*A SYSTEM FOR RECORDING INDIVIDUALIZED BEHAVIORAL
DATA IN A TOKEN PROGRAM¹*

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A data matrix system used to record and summarize individual behavioral data is described. The major characteristics of the system are: (1) it provides a place to record and summarize all patient token exchanges, whether for standard contingencies or for idiosyncratic behavior; (2) it serves as a record and summary for time samples observed during a 24-hr period and as a record of reliability data on time sample measures; (3) it provides a place where the new token balance for each patient can be calculated and recorded for use the next day; (4) it provides for calculation of an individual patient's token balance at any given moment; and (5) it is a permanent record of each patient's daily participation in the program and documents progress in terms of his economic status as well as in changes in critical target behaviors.

An integral part of all token economy programs is the observation, quantification, recording, and analyzing of patient behavioral data. As in any information system, this needs to be accomplished in a manner as efficient, accurate, and easily retrievable as possible. The data also should reflect, as precisely as possible, empirical behavioral phenomena and not represent statistical artifacts. A data matrix is described that embodies many of the characteristics described above.

Program Description

This data collection system is used on a token economy program on a closed psychiatric ward at the Veterans Administration Hospital in Birmingham, Alabama. The program has been in operation since July 8, 1969. The facility is generally for short-term psychiatric admissions with the average stay being 34 hospital days. Some idea of the diagnostic breakdown within the patient population may be gained from the

following data collected over a two-month period, from September through October 1969: functional psychosis—43%, personality disorders—38%, neurotic disorders—14%, and psychosis associated with organic brain syndrome—5%.

Data Recording

As in most programs, this one involves certain behavioral contingencies expected of all patients. Examples are awakening on time, good grooming, and job performance. Since many of the patients are not severely regressed, but, rather, exhibit idiosyncratic maladaptive behavior, consideration is given to these "special behaviors" on an individualized basis. These behaviors are observed using the time sampling technique described by Milby (1970). They are quantified with the aid of operational definitions. Costs and earnings for common events requiring behaviors expected of all patients are recorded at the time of pay-off directly onto the data matrix. Costs and earnings for individual activities and special behaviors are recorded at the time of pay-off on an individual patient's card, which he carries with him at all times. Figure 1 shows the patient card that each individual carries on his person. This card is carried in the shirt pocket of every patient and is used to record events only

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A patient's token balance at any given moment may be obtained by considering the earnings and expenditures recorded on the card, in addition to those already recorded on the matrix. This balance results if the difference between earnings and expenditures is appropriately added to or subtracted from the entered balance for the previous day. This provides a useful source of feedback for both patients and staff.

The data matrix is a summary matrix that incorporates all information necessary for the daily functioning of the program. It incorporates data from four major sources: (1) common

Figure 2 shows the data matrix. The matrix includes data transferred from the individual 3 by 5 in. patient cards and from time sample forms. Common events for all patients such as arising on time, meals, *etc.*, are recorded directly onto

COST				
Event	Spec. Beh.	Time	Cost	Init.
Staff				
PRN				
TV				
Coffee				
Nap				
Pool				
Card Games				

Fig. 1. Two sides of the 3 by 5 in. card on which individual earnings, spendings, and special behaviors are recorded for each patient at the time of their occurrence.

Another part of his duties, not included in the average time recorded above, is to add new data points to the target behavior graphs of all patients being specially observed or time sampled. Thus, in 1 hr, 27 min, plus the time it takes to add data points to a few graphs, a complete record of the ward and of all individual patients on the ward is kept up to date for easy reference.

Use of both a Master Sheet with individual cards provides advantages not found in the Colman and Boren (1970) system. The individual cards provide feedback to patients many times per day regarding their behavior and its effect on the environment. Such feedback in and of itself has been shown to be effective in modifying behavior (Cooper, Thompson, and Baer, 1970; Leitenberg, Agras, Thompson, and Wright, 1968; O'Brien and Azrin, 1970; Panon, Boozer, and Morris, 1970; Suchotliff, Greaves, Stecker, and Berke, *unpublished*). Use of the individual cards on which staff members make notes and sign their initials also provides important discriminative stimuli for delivery of social reinforcement by staff members.

