CONTROL OF THE BEHAVIOR OF SCHIZOPHRENIC PATIENTS BY FOOD[1]

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Operant-conditioning principles using food as a reinforcer were applied to control the behavior of 45 chronic schizophrenic patients. The investigation was conducted in a psychiatric ward in which there was 24-hr environmental control.

In order to use food as a reinforcer for controlling psychotic behavior, it was necessary first to deal with the eating deficits in the patients. Approximately 50% of the ward population was selected because of a history of refusal to eat. Their refusal to eat had remained relatively unaffected by one or more of these treatments: spoonfeeding, tubefeeding, intravaneous feeding, and electroshock. These treatments were discontinued, and the patients were left alone at mealtimes. The results show that social reinforcement in such forms as coaxing, persuading, and feeding the patient tend to shape patients into eating problems so they are conditioned to eat only with assistance. When refusal to eat was no longer followed by social reinforcement, the patients soon started eating unassisted. When access to the dining room was made dependent upon a chain of responses including a motor and social component, all patients learned these responses.

Attempts to control the behavior of schizophrenic patients have relied heavily on the use of reinforcers such as candy, cigarettes, and money (Lindsley, 1956; King, *et al.*, 1957; Hutchinson & Azrin, 1961). To improve the limited effectiveness of these reinforcers, Lindsley (1956) studied the reinforcing characteristics of a wide range of stimuli. For example, he has used such reinforcers as religious pictures, auditory feedback, and music. These reinforcers have proved to be effective for some individuals, but not appropriate for general use. In research with humans, a powerful reinforcer is greatly needed which will have general application irrespective of such variables as age, intelligence, or psychological deficits. One such reinforcer is food.

The advantages of using food as a reinforcer are self-evident. Indeed, the control of psychotic behavior may be made more effective by marking food contingent upon desired behaviors. Since most experimenters are keenly aware of the possibilities of food as a reinforcer one may well wonder why it has not been used. The most probable reason is the administrative difficulties encountered in controlling food in the patient's environment.

As part of a programmatic research in the development of techniques for the control of psychotic behavior, we attempted using food as a reinforcer. However, in the planning stages of this investigation, we learned that a number of schizophrenic patients refused food and required special treatments to prevent possible starvation. Therefore, attempting to use food as a reinforcer of general application seemed unreasonable. An inquiry indicated that "eating problems" were often regarded as symptoms of the patient's "mental condition." Many of these patients exhibited delusions or made peculiar statements regarding food. For instance, some insisted the food was poisoned, others claimed God forbade them to eat, and so on. Frequently, a "dynamic" interpretation was found in the patient's file to explain his refusal to eat. Other times, "psychotic intrusions" and lack of "reality contact" or "ego identification" were also advanced as explanations. All of these interpretations seemed to point to one conclusion: eating problems can be modified only if the patient's mental state is modified first.

[1]This report is based, in part, on a 2-year research project conducted at the Saskatchewan Hospital, Weyburn, Saskatchewan, Canada, and supported by a grant from the Commonwealth Fund. Grateful acknowledgement is due to H. Osmond and I. Clancey of the Saskatchewan Hospital for making the research possible at this institution. The advice and criticisms of J. Michael, I. Goldiamond, and N. Azrin are also greatly appreciated.

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Refusal to eat is observed in most mental hospitals. The treatment varies from hospital to hospital, and, indeed, from ward to ward. Often, a patient requires only a personal "reminder," such as when the nurse[4] looks for the patient at mealtimes and lets him know that he had better go to the dining room to eat. Other times, the nurse takes the patient by the hand to eat. If the patient complains of the food being poisoned, the nurse may ingest a few spoonfuls and say, "Look, I'm eating the same food you have; you can see it is not poisoned." If the patient's eating behavior remains unaltered, spoon-feeding, tubefeeding, intravenous feeding, and electroshock treatments are often used. Although the patient may start eating after any or all of these treatments, many patients do so only for short periods of time. Those patients who require "constant supervision" are regarded as chronic eating problems.

Such considerations form the background for the problems concerning the schizophrenic's eating behavior. Clearly then, we had to first determine if food alone would control normal eating behavior in schizophrenic subjects, including those patients known as chronic eating problems. Only then could we proceed to study the effects of food as a reinforcer.

