

*THE EFFECTS OF TOKEN REINFORCEMENT AND FEEDBACK  
ON THE DELUSIONAL VERBAL BEHAVIOR OF  
CHRONIC PARANOID SCHIZOPHRENICS<sup>1</sup>*

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Prior research with token reinforcement in the psychiatric population has been directed at work adjustment, more than at major symptomatic behaviors. The purpose of the present research, on the other hand, was to investigate the effects of feedback and token reinforcement on the modification of delusional verbal behavior in chronic psychotics. Six male and four female paranoid schizophrenic patients participated in the study. The results indicated that the effects of feedback were effective about half the time in reducing percentage delusional talk, but in at least three cases produced adverse reactions. Token reinforcement, however, showed more consistency and reduced the percentage of delusional verbal behavior in seven of the nine subjects exposed to this procedure. The effects of both feedback and token reinforcement were quite specific to the environment in which they were applied and showed little generalization to other situations. It would appear that using token reinforcement can reduce the percentage delusional speech of chronic paranoid schizophrenics.

The effects of token reinforcement on the behavior of chronic psychotics has been widely examined and reported (Atthowe and Krasner, 1968; Ayllon and Azrin, 1964, 1968; Davison, 1970; Krasner, 1968; Lloyd and Abel, 1970; Schaefer and Martin, 1969). For the most part, token-economy programs have been used in the modification of work adjustment, grooming, and other self-care behaviors, rather than major symptomatic behaviors. Ayllon and Azrin

(1968) felt that it is worthwhile to deal with the non-symptomatic behaviors because once functional behaviors are established, many symptomatic behaviors disappear. These authors speculated that symptomatic behaviors are reduced or eliminated because they cannot exist side by side with the functional behaviors: *e.g.*, a person working steadily on a job cannot take time out to write delusional letters. Ayllon and Azrin (1968) do not present experimental data to support this assertion, which seems questionable since many hospitalized psychotic patients have full or part-time hospital jobs yet continue to display pathological symptoms.

In the population of chronic psychotics, verbal delusional speech is one of the more striking and more easily measured "abnormal" behaviors. Over the past 10 yr, several studies have begun to examine the applicability of operant procedures to the direct modification of delusional behavior in chronic schizophrenics. In one of the first studies to focus on the modification of "sick talk", Rickard, Digman, and Horner (1960) reported a dramatic change in the delusional talk of a 60-yr-old male psychotic who had been hospitalized continuously for over

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20 years. The authors attributed the change to the verbal reinforcement procedure they used. Similarly, Kennedy (1964) reported operant modification of delusional verbal behavior, but her study like Rickard, *et al.*, (1960) did not demonstrate experimentally that the reinforcement procedures produced the changed behavior. Ayllon and Haughton (1964) reported a more impressive control of delusional and hypochondriacal talk than the above studies. In their investigation, each of three patients was observed and their verbal behavior recorded 15 to 20 days before experimental manipulation. Nurses recorded all verbal interaction with each patient, limiting each contact with the patient to a maximum of 3 min. Each interaction was classified as either psychotic or neutral. When psychotic and neutral verbalizations alternated within any one contact, the speech was classified as psychotic. Contingent reinforcement for either class of verbal behavior consisted of listening to or taking interest in the patient and occasionally giving cigarettes or candy. Extinction consisted of withholding social attention and other tangible reinforcers. In each of the three cases, when contingent reinforcement was attached to the response class of either neutral or psychotic talk, that response class increased in frequency. Conversely, whenever extinction was applied to either response class, frequency decreased compared to the baseline level of occurrence. From the point of view of an experimental analysis of the modification of delusional speech, however, there are two weaknesses in this study. Only one subject exhibited classic delusional speech as distinguished from hypochondriacal speech; there were no reliability checks on nurses' recordings, the only measure of "sick talk" provided.

Meichenbaum (1966) investigated operant procedures in the modification of verbal behavior in psychotic patients. Under well-controlled laboratory conditions, Meichenbaum (1966) found that both token reinforcement and verbal praise reduced the percentage of "sick talk" and increased the level of abstraction on a proverb

test in chronic psychotic subjects. The results were made more impressive by tests of generalization, which showed improvement in response classes other than those directly reinforced during the training. One major shortcoming of Meichenbaum's (1966) study was that he simultaneously introduced instructions, positive reinforcement, and punishment into the training sessions, and thus was unable to assess independently the contribution of these variables to changes in the target behaviors.

As an extension of the previous research in this area, the present research used a token-economy procedure to modify the delusional verbal behavior of chronic paranoid schizophrenics. The token system was not confounded with other procedures and was much more extensive than that employed in the Meichenbaum (1966) study. Tokens were needed for almost every aspect of the patients' ward life in the present study and the entire economy was aimed at modifying only delusional verbal behavior. Additionally, the experimental design, which used each of 10 subjects as their own control, allowed an independent assessment of the effects of feedback (telling a subject when he is speaking correctly or incorrectly and describing for him the correct response) and positive token reinforcement. Finally, delusional speech was measured during individual therapy sessions, during time samples on the ward, and during a psychiatric interview.

## METHOD

### *Subjects*

Ten paranoid schizophrenics from the Vermont State Hospital participated in the study. The mean age of the six male and four female patients was 44.9 yr and they had been hospitalized for a mean period of 12.2 yr.

All 10 patients were transferred from the Vermont State Hospital to the Clinical Research Center of the Medical Center Hospital of Vermont, where they remained throughout the study. No changes were usually made in the

patient's medication immediately before or during the experiment. Extra medication was given from time to time when a patient became unmanageable. Extra medication was required for Subject 1 three times during the feedback phase and twice during baseline phases and for Subject 9 once during the feedback phase.

Table 1 summarizes some of the biographical characteristics of these patients.

*Measures*

Each patient's verbal behavior was recorded during (a) training sessions with a therapist, (b) conversations with the nursing staff on the

**Table 1**  
**Age, sex, years of hospitalization, education level and characterization of delusions of the 10 experimental Ss.**

Subjects	Age	Sex	Years of Hospitalization	Education Level	Characterization of Delusions
S1	55	F	8	8th	"Mr. Bean is torturing me with electricity."
S2	40	M	8	8th	"I am the lord. I was born in the year 1."
S3	34	M	6	8th	"Clair is after me. She made me kill 56 commies."
S4	63	M	35	7th	"I have a radio in my head."
S5	67	M	21	7th	"Big Lady has an electric gun on me."
S6	35	M	5	College	"People in the higher standards world gave me power."
S7	45	F	2	8th	"My sister-in-law makes my face ugly at night."
S8	28	F	4	High School	"The Mafia is trying to kill me because I know who killed Kennedy."
S9	25	M	9	9th	"Everyone is treating me. When you tap your finger it's part of my treatment."
S10	57	F	32	High School	"I'm Queen Arlene, the 4th crown queen of North America."

ward, and (c) interviews with a psychiatric resident unfamiliar with the design of the study. Because of administrative and technical constraints, formal reliability checks on recording of frequency of delusional behavior could be carried out only during therapist sessions. Time samples of ward measures by nursing staff and the results of "mental status" psychiatric interviews are nevertheless included in this report to provide some idea of the generalization of effects to different settings and people. Although less rigorous clinical evaluations and criteria were used for this purpose, it should be remembered that these and other even cruder impressions are the typical bases for evaluating patient progress in psychiatric settings. In a practical sense, the general value of specific changes in behavior have to be evaluated, in part, by these "clinical" criteria.

