other non-experimental cause. That a reversal could be obtained indicates that within the limits of the training up to that time, the response consequences continued to have an important role in the maintenance of eye contact between Fred and the experimenter.

An attempt was made to measure the generality of the change in the extent to which Fred's eyes contacted the eyes of other persons. Fred engaged in brief daily conversations with the experimenter and with a neutral individual. During these conversations, eye contact was surreptitiously measured. Over the course of the study, eye contact with the experimenter increased slightly, while eye contact with a neutral individual was minimal and showed no appreciable increase. Thus the amount of generalization, while small, appeared to be related to the similarity of the situation in which it was measured to the situation in which Fred had been trained originally.

Of the many of Fred's responses being measured, the only performance change that followed the home visit was a decrease in the amount of looking at the experimenter during their brief conversations. It is possible that Fred's parents unintentionally reinforced behaviors other than eye contact when talking with him, and that the observed decrement was the result of generalization from this home training; it is also possible that this decrement was due to other unmeasured and uncontrolled variations in the environment.

NON-LABORATORY TRAINING

Once it had been ascertained that Fred was able to discriminate his behavior to visual cues in the experimental environment, we attempted to manipulate some aspects of his daily life so that he would be required to respond to additional visual cues there also. Experimental contingencies were introduced by the experimenter or by the ward aides under the supervision of the experimenter.

EXPERIMENT I: CAFETERIA LINE

Fred ate three meals a day in the institution cafeteria, where a variety of items had to be taken from a long counter, placed on a tray, and carried to a designated table before he could eat. Initial observations of his behavior in the cafeteria line indicated that Fred obtained some items for himself, often after feeling about for some time in the vicinity of the item, and was given other items by the aides, by other boys from his ward, and by the kitchen staff. Often he would leave the end of the line without all the items he could

have taken, *e.g.*, a napkin, dessert, or a glass of water.

Method

Beginning after Session 9, a record was kept of how Fred had obtained each of the items on his tray at the end of the cafeteria line. Thus the behavioral measure was the per cent of available items secured without help. Only the lunch meal was observed. Initially, these records were kept by the experimenter, later by the assistant. The recording of these two individuals agreed perfectly on the four days during which both kept records.

After records had been obtained for 18 lunch periods, the aides were instructed to refrain completely from giving items to the boy. He was told by them that if he did not select an item for himself, no one would give it to him, and he would not be allowed to return to the line to get it later. This new procedure was supervised by the experimenter; if an aide forgot and gave the boy an item, it was immediately removed from the tray. Similarly, any item given him by kitchen workers or other boys was removed, so that he ended up with only those items he himself took. The aides often verbally indicated items which he was about to pass by, but he was never assisted in getting such an item. His behavior in the lunch line was recorded for 18 days with this procedure in effect. Although the aides reported carrying out the same procedure in the breakfast line during this period, neither the experimenter nor her assistant was present at breakfast to verify that this was done. Different aides supervised dinner, and no report is available as to what happened at that meal.

At this point in the training, the aides' assistance was reintroduced to determine if the experimental withdrawal of help had been responsible for the alteration of Fred's behavior. The data obtained during this period are not strictly comparable to those of the baseline period. In that part of the experiment, the aides had helped Fred obtain items, assuming that he could not see. Now, however, they knew that he was able to take all of the items for himself without assistance, and it was difficult for them to behave as they had during the baseline period. Nonetheless, the following procedure was established: on the first day of reinstatement, the aides gave

the boy eight of the 12 items before he would have had the chance to get them for himself. On the succeeding six days of this procedure, Fred went through the cafeteria line with no assistance; as soon as he sat down, the aides brought him any items missed, and made comments about how they wanted to help him.

In the final phase of this experiment, Fred was once more told he would have to get his food for himself. Eight more days were recorded.