THE EXPERIMENTAL WARD AND CONTROL OVER THE REINFORCEMENT

This study was conducted in a mental hospital ward, to which only authorized personnel were allowed access. The dining room was the only place where food was available, and entrance to the dining room was under full experimental control. Water was freely available at a drinking fountain on the ward. None of the patients had ground passes or jobs outside the ward.

EXPERIMENT I: CONTROL OF NORMAL EATING BEHAVIOR OF SCHIZOPHRENIC PATIENTS BY FOOD

Subjects

The *Ss* were 32 female patients in a mental hospital. Seven of these patients were selected solely because they were regarded as eating problems and because they were able to walk. Before they were admitted to the experimental ward, these patients had been spoonfed, tubefed, or given electroshock therapy when they refused to eat. The remaining 25 patients were selected at random from a population of long-standing schizophrenic patients. The median for continuous hospitalization for all patients was 20 years. The median age for the group was 54 years. The diagnostic categories for the patients were: 30 schizophrenics, 1 mental defective, and 1 patient suffering from involutional depression.

No medications were given to 28 of the 32 *Ss* during the investigation. Phenothiazine derivatives were administered to 4 patients.

Procedure

The traditional treatments for eating problems were discontinued. Patients were no longer coaxed, reminded, led, or escorted to eat. They were not spoonfed, tubefed or subjected to electroshock therapy.

In order to bring eating behavior under the sole control of food, the nurses were kept away from the patients at mealtimes. In so doing, the social reinforcement in the form of attention and sympathy for refusal to eat was removed. If the patient was to eat a meal, she had to walk into the dining room without any coaxing, persuasion, or guidance from the nurses. To insure objectivity of recording, the response recorded was "entering the dining room." Eating invariably followed this response; therefore, the terms eating and entering the dining room are used interchangeably.

At mealtime, a time interval of 30 min was allowed for the patients to be admitted to the dining room. Patients were not told of the time limit. A nurse called the meal and opened the dining room; and at the end of the 30-min interval, the door was locked and no patients were allowed to enter.

Results

The eating problems of the schizophrenic patients were eliminated. As Fig. 1 shows, the patients with eating problems showed a low percentage of meals eaten upon the removal of all assistance for taking meals. These patients maintained a stable percentage of eating when access to the dining room was

[4]As used in this paper, "nurse" is a generic term, including all those who actually work on the ward (attendants, aides, and psychiatric and registered nurses).

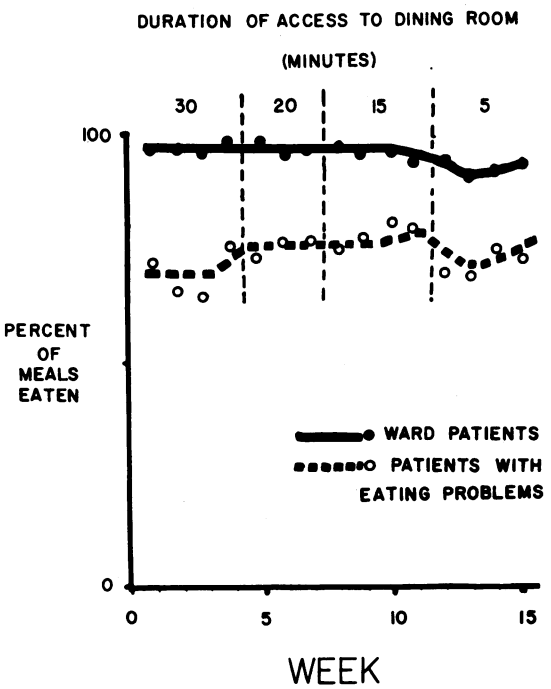

Fig. 1. The unassisted eating by mental patients. All assistance, persuasion, and spoonfeeding at mealtimes were removed. Following meal call, access to the dining room was gradually reduced from 30 min to 20, to 15, and, finally, to 5 min.

limited to 30 min. After 4 weeks, only 20 min of access to the dining room was allowed. Under this reduced access time, the patients still maintained a stable eating behavior. Even when only 15 min of access time was allowed, the patients continued eating their meals. The time limit for entering the dining room was then reduced further to 5 min. Only under this stringent requirement did the patients show a slight temporary drop in the percentage of meals eaten. The rest of the ward patients showed a similar stability in the percentage of meals eaten, and also a slight drop when the time limit for access to meals was lowered to 5 min. The main difference between these two groups of patients lies in the overall percentage of meals eaten.