(a) *Sessions with therapist.* In each session, a patient was asked a series of 15 questions designed to evoke delusional responding. For example, if a patient believed that he was being persecuted by Mr. X, a question such as "Is Mr. X following you?" might be asked. These questions were randomly drawn each day from a larger pool of 105 questions. A separate pool of questions was designed for each Subject. Two sessions were held per day. Each patient was instructed that the questions were for the purpose of finding out more about the way they thought and that they should answer the questions correctly. During the sessions, 20 sec were allowed after each question for the patient's response. If the patient's response was monosyllabic, he was asked to tell more about it. Each response was judged and recorded by the therapist as either delusional or nondelusional, and at least 25% of the sessions were tape recorded and reviewed by an independent judge as a reliability check. Reliability checks were made during every experimental phase. The independent judge was unaware of the purpose of the experiment. The judge, who was a psychiatric nurse, recorded each response of the patients as being delusional or nondelusional. The per-

centage agreement in these checks was always above 90% except for Subjects 5 and 9, where the agreement was between 85% and 90%.

Before reviewing a series of tapes for a particular patient, the judge was given an accurate life history of the patient from the hospital records, which contained examples of the patient's delusional speech. Since the tokens were made of paper, the judge could not hear the experimenter passing tokens to a patient and inadvertently receive cues as to which phase was being reviewed. Furthermore, the judge was instructed to make her judgements immediately after each patient's response, thus eliminating cues during the feedback phase as well. Confidence in the above reliability checks is supported by the fact that the percentage agreement for token reinforcement and feedback phases was always within 7% of the percentage agreement for baseline phases.

(b) *Ward.* Verbal behavior of each patient was recorded by the nursing staff on a random time sample 20 times a day. The 10 nurses on the staff were instructed to interact with the patients in a non-directive fashion, not to probe for delusions and to let the patients carry as much of the conversation as possible. This was essentially the identical procedure used by Aylton and Haughton (1964) for recording delusional and hypochondriacal talk. Typically, the nurses would approach a patient and ask how things were going.

Before interacting with a particular patient, a complete life history containing examples of delusional speech was read by each of the nurses.

Each time sample included 3 min of conversation, which the nurses timed by their wrist watches. The nurses judged each minute separately and by two categories: delusional or nondelusional. If any fraction of a minute contained delusional talk, the entire minute was recorded as delusional. If there was no conversation during a time-sample minute, that minute was not included in the data. Although, regrettably no tape recordings could be made of these interactions, there is reason to believe that

these ward measures were accurate. This is because the nurses also judged and recorded verbal behavior that occurred outside of the time samples in the same manner in which verbal behavior was recorded during time samples. Verbal behavior outside of time samples included all conversations between patients and nurses that occurred spontaneously. And, although the amount of conversation that occurred outside of the time samples varied widely from day to day, the mean percentage delusional talk outside of time samples never varied more than 4% from the time samples for any phase and almost always coincided with the mean percentage delusional talk during time samples. Thus, the measurements on the ward were consistent within a day. Another reason to have more than the usual confidence in these time-sample measures on the ward has to do with the fact that throughout the study, 10 nurses were involved in obtaining these samples.

Throughout the study, the nurses' records were analyzed mainly to ensure that there was little discrepancy in a day between a series of time samples obtained by one nurse and a series obtained by another nurse, especially if these samples were equivalently distributed throughout the hours of the day. Such discrepancies among the nurses were not observed for any of the patients, although numerical data supporting these observations were not recorded.

(c) *Independent psychiatric interviews.* At the beginning of the experiment and at the end of each experimental phase, a psychiatric resident unfamiliar with the experimental conditions interviewed each patient for 30 min and evaluated his mental status and any changes that occurred in his delusional verbal behavior. All behaviors of each patient were noted as zero during the initial interview. The psychiatrist compared all subsequent interviews to the first one and noted any changes in a patient's behavior on a scale from -7 (worsened very much) to +7 (improved very much). Each separate behavior of a patient *i.e.*, appearance, effect, memory, *etc.* was rated during each inter-

view and all ratings (positive and negative) were added, yielding a total score for each interview. The total score was then converted into a percentage change score. No reliability check was made on these data. The psychiatric interviews were included in the study merely to detect whether or not an independent psychiatrist could observe any changes in the experimental Subjects' behavior. These interviews were held at the end of each experimental phase, to determine if specific changes observed in training sessions would also be reflected in other environments, such as interviews with a psychiatrist, even though no special program had been used to promote such generalization.

#### *Experimental Phases*

During baseline phases, patients received 250 individually marked tokens from the nurses at the beginning of each day and no contingencies were placed on a patient's verbal behavior, either in therapist sessions or on the ward. If a patient spent all 250 tokens before the end of a day, he could receive additional tokens by simply asking the nurses for them. During the feedback phase, a different colored light was shown after each answer of the patient to indicate to him if his response was correct or incorrect. In addition, feedback was given to the patient after each answer informing him why his response was correct or incorrect. For example, if the therapist asked the question "Are you Jesus Christ?" and the patient answered that he was Jesus Christ, the therapist would then reply "Your answer is incorrect, Jesus Christ lived almost two thousand years ago. Your name is Mr. M. and you are forty years old." On the other hand, if the patient's answer to the question was correct, the therapist would confirm the answer by replying "Your answer is correct, you are not Jesus Christ." This was done in therapist sessions only. Free presentation of tokens continued during this phase. During token reinforcement phases, tokens were made contingent on non-delusional behavior, and given for every correct response. At first, they

could be earned only during the sessions with the therapist. Subsequently, tokens were provided for non-delusional behavior exhibited both in sessions and on the ward, both during time samples and whenever a patient spoke spontaneously to the nurses outside of the time samples.

When tokens were contingently given, the patients were informed that tokens now had to be earned by "talking correctly". The contingencies were also explained to each patient by the therapist, *e.g.*, "for each minute that you talk correctly to the nurses and for each question you answer correctly in sessions you will receive X tokens". Normally, each phase lasted seven days. However, if the data in a particular phase met either of the following criteria, the phase was extended four additional days in order to observe if the trend in the data would be maintained:

1. Five of seven of the data points of a particular phase were below the corresponding points of the previous phase.
2. There was at least 20% reduction in delusional behavior on the last day of a phase compared to the final day of the preceding phase.