Results and Discussion

During the initial baseline period of observation, the aides frequently assisted Fred in obtaining items in the cafeteria line by handing him dishes and by putting his hand on dishes for which he had been feeling. Fred obtained by himself from three to eight of the 12 available items, averaging six of 12 items obtained without assistance. When he was no longer given assistance, the proportion of available items obtained increased until he took nearly all the items (see Fig. 4). Of 46 items available on the last four days of this portion of the experiment, Fred took all but dessert and butter, once each.

Fig. 4. Self-help in the cafeteria line. Typically 12 items were available during each lunch period. On the thirty-seventh day, Fred was given eight of 12 available items before he was able to get them for himself. For this reason, the data on that day were not obtained under the same conditions as the other data points in this figure.

On the day that assistance was reinstated by having the aides hand Fred many items, he was not given the opportunity to help himself (see Fig. 4). On the six succeeding days, he helped himself somewhat more than during the initial baseline period, but less than on the final days of the time in which he was

getting no assistance. When assistance was again withheld and Fred was told repeatedly that he would get no more help, he obtained for himself nearly 100% of the items.

Ayllon and Azrin (1964) increased the proportion of patients who picked up a knife, fork, and spoon in a cafeteria line. They did this by instructions and by giving patients who obtained the correct utensils extra items of food, or by enabling those who made the correct response to avoid a brief delay in obtaining their food. In the present experiment, Fred received no additional consequences when he selected items for himself. The increase in Fred's self-help in the cafeteria line appeared to be a function of a combination of instructions to help himself and withdrawal of previously provided assistance. Obtaining the available items appeared to maintain Fred's behavior in the absence of additional consequences.

This experiment demonstrated that one factor preventing Fred from using visual cues for self-help was the assistance provided to him by other persons. The changes in his behavior coinciding with the various experimental manipulations indicated his sensitivity to the amount of help provided. When he was required to be on his own, he managed very well; when he was helped, he relied on this assistance.

EXPERIMENT II: EATING BEHAVIOR

Fred's eating behavior was not that of a normal 16-yr-old. He ate only with a spoon, refusing a fork if it was offered to him. With the spoon, he scooped at the food on his plate, pushing much of it off the left side of the plate onto the tray, from which he ate it with his hands. He did not look at his plate as he ate; he often set a glass of liquid down on some uneven surface, causing it to spill. Training of Fred's eating behavior was initiated to demonstrate another instance in which he could learn to respond to visual cues in his daily life.

Method

Procedure. After an initial period of recording Fred's eating behavior, the experimenter trained him during lunch in the use of the fork, in the correct utensil for various foods, and other aspects of normal eating. Much of the training was done by instructions

and criticism. In addition, when Fred brought a utensil to his mouth with no food on it, his plate was removed for 10 sec, and he was told, "Nothing on the fork", or other suitable comment. After 11 days of training, occasional lunch periods were recorded during which the experimenter was not present.

Recording eating behavior. Eating behavior was divided into three categories, and instances of each category were recorded as they occurred during successive 10-sec intervals during the meal. The categories were (a) appropriate eating: what is socially acceptable, (b) appropriate but sloppy eating, and (c) inappropriate eating. Observers carried a list of the specific responses assigned to each category.

Reliability of observation records. For the first 19 days of observations, the experimenter recorded the behavior. For the next four days, both the experimenter and her assistant made observations, discussing each day's recording after it was completed, but having no knowledge of each other's scoring during the observation period. For the remainder of the study, the assistant recorded the behavior.

Reliability measures were calculated following the procedure used by Etzel and Gewirtz (1967): an agreement was defined as the simultaneous checking of a response category by both observers; a disagreement was defined as the checking of a category by the experimenter and not the assistant, or *vice versa*. An agreement about the nonoccurrence of behavior in any response category was not counted as an agreement. This procedure for computing reliability yields a more conservative estimate of the agreement between raters than one which includes agreement about non-occurrences.