The eating behavior of two patients differed somewhat from that of the rest of the patients. One patient stopped eating for 7 days, and then was given milk, concentrated protein, and multivitamins intermittently. In time, she was maintained on a fluid diet of 1200 to 1500 calories per day, and received this at the same time other patients received medications. She was kept on this regimen for 110 days, so that she lost 18% of her body weight. Thereafter, she started going to the dining room. Another patient who suffered from obesity stopped eating for 15 days, drinking only water during this time. At the end of this fast, she had lost most of her excess weight (15% of the original weight). At this time, she resumed going to the dining room with all of the other patients.

Discussion

These findings demonstrate that the control of the eating behavior of schizophrenic patients by food alone is feasible. Even patients who fasted for long periods eventually came under the control of food.

Of course, the development of normal eating in schizophrenic patients did not occur immediately. Initially, patients engaged in a wide range of behaviors directed at seeking encouragement and physical assistance from the nurses. For example, some patients went as far as the dining room door but remained standing there, as if waiting for the nurse to ask them in. Other patients waited in a similar expectant manner for as long as 25 min before going to eat. Often, the patients informed the nurse that they had not eaten and solicited encouragement to do so. For example, one patient said to a nurse, "I haven't eaten yet today, should I go eat now?" When confronted with these behaviors, nurses made no comment, of course. Instead, they acted as if they had not noticed the patient's efforts to obtain help. Since the nurses did not force the patients to eat, several patients arrived late for the first few meals. Because none of the help-seeking behaviors commanded attention from the nurses, they gradually disappeared.

In contradiction to the psychiatric theories, warnings, and cautions of the ward and professional staff, these findings show that psychotic patients will eat and will do so without assistance. Indeed, this assistance appeared to produce whatever eating problems existed. This finding is made more significant considering that seven patients were selected because of a long history for being helped to eat. Most patients ate about 90 percent of the available meals; but the patients with eating problems ate about 70 to 80 percent. Except for the difference in the percentage of meals eaten, all patients learned to eat unassisted.

The eating behavior of two of the patients took somewhat longer to come under the control of food alone. One patient who fasted for 15 days had a 17-year history for requiring "personalized" help to eat. She had refused to eat unless the head nurse personally took her to the dining room for every meal. Since the patient's "requirement" to eat could not always be met (the head nurse had days off), she intermittently allowed others to take her to the dining room to eat. The other patient who fasted for 7 days had required some degree of persuasion and coaxing to eat for the past 3 years. Although both patients stopped going to the dining room for varying periods of time, they resumed eating without persuasion, coercion, or the use of electroshock treatment. Despite their failure to eat, both of these patients were maintained in excellent health.

The fact that these patients were not only able to eat their meals without assistance, but, in addition, learned to meet the temporal demands was a revelation to the nurses. However, when the 5-min limit was introduced, the nurses were extremely wary about the advisability of such a move. The main objection was that it was such a short time interval that only with a watch could the patient succeed in going to meals on time. Because the patients were given no information whatever about the time limit, the nurses regarded this 5-min interval of time as one that would be extremely difficult for the patients to meet.

Neither psychiatric diagnosis nor body weight were related to the development of eating problems. For example, some schizophrenic as well as mental defective patients had a history of eating difficulties. Likewise, a subject weighing over 200 pounds had a long history of refusing to eat, and so did a subject of 75 pounds. Fears concerning the imminent danger of starvation in lightweight subjects were unfounded. Both heavy and lightweight *Ss* eventually ate when refusal to eat was no longer followed by social reinforcement.

These results lead to two conclusions: 1) problem eaters are actually encouraged (shaped) by their social environment to refuse food; and 2) food is a sufficient reinforcer to control normal eating behavior of schizophrenic patients.