On occasions when the percentage delusional talk of a patient did not decrease on the ward as a result of token ward reinforcement, or when a patient had a very low percentage of ward delusional talk, a bonus token phase was added. Under the usual system of token reinforcement on the ward, a patient could increase the absolute frequency of both non-delusional and delusional statements, keeping the percentage constant but earning more tokens as a result of the increased frequency of non-delusional statements. This was a particular problem for behavior that took place outside of therapist sessions and outside of the 20 prescribed time samples on the ward. This was not a problem under the bonus system, however, because bonus tokens were given contingently on a percentage basis. For example, if bonus tokens were predetermined to be available for a percentage

criterion of 10%, then only if the patient spoke delusionally less than 10% of the time during any of three time periods of a day, could he receive bonus tokens for that time period. Each of the three time periods (9 a.m. to 1 p.m.; 1 p.m. to 6 p.m.; 6 p.m. to 9 a.m.) were considered as separate opportunities to earn bonus tokens.

Tokens were exchangeable for the following items and events plus any other things found to be reinforcing to a particular patient:

1. meals
2. extra dessert
3. canteen
4. cigarettes
5. time off the ward
6. time in the TV and game room
7. time in bedroom between 8 a.m. and 9 p.m.
8. visitors
9. books and magazines
10. recreation, dances on other wards.

The exchange rate was individually tailored for each patient depending on his particular likes and interests and pattern of spending. The economy for each patient was designed during a 10-day pre-baseline phase when patients were given tokens freely. During the pre-baseline phase, all items and events were given equal values and careful records were kept of how and when a patient spent his tokens. Thus, if it was observed that a patient spent many of his tokens on books, then once the experiment started, books would be assigned a high value in terms of number of tokens. The economy also used different-shaped and different-colored paper tokens. In this way, each patient had his own set of tokens, which could not be traded with others. Also, a different colored token was needed on each day and thus, a patient could not hoard his tokens from day to day but had to spend tokens on the day they were earned.

#### *Experimental Design*

All 10 Subjects began the experiment by undergoing a seven-day baseline phase during which time delusional behavior both in therapist

sessions and on the ward was measured. After this phase was completed, the experimental conditions (either reinforcement or feedback) were instated. Subsequent baseline phases were introduced whenever an experimental variable produced a marked decrease in delusional behavior. If, during the baseline phase (which followed the experimental phase) delusional behavior increased to about its former level, then it could be concluded that the changes that occurred during the experimental phases were due to the experimental variable and not simply to passage of time or other uncontrolled experiences. This is the usual ABA design.

It is quite possible that the effects of the feedback condition could influence how a patient responded during token reinforcement if feedback always came first (and *vice versa*). To control for this possibility, a counterbalanced sequence was employed. Subjects 1 to 5 were exposed to the following sequence: Baseline, Feedback, Baseline, Token reinforcement in therapist sessions, Baseline, Token reinforcement on the ward, Baseline. Subjects 6 to 10 were exposed to a different sequence: Baseline, Token reinforcement in therapist sessions, Baseline. Interspersed baseline phases were included only if there was a reduction in delusional behavior in prior phases. The token bonus phase was introduced into the above two sequences whenever a patient's behavior warranted it.

## RESULTS

The results from the therapist sessions and from time samples on the ward are presented in figures as percentage delusional talk. In sessions, this really means percentage of 30 responses that were delusional, and for time samples on the ward it refers to the percentage of twenty 3-min intervals that contained some delusional speech. The data for each Subject are presented separately in graphic form so that the time course and relationship between performance in sessions and on the ward is made clear for each Subject. This is followed by a summary table of results for each Subject.

### *Results Subject 1*

The effects of feedback and token reinforcement on the verbal behavior of Subject 1 are presented in Figure 1 in terms of percentage delusional talk. Feedback during therapist sessions did not reduce the percentage of delusional responses to specific questions. In fact, feedback appeared to upset the patient and she required extra medication three times during this phase.

After the feedback phase, token reinforcement applied in sessions alone (phase 3) and on the ward (phase 5) produced substantial decreases in the percentage delusional talk.

### *Results Subject 2*

The effect of feedback on the verbal behavior of Subject 2 is presented in Figure 2.

The percentage of delusional responses during therapist sessions was reduced from about 85% at the end of the initial baseline (phase 1) to about 0% at the end of the feedback phase (phase 2). Although there was a slight reversal during subsequent baseline phase (phase 3) of the percentage of delusional talk in sessions, it was felt that the reversal was not substantial enough to warrant further experimental manipulations. Furthermore, the amount of delusional talk on the ward was less than 2 min a day and consequently insufficient for experimental purposes.

### *Results Subject 3*

The effects of feedback and token reinforcement on Subject 3 are presented in Figure 3.

Feedback during therapist sessions (phase 2) produced only a transitory decrease in delusional responding. Token reinforcement, on the other hand, consistently reduced the percentage delusional responding whenever it was employed in therapist sessions and on the ward under the bonus system.

### *Results Subject 4*

Feedback in therapist sessions did not reduce percentage delusional talk of Subject 4.

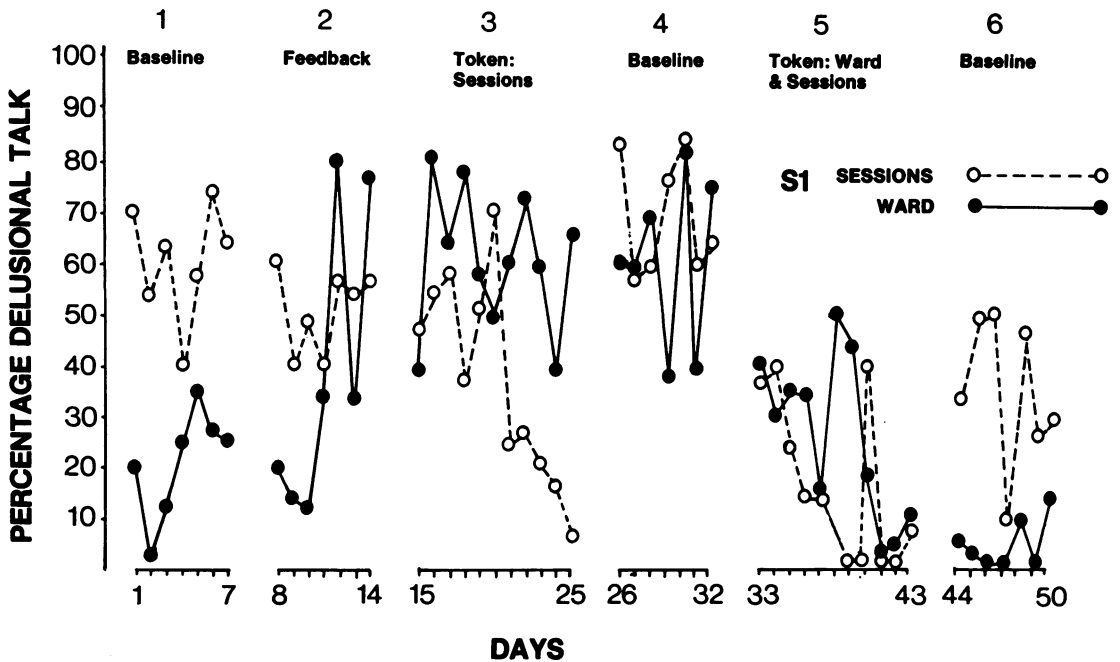


Fig. 1. Percentage delusional talk of Subject 1 during therapist sessions and on ward for each experimental day.