Because data are transferred from the individual cards to the Master Sheet there is a possibility that errors in transfer of data could interfere with the usefulness of the Master. To assess this possibility, the reliability of data transfer from cards to Master over 16 days was checked. Two staff members independently transferred data from the same patient cards to a Master Sheet. The number of disagreements on any entry were noted and expressed as a percentage of the total entries possible for that day. Reliability over the 16-day period, expressed as percentage agreement, ranged from 91.3% to 100% with the mode being 100%.

To assess the reliability of behavioral measures, two nursing staff members simultaneously observed and independently recorded observations during prescheduled 30-sec periods throughout the day. No effort was made to ensure that the same two staff members made reliability measures, so that most of the staff

participated in the reliability assessment, and each had different co-observers at various times.

The timed 30-sec observation period was indicated by one observer to the other via unobtrusive signal. At the end of the 30-sec period, each observer independently indicated whether each of the target behaviors for that patient did or did not occur during the 30 sec. Fourteen to 23 such observations were made on two to three patients per day over a one- to three-day period. As many as eight target behaviors were observed for any one patient. Number of patients observed, total observations, frequency detections by one or both observers, frequency agreements between observers as to whether target behavior did or did not occur and reliability and occurrence reliability are found in Table 1. Reliability is expressed as per cent agreement between observers on occurrence-nonoccurrence of the behavior, *i.e.*, agreements/total observations. Occurrence reliability is expressed as the per cent agreements between observers when the behavior is detected, *i.e.*, detection agreements/total detections. The table summarizes the reliability data gathered on all research patients admitted to the token economy program over the two-month period from March 21, to May 23, 1972. Operational definitions for the first three behaviors in the table are: (1) *Social Interaction*—"Talking to, working with or playing with another person during the observation period". (2) *Pacing*—"Walking which involves at least one turn of approximately 180° during the observation period". (3) *Whining and Complaining*—"Talking about one's body or physical condition to anyone but a nurse or physician during the observation period". A list of complete operational definitions for each of the behaviors listed in Table 1 may be obtained by writing to the first author.

Inclusion of occurrence reliability in the table reflects a concern with reliability of behavioral observations where the behavior occurs infrequently. When a target behavior occurs once per day or less, standard reliability measures, usually expressed as total agreements on whether the

Table 1

Summary of behavioral observation data and two kinds of reliability measures on all patients admitted to the token economy program during a two-month period.

<i>Target Behavior</i>	<i>No. Patients Observed</i>	<i>Total Observations</i>	<i>Frequency Detection</i>	<i>Frequency Agreements</i>	<i>Reliability</i>	<i>Occurrence Reliability</i>
Social interaction	16	348	126	341	98%	94%
Pacing	7	187	16	186	99%	94%
Whining and Complaining	6	140	1	140	100%	100%
Inappropriate lying down	7	195	32	192	98%	91%
Delusional speech	6	99	1	99	100%	100%
Inappropriate verbal behavior	6	87	4	84	97%	75%
Talking to self	4	124	7	124	100%	100%
Inappropriate motor behavior	3	61	10	61	100%	100%
Verbal aggressive behavior	2	60	1	60	100%	100%
Self-initiated social interaction	2	92	2	92	100%	100%
Sitting alone	2	64	41	64	100%	100%
Arising during sleep	2	36	—	36	100%	—
Inappropriate laughing and giggling	1	23	3	22	96%	67%
Head on table	1	31	15	31	100%	100%
Self-derogatory verbal behavior	1	57	—	57	100%	100%
Assertive behavior	2	69	—	69	97%	—

behavior did or did not occur divided by total observations, can reflect high agreement but only on the non-occurrence of a behavior. Though it is important to have high reliability about the non-occurrence of behavior, such high per cent reliability can be deceptive and not represent reliability of agreement *when the target behavior occurs*. For this reason, we have regularly kept records of both kinds of reliability on new target behaviors, usually until operational definitions have been refined, several staff members exposed to the patient, and total reliability percentages in the 