EXPERIMENT II: CONTROL OF THE MOTOR BEHAVIOR OF SCHIZOPHRENIC PATIENTS BY FOOD

Subjects

After we had proved that patients will eat, we were now in a position to use food as a reinforcer in the development of motor responses.

In order to increase the generality of our findings about the control of normal eating by food, 6 patients regarded as feeding problems were added to the previous group. This addition made a total of 38 patients, 13 of whom were selected because of a history of refusing food. The median length of hospitalization for these 6 patients was 16 years; their median age was 49 years. All 6 *Ss* were diagnosed as schizophrenic. One *S* received barbiturates, and the other 5 *Ss* received no medication.

Procedure

The patients were required to drop a penny into the slot of a collection can to gain entrance to the dining room. In addition, access to the dining room was limited to 5 min from the time of meal call. The development of the coin as an S^D for entering the dining room was begun by having a nurse distribute a penny to each of the patients congregated outside the dining room door at mealtime.

In anticipation of difficulty, some shaping was used in this experiment. The first day of Experiment II, the 5-min access to the dining room was increased to 10 min per meal. However, after the second day, the time interval was again reduced to, and maintained at, 5-min. The nurses also used verbal shaping on the first day. The nurse told the patients, "Give this penny to the nurse when you go to eat." When the dining room door was opened, another nurse stopped the patients at the door with, "Drop the penny in the collection can, please." (The nurse pointed to the can placed outside the dining-room door.)

Results

All patients learned the motor response required to obtain food reinforcement. Figure 2 shows that both the original patients and the new ones added for this experiment showed

a gradual development of the motor response. The segment of Experiment I immediately preceding Experiment II is included here by way of comparison. In the transition from Experiment I to Experiment II, the behavior of the original patients shows a temporary drop followed by a nearly complete recovery.

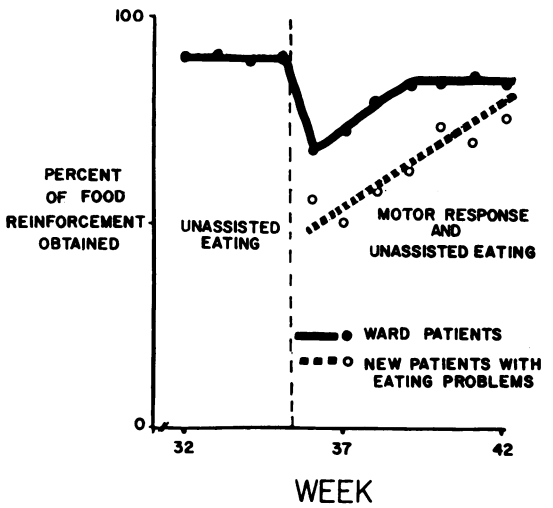

Fig. 2. When an additional requirement (motor response) is added to the requirement of meeting a time limit to obtain food reinforcement, the percentage of food reinforcement obtained initially decreases. As the response develops, the percentage of food reinforcement obtained increases to approximately its previous level.

The motor response of the new patients reached a level comparable with that of the original patients. The difference between them is less than 10%.

Discussion

Irrespective of the patient's history concerning eating, all patients learned the motor response. The acquisition of motor behavior was gradual for both the original and new patients. Initially, patients displayed behaviors which suggested the difficulties in developing the penny as a discriminative stimulus.

The first day, a few patients took the penny; others simply shrugged and went away; some refused the penny; and still others did not acknowledge the nurse's presence. During Experiment I, patients learned that failure to find the dining-room door open led to missing that meal. However, in Experiment II, patients were excluded from the dining room although the door was open. Without the penny, the patients missed the meal. As a result, the penny became the S^D for admission to the dining room.

Up to this point, little verbal interaction was observed among the patients. However, during the first 2 weeks of this experiment, the verbal interaction reached a relatively high frequency. The content of these verbal interactions was largely circumscribed to events associated with meals. For example, some patients asked how to get pennies. Others commented on their having been too late to eat. Once, a patient helped another to eat by "lending" her a penny.