Token reinforcement, however, did reduce delusional responding in therapist sessions in both phases 4 and 6. Since Subject 4 had a very low percentage and amount of delusional ward talk, the bonus token system was applied to ward behavior. During the bonus phase, delusional talking on the ward was reduced to zero %.

#### Results Subject 5

The effects of feedback and token reinforcement on the verbal behavior of Subject 5 are presented in Figure 5.

Subject 5 initially reduced the percentage delusional responding in therapist sessions when feedback was introduced. After three days, percentage delusional talk in sessions increased but the overall reduction during this phase was still substantially below the first baseline.

Token reinforcement in sessions also reduced the percentage delusional responding in phases 4, 6, and 7. Token reinforcement was not effective on the ward during phase 6 but was effective during phase 7 when the bonus system was introduced.

#### Results Subject 6

The results of Subject 6 are presented in Figure 6.

Delusional talking did not decrease either in therapist sessions or on the ward as a result of either token reinforcement or feedback. Feedback did, however, appear to upset Subject 6 very much and he began accusing the therapist of persecuting him.

#### Results Subject 7

The effects of token reinforcement and feedback for Subject 7 are presented in Figure 7.

Token reinforcement reduced the percentage delusional talk in therapist session (phases 2, 6, and 7) but did not reduce the percentage delusional talk on the ward in phase 6 or in phase 7 when the bonus system was applied. Feedback applied in therapist sessions (phase 4) slightly reduced the percentage delusional talk.

#### Results Subject 8

The results of Subject 8 are presented in Figure 8.



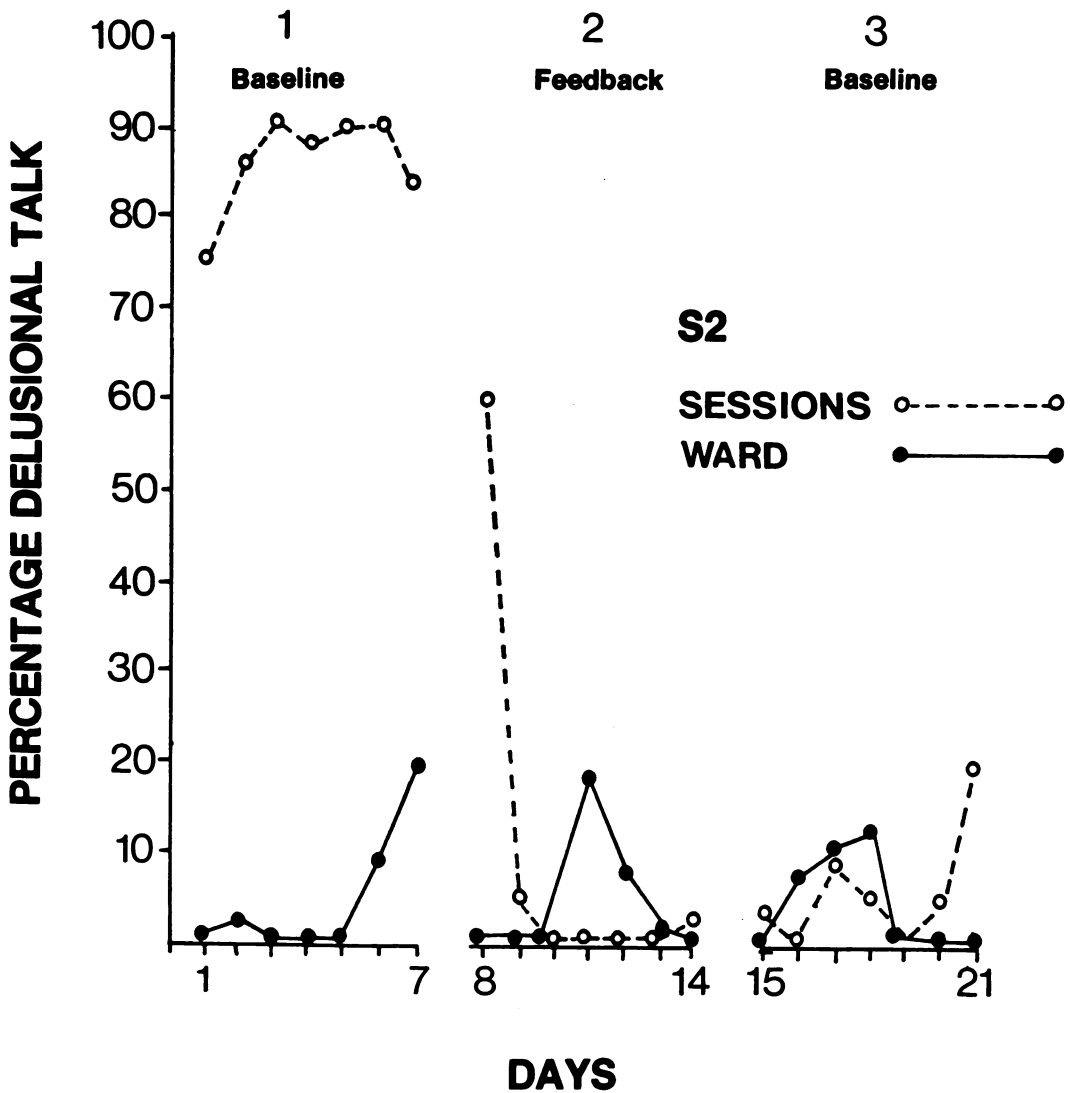


Fig. 2. Percentage delusional talk of Subject 2 during therapist sessions and on ward for each experimental day.

Both token reinforcement and feedback were effective in reducing the percentage delusional responding in therapist sessions. Since there was zero percentage delusional talk on the ward throughout phases 3, 4, and 5, no further experimental manipulations were conducted with Subject 8.

*Results Subject 9*

The effects of token reinforcement and feedback on the delusional verbal behavior of Subject 9 are presented in Figure 9.

As shown in Figure 9, token reinforcement in sessions (phases 2 and 6) substantially reduced the percentage delusional talk.