The agreement percentage and total number of intervals on which each figure was based for appropriate eating, appropriate but sloppy eating, and inappropriate eating were 47% (38), 65% (26), and 80% (65), respectively. Reliability figures were derived from 44 min of simultaneous observations during four meals. Since the figures showed a relatively low amount of agreement in judgments about appropriate eating and appropriate but sloppy eating, these data are not reported. However, the agreement obtained in scoring inappropriate eating was adequate, and these data are reported. Table 1 describes the re-

Table 1

Responses Scored as "Inappropriate Eating"

Uses hands instead of correct utensil
Uses wrong utensil
Moves food around on plate without picking it up (even with correct utensil)
Eats from empty utensil (even if correct one)
Eats food spilled on tray (even with correct utensil)
Holds dish up off tray entirely, or tips it up on one side
Waves eating utensil
Sticks out tongue with or without food on it
Spits out food

sponses scored as being inappropriate eating behavior.

Results and Discussion

Training by the experimenter resulted in a marked decrease in the amount of Fred's eating behavior scored in the inappropriate eating category (see Fig. 5). When the experimenter withdrew after some training had occurred, Fred's eating behavior returned to approximately the pattern observed before any training.

This experiment demonstrated that Fred's inappropriate eating could be markedly reduced. One aspect of this reduction was that he less often had no food on the eating utensil when that utensil was brought to his mouth; this change appeared to depend on the use of visual cues. Within the limits of this experiment, Fred's eating behavior was not altered to the point where it evidenced improvement in the absence of the experimenter, but nothing indicates that this could not eventually occur.

Fig. 5. Elimination of inappropriate eating behavior. During the training periods, the experimenter instructed, praised, criticized and interrupted Fred's eating behavior; in the periods of no training, she did not interact with him during the meal.

As in the preceding experiment, when individuals in Fred's environment reinforced behavior dependent on the use of visual cues, he was able to produce such behavior; when such behavior was no longer reinforced, as in eating in the absence of the experimenter, the former behaviors reappeared.

CONCLUSIONS

In this experiment, seeing was defined in terms of non-verbal behavior with respect to stimuli. The subject, Fred, who had been diagnosed as blind, was assumed to see those objects and only those objects to which he could make a discrete, observable response. In these terms, we were concerned with the extent to which we could increase the amount of control which visual stimuli had over Fred's non-verbal behaviors. This contrasted with other types of treatment of persons diagnosed as functionally blind, in which much time is often devoted to the individual's verbal reports of his inability to see.

The present work, together with that of Brady and Lind (1961), and Zimmerman and Grosz (1966), demonstrated the therapeutic benefits which may result from direct manipulation of the consequences of the "blind" individual's non-verbal interactions with the environment. These experiments collectively showed that sighted individuals who are barely responding to visual cues can be trained through reinforcement procedures to rely so much more extensively on visual stimuli that others no longer label them as "blind".

Further, this body of research suggests that once new behaviors have been learned by an individual, it is important that these new behaviors be supported by appropriate new responses on the part of the people around him. For example, the subject studied by Brady and Lind, and Grosz and Zimmerman (1965), began reporting that he could not see within a few months after he had been discharged from the hospital as sighted. One possible explanation for this might be that behaviors related to blindness were reinforced once he had left the hospital. In the present experiment, the results of the generalization tests of eye contact training, and the two non-laboratory experiments, supported this point. We found limited spontaneous unreinforced generalization of eye contact training. How-

ever, when generalization to new situations was supported by explicit reinforcing consequences, as in the cafeteria line and eating behavior experiments, Fred began to use additional visual cues.

Ayllon and Azrin (1964) showed that behaviors can be rapidly established in humans through the use of instructions, though the behaviors must be followed with reinforcing consequences in order for them to be maintained, once they have occurred. On the basis of their report, we used instructions with Fred at every opportunity, to save time by indicating to him the behavior that was going to be reinforced, rather than shaping the correct response with the reinforcement contingency. For example, in the two-choice discrimination tests, Fred was told which was the correct stimulus and was instructed to point to it, before training on each new pair of stimuli. However, the role of these instructions was not evaluated.

To the best of our knowledge, Fred developed no "other manifestations of hysteria" during the experimental period.

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