The behavior of picking up a penny and dropping it in a slot was at first viewed with alarm by the nurses. Several arguments were offered to support their fears. It was suspected that patients would lose or throw away their pennies, or, worse yet, eat them. Because of their long period of hospitalization, the patients were regarded as "incapable of knowing" what the pennies were intended for. In addition, dropping a penny in a slot was considered a difficult task for patients who hallucinated so much that their symptoms would interfere with the completion of the task. Another argument was that patients would hoard pennies at the risk of starving rather than part with them. These fears were unfounded. All patients learned to execute the motor responses in the desired manner.

EXPERIMENT III: CONTROL OF THE SOCIAL BEHAVIOR OF SCHIZOPHRENIC PATIENTS BY FOOD

Subjects

Once we had proved that schizophrenics can be conditioned to execute a nonsocial motor response, we became interested in exploring the extent to which we could control social responses. The purpose of this experiment was to determine whether schizophrenics could be conditioned to cooperate with one another when the reinforcer is food.

Two patients who had been in Experiments I and II were excluded from Experiment III. The first patient was excluded because of a broken bone which required that she leave the ward; the other patient was transferred to another ward for routine tuberculosis check-up. Seven more patients with a history

for being helped to eat were added for this experiment. This addition made a total of 43 patients, 20 of whom were selected because of a history of refusing food.

For the 5 years preceding admission to the experimental ward, all seven additional patients were assisted regularly to eat their meals. Five of these patients had been given a food tray on the ward at mealtime. The food tray was placed on a table in front of the patient while a nurse sat with her to supervise her eating. Because these patients had eaten under these circumstances, the nurses had not regarded them as eating problems. The other two patients had been taken by the hand to the dining room to eat, and were intermittently spoonfed until they started to eat by themselves.

The median length of hospitalization for the seven additional patients was 21 years; their median age was 55 years. Five patients were diagnosed as schizophrenic, and two were diagnosed as mental defective. Only two of these patients received medication: one received a phenothiazine derivative; and the other, barbiturates.

Procedure

In Experiment II, all patients learned to execute the motor response that admitted them into the dining room, *e.g.*, obtaining the penny from the nurse and dropping it into the slot. After the penny was established as the S^D for admission to the dining room, the next step was to make receipt of the penny dependent upon a cooperative response between two patients.

For the present experiment, a device was designed which functioned upon the co-ordinated effort of two people; thus, the term "social response." The device consisted of a table with one doorbell button at each end and a red light and buzzer in the middle. When the two buttons were pressed simultaneously, the light-buzzer came on. When only one was pressed, the light-buzzer remained off. Since the buttons were 7 1/2 ft apart, one person could not press both of them at the same time.

To allow sufficient time for the proper execution of the social response, the device was available for the 5 min immediately preceding the meal call, and also during the 5-min duration of access to the dining room. Verbal shaping was used the first week to facilitate learning the response. The instructions used to shape the patients were minimal; *e.g.*, "Push the button and see what happens," or "It takes two people to make the buzzer go." When two patients pressed the buttons, the light-buzzer came on and the nurse handed a penny to each "partner."

This social response enabled the patients to obtain the coin, but did not allow them free access to the dining room. Admission to the dining room required that the patient also insert the penny into the slot. Hence, the social response was required in addition to the motor response.

Results

The original patients, as well as the new ones added for this experiment, learned the social response necessary to obtain the coin; when they inserted the coin into the can, they had access to food reinforcement.

Figure 3 shows that after the 1-week period of response shaping, both groups showed a gradual development of the social response. Again, in the transition from one behavioral requirement to another, an initial temporary drop in the behavior was observed. Only one patient failed to develop the social response.

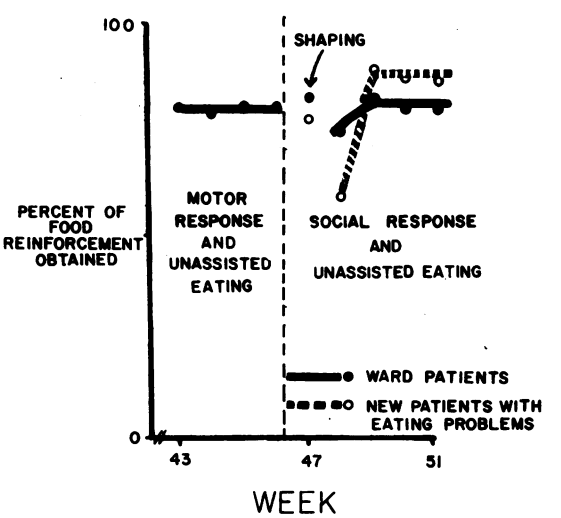

Fig. 3. When an additional requirement (social response) is added to the requirement of meeting a time limit and making a motor response, the percentage of food reinforcement obtained initially decreases. As the response develops, the percentage of food reinforcement obtained increases to approximately its previous level. Development of the social response required some shaping.