Feedback in therapist sessions in general reduced the percentage delusional talk. On the fourth day of the feedback phase (4), the patient became very upset, however, because he felt that in speaking correctly (non-delusionally) he was lying and that this would extend his stay in the hospital. After being reassured by a psychiatrist that his stay in the hospital would not be effected primarily by how he answered

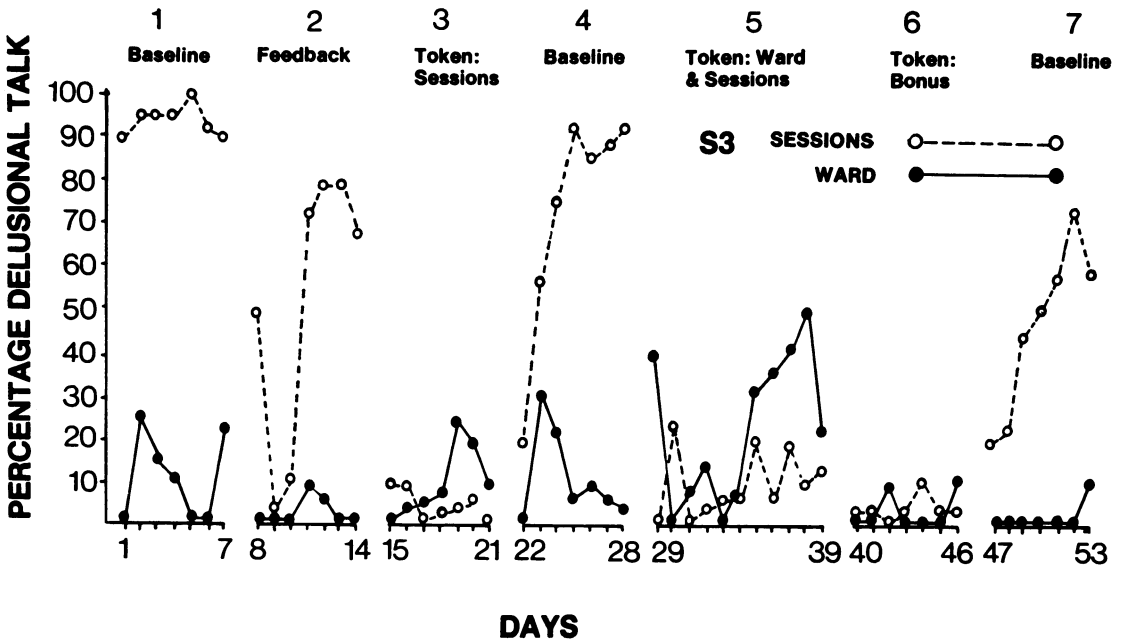


Fig. 3. Percentage delusional talk of Subject 3 during therapist sessions and on ward for each experimental day.

the questions in therapist sessions, he once again began answering the questions nondelusional. Token reinforcement on the ward substantially reduced the percentage delusional talk.

*Results Subject 10*

The results of Subject 10 are presented in Figure 10.

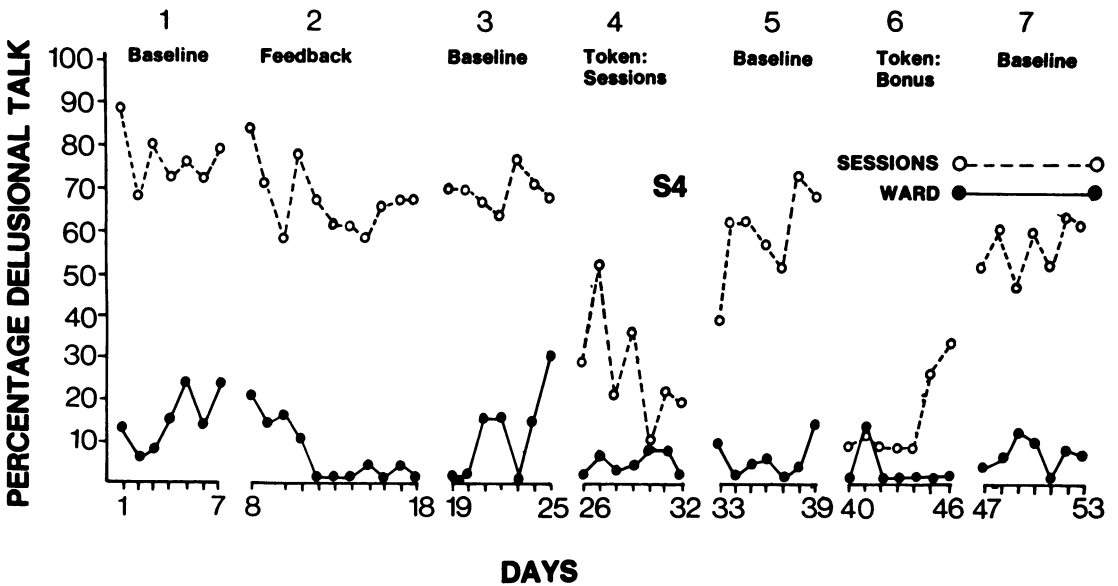


Fig. 4. Percentage delusional talk of Subject 4 during therapist sessions and on ward for each experimental day.

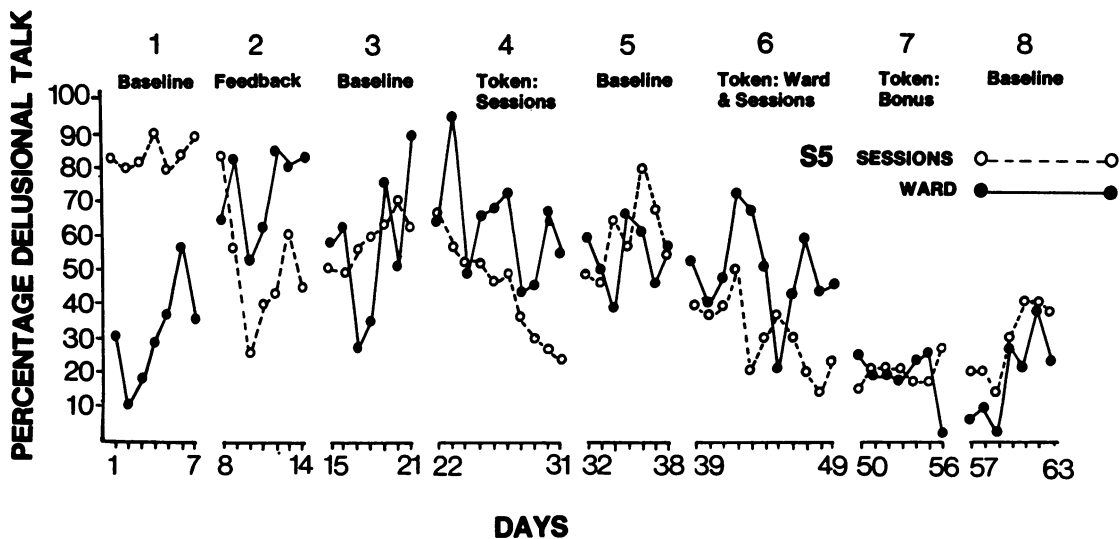


Fig. 5. Percentage delusional talk of Subject 5 during therapist sessions and on ward for each experimental day.

Neither token reinforcement nor feedback reduced the percentage delusional talk of Subject 10, either during therapist sessions or on the ward.

