THE TOKEN ECONOMY: AN EVALUATIVE REVIEW[1]

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Token economies have been applied in a wide range of settings. While there are several advantages to the use of this procedure, there are obstacles that may impede its implementation and therapeutic efficacy. These include: staff training, client resistance, circumvention of the contingencies, and non-responsiveness of subjects. Studies employing token programs with psychiatric patients, retardates, children in classroom settings, delinquents, and autistic children are reviewed. Although token economies are successful while in operation, the issue of generalization of behavior gains or resistance to extinction has not been given careful consideration. Inasmuch as generalization is perhaps the most crucial issue, several procedures are presented that are designed to facilitate maintenance of performance when reinforcement is withdrawn. Methodological suggestions for investigations on token reinforcement in applied settings are presented.

Operant approaches to behavior change have become increasingly popular in recent years (see Bandura, 1969; Sherman and Baer, 1969; Ullmann and Krasner, 1965, 1969). An extraordinarily wide range of deviant and maladaptive behavior has been treated, ranging from decreasing the frequency of thumbsucking (Baer, 1962) to teaching mute autistic children to speak (Lovaas, 1968). The success of these techniques encouraged investigators to develop systems to modify the behavior of groups of individuals with maladaptive behaviors. This was made possible by using generalized conditioned reinforcers (see Kelleher and Gollub, 1962). Such reinforcers are interchangeable for a wide variety of primary and back-up reinforcers.

There are a number of advantages in using generalized conditioned reinforcers. Specifically, conditioned reinforcers: (1) bridge the delay between the target response and back-up reinforcement; (2) permit the reinforcement of a response at any time; (3) may be used to maintain performance over extended periods of time

when the back-up reinforcer cannot be parcelled out; (4) allow sequences of responses to be reinforced without interruption; (5) maintain their reinforcing properties because of their relative independence of deprivation states; (6) are less subject to satiation effects; (7) provide the same reinforcement for individuals who have different preferences in back-up reinforcers; and (8) may take on greater incentive value than a single primary reinforcer since, according to Ferster and DeMyer (1962), the effects resulting from association with each primary reinforcer may summate.

There are additional advantages in using *tangible* conditioned reinforcers, such as tokens, instead of other generalized conditioned reinforcers, such as approval. Some of these as listed by Ayllon and Azrin (1968a) are: "(1) The number of tokens can bear a simple quantitative relation to the amount of reinforcement; (2) the tokens are portable and can be in the subject's possession even when he is in a situation far removed from that in which the tokens were earned; (3) no maximum exists in the number of tokens a subject may possess . . . ; (4) tokens can be used directly to operate devices for the automatic delivery of reinforcers; (5) tokens are durable and can be continuously

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present during the delay . . . ; (6) the physical characteristics of the tokens can be easily standardized; (7) the tokens can be made fairly indestructible so they will not deteriorate during the delay; (8) the tokens can be made unique and nonduplicable so that the experimenter can be assured that they are received only in the authorized manner." (p. 77). In addition, tokens provide a visible record of improvement. This may facilitate social reinforcement from staff members, as well as self-reinforcement.

A brief explanation of the steps required to implement a reinforcement program will facilitate the presentation of the token programs in this review. Initially, identification of those behaviors to be altered is required. Investigators have emphasized the importance of specifying the responses of interest in descriptive terms in order that reinforcement can be delivered for an unambiguous response, and so that evaluation of progress through behavioral assessment can be made (Ayllon and Azrin, 1968a, p. 36; Schaefer and Martin, 1969).

After target behaviors are determined, the available reinforcers in the environment must be defined and enumerated. Back-up reinforcers for tokens may be selected on the basis of a principle elucidated by Premack (1965). The principle states that a more-probable or higher-frequency behavior may be used to reinforce a less-probable behavior. Thus, to select effective reinforcers, it is only necessary to note which responses are frequently emitted. Privileges such as "sitting around", leaving the ward, going on walks, and watching television can be used as reinforcers if their performance is of a higher relative frequency than the other behaviors that they are to reinforce. Other reinforcers included as back-up reinforcers in virtually every token program include canteen items usually displayed in a "store". At various periods of the day, clients may exchange tokens for food, cigarettes, toys, toiletries, and so on.

After target behaviors are agreed upon and reinforcers are selected, it is necessary to establish the tokens as secondary reinforcers. Verbal explanations are often enough. When instructions are not sufficient, tokens are established as conditioned reinforcers by making them discriminative stimuli for the back-up reinforcers. This is typically accomplished by giving out a few tokens immediately before the opportunity to "spend" them. After the value of tokens is established, clients are informed that they may earn tokens by performing various behaviors. Finally, the rules of the token system are provided, *i.e.,* how tokens may be earned, spent, and lost; and the system is in operation.

Although this model generally holds, programs often differ in a number of procedural details. For example, in some programs, reinforcement contingencies are the same for all people in the economy; in other programs, the contingencies are individualized. In the former case, a particular behavior is reinforced for all clients with the same magnitude of reinforcement (*i.e.,* number of tokens). In the latter case, performance of a particular behavior (*e.g.,* reading) may be reinforced for some individuals but not for others, or the magnitude of reinforcement may vary. Individualized contingencies have the obvious advantage of focusing on particular idiosyncratic problems. A number of token programs have combined the two types of contingencies. That is, use is made of group contingencies, and added to these are ways in which each individual can earn tokens depending upon his particular problems.

Programs also differ considerably in the amount of staff training provided and in procedures initiated to: (1) minimize resistance of clients to the economy, (2) prevent circumvention of the contingencies, and (3) deal with nonresponsiveness. The way in which these problems are resolved can make the difference between an effective and ineffective program. Because of this, a detailed review of these problems follows.

Staff Training[2]

The training of staff to administer a token economy represents a formidable task for the

effective use of reinforcement procedures. Perhaps more than with other procedures carried out in treatment facilities, the nonprofessional staff must be adept at employing the procedures of an operant program. Nonprofessional staff, as behavioral engineers, are responsible for what behaviors are reinforced, extinguished, shaped, punished, and so on.

Training is a formidable task because attendants and teachers often maintain inappropriate behavior by reinforcing deviant responses (Buehler, Furniss, and Patterson, 1966; Dobson, Gelfand, and Gelfand, 1967; Ebner, *unpublished*). In mental hospitals, in particular, contingencies are frequently arranged for the comfort and convenience of the attendants, rather than the treatment and training of the patients (Dunham and Weinberg, 1960; Goffman, 1961; Ullmann and Krasner, 1969). Many researchers have emphasized the importance of adequate staff training programs (*e.g.,* Becker, Kuypers, and O'Leary, 1968; Krasner, 1968; Miron, *unpublished*). Ross (*unpublished*) suggested that the staff remains the "Achilles' heel" of operant programs. Although there is no doubt that staff training is important, behavior change has sometimes been accomplished by staffs having only minimal levels of training (Kuypers *et al.,* 1968; Meichenbaum, Bowers, and Ross, 1968). Even so, a highly trained staff would appear to be an advantage. Only quite recently has there been any research evaluating training programs. Most training programs rely upon the usual academic procedures of lectures, reading, and examination. Such procedures impart knowledge of behavior principles without guarantees that staff perform appropriately

when in contact with the clients. In fact, Gardner (1972) found that rehearsing appropriate behavior in training led to superior performance than did lectures alone.

Even when staff are trained adequately, positive consequences must be associated with desirable performance. For example, Panyan, Boozer, and Morris (1970) showed that subsequent to their training program, the staff became increasingly lax in their use of skills. Once feedback was reinstated, the staff improved.

Some programs have been able to reinforce the staff with tangible reinforcers, such as salary increases, vacations, and workshift preferences (*e.g.,* Ayllon and Azrin, 1968*a*). A less-dramatic procedure was employed by McNamara (1971). He dispensed tokens to teachers that could be exchanged at the end of the day for beer.

The training of staff into effective behavioral engineers remains a crucial obstacle that must be successfully confronted for a maximally effective program. Effective implementation of reinforcement procedures with qualified staff is a prior condition that must be met before the theoretical questions regarding the application of various principles can be considered. Even when staff behaviors are effectively altered while the program is in effect, there has been little follow-up of staff behavior to ensure that these changes are maintained. Although the evidence for resistance to extinction is not encouraging (Kazdin, 1972*a;* Panyan *et al.,* 1970) one interesting study has been reported. Baldwin (1967) found that attendants, trained in reinforcement techniques on a token economy ward with retarded children, performed significantly more positive patient-oriented responses and less "custodial" responses when working on other wards than attendants without training.

Resistance of Clients to the Token-Reinforcement System

Client resistance is expressed in the form of anger, complaints, disruptive behavior, impulsive acts, rule-breaking, and requests for transfer to other wards or hospitals. Although there have

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[2]The significance of staff training in operant conditioning programs is attested to by the appearance of various training manuals for the ward personnel of psychiatric patients (Schaefer and Martin, 1969) and retardates (Bensberg, 1965), and for the parents and teachers of school children (Becker, Engelmann, and Thomas, 1971; Homme, Csanyi, Gonzales, and Rechs, 1969; Meacham and Wiesen, 1970; Mink, 1970; Patterson and Guillon, 1968).

been only a few reports of adverse reactions to the initial establishment of token reinforcement procedures (*e.g.,* Guyett, *unpublished;* Lachenmeyer, 1969), it is probably a more frequent problem than has been reported. However, from the numerous reports that have failed to note patient resistance, and the few reports that mention favorable patient reaction, it would appear that client resistance is not intrinsic to the token reinforcement procedures. It may be reasonable to expect minor resistances to follow implementation of contingent reinforcement procedures. Token programs often use reinforcers (*e.g.,* privacy, recreational privileges, free-time, meals, and so on) that were previously freely available.