This patient continued paying for meals by finding pennies, and even dimes, which she exchanged for pennies. Since the S^D for entering the dining room was paying a penny, the nurse admitted her to eat.

Discussion

This experiment clearly demonstrates the feasibility of exacting co-ordinated social behavior from chronic schizophrenic patients in a hospital.

The response of the seven patients added for Experiment III followed the same general general trend observed previously with eating problems. During the first few meals, the patients typically stayed away from the dining room, as if waiting for the nurse to come to get them. Next, the patients were observed gradually nearing the dining-room door, sometimes too late for the meal. By the second or third day of not eating, the patient entered the dining room after making the appropriate responses.

Verbal shaping was used only during the first week, but many patients neither acknowledged the nurse's presence nor followed the minimal instructions. Because patients were not allowed to enter the dining room without first inserting a penny, most went immediately to the table where patients were pressing the buttons. Some patients tried pressing the button in the absence of a "partner." Since nothing happened, a few banged the table, others walked away, and still others remained pressing the button until someone managed to press the opposite button. In a short time, there were two lines of patients, one behind each button.

The social responses necessary to gain access to meals produced other related responses. These were largely verbal responses directed to patients or to the nurses. Verbal behavior among patients centered about giving or receiving mutual help and information regarding the execution of the social response. The following are typical examples of this behavior. One patient approached another and asked her, "Why don't you go to dinner? You can go to dinner by asking the nurse for a penny." The patient who had been spoken to got up and went to the nurse. On another occasion, a patient directed another to the table and instructed her, "Come on, lady, push the button; it takes two." The patient pushed the button as requested, and both obtained their penny and went to eat.

Verbal responses directed to nurses also occurred in the context of the experimentally produced social responses. For example, one patient asked the nurse, "Is this some kind of new game, what are we supposed to do?" On another occasion, a patient was pressing the button repeatedly in the absence of a partner. At this point, a patient observing this situation told the nurse, "I'll help her now if she will help me sometime," and she proceeded to press the button. Both patients obtained their pennies and hurried to the dining room.

The results of this experiment were very surprising to the staff. Because virtually all of the patients were regarded as chronic, and "out of reality contact," it seemed useless to expect them to be aware of each other. Because many patients exhibited hallucinations, *e.g.*, gesticulating and talking incessantly in the absence of a visible audience, it seemed unreasonable to the staff to expect these patients to interrupt their psychotic symptoms in time to engage in the social response demanded in this experiment. Finally, the experiment was regarded as so stressful for the patients that a "wave" of eating problems, particularly among those with a long history of such behavior, was anticipated. None of these apprehensions was supported by our results. By the deliberate, controlled scheduling of consequences, the patients learned the appropriate responses. However, unscheduled, or uncontrolled, consequences will shape the behavior of patients and staff just as effectively. Two incidents in this experiment illustrate this.

As mentioned previously, one patient was able to find the coins required for entrance to the dining room. Because inserting the coin into the slot was the sole determiner for the admittance to the dining room, she did not have to learn the social response.

Another example is that of the nurses who learned to admit the patients into the dining room upon hearing the click of the coin when it was inserted into the slot. This resulted in the occasional use of slugs, and other small metallic objects. However, this cheating by a few patients was quickly eliminated by the staff's intermittent request to see the penny before it was inserted into the slot. The moral of

this story is that consequences, whether they are scheduled or not, will shape the responses of patients and staff effectively; therefore, great care must be taken not to develop a response adventitiously.

SOME NUTRITIONAL ASPECTS ASSOCIATED WITH TEMPORARY FASTING

None of the *Ss* in this investigation became either medically or behaviorally handicapped as a consequence of the experimental procedures.[5]

The manipulation of food as the reinforcer was not attempted until there was unequivocal evidence of the safety of carrying out this experimental procedure. By careful and continuous observations of the *Ss'* behavior in and out of the dining room, sudden changes in their physical condition were prevented.