*Summary of Results Subjects 1 to 10*

Since all Subjects did not participate in equal sequences or number of experimental conditions

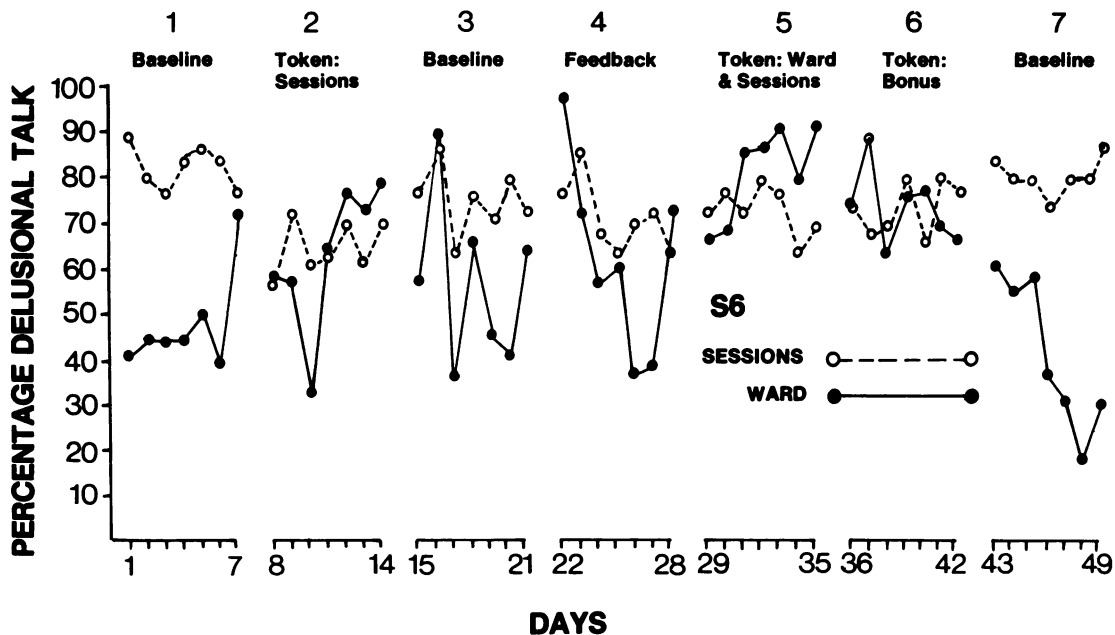


Fig. 6. Percentage delusional talk of Subject 6 during therapist sessions and on ward for each experimental day.

or phases, grouping the data across Subjects according to means or medians either on a daily or complete phase basis yields misleading data that do not take individual trends into account. The data therefore are summarized in Table 2 by reporting the means of the last two data points of each phase for each individual Subject.

It is felt that the last two data points of a phase accurately reflect the effectiveness of a particular variable when compared to the last two data points of preceding and succeeding phases. Both amount of reduction and trend in the data are represented by this measure. Twenty per cent change in delusional verbal behavior during a phase compared to preceding

and succeeding phase was accepted as an effective change in a Subject's behavior.

As reported in Table 2, none of the 10 Subjects showed a reduction of 20% in delusional responding during feedback phases compared to preceding and succeeding phases. Five Subjects (2, 5, 7, 8, and 9) did, however, show reductions in delusional responding of at least 20% without reversals, while five Subjects (1, 3, 4, 6, and 10) showed little change in percentage delusional responding when feedback was given.

Token reinforcement applied in therapist sessions effectively reduced delusional responding in these sessions by at least 20% in six out of nine Subjects (1, 3, 4, 5, 8, and 9) while Subject

Table 2

Mean percentage delusional talk of each S based on last two data points of each phase in therapist sessions and on the ward.

Subjects	Phase Sequence							
	Baseline	Feedback	Baseline	Token: Sessions	Baseline	Token: Ward & Sessions	Bonus	Baseline
S1 Sessions	68.1	59.8	—	11.6	61.4	1.6	—	28.2
S1 Ward	26.2	50.4	—	52.9	56.7	7.4	—	11.3
S2 Sessions	83.0	1.6	13.3	—	—	—	—	—
S2 Ward	16.6	5.9	0.0	—	—	—	—	—
S3 Sessions	91.3	73.0	—	3.3	91.3	11.6	5.0	64.7
S3 Ward	27.0	9.9	—	36.3	5.0	21.6	4.6	4.0
S4 Sessions	76.4	66.4	68.1	21.6	61.4	—	29.9	61.4
S4 Ward	27.0	2.6	24.2	4.4	13.3	—	0.0	3.2
S5 Sessions	86.3	51.5	64.7	24.9	59.8	18.3	21.6	38.2
S5 Ward	48.3	79.2	70.6	61.9	51.7	45.1	4.6	29.2
	Baseline	Token: Sessions	Baseline	Feedback	Baseline	Token: Ward & Sessions	Bonus	Baseline
S6 Sessions	79.7	64.7	76.4	68.1	—	66.4	78.0	83.0
S6 Ward	58.2	79.5	50.7	56.6	—	78.8	69.6	25.7
S7 Sessions	89.6	59.8	69.7	48.1	63.1	48.1	36.5	71.4
S7 Ward	23.0	12.5	19.1	9.1	18.8	14.0	37.4	20.9
S8 Sessions	86.3	18.3	49.8	8.3	0.0	—	—	—
S8 Ward	6.9	3.3	0.0	0.0	0.0	—	—	—
S9 Sessions	79.7	13.3	54.8	5.0	20.0	1.7	—	51.5
S9 Ward	13.4	8.9	44.9	16.3	34.8	3.4	—	14.0
S10 Sessions	83.0	66.4	73.0	64.7	—	66.4	—	—
S10 Ward	16.6	33.1	8.2	11.3	—	58.2	—	—