A general method employed that seems to mitigate resistance involves planning the program in conjunction with the client, thus emphasizing his responsibility for his behavior. For example, Steffy (*unpublished*) reported the planning of token reinforcement programs with aggressive psychotic patients. Contractual agreements were successfully made with patients on an individual basis in order to link reinforcers with the performance of critical behaviors.

Patients have also been employed in the execution of routine duties connected with the token system (*e.g.,* banking of tokens, checking attendance of patients to assignments) (Atthowe, *unpublished, c*); and have had important roles in developing contingencies (Lovitt and Curtiss, 1969).

Procedures exemplified by Steffy (*unpublished*) and Atthowe (*unpublished a, unpublished c*) appear to be effective in overcoming the patient resistance reported by other authors. Emphasis on patient responsibility for his own behavior, lack of coercion, contractual arrangements of programs, and client voice in matters relating to the program, all seem to mitigate against patient rebellion and the possibility of an unjust and oppressive system.

Circumvention of Contingencies

Often, specific contingencies for clients can be circumvented if tokens or back-up reinforcers are obtained in ways contrary to the goals of the administration and staff. One report has been presented of a female schizophrenic obtaining back-up reinforcers from male patients in exchange for sexual favors (Liberman, 1968). Stealing tokens has also enabled some individuals to escape reinforcement contingencies. Typically, to overcome stealing, tokens are in some way marked to individualize them, thus making theft unprofitable (Lachenmeyer, 1969).

Contingencies may also be escaped when behaviors are performed without staff surveillance. This presents a twofold problem for token programs. When staff members are not present, desirable behaviors performed by a client are unreinforced. Similarly, undesirable responses performed in the absence of staff may be reinforced (by peers, or the reinforcers gained from the behavior). To resolve this dilemma, investigators have tried to design programs such that desirable responses (as well as undesirable responses) are detected by some change in the physical environment (Burchard, 1969). For example, in examining whether or not an individual performed various self-care behaviors, specific checks are made to notice if the patient's bed is made, if he is showered, and so on (Ayllon and Azrin, 1965, 1968*a*). The number of behaviors that may be defined by distinct changes in the physical environment is limited. Subtle behaviors are often not handled by the contingencies, perhaps because their effects are difficult to define. Thus, escape from reinforcement contingencies remains a problem in all token programs. Even so, as Burchard (1969) noted, considerable changes have been obtained by means of token reinforcement. It is an empirical question as to whether complete control of complex contingencies is a prerequisite for effective treatment.

Nonresponsiveness to Reinforcement Procedures

Some populations with which reinforcement techniques have been used may present limiting

conditions for the effective application of operant principles. For example, Lindsley (1956, 1960) and Sidman (1960, 1962) found that psychotics in a free-operant situation responded quite differently than normals. Response rates were much slower and there were many unpredictable pauses in responding. Similar results have been found with the mentally retarded (Barrett and Lindsley, 1962; Ellis, 1962; Spradlin, 1962) and with autistic children (Ferster and DeMyer, 1961, 1962; Metz, 1965). These studies suggest that nonresponsiveness could be expected to be a problem in token economies with these patient populations. Indeed, this has been the case.

Ayllon and Azrin (1965), in their series of studies on the effect of contingent reinforcement in altering job preferences, found that 18% of the chronic schizophrenic patients "were relatively unaffected by the reinforcement procedure" (p. 318). The patients who did not respond were not distinguished by psychiatric diagnosis, age, IQ, or length of hospitalization. The authors suggested that a failure to use sufficiently reinforcing behaviors, such as sleeping and eating, in the management of the contingencies accounted for the unresponsiveness of some subjects.

Atthowe (unpublished), and Atthowe and Krasner, (1968) reported that 10% of the patients (those most severely withdrawn) did not gain from the token program. Of the individuals who did respond to the token economy, the "most active" patients gained the least. Nonresponsiveness was attributed to a failure to use strong reinforcers, and to the use of a generalized ward program in lieu of individualized contingencies. Other studies with psychiatric patients have also found that long-term withdrawn patients show the least over-all improvement (e.g., Curran, Jourd, and Whitman, unpublished; Golub, unpublished; Steffy, unpublished).

Reports of nonresponsiveness have not been restricted to psychiatric settings. Zimmerman, Zimmerman, and Russell (1969) reported that three of seven retardates studied were unaffected by the token-reinforcement contingencies. Ray and Shelton (unpublished) reported that 13% of the disturbed adolescent retardates studied did not show significant reductions in inappropriate behaviors. It was noted that all of these subjects exhibited psychotic symptoms or "complex" behavioral problems. An examination of the data reported by Hunt and Zimmerman (1969) indicates that two of 14 subjects did not increase performance over baseline.

The data are rather convincing that a small percentage of patients in almost all token programs remain unaffected. The question that remains is whether this is due to the practical problems related to implementing and carrying out the procedures or whether it is due to the applicability and appropriateness of the operant paradigm with some individuals (see Davison, 1969, for possible limitations of the operant paradigm with psychiatric patients). Although the research to answer this question has not yet been done, some interesting solutions for nonresponsiveness have been proposed.

Many researchers individualize the contingencies of the economy to maximize the probability of responsiveness. Atthowe and Krasner (1968) occasionally devaluated the tokens as a way of discouraging hoarding and encouraging utilization of available reinforcers. Ayllon and Azrin (1968b) used what they call "reinforcer sampling" to increase responsiveness. Patients are first encouraged to sample potential reinforcers in settings that would maximize their use. Only after the reinforcer has acquired value for the patient is it associated with tokens.

Having provided an overview of the procedures employed in token economies, a review of specific programs is now presented.

Psychiatric Inpatients

The major impetus for token economies with psychiatric inpatients has come from the creative and systematic work of Ayllon and Azrin (1965, 1968a). They employed a token economy for "backward", female, chronic schizo-

phrenics at Anna State Hospital in Illinois. The patients had a median age of about 50 yrs and median years of hospitalization of about 16. Because patients exhibited severe behavioral deficits, the authors had very modest goals. The behaviors reinforced were primarily work activities and self-care behaviors. To evaluate the effectiveness of the reinforcement procedures, Ayllon and Azrin used the within-subject ABAB design in which the frequency of the behavior of interest is alternately reinforced and not reinforced in consecutive phases of the experiment.

The studies indicated that reinforcement was effective in maintaining job performance in the hospital, as compared with noncontingent token reinforcement. The reinforcement contingencies were effective in altering voluntary job preferences by manipulation of the number of tokens that could be earned. Similar effects were demonstrated with on-ward assignments. Additionally, the distribution of tokens noncontingently led to a decrease in such behaviors as job attendance, thus demonstrating the salience of the response-reinforcement relationship. This initial research program was successful in demonstrating the efficacy of a token economy.

Following the lead of Ayllon and Azrin, the use of token economies within psychiatric facilities has increased dramatically. In a recent report of the Veterans Administration (Chase, *unpublished*) it was noted that as of December, 1969 there were 27 on-going token economy programs within VA hospitals alone, involving 937 patients. Although token economies have proliferated at an accelerated rate, there are only a few systematic outcome studies.

The previously mentioned work of Ayllon and Azrin (1965, 1968a) indicated that contingent reinforcement could increase the frequency of work activities and self-care behaviors of long-term chronic schizophrenics. The immediate goal of the program was improved behavior within the hospital, and this was accomplished. This is not a trivial demonstration, because it is often the lack of these behaviors

that prolongs the chronic schizophrenic's hospitalization. Other studies have also indicated that the self-care behaviors of chronic schizophrenics can be modified within the framework of a token economy (Atthowe and Krasner, 1968; Ellsworth, 1969, Golub, *unpublished;* Lloyd and Garlington, 1968; Steffy, Hart, Craw, Torney, and Marlett, 1969). Self-care behaviors that have been successfully increased by such programs include continence, self-feeding, getting out of bed on time, and personal appearance routines such as shaving and wearing clean clothes.

Even when the token economy is focused primarily upon self-care behaviors, some authors have reported beneficial effects in social behaviors. Atthowe and Krasner (1968), for example, rated the "social responsiveness" of patients in a weekly group meeting. They found that the social interaction was significantly increased after the introduction of a token economy, even though it was not one of the target behaviors. They also report a general "widening of interest and a lessening of apathy" (p. 40).

Some programs have attempted to modify social behavior and apathy directly, rather than depend upon generalized effects. A notable attempt in this direction has been the work of Henderson and Scoles (1970; Scoles and Henderson, *unpublished;* Henderson, *unpublished,* 1969). They developed a program for psychotic men that focused on vocational habits, countersymptom behavior, and social adjustment. The social activities that were reinforced included engaging in superficial conversation, initiating social interactions, conversing with visitors from the community, and showing leadership and social approach responses. Introduction, removal, and reintroduction of contingent token reinforcement indicated that social responsiveness was clearly under the control of the reinforcement contingencies. However, independent measures of social performance taken throughout the study failed to demonstrate behavioral changes beyond the specific responses reinforced (Scoles

and Henderson, *unpublished*). The specificity of the effects of reinforcement were noted also by Henderson (*unpublished*). In this latter study, improvements in social and vocational skills were reported. However, in spite of these improvements, symptomatic behaviors remained for some patients.

Schaefer and Martin (1966) also attempted to modify social interaction and apathy. Their operational definition of apathy was engaging in only one behavior (*e.g.,* standing) without the simultaneous performance of a concomitant behavior (*e.g.,* talking). Behavioral checklist data were gathered on chronic patients. Half of the patients received token reinforcement for the performance of various responses related to personal hygiene, social interaction, and adequate work performance; the remaining patients received tokens noncontingently. The results over a three-month period indicated that patients on contingent token reinforcement significantly decreased on apathy ratings over time and were significantly more improved than control subjects at the termination of the study. This study is particularly noteworthy because it is one of the few in which a randomly assigned control group was included.

In addition to changing social behavior, decreasing the frequency of aggressive behavior has been an important goal. Steffy and his associates (Fenz and Steffy, 1968; Steffy, *unpublished;* Steffy *et al.,* 1969) described a program to deal with both aggressive and regressed female in-patients. As part of this program (Steffy, *unpublished*), individual contracts were made and negotiated with each patient to help bring her aggressive behavior under control. Seven of nine aggressive patients showed increased job productivity and fewer acts of violence. However, the behavior of six of the eight socially withdrawn patients was not altered.

The primary focus of a program developed by Curran, Jourd, and Whitman (*unpublished*) was on behaviors related to self-control (*e.g.,* no physical assaults). Reinforcement was also given for work performance and self-care behaviors. Positive (token) and negative reinforcers were employed. Negative reinforcers included time-out from reinforcement, seclusion, and physical restraint. Periods of controlled behavior received positive reinforcement even if seclusion or physical restraint had been needed to facilitate control. Evaluation of patient progress consisted of ratings of the patients' self-control during the program compared with retrospective ratings of the patients' level of control before the program. Hospital records were used to make retrospective ratings. Improvement was noted for 64 of the 73 patients in the ratings of controlled behavior. However, the manner in which assessment was made, the use of retrospective ratings without the raters being "blind" as to the patients who were treated, and the lack of control periods (within subjects) or of a control group all make the specific therapeutic agent of the program unclear.

Few studies have compared reinforcement procedures with other therapeutic treatments. In one such study, Marks, Sonoda, and Schalock (1968) compared relationship therapy (individual sessions five days per week for 1 hr) with contingent token reinforcement on social behavior, work competence, and communication skills. Each patient received both treatments consecutively (with the order being balanced for half of the patients). Both treatments were effective, as indicated by improvement on personality and behavioral measures. There were no differences between the treatments. The authors noted some difficulties in keeping the treatments distinct (*i.e.,* administering individual therapy without reinforcing desirable behaviors, and *vice versa*). Hartlage (1970) also compared contingent reinforcement with individual therapy. He found that contingent reinforcement was the more effective treatment for chronic schizophrenics, as indicated by measures of hospital adjustment and interpersonal relations.

In summary, the effectiveness of token reinforcement to increase the frequency of a target

response (whether it be self-care of social behavior) seems well established. However, it is also necessary to know whether the gains made will be maintained in settings outside of the hospital. This aspect is discussed more fully in the section on generalization.

The Mentally Retarded

Ward and self-care behaviors. The necessity of teaching severely retarded children basic self-care behaviors has made that response class an important focus for many token programs established in institutional settings. There have been many reports describing ongoing token programs in which little if any outcome data are presented (*e.g.*, Anderson, Morrow, and Schleisinger, *unpublished;* Bourgeois, 1968; Rooney, 1966). What follows is a brief presentation of those few studies attempting some systematic evaluation.

In a token program developed by Girardeau and Spradlin (1964) for retarded girls in a cottage residential setting, reinforcement was contingent on good grooming, work tasks, and cooperative play. Individualized criteria for performance were set to reward improvement. Individualized contingencies were also used for behavior problems of particular individuals. The authors report marked gains four-and-one-half months after beginning the program. Lent (*unpublished, unpublished,* 1968) continued and expanded the program started by Girardeau and Spradlin. Residents were rewarded for personal appearance, occupational skills, social behaviors, and functional academic skills. They received check marks for their. performance of clearly specified appropriate behaviors. Group contingencies were used, together with individualized contingencies for specific problems. The highly specific behavioral criteria ensured high interrater reliability (Lent, *unpublished*).

Lent (*unpublished*) reported that several behaviors within each of the previously mentioned categories were modified by token reinforcement. Moreover, when token reinforcement was dis-

continued, social reinforcement maintained or increased the initial improvements. Analysis of a 1-yr follow-up indicated significant group improvements in self-care, personal appearance, walking, and sitting behaviors. Social skills and verbal behavior did not improve over baseline.

Hunt, Fitzhugh, and Fitzhugh (1968) also described a token program designed to improve personal appearance of retardates (mean IQ = 73). Those retardates who were most likely to graduate to the community were brought together in their own ward and participated in the program. Behaviors related to personal appearance while performing work activities were the focus of the program. An initial period (14 days) of continuous reinforcement was followed by intermittent reinforcement (10 days). During intermittent reinforcement, subjects more frequently met the personal appearance criteria than during continuous reinforcement. Examination of the individual data indicated that reinforcement was effective in temporarily improving four of the 12 subjects. These subjects exhibited appropriate behavior during the reinforcement phases and met the criterion less frequently when reinforcement was discontinued. It is unclear what the results indicate about the remaining subjects who maintained appropriate behavior during the extinction phase. However, since an individual baseline was not taken, there is no way of differentiating subjects who improved during reinforcement phases from subjects who met the criterion before the program began.

Ray and Shelton (*unpublished*) reported a token program with 42 institutionalized retardates in which the focus of contingent reinforcement was on behaviors related to self-care, dining-room activities, and meal routines. The majority of the subjects in the program (77%) were reported as showing significant reductions in several inappropriate behaviors, such as eating at an inappropriate speed, and failing to meet standards of personal cleanliness. Of the 62 retardates who were in the program at some point

during its 2-yr duration, eight (13%) were regarded as program failures. There were no experimental control periods in which the reinforcement contingencies were reversed or omitted.

Classroom behaviors. One of the earliest programs was developed by Birnbrauer and Lawler (1964) for severely retarded children (IQs below 40). Behaviors reinforced were entering the classroom quietly, hanging coats, sitting at desk attentively, and working persistently on a task. Initially, candy was made contingent upon the performance of appropriate behaviors; subsequently, tokens were used and could be exchanged for candy and trinkets. Token reinforcement procedures were effective in improving 37 of 41 pupils on behavioral criteria. The specific aspects of the program that led to these improvements, as the authors note, are unclear because control periods were not included.

Birnbrauer, Wolf, Kidder, and Tague (1965) expanded the program of Birnbrauer and Lawler (1964) and attempted systematic evaluation of the token reinforcement procedures. The dependent measures were the percentage of errors in assignments, productivity (the number of items completed), and the amount of disruptive behavior. Token reinforcement was dispensed according to individualized performance criteria. An ABAB design was used in which token reinforcement was followed by no token reinforcement and then by token reinforcement again. Contingent social approval was given for appropriate behavior throughout the study. The results confirmed the importance of token reinforcement because the majority of subjects (10 of 15) showed decreased performance on at least one of the three criteria when tokens were not given. However, only four subjects showed decreases in performance on all criteria, and five subjects were not adversely affected at all.

Orlando, Schoelkopf, and Tobias (*unpublished*) described a similar classroom program for trainable and educable retardates. Token reinforcement was dispensed for behaviors such as number and letter identification, cursive writing, and completing art work. The authors note that generalized positive effects were evident beyond the particular situations in which tokens were given and that individualized reinforcement contingencies appeared to be superior to group contingencies.

Zimmerman, Zimmerman, and Russell (*unpublished,* 1969) tested the effectiveness of a token program in developing instruction-following behavior. The class was initially praised when instructions were followed, then given token reinforcement (with praise), then again praise alone, and, finally token reinforcement (ABAB design). The duration of the experiment was seven weeks.

For four of seven subjects, token reinforcement generated and maintained higher frequencies of instruction-following behavior than did contingent praise. Two subjects were not differentially affected by alterations of the contingencies, and one subject showed improvement throughout the study. It is important to note that this study compared the effects of contingent praise with and without the benefits of token reinforcement. Thus, the "failures," *i.e.,* subjects who did not respond differentially to social and token reinforcement, perhaps demonstrated the equality of the reinforcers for these subjects, rather than reflected the ineffectiveness of the operant procedures.

Workshop. Zimmerman, Stuckey, Garlick, and Miller (1969) evaluated the effectiveness of a token program for retardates in a sheltered workshop. After a baseline was established, subjects were told that although they would not earn tokens for a while, they could "practice" (by working well) ·so that they would know how to earn tokens. During this practice period, subjects were told how many tokens they would have earned if tokens had been given. Thus, the effect of feedback could be assessed independently of token reinforcement. In the next phase, contingent reinforcement was delivered for production. This was followed by a phase

consisting of alternating days of practice and token reinforcement. Then, baseline data were again collected with all contingencies removed.

The results were that token reinforcement elicited the highest production rates, followed by practice and then baseline. There was no difference between the first and second baseline. This study indicates clearly that feedback alone can improve performance, but that token reinforcement increases performance even further. This study is particularly noteworthy for attempting to separate the information value of tokens from their incentive and reinforcement value.

Hunt and Zimmerman (1969) evaluated token reinforcement for institutionalized retardates in a simulated workshop. After a baseline period in which productivity was assessed, 14 subjects were informed that increases in production (over individualized criterion levels) would be rewarded with coupons redeemable for items in a canteen. During the experimental sessions, this bonus for production was alternated with no coupon payment. Following this period, all reinforcement was removed. The results were that productivity was significantly higher in those periods in which reinforcement was given than in periods in which no "bonus" was given. Performance in the postexperimental baseline was significantly higher than in the preexperimental baseline. A closer examination of the data presented indicates that a number of individuals did not increase in productivity in the experimental sessions, and of those who did, some did not differentially respond to the token-reinforcement and nonreinforcement periods within the experimental sessions.

Children in Classroom Settings

Operant principles have also been applied in elementary schools. Usually, classroom problems may be alleviated by instructing teachers to use attention, praise, and approval as social reinforcers (Becker, Madsen, Arnold, and Thomas, 1967; Hall, Panyan, Rabon, and Broden, 1968;

Madsen, Becker, and Thomas, 1968; Schmidt and Ulrich, 1969; Thomas, Becker, and Armstrong, 1968; Ward and Baker, 1968). However, in some settings and for some children, praise may not be sufficiently reinforcing. In these instances, a token system may be more effective. Since token programs in the classroom have been recently reviewed (O'Leary and Drabman, 1971), only a sample of relevant studies is included here.

Walker and Buckley (1968) used token reinforcement with a child who had particular difficulty in paying attention to classroom tasks. Academic skills and social responsiveness had been previously altered with contingent social reinforcement but attending behaviors remained unaffected. A special treatment session was scheduled in an isolated room for 40 min daily, during which the subject could earn points. The points could be exchanged for various tangible objects. The subject was rewarded for paying attention for increasing durations of time (to a maximum of 10 min). During a baseline period, the subject attended an average of 33% of the time. During contingent reinforcement, this increased to an average of 93%. Finally, when reinforcement was withdrawn, the average percentage of attending behavior fell to 44%. After the experiment, attending behaviors were maintained in the classroom at a high level with token reinforcement delivered on a variable-interval schedule.

A series of studies using entire classrooms has been done by O'Leary and Becker and their associates. In the first study, O'Leary and Becker (1967) described the use of token reinforcement in an elementary school adjustment class. Students were placed in the special class because of a history of undesirable classroom behaviors. Observations were made on a 20-sec observe, 10-sec record basis for a 2.5 hr period each day. During baseline, teachers conducted the class as usual. During the token-reinforcement period, students were told which behaviors received points. These included paying attention, remain-

ing seated, and facing forward. Points were exchangeable for small prizes.

The average deviant behavior for all children was 76% during the baseline period and 10% during token reinforcement. Although the procedures led to dramatic improvement in classroom behaviors, the effects of increases in teacher attention and daily instructions were confounded with the token reinforcement contingencies. As mentioned previously, contingent teacher attention without token reinforcement is often effective in reducing deviant behaviors.

Kuypers et al., (1968) set up another token economy in an elementary school classroom. However, in this study, the teachers received less training. They were not given background training in operant procedures, but rather were just given written instructions in how to carry out the study. Observations of behavior during baseline indicated deviant behavior for 54% of the observational periods. The percentage decreased to 28% when token reinforcement was given for instruction-following behaviors. An increase in percentage of deviant behaviors to 41% was noted when token reinforcement was removed. Individual data revealed that four of the six children studied were reliably affected by the token reinforcement procedures. Little generalization of beneficial effects was noted from the afternoon class in which tokens were delivered to the morning sessions in which token procedures were not in effect.

The authors regarded this token program as being only marginally effective, particularly when compared to the results reported by O'Leary and Becker (1967). The discrepancy in the efficacy of the two programs was attributed to several factors in the replication. Primarily, there was a failure of teachers in the second program to use contingent teacher attention and praise.

O'Leary, Becker, Evans, and Saudargas (1969) analyzed the various procedures that were confounded with the token reinforcement contingencies in the previous studies. The effects of classroom rules, structured educational lessons, teacher praise, and token reinforcement were examined on disruptive behaviors in an elementary school classroom.

Eight experimental phases were presented to the class in the following order: (1) baseline period; (2) classroom rules, i.e., instructions; (3) planned lessons; (4) praising of appropriate and ignoring of inappropriate behaviors; (5) token reinforcement; (6) praising and ignoring; (7) token reinforcement; and (8) follow-up. The follow-up period was in fact another token reinforcement period in which there were fewer back-up reinforcers and in which group competition was introduced.

Rules, lesson structure, and praise-and-ignore conditions did not have any reliable effect on deviant behaviors. Token reinforcement decreased disruptive behavior for six of the seven subjects. The "follow-up" period was somewhat less effective than previous token periods. Generalization effects, such as increased class attendance during token-reinforcement periods and gains in achievement test scores, were also noted. The authors concluded that token reinforcement was effective in reducing disruptive behavior, whereas rules, lesson structure, and social reinforcement were not. However, the results were less effective than those reported by O'Leary and Becker (1967) in which rules, praising of appropriate and ignoring of inappropriate behaviors, and token reinforcement were introduced simultaneously.

Although analysis of the separate treatments was the goal of this investigation, treatment conditions were cumulative. Rules were included in the planned lesson period, and these conditions were both included in the praise-ignore condition. Hence, evaluation of the separate effect of each condition is not possible. Even if the conditions were not combined in this manner, the order of conditions was fixed. Thus, the effect of any condition cannot be separated from the order in which it appeared or the effect of a history of prior conditions. In contrast, Kazdin

(1972*b*) was able to analyze the separate effects of instructions and token reinforcement. Four different token economies were implemented in elementary school classes. They represented all combinations of the two variables: instructions (either given or not) and reinforcement (either contingent or noncontingent). The results indicated that contingent reinforcement, irrespective of instructions, increased on-task and decreased deviant behaviors. There was evidence of generalization because improvement was noted in both morning and afternoon sessions, even though reinforcement was given only in the morning.

Token procedures have not only been applied to classroom management problems, they have also been applied to help increase academic activities. Bushell, Wrobel, and Michaelis (1968) focused upon such classroom behaviors as writing, reciting, participating in activities, and completing projects with preschool children. Tokens could be exchanged for a special event each day such as a short trip, movie, or story. In a within-subject design, a token-reinforcement period was followed by a period in which tokens were given contingently, but all subjects received the special privilege. After this period, the contingencies were reinstituted and tokens were again required for the special event. The results indicated that study behavior scores varied with the contingent delivery of the back-up reinforcer. Performance declined when tokens had no special purchasing power.

Wolf, Giles, and Hall (1968) examined the effectiveness of token reinforcement procedures in a remedial education program for low achieving elementary school students (mean IQ = 88). Reinforcement (points redeemable for candy, novelties, clothing, food, field trips, movies, privileges, money, and numerous other items) was given for completing classroom assignments correctly. Points were given differentially depending upon the grade received for a particular remedial assignment as well as report-card grades for regular class assignments. In an initial experiment, it was demonstrated in a within-subject design (n = 2) that varying the magnitude of reinforcement decreased or increased the number of reading assignments completed.

In a second experiment, tokens were given for language and arithmetic, as well as reading. After responses stabilized, the magnitude of reinforcement was increased for an individual's area of lowest performance. The results indicated that varying the number of tokens for a particular behavior altered performance on that behavior without affecting the performance of other behaviors for which reinforcement had not changed. For every subject (n = 11), shifts in contingencies led to shifts in performance of assignments.

A number of additional token reinforcement contingencies were included in this program. Reinforcement was administered for extra work assignments, attendance, grade averages, "good" behavior, and cooperation. The effects of these contingencies were not systematically evaluated. The over-all effect of the program was evaluated by comparing the subjects in the remedial program with a control group selected for, but not assigned to, the program. At the end of a 1-yr period, the subjects who received the remedial program were significantly higher in public school grades and in gains on an achievement test than the subjects not exposed to the program.

In another study described by Wolf and Risley (*unpublished*), points were given for completing assignments correctly and for being in one's seat when a bell sounded. The bell was sounded on a variable-interval schedule (VI 20-min). The results of these procedures showed an increase in academic behavior and a decrease in disruptive behavior. These behaviors did not show improvement when token reinforcement was administered noncontingently or when subjects were only instructed to behave in the desired manner.

A special program was developed for one subject whose out-of-seat behavior had not been substantially affected by the previous contin-

gencies. Her behavior was brought under control when it was used to determine whether or not her classmates would receive reinforcement. The use of an individual's performance as a criterion for delivering reinforcement to one's peers, along with concomitant peer pressure and social reinforcement, appears to be effective in modifying behavior (*e.g.,* Patterson, 1965).

Barrish, Saunders, and Wolf (1969) developed this idea further within a token system in an elementary classroom. Students were divided into two separate teams or groups. Disruptive behaviors (talking out or being out of seat) of any individual resulted in a point for his team. The group with the fewest points over various periods of time received a number of privileges (*e.g.,* extra recess, time for special activities). The contingencies significantly and reliably modified the target behaviors. Inappropriate behaviors increased when contingencies were removed.

A study by Hewett, Taylor, and Artuso (1969) is interesting by virtue of its design. Token reinforcement was employed in elementary school classrooms to reinforce the attentiveness of students and to improve reading and arithmetic skills. In the experimental (E) condition, the teacher administered tangible and token reinforcement for appropriate behaviors. In the control (C) condition, the teacher was instructed to rely on her usual method of teaching, including social reinforcement, but token reinforcement was not employed. The experiment was conducted over a 34-week period. For two consecutive periods of 17 weeks, four sequences were employed as follows: E-E, C-C, E-C, and C-E. The subjects were assigned to one of these groups in a manner that achieved comparable class groupings with respect to IQ, age, and academic achievement. (The precise manner of matching and assigning subjects to conditions was not presented.)

The results indicated, as predicted, that the E-E group (token reinforcement over the entire 34 weeks) was higher than the C-C group in attentive behaviors. The C-E groups, which only received token reinforcement in the final 17-week period, showed marked improvement in the final period. The E-C groups, contrary to the prediction, did not show a decline in performance when token reinforcement was withdrawn after the first 17-week period. For this latter group, a moderate gain was noted when token reinforcement was removed. The reason for the stability of the gain in behaviors in the control period is not clear from this study. Although token reinforcement improved attending behaviors, reading and arithmetic achievement levels were not reliably affected. Several additional studies (Clark, Lachowicz, and Wolf, 1968; Graubard, 1969; Haring, Hayden, and Nolan, 1969; McKenzie, Clark, Wolf, Kothera, and Benson, 1968; Miller and Schneider, 1970) have also indicated that token reinforcement is an effective means of altering classroom behavior.

Delinquents

One of the major difficulties in treating delinquents is that much of their deviant behavior may be maintained by peer support. In fact, deviant behaviors in institutional settings are often reinforced by peers more times than they are punished by staff, and socially conforming responses are punished more often by peers than they are reinforced by staff (Buehler *et al.,* 1966). In addition, peer reinforcement of antisocial behavior is often more immediate than contingent social or token reinforcement from staff members (Ross, *unpublished b*). An additional difficulty is that delinquents often have an extensive repertoire of inappropriate responses. The suppression of a particular response may lead to the performance of other inappropriate responses (Meichenbaum *et al.,* 1968). The response frequency of delinquent behaviors for a given individual is usually low, making another difficulty for the application of operant techniques (Burchard and Tyler, 1965). Finally, Ross (*unpublished a*) noted that institutionalized delinquents were adept at finding loopholes in a token reinforcement program, modifying

the program to suit their own ends, and constantly testing the limits of the system. Perhaps for the above reasons, the application of operant procedures to delinquents has clearly been less frequent than to other populations.

Because delinquents frequently are behind in school, academic performance has been an important target response for token programs. In a case study, Tyler (1967) described a program to alter the academic performance of an institutionalized delinquent. Tokens were contingent upon daily and weekly evaluations of performance. They were exchangeable for noninstitutional clothes, use of a comfortable bed, and canteen items. Grade-point average increased during the three-week period in which token reinforcement was employed. Performance declined when the subject was taken off the program.

A token program with two groups of adolescent delinquents was reported by Tyler and Brown (1968). In this study, a quiz was given each day based on the televised news of the preceding day. Members of one group received tokens contingent upon their quiz scores, whereas members of the other group received tokens independently of their performance. After approximately four weeks, the experimental conditions for the groups were reversed. The results indicated that quiz performance was greater during contingent reinforcement for both groups.

Meichenbaum et al. (1968) employed token reinforcement to modify classroom behaviors of institutionalized female delinquents. Classroom behaviors were categorized as inappropriate (unrelated to the task set forth by the teacher) or appropriate (related to class activity). Subjects were given feedback notes by observers in the classroom when their behavior was appropriate. These notes could be exchanged for money.

The results indicated that after a baseline period, the introduction of reinforcement (FI schedule) in the afternoon led to a sudden improvement in behavior. However, only the behavior in the afternoon session was altered; behavior during the morning session, which was not reinforced, was not modified. Subsequently, when reinforcement was given for behavior during the morning (VI schedule), classroom behaviors improved to a level equal to the afternoon performance. In a final condition, fining of tokens (i.e., punishment) for inappropriate behavior was combined with the existing reinforcement for both morning and afternoon periods. A combination of these procedures led to a decrease in inappropriate behaviors compared to the effect of reinforcement alone. The schedules of reinforcement, fixed and variable, did not differentially affect performance. At the end of treatment, the class showed a mean level of appropriate behavior that was significantly higher than the pretreatment level. The final level of appropriate behavior was found to be about the same as that of noninstitutionalized students in a nearby school.

Cohen (1968) also employed token reinforcement techniques for developing academic skills. His subjects were institutionalized delinquents. For approximately 3 hr each day, each subject had the opportunity to work on educational materials that were individually preprogrammed. Individuals were not coerced to work on assignments or remain in the classroom. However, points (exchangeable for consumable items, privileges, private facilities, and money) were given for correct completion of assignments, test performance, and studying. Points were given once a week for the entire week's work. Measures of time spent studying indicated that the behavior was controlled by reinforcement, and that students studied more frequently as "pay day" approached. After eight months, subjects who previously had little interest in academic pursuits and had dropped out of school had gained more than two grade levels on standard achievement tests.

Even though academic deficits are important, the primary target response for delinquents is usually antisocial behavior. Burchard and Tyler (1965) reported such a case study. Timeout from reinforcement was used for antisocial and disruptive behavior, and tokens were used to

reinforce amount of time not in isolation. Tokens were backed up by canteen privileges. The timeout and reinforcement procedures were effective in reducing the severity and frequency of unacceptable behaviors.

Burchard (1967) described a program for delinquent adolescents who were mildly retarded (IQ ranging from 50 to 70). The population was characterized by a variety of antisocial behaviors such as property damage, theft, arson, truancy, and so on. A general ward program was developed for training in practical skills (personal, social, recreational, educational, and vocational). This program is one that has effectively employed a number of punishment procedures. Behaviors that were punished were those that were considered likely to be met with punishment in the community. Reinforcement was delivered for those behaviors that were considered as most likely to be met with reward in the community.

Two experiments were reported by Burchard. In the initial study, tokens were given for the amount of time spent sitting at assigned seats in a classroom and workshop, and for the number of problems or tasks completed. The effect of reinforcement was examined in an ABAB design (contingent, noncontingent, and contingent reinforcement periods). Each experimental period lasted for five consecutive days. The results indicated that the target behaviors varied with the reinforcement contingencies. There was no overlap in the response distributions for contingent and noncontingent periods.

In a second experiment, the effect of punishment was examined on a variety of inappropriate behaviors such as stealing, lying, cheating, and fighting. Timeout from reinforcement (loss of tokens and required time spent in "timeout" area for a short period of time) and seclusion (loss of a greater number of tokens than for timeout, and isolation in a special room for a longer period of time than above) were used. In phase one of the experiment, the number of tokens a resident was fined depended upon his frequency of timeout and seclusion. In phase

two, the resident was charged a constant fee that was not contingent upon his performance. The final phase was a reinstatement of phase one. The results indicated that the total number of timeout and seclusion periods varied with contingent and noncontingent fining. When residents were fined according to their inappropriate behaviors, the number of timeout and seclusion periods were less than when there was no contingent relationship. It should be noted that the overlap in distributions for the ABA periods indicates that the differential effect of the punishment procedures was not of great magnitude.

Phillips (1968) implemented a token program for three delinquent males assigned to a foster care program. Tokens (points), which could be exchanged for several privileges, were given out for a variety of behaviors relating to academic achievement, cooperative behavior, self-care skills, household chores, and being informed of current events. The boys could lose tokens for such things as being late and getting poor grades. Five experiments were conducted within the general context of the token program.

The results of these five experiments indicated that aggressive statements and poor grammar decreased, and tidiness, punctuality, and amount of academic tasks completed increased. Fining tokens for various inappropriate behaviors in these studies was shown to decrease the target high-frequency behavior. In altering "poor" grammar (use of the word "ain't"), changes effected by fining were maintained when fines were removed. The effect of fining appeared to be specific to the situation in which it was employed. For example, tardiness for one activity, if fined, did not appear to alter tardiness in other situations. Instruction alone in which the subjects were told to behave in a certain manner (*e.g.,* "do not talk aggressively", or "speak correctly") was considerably less effective than contingent punishment or reward.

Stayer and Jones (*unpublished*) reported the use of a token reinforcement program for soldiers who were labeled conduct disorders. For

these soldiers, a special hospital ward was established in which they could earn points for participation in various scheduled activities, and work performance. Points could be exchanged for canteen items, recreational activities, privileges, and money. Although no data are reported for the specific effects of reinforcement contingencies, follow-up assessment conducted at three, six, and nine months revealed a higher percentage (69%) of treated soldiers having completed a tour of duty or serving in good standing than a nontreated comparison group (28%). A recent report on the token program at Walter Reed Hospital (Boren and Colman, 1970) evaluated the effects of various procedures (alterations of reward magnitude, modeling, response-chaining, response-cost, and group *versus* individual contingencies). Positive token reinforcement was shown to increase attendance to meetings, verbal behavior, and discussions of personal as opposed to impersonal problems. Interestingly, the removal of tokens (fining) did not decrease inappropriate behavior as intended, but increased it.

Autistic Children

The use of operant conditioning procedures with autistic and schizophrenic children has produced dramatic results. Self-destructive behaviors have been extinguished (Lovaas, Freitag, Gold, and Kassorla, 1965; Wolf, Risley, and Mees, 1964), speech has been developed (Lovaas, Berberich, Perloff, and Schaeffer, 1966), and stuttering has been decreased (Browning, 1967). The efficacy of positive and negative reinforcement, as well as punishment, has been demonstrated for a number of behavioral problems (Lovaas, 1968). In the majority of work, there is a predominant reliance on primary reinforcement, such as food or avoidance of pain. Although no general token programs for autistic children have been presented in the literature, token reinforcement has been employed in a few studies. Because of the problems associated with treating this population, it is particularly interesting to mention

briefly studies effecting behavioral changes with token reinforcement.

Ferster and DeMyer (1961, 1962) are responsible for the initial use of conditioned reinforcement with autistic children. A simple response (key pressing) was employed to examine sustained performance and responsiveness to various reinforcers. Generalized conditioned reinforcers (coins) were used, which the subject could deposit in a vending machine to obtain food, candy, and toys. The task requirements for reinforcement were altered gradually to develop complex responses. The results indicated that it was possible to bring the behavior of autistic children under control of conditioned reinforcers, and gradually widen their behavioral repertoire. As the authors pointed out, the use of operant techniques in these studies was an attempt at experimental analysis of behavior rather than to develop complex responses for the purpose of treatment.

Hingtgen, Sanders, and DeMyer (1965) employed a lever-pressing task with childhood schizophrenics. Lever pressing was trained in two individuals, simultaneously, who were working independently. Gradually, cooperative responses were required for reinforcement; *i.e.,* token reinforcement for one individual depended on the prior response of the other. Cooperative behaviors were shaped in three pairs of subjects in this manner.

Other investigators have explored responses of greater complexity. Metz (1965, *unpublished*) used token and primary reinforcement to train autistic children to perform imitative behaviors. Initial training involved demonstration of various nonverbal tasks by the experimenter (*e.g.,* hugging a doll, blowing a horn, moving blocks) and rewarding with praise and tokens for imitative responses. The tokens were exchangeable for food. Subsequent to training, additional testing on similar tasks revealed that the imitative response set generalized to other tasks than those in which the subjects were trained. Moreover, the imitative response set was maintained by praise alone without token reinforcement.

Thus, the training procedure was effective in developing generalized imitative behavior. This achievement is significant inasmuch as imitative response patterns represent a particular response deficit in autistic children.

GENERALIZATION

Generalization may be divided into stimulus and response generalization. Stimulus generalization refers to the transfer of effects to other stimulus conditions or situations. In other words, the concern is whether behavior change is maintained when there is no token economy. Response generalization here refers to the spread of effects to behaviors or responses that were not of initial focus. That is, generalization occurs from the responses upon which treatment focused to other responses that may be related but were not specifically dealt with.

Stimulus Generalization

The generalization of treatment effects to stimulus conditions in which token reinforcement is not given might be expected to be the *raison d'être* of token economies. An examination of the literature leads to a different conclusion. There are numerous reports of token programs showing behavior change only while contingent token reinforcement is being delivered. Generally, removal of token reinforcement results in decrements in desirable responses and a return to baseline or near-baseline levels of performance. Such a state of affairs led Zimmerman, Zimmerman, and Russell (*unpublished*) to conclude that token economies are prosthetic rather than therapeutic, a distinction made by Lindsley (1964). Prosthetic environments show changes only during treatment conditions, whereas removal of these conditions results in a loss of treatment effects. Therapeutic environments show changes that are maintained beyond the treatment conditions themselves. Identification of token economies with prosthetic environments emphasizes the fact that behavior controlled by token reinforcement contingencies

fails to generalize to conditions in which those conditions are not in effect.

However, it may be premature to identify token economies as only prosthetic environments. The relevant experiments have not been done. Most researchers have used the within-subject design with a reversal of effects to indicate that the reinforcement procedures were functionally related to the dependent variable. The goal of the research was not maintenance of desired behavior. In fact, Bijou, Peterson, Harris, Allen, and Johnston (1969) cautioned researchers using an ABAB design not to wait too long before reversing, lest the behavior come under the control of new conditioned reinforcers and thus not reverse.

It is evident that the meaning of stimulus generalization changes somewhat depending upon the treatment setting discussed. In the psychiatric hospital, generalization refers to the transfer of behavior from within the hospital to extratreatment settings (the community, home, and place of employment). Remarkably little research has assessed generalization directly. Generalization is usually inferred from increased discharge and decreased readmission rates (Athowe and Krasner, 1968; Curran *et al., unpublished,* Ellsworth and Foster, 1969; Henderson and Scoles, 1970; Schaefer and Martin, 1966, 1969; Steffy *et al.,* 1969). Since discharge and readmission rates depend upon administrative decisions, increases and decreases can be accomplished without concomitant changes in the psychological status of the patients. In this regard, recent programs are likely to benefit from the community psychology emphasis that has swept the mental health field in recent years. Hospital staffs have been encouraged to discharge patients and to develop community resources so that patients could be treated without requiring prolonged hospitalization. Any program that contrasts present discharge and readmission rates with those before the program started is likely to find favorable statistics. Thus, in many reports, it is not clear whether token economies are in fact more successful at keeping people in the

community or have benefited from a change in the orientation of the hospital staffs. Even in studies that have included control groups, ward staff and treatment have been frequently confounded. Differential discharge and readmission rates may have been due to different staff policy rather than to the generalized effects of token economies. In summary, although token economies have been dramatically effective at changing behavior within the psychiatric hospital, there is little evidence that improvement is maintained outside the institution.

For token programs implemented in a classroom setting, generalization refers primarily to the transfer of performance within the same setting. With some exceptions (Wahler, 1969), behavior in nonschool settings is not monitored for evidence of generalization. Instead, the goal is to maintain improved classroom behavior when the token economy is withdrawn and in classes not associated with the token economy. As in the case of mental hospitals, generalization in classroom settings is not usually found unless it is programmed as part of the procedures. Reinforcement programs that have been implemented in either the mornings or afternoons (Becker *et al.*, 1967; Broden, Hall, Dunlap, and Clark, 1970; Kuypers *et al.*, 1968; Meichenbaum *et al.*, 1968; O'Leary *et al.*, 1969), with few exceptions (Kazdin, 1972*b;* Walker, Mattson, and Buckley, *unpublished*), have not found evidence of generalization to the part of the day in which tokens were not dispensed. Also, studies that have examined resistance to extinction have generally found that behavior changes are not maintained (Barrish *et al.*, 1969; Kuypers *et al.*, 1968; O'Leary *et al.*, 1969; Walker and Buckley, 1968). However, few direct attempts to program generalization have been made. An exception to this is a study by Patterson and Brodsky (1966) in which a 5-yr-old boy was treated for multiple problems at home and in school. To ensure generalization, the child's environment was programmed to support adaptive behaviors. Peers were rewarded for reciprocating positive social interaction, and

the parents were trained to use contingent reinforcement at home. These procedures were effective in maintaining improved behavior both at school and at home. In light of studies where behavior changes are not maintained, it appears that generalization should be planned, rather than depended upon as an inadvertent consequence of the token program. However, few direct attempts to program generalization have been made.

Response Generalization

There has been a paucity of reports of response generalization in the literature on token reinforcement. Primarily this is due to the fact that both treatment and the assessment of treatment effects focus directly on the target behavior. Usually, concomitant changes in nontarget behaviors are not measured. Some evidence for generalized effects of the token system relates to the cluster of behaviors usually called "institutionalization". Several authors have commented on the deleterious effects of the "total" institution (Goffman, 1961; Scheff, 1966; Ullmann and Krasner, 1969). Changes in specific target responses have led to a decrease in institutionalized behaviors. Atthowe (*unpublished b*) and Atthowe and Krasner (1968) focused on target behaviors such as attendance to group activities, self-care behaviors, social interaction, and participation in activities (Atthowe, *unpublished a*). Some generalized effects were noted, such as greater utilization of day passes and an increase in discharge rates. Although social interaction among patients was reinforced, Atthowe (*unpublished b*) reported that some forms of social interaction not specifically reinforced showed marked improvement. Similarly, Schaefer and Martin (1966) reported that hospitalized schizophrenics, at the termination of token reinforcement procedures, were significantly less apathetic, as measured by clearly discernible behaviors, than control patients given "normal" ward treatment. The findings of these studies conducted with mental patients support the notion that token programs increase the gen-

eral interests and participation of inmates in an institutional setting.

Aside from decreasing apathy and increasing activity of patients, a few studies present more specific data on response generalization. Winkler (1970) noted that episodes of both violence and noise decreased on a psychiatric ward while a token program was in effect for behaviors not directly related. Other authors working with psychiatric patients have reported anecdotal accounts of response generalization. Steffy (1968) reported mood changes and improvement in social behavior, and Curran *et al.*, (*unpublished*) reported improved "maturation and personality development."

Burchard and Tyler (1965) reported the decrease in both frequency and severity of disruptive behavior as a result of a token program with an institutionalized delinquent. The concurrent change of frequency and topography of the response would seem to be evidence of response generalization.

The clearest evidence for response generalization has been reported by Meichenbaum (1969). This study investigated the differential effects of instructions and reinforcement on the language behavior of schizophrenics. Subjects were reinforced for either "healthy" talk or proverb abstractions. Subjects receiving reinforcement for only one of these two response classes, showed improvement in both. In addition, treated subjects showed improved behavior on a word-association test and a similarities subtest of the Wechsler-Bellevue Adult Intelligence Scale. Similar improvement was not shown by no-contact control and attention-contact control subjects.

In general, response generalization has received little empirical investigation in token reinforcement programs. The references to beneficial effects of reinforcement contingencies are generally restricted to the target behaviors of interest. While the specificity of assessment is desirable and remains a singular advantage of operant or learning programs over treatment programs based on other models (see Kanfer

and Saslow, 1969), multiple-response measures and measures of a more global or general nature might be meaningful additions.

Procedures to Increase Generalization

Although most research with token economies has not focused upon generalization, a number of procedures have been used to enhance maintenance of behavioral gains. Perhaps the most frequently used procedure is to follow Ayllon and Azrin's (1968a, pp. 49-56) Relevance of Behavior Rule which states: "Teach only those behaviors that will continue to be reinforced after training." Thus, behaviors should be selected that can come under the control of naturally occurring reinforcers in the person's environment. Target behaviors that have typically been selected in token economies (self-care behaviors, work skills, academic behaviors) do meet this criterion. These are behaviors that will continue to be reinforced (*e.g.*, by social approval) after training.

Because social approval is not reinforcing for everyone (*e.g.*, delinquents; Quay and Hunt, 1965), it may be important to increase the reinforcement value of verbal statements and praise. For example, in a study reported by Wahler (*unpublished*), parental approval of cooperative behavior was initially ineffective in modifying the uncooperative behavior of their children. A reinforcement program was then developed in which tokens (exchangeable for toys) and approval were given for cooperative responses. Gradually, tokens were eliminated, and cooperative behavior was successfully maintained by social approval. Pairing verbal praise and token reinforcement has been used by a number of researchers in the hope of facilitating subsequent generalization (Atthowe and Krasner, 1968; Lent, *unpublished*; O'Leary and Becker, 1967). The efficacy of this procedure has been demonstrated recently (Locke, 1969).

Another technique employed to facilitate generalization involves the gradual removal of token reinforcement. Schaefer and Martin

(1969) discussed how token reinforcement was gradually faded out in a hospital setting for psychotic patients. Praise, extra privileges, and staff approval were all given contingently and were gradually substituted for token reinforcement as the individuals improved. Atthowe and Krasner (1968) described an "elite" group of patients who, because of their prolonged performance of appropriate behavior, were given a *carte blanche* for privileges, and were free from specific reinforcement contingencies.

Another way to fade token reinforcement is to have the subjects spend increasingly longer parts of their day out of the program. Henderson and Scoles (1970) employed this technique while training psychotic males in vocational, social, and countersymptom behaviors. To facilitate generalization, individuals participated in social activities in the community where non-token reinforcers presumably would be operative. Kelley and Henderson (1971) reported that individuals in their program are reinforced for looking for jobs in the community, obtaining interviews, and making phone calls to prospective employers. Once employment is secured, additional privileges are given (*e.g.,* move to the "penthouse" in the facility). Exposing an institutionalized patient to the community not only removes the specific token reinforcement contingencies that might be controlling his behavior but also places him under stimulus conditions similar to those he will experience subsequent to discharge.

Requiring that the subject spends time in the community is one way of varying the stimulus conditions for appropriate behavior. Stimulus variation can also be directly programmed. Goocher and Ebner (*unpublished*) trained a deviant child in appropriate classroom behavior, initially, in the presence of only the experimenter. Gradually, planned distractions were introduced (*e.g.,* a television set operating). Finally, the training was continued in the classroom itself in the presence of other children. Although deviant behavior often increased when distracting stimuli were introduced, it was

quickly extinguished. In addition, appropriate behavior was maintained after the termination of training.

Stimulus variation has not been attempted on a large-scale basis in a token program. Even programs using exposure to community activities or employment as part of generalization training do not usually reinforce behavioral performance in the community (an exception is Kelley and Henderson, 1971). In one of the few attempts to do so, Lent (*unpublished b,* 1968) trained adolescent retardates in various household activities in which they might participate upon discharge. A model home, built on the grounds of the institution, had facilities in which household training could be conducted. This represents one of the few attempts to reinforce behavior under stimulus conditions similar to extratreatment conditions.

Stepwise or leveled token systems have been employed to maintain desirable behaviors and the beneficial effects of treatment, and hence, constitute another technique to enhance generalization. Several token programs require individuals to begin at an initial level and, depending on their improvement and sustained performance, allow them to progress to higher levels. Initial levels require the performance of few behaviors and offer few reinforcers. After the individual is able to meet the particular requirements of a given level for a certain period of time, he is able to progress to a level that will entitle him to receive added privileges. The notion of levels is not new in, for example, mental hospital procedures, and bears similarity to the reasoning behind the halfway house movement. In levelled token programs, it is the goal to have the patients at the highest level perform desirable behaviors without token reinforcement. In leveled token programs, it is the goal planning of programs for other patients, assume responsibilities for other patients on the ward, and so on (Garlington and Lloyd, *unpublished;* Guyett, *unpublished;* Schaefer and Martin, 1969). Terminal treatment behaviors in a leveled system are assumed to be closely related to

extrainstitutional performance demands. Albeit the leveled system has *prima facie* appeal, its use remains to be justified by follow-up data.

Another technique employed to facilitate generalization involves training relatives in behavioral principles so that important contingencies can be continued. This procedure is not new to the operant approach, but has been used only in a few instances with token-reinforcement procedures. O'Leary, O'Leary, and Becker (1967) trained an aggressive, hyperactive child to cooperate at home. Training was conducted by the experimenters in the child's home. Reinforcers for cooperative behaviors consisted of candy, social, and token reinforcement (exchangeable for small toys). The child's mother was trained to take over the entire token program with the child. Although some deviant behaviors remained, the operant procedures carried out by the parent were clearly effective in increasing cooperative behaviors. Other investigators have reported similar success with parents of psychiatric patients (Henderson and Scoles, 1970) and of brain-damaged children (Salzinger, Feldman, and Portnoy, 1970).

Self-reinforcement (Kanfer, 1970) represents a technique of considerable potential. This technique relies on the individual giving himself a reinforcer contingent upon the performance of an appropriate response. If an individual can be trained to reward himself, or develop his own contingencies (Homme, Csanyi, Gonzales, and Rechs, 1969; O'Leary, *unpublished*), it is more likely that he will be able to monitor his behavior in a number of settings. Although self-developed contingencies may be more effective than externally imposed ones (Lovitt and Curtiss, 1969), self-reinforcement has not been more effective than externally administered contingencies (Johnson, 1969). Self-reinforcement should be more fully investigated. Self-regulation (Kanfer, 1970) and self-control procedures (see Bandura, 1969 for a review) appear to be useful for maintaining a variety of behaviors. Although such techniques might have some limitations with populations that often receive token rein-

forcement procedures (*e.g.*, retardates), such limitations cannot be determined on *a priori* grounds.

Although there is an abundant literature on the effects of schedules of reinforcement on extinction, schedules are seldom varied in token economies. Partially, this is due to the fact that it would be uneconomical to monitor the schedules so closely. In addition, intermittent schedules may only delay extinction, rather than prevent it. Nevertheless, a few studies have investigated the effects of different schedules. Somewhat inconsistent results have been obtained (Haring and Hauck, 1969; Meichenbaum *et al.*, 1968). So little is now known about the effects of schedules of reinforcement in token economies, that it is an obvious next step for research in the area. This is particularly so since reinforcement is seldom dispensed according to a 1:1 ratio schedule. In the typical token economy, much behavior, both appropriate and inappropriate, goes undetected. In addition, the staff is by no means the only dispenser of reinforcers.

Delay of reinforcement is another variable that would seem to have implications for increasing resistance to extinction. Two separate procedures have been employed in delaying reinforcement. One procedure used is to increase the delay between the response and token reinforcement. For example, in the token economy presented by Atthowe and Krasner (1968), a number of behaviors earned tokens that were paid at the end of the week, rather than upon each performance of the response. Atthowe and Krasner utilized a number of different delay periods for various behaviors.

Another delay of reinforcement procedure involves the manipulation of the delay between token reinforcement and the exchange of tokens for back-up reinforcers. The delay here is in the exchange of back-up reinforcers, rather than in the presentation of conditioned reinforcers. O'Leary and Becker (1967) employed this technique for elementary school students. Points were given for instruction-following behaviors. Gradually, the number of reinforcement periods

decreased and the delay between token reinforcement and exchange of tokens increased up to a four-day delay period.

Manipulation of delay of reinforcement (token or back-up) is designed to increase resistance to extinction, presumably because of the resemblance of delayed reinforcement in treatment and nontreatment settings. Numerous rewards in the natural setting (*e.g.*, grades, money) are delayed. Thus, it seems desirable to train subjects so that they could perform without receiving rewards immediately for performance. It is assumed that training under delayed reinforcement in a treatment setting will generalize to performance in nontreatment settings. It is also hoped that in the treatment setting when extrinsic reinforcement is delayed, behaviors will come under the control of naturally occurring reinforcers, such as praise and attention. Evidence supporting these assumptions is not available.

The manipulation of other parameters of reinforcement (*e.g.*, varied reinforcement; Kimble, 1961) could also be used to increase resistance to extinction. With varied reinforcement, a number of aspects of reinforcement are varied simultaneously (*e.g.*, magnitude, delay, and place of reinforcement).

Although there are a number of procedures for potentially increasing generalization, it is our guess that the most fruitful techniques will be the ones that emphasize programming the natural environment (*e.g.*, Kazdin, 1971; Patterson and Brodsky, 1966). The investigation of reinforcement parameters during acquisition may help refine the token economy methodology, but it seems unlikely that it will provide a means for dramatically increasing generalization.

METHODOLOGY

The majority of investigations of token economies employs designs in which the subject is his own control. Of these, the most frequently used is the ABAB design (where A refers to the baseline period and B refers to the treatment). This design has been referred to as the intra-subject replication design (Sidman, 1960), the reversal technique (Baer, Wolf, and Risley, 1968), and the equivalent time-samples design (Campbell and Stanley, 1963). If the behavior of the subject(s) improves whenever treatment is presented and declines whenever treatment is withdrawn, and this occurs repeatedly, a functional control of the target behavior has been powerfully demonstrated. The four stages of the ABAB design (alternations of base and treatment conditions) appear to represent the basic essential in demonstrating a functional relationship. There are, of course, several variations of the design. For example, in later phases, after functional control has been demonstrated, procedures to enhance stimulus generalization or resistance to extinction may be implemented and assessed. A major advantage of this design is that it rules out maturation and chance as alternative hypotheses for the effectiveness of the experimental variable. Nevertheless, there are a variety of problems in using this design to which the researcher should be alerted.

The first problem involves reversing or withdrawing the experimental contingencies. The ABAB design is suitable only if the behavior being studied is transient and reversible. However, it is by no means clear that the effects of token economies are transient and reversible. Although in most cases the behavior does reverse with the reversal of conditions, there are instances in which this does not happen (*e.g.*, Kazdin, 1972*b*; Walker *et al., unpublished*). Often, this may be taken as evidence that the behavior has come under control of other variables in the environment or as evidence for resistance to extinction. However, if resistance to extinction is being tested (and a reversal is not expected), this within-subject design is inadequate. In this instance, the design does not control for the effects of maturation, regression to the mean, or extraneous change-producing events. To control for these alternative hypotheses, other de-

signs, such as multiple-baseline or between-subject designs, are essential. These designs are discussed later in this section.

Difficulty in reversing the behavior often occurs because baseline stimulus conditions are not reinstated. Other aspects of the environment (*e.g.,* social approval) may have changed concomitantly with the introduction of tokens, but then were not reversed when tokens were withdrawn. This problem frequently can be avoided if, in addition to the records of response frequency, detailed records of stimulus conditions are kept.

Another potential confound that may vary with the presentation and withdrawal of token reinforcement is staff behavior. During the reinforcement phase of the experiment, the staff may dispense considerable attention, encouragement, and contact with the subjects, which they may withdraw during the reversal phase. For example, in one study it was suggested that staff may have more contact with subjects when contingent reinforcement is given than when noncontingent reinforcement is given (Mandelker, Brigham, and Bushell, 1970). This may have the effect of ensuring the expected reversal. However, it does not demonstrate the functional control of *token* reinforcement over the target response. One solution to this is to have baseline and reversals include social approval and attention, thus evaluating the effectiveness of token reinforcement as a supplement to approval. Even so, the staff may alter their behavior subtly to ensure the reversal. Potential solutions to this problem that should be investigated are: (1) alerting staff of this problem; (2) reducing their commitment to the reversal by structuring it as an exploratory alteration of the contingencies; and (3) detailing changes in staff behavior across experimental phases.

In addition to difficulties associated with reversal, a second, and related, problem of the ABAB design is that some variable other than token reinforcement that covaries with its presentation and withdrawal, may have functional control over the response. For example, changes

in behavior may be due to the instructions to the subjects at the onset of each phase, rather than to the changes in contingencies. Thus, in one of the studies reported by Ayllon and Azrin (1965), patients were instructed at the beginning of the reversal that they were in a sense receiving a "vacation with pay". It is not surprising that work performance fell dramatically during this "noncontingent reinforcement" phase because people seldom work during vacations. The effect of instructions, or of what Orne (1962) calls the demand characteristics of the experiment, remains a plausible alternative hypothesis of the effectiveness of token reinforcement in many studies. Yet, the effect of instructions in the absence of reinforcement has been shown to be transient (*e.g.,* Packard, 1970).

A third problem area for the ABAB design is the generalizability of the results to other settings. The results may not generalize to settings in which the experimental variable is available continuously and does not alternate with a baseline period. Although this seems implausible, often response frequency reaches new heights immediately after a reversal, and it is possible that the reversal was a prerequisite for this degree of effectiveness. In cases where the effectiveness of one phase may depend upon the experience with the preceding phases, between-subject designs would provide convergent validation of the effectiveness of the techniques without confounding them with sequence effects. In spite of these limitations to the usefulness of the ABAB design, it still provides the most practical evaluative tool for evaluating ongoing programs. No token economy should be instituted without providing for systematic evaluation. Although in most instances, this design will be quite sufficient, other designs may be useful.

One such design is the multiple-baseline design (Baer, Wolf, and Risley, 1968) or the multi-element baseline design (Sidman, 1960). In this design, a functional relationship between controlling conditions and behavior is demonstrated somewhat differently. This is particularly well suited to situations in which a behavioral

reversal is unanticipated or undesirable. There are at least three variations of this design depending upon whether multiple-baseline data are collected across behaviors, across individuals, or across situations. (For an excellent example of the use of multiple baseline designs as discussed here, refer to Hall, Cristler, Cranston, and Tucker, 1970.)

When multiple-baseline data are collected across behaviors, several (two or more) behaviors of a subject (or subjects) are monitored. After all behaviors have stabilized, reinforcement is made contingent upon the occurrence of only one of the responses. Ideally, as the first target response changes, the other behaviors remain at baseline levels. After the initial target response has stabilized at its new level, the contingency is extended to include an additional target behavior. This procedure is continued until all behaviors have been included in the contingency. Although, there are no reversals or returns to baseline in this design, extraneous events are ruled out as alternative hypotheses by the demonstration that the baseline response frequencies of the specific behaviors remain stable until the contingencies are applied to each consecutively.

A major difficulty in using this version of the design is the possibility of response generalization. Some responses may remain independent as contingencies are applied to one of them, but other responses will change as the target response changes. Clearly, before this design can be effectively utilized, more information about the nature and extent of response generalization in token settings will be required.

Another version of this design employs multiple-baseline data on a single response across several individuals. Each subject receives only baseline and treatment phases with no reversals. However, the subjects receive the baseline phase for differing lengths of time, thus ruling out extraneous events as a plausible hypothesis for the effectiveness of the contingencies. The advantage of this design over the previous one is that response generalization presents no special difficulties. However, it is sometimes possible

that altering the behavior of one subject may affect the performance of other subjects, even though baseline has been continued for the other subjects (see Broden, Bruce, Mitchell, Carter, and Hall, 1970).

A final version of the multiple-baseline design examines baseline data across several situations for one or more individuals. In this version, the contingencies are introduced in one situation while baseline data are collected on the behavior(s) in other situations. Sequentially, the contingencies are introduced into different situations. Here, it is demonstrated that the behavior does not change in a given situation until the contingencies are extended to include these situations.

As a final type of design to be discussed, between-subject designs may be used in which subjects are randomly assigned to experimental and control groups. This design is also appropriate for situations when reversals in behavior are not expected. If the behavior of control subjects does not change, while that of the treatment subjects does, experimental control of the behavior has been demonstrated. There is obvious resemblance between this design and multiple-baseline design across individuals. However, in the between-subject design subject selection to groups is random. In addition, it is possible to evaluate components of a treatment (without confounding with sequence) by assigning different components to different treatment groups. Although this is a potentially powerful design, it is usually rarely found in the token economy literature, primarily because practical considerations within the applied settings make random assignment difficult, if not impossible. In order for this design to be used, random assignment is essential. Otherwise, the treatment and control groups may differ because of variables not related to the one being investigated. Campbell and Stanley (1963) described a number of between-subject experimental designs that might be used when random assignment is not possible. However, the within-subject designs already described appear preferable to these in most situations.

CONCLUSION

The extensive literature that has developed on token economies indicates clearly that a wide variety of behaviors can be changed in many different populations of subjects using conditioned reinforcers. However, there are three areas in particular that have been insufficiently investigated and in which future studies could profitably concentrate.

First, studies investigating programmed generalization are badly needed. Inasmuch as maintenance of target behaviors beyond the token reinforcement conditions is an important goal of token programs, the examination of variables that contribute to response maintenance appears to be especially important. As reviewed earlier, numerous procedures for augmenting generalization and resistance to extinction are available. The application of these techniques for use in token economies should be evaluated.

Second, few investigators have tried to bring complex behaviors such as language and social behavior under control of token reinforcement. This is probably because the practical problems associated with monitoring and escaping contingencies are difficult to solve. However, any general methodology of behavior change must address itself to these complex behaviors as well.

Third, almost all studies report that the behavior of some subjects was not altered. At this stage in our knowledge it is not clear whether this was due to not applying sufficiently individualized contingencies or whether there are important individual-difference variables that interact with the token procedures. Both possibilities require further investigation.

That token programs are effective in altering behaviors, and offer numerous advantages as treatment programs, cannot be disputed from an examination of the literature. The stability of changes effected, and the generalization of improvements to nontreatment settings, if demonstrated, will strengthen the thrust of the trend to establish token economies in numerous treatment, rehabilitation, and educational settings.

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