Basic nursing skills such as taking temperature, pulse, and weekly weights were sufficient to screen those *Ss* whose bodily condition required further attention. In a few cases, blood samples and urine specimens were obtained at regular intervals for medical examination. Because of the poor eating behavior of eight patients, supplementary vitamins were administered, and only one patient required a special diet to make up for a possible vitamin dificiency. (See Experiment I.) There is a 10% difference between the meals eaten between the start and conclusion of this investigation. The reason for this slight difference is largely that some patients attended meals fewer times; but when they did, they ate as much as they could. Because the amount of food that patients ate at one meal was not controlled, a few patients could afford to eat only once a day or every 2 days. During the 12 months of this investigation, 64% of the total group missed one full day of meals. Although close to 50% of the patients had a history of refusing food, only 20% of the 45 patients missed as many as 5 days of meals. Typically, patients resumed eating after 2 to 5 days of fasting. The most significant clinical aspect of these experimental procedures is the finding that 98% of the patients will take an adequate diet without any assistance. The other 2% were easily cared for through vitamins.

These results have implications for eating problems in general. First, hospital personnel have emphasized regularity of eating, and, as a consequence, have shown the patients an unusual concern with food. Moreover, in doing so, hospital personnel have tended to demand more regularity in eating from patients than one would from normals. A great deal of unnecessary physical and social coercion has been brought to bear whenever the patient has refused food. Paradoxically, there has been little concern with keeping accurate records of the patient's eating behavior. The absence of records of eating behavior has made it difficult for hospital personnel to know what the eating characteristics are for each patient. Although most hospital personnel would not allow the patient to miss more than 1 or 2 days of meals, it is clear that patients can maintain excellent health despite their poor eating behavior.

WEIGHT AS AN INDEX OF EATING

Patients were weighed every 4 weeks, and some, as often as once a week. The mean weight of the patients before Experiment I was 138 pounds, with a median of 128, and a range of 75 to 241 pounds. A comparison of their weights over a 6-mo period showed less than a 10% difference in weights before and after Experiment I. In the opinion of the ward's medical consultant, the small loss of weight was essentially of excess weight.

A comparison of the patients' weights over a 6-mo period before and after Experiments II and III indicated that 4 out of 45 patients lost more than 10% body weight. In the same period, two patients gained more than 10% body weight.

BEHAVIOR OF INDIVIDUAL PATIENTS

Figure 4, P-1, shows the typical effects of restricting access to meals by a time limit, plus the addition of motor and social responses. This record shows the characteristic drop in the level of responding each time that more complex behavior was required to obtain food reinforcement.

[5]The medical consultant for the ward was J. Horbaczewski, M.D. His close contact with the procedures on the ward insured that this investigation be carried out under strict medical supervision.

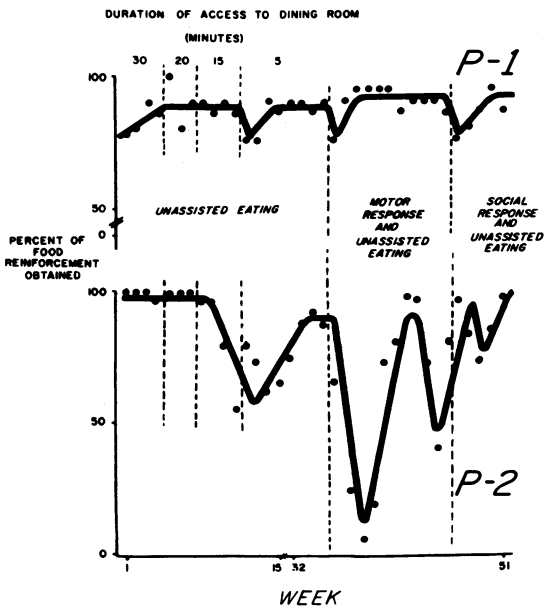

Fig. 4. Individual records of two patients. The top record (P-1) shows the typical effects of adding behavioral requirements to obtain food reinforcement. The bottom record (P-2) shows a high degree of variability seen in a few cases.