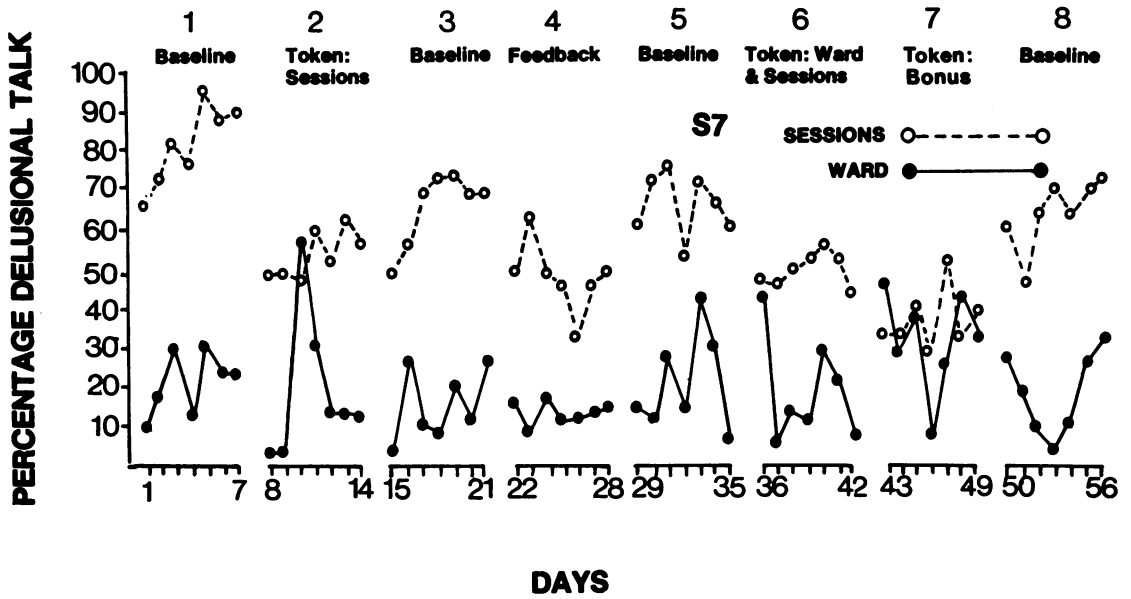


Fig. 7. Percentage delusional talk of Subject 7 during therapist sessions and on ward for each experimental day.

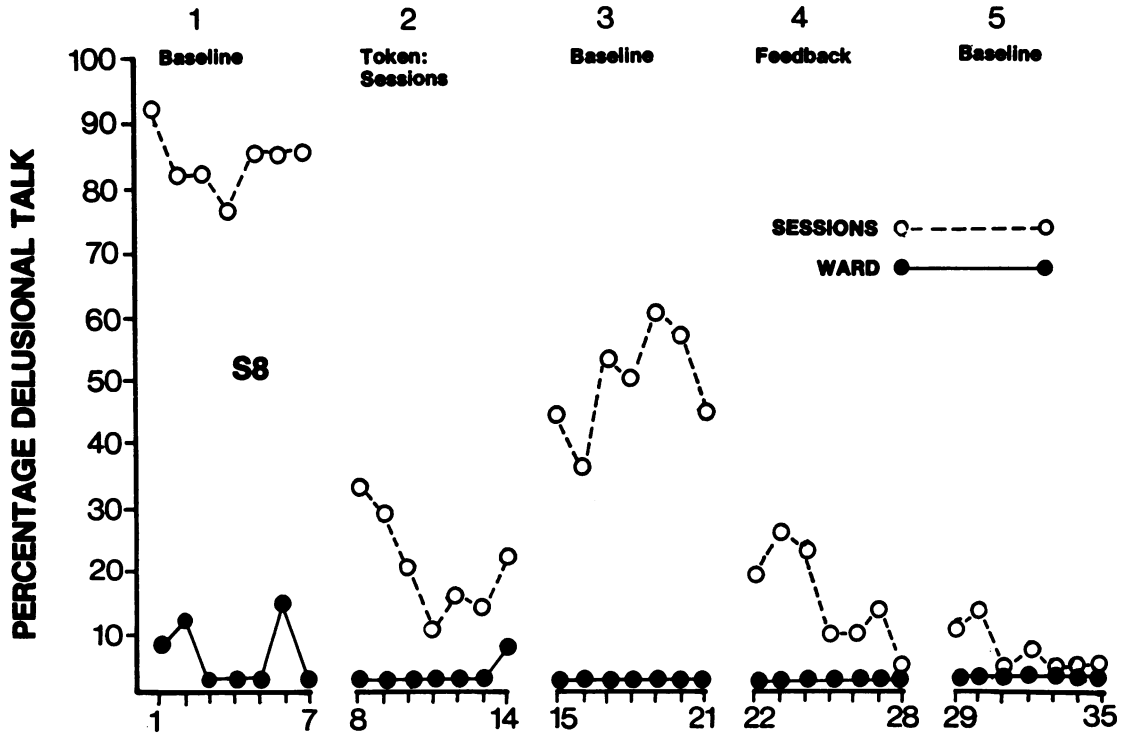


Fig. 8. Percentage delusional talk of Subject 8 during therapist sessions and on ward for each experimental day.

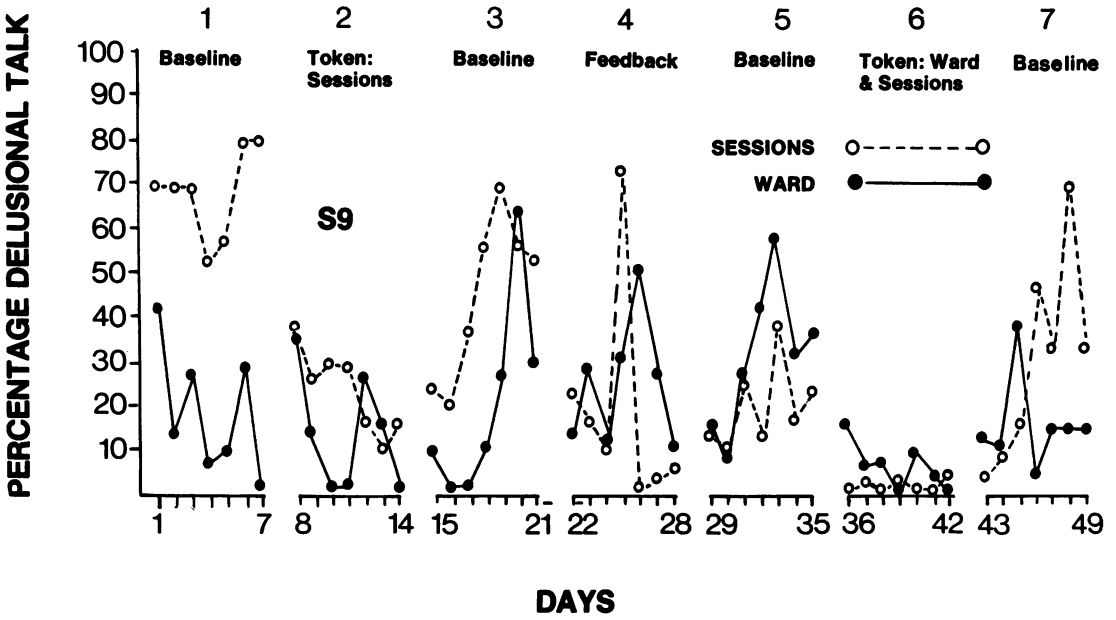


Fig 9. Percentage delusional talk of Subject 9 during therapist sessions and on ward for each experimental day.

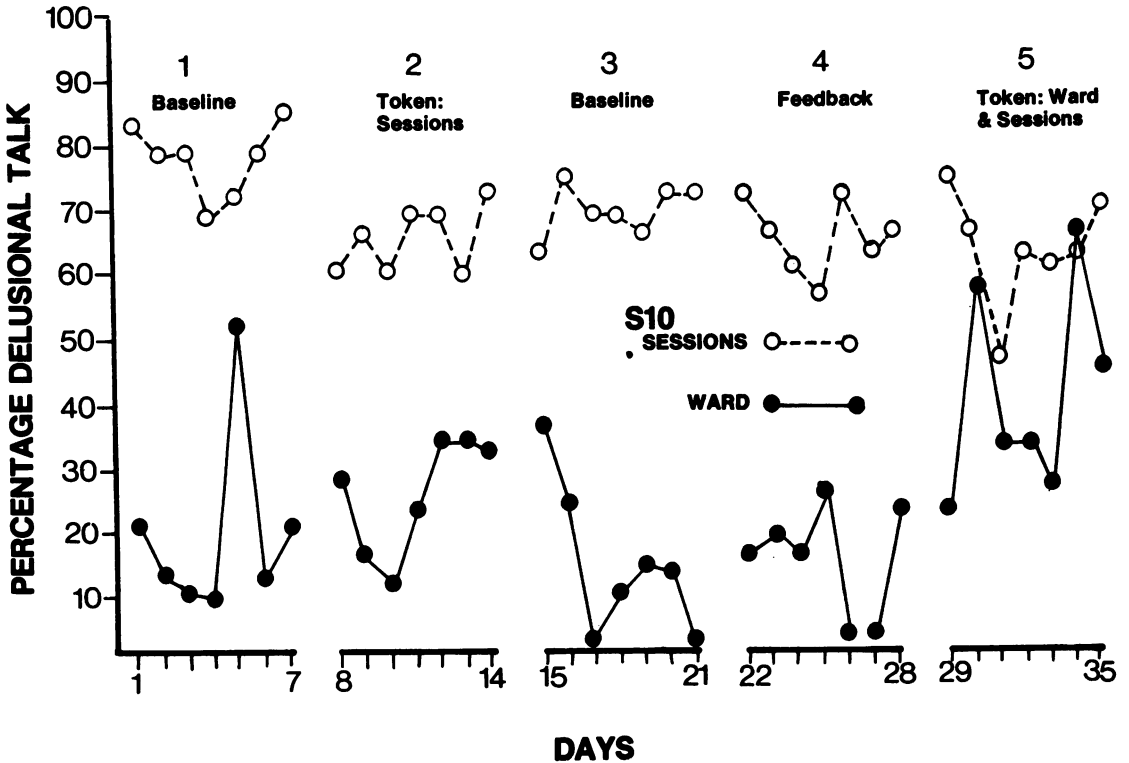


Fig. 10. Percentage delusional talk of Subject 10 during therapist sessions and on ward for each experimental day.

7 showed a reduction of over 20% without a reversal and Subjects 6 and 10 showed little change in delusional responding.

Token reinforcement applied to the ward had less effect on ward behavior than token reinforcement in sessions had on session behavior. No Subject showed 20% reductions in delusional talk on the ward with subsequent reversals, but Subjects 1 and 9 did show 20% reductions under the usual procedure and Subject 5 under the bonus procedure without reversal in the subsequent baseline phase. Four Subjects (3, 4, 5, and 7) did not reduce delusional talk by 20% under the usual token ward reinforcement procedure (although Subject 4 did reduce delusional talk from 13% to 0) and two Subjects (6 and 10) increased delusional talk by over 20% when token reinforcement was applied to the ward.

#### *Results of Independent Psychiatric Interviews*

The independent psychiatrists were unable to detect changes in a patient's overall mental status or in a patient's delusional speech that were specifically correlated with reductions in delusional speech noted in therapist sessions. In general, the psychiatrists noted either no changes at all in the patients or gradual improvement in the patients from the beginning to the end of the experiment, regardless of experimental phase.

## DISCUSSION

From this research it may be concluded that token reinforcement can reduce the percentage delusional talk of paranoid schizophrenic patients within a relatively short period of time, particularly in specially designed training sessions, and to a lesser extent on the ward. This finding extends the work of others (Ayllon and Azrin, 1968; Schaeffer and Martin, 1969) who have shown that token reinforcement can modify non-symptomatic behaviors of schizophrenic patients. In addition, these results extend the

work of several uncontrolled studies on the use of reinforcement procedures in modifying delusional behavior (Kennedy, 1964; Rickard, *et. al.*, 1960; Richard and Dinoff, 1960). It also lends support to a study by Ayllon and Haughton (1964) that experimentally demonstrated in one patient that verbal reinforcement can modify long-term delusional speech, and a study by Meichenbaum (1966) that demonstrated that token and verbal rewards and punishments used together can modify "sick talk".

The difference in effectiveness of reinforcement procedures employed in therapist sessions and on the ward is of interest. Since the training sessions, as distinguished from the time-sampling procedure, were designed to elicit delusional behavior, reinforcement contingencies could be administered more regularly and systematically. A similar procedure, although more difficult to employ on the ward by nursing staff, would probably facilitate change in delusional behavior that is as chronic as was studied in these 10 cases. Furthermore, more precise and objective measuring systems incorporating frequent reliability checks might improve the effectiveness of the ward reinforcement procedure.

For example, the nurses could use voice-activated shoulder tape recorders to record their interactions with the patients. The tape records could then be used to teach the nurses to deliver tokens reliably following specified verbal behavior of the patients.

The role of feedback in the present study is not clear. In an earlier study by Ayllon and Azrin (1964) and in their more recent book (Ayllon and Azrin, 1968), it is suggested that instructions that define for the patient the desired response are useful in conjunction with token reinforcement for shaping and changing behavior. In working with actual delusional behaviors, on the other hand, such instructions (which in this case are labelled feedback because they are consequences of behavior rather than antecedents) appear effective with some patients (Subjects 2, 5, 7, 8, and 9), ineffective with

others (Subjects 1, 3, 4, 6, and 10), and in some cases undesirable since they may cause some hostility on the part of the patient, as was noted in Subjects 1, 6, and 9. Feedback by itself has been found to have therapeutic benefit with some neurotic cases (Leitenberg *et. al.*, 1968) and it was effective in some of the Subjects in the present study as well, suggesting that much work needs to be done in order to predict when a given type of behavioral interaction is likely to succeed in a given case.

The present research suggests that the effects of token reinforcement and feedback were very specific to the environment in which they are employed. That is, there appeared to be little generalization to situations outside the specific training environment and certainly, changes in a patient's delusional system and general mental status could not be detected by a psychiatrist, even though some changes were observed in training situations. Either longer phases or special procedures may be necessary to facilitate generalization. Special procedures might include the use of intermittent schedules of reinforcement and the inclusion of family and friends in the dispensing of tokens on the ward. Family and friends could then substitute verbal praise for token reinforcement and apply this procedure both on the ward and later in situations outside of the hospital.

The results may be interpreted as demonstrating that long-standing delusional verbal behavior of schizophrenics can be modified with token-economy procedures. This does not mean that this procedure is a new and effective treatment of paranoid schizophrenia, for certainly the limitations of this experiment and the results do not warrant such far-reaching conclusions. Further research in this area may prove to be valuable, however, in developing effective procedures for the treatment of specific behaviors in the psychotic population, such as delusional speech.

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