The patients' eating behavior also showed some variability. Because the experimental conditions were programmed for the whole group, in some instances a behavioral requirement was introduced at a time when an individual's behavior was not yet stable. (See Fig. 4, P-2.) Also, this variability occurred in part because the amount of food that patients ate at one meal was not controlled. Some patients went to eat fewer times; but when they did, they ate as much as they could, returning to the food counter several times during each meal.

DEVELOPMENT OF RESPONSE CHAINS

During Experiments II and III, the behavior of going into the dining room was only the final link in a chain of responses. The required responses included obtaining the coin, inserting it in the collection can, and entering the dining room. Sometimes, one or more links of the chain of responses was missing. For example, some patients obtained the coin from the nurse but either lost or misplaced it. A few times, patients exhibited the necessary chain of responses, but stopped short of entering the dining room. For example, upon being stopped for not inserting a penny in the collection can, one patient said, "Why do I have to do that, I'm the Queen." But because she was not allowed to enter the dining room, she finally inserted the penny. Never again did she make reference to being a Queen as an attempt to gain access. Another patient insisted, "I can't put the penny in." Consequently, she missed that meal; but at the next meal, she could and did "put the penny in."

Such omissions and distortions of the desired chain were drastically reduced during the experiment. Admission to the dining room was dependent solely upon the appropriate response. In time, inappropriate responses to the situation became rare.

DISCUSSION

Leaving patients alone at mealtimes served to withdraw the social reinforcement provided by the nurses for refusal to eat. This procedure was suggested by a previous investigation (Ayllon, 1960). In that study, a patient who had been helped to eat for 16 years was left unaided at mealtimes. After refusing food for 3 days, the patient started to eat on her own, without being persuaded, coaxed, or induced to eat, by any of the traditional methods. The major findings of that study were confirmed here.

During the first few meals, the patients typically stayed away from the dining room, as if waiting for the nurse to come to get them. Next, the patients were observed gradually nearing the dining-room door, sometimes too late for the meal. By the second or third day of not eating, the patient engaged in the appropriate responses preliminary to entering the dining room and eating unassisted. One conclusion is inescapable: refusal to eat, and verbal behaviors associated with it, may be conditioned through social reinforcement. Indeed, a wide range of behavioral responses may be made to increase or decrease through social reinforcement in such forms as attention or sympathy (Ayllon & Michael, 1959).

The eating behavior of schizophenics can be controlled solely by food. This generalization also applies to extreme cases, as indicated by the two patients who stopped eating for

1 week and as long as 2 weeks. Under normal hospital conditions, these patients would have been tubefed or given electroshock therapy after 2 to 3 days of refusing food. After 1 year of this work, all of the patients, including those who had a history for being helped to eat, were taking as good or better a diet than they had before this study. What is most significant is that they soon learned to do so without any assistance whatever.

These findings indicate that food is indeed a powerful reinforcer which may be used experimentally and therapeutically to develop or strengthen a wide range of normal behaviors. Contrary to the fears manifested by various psychiatric personnel, the patients were able to learn all the responses required in order for them to eat.

Medication, severity of illness, length of hospitalization, and age were not significantly related to the acquisition or maintenance of the behaviors studied. Likewise, a subnormal IQ presented no great problems in establishing the desired performance. The three mental defective patients in the group learned the behavioral responses quickly, and their performances were characteristically stable compared with those of schizophrenic patients.

A significant finding concerned the patients' verbal behavior. When patients encountered difficulties in securing their daily food, their verbal behavior increased notably. There was seldom any verbal interaction at mealtime when the patients were merely required to meet a time limit for access to the dining room. However, a large number of remarks and comments among patients occurred when access to meals was made contingent upon the motor and social responses. Two aspects of this verbal behavior are noteworthy. First, these verbalizations were usually appropriate to the situation. Second, these verbalizations took place only under stressful conditions. Typically, the patients' verbal behavior occurred during the first 2 weeks of each experimental change. Subsequently, very little verbal interaction was observed. This particular aspect of verbal behavior was also noticed by Azrin and Lindsley (1956) in an early experiment on cooperation in normal children.

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Received August 25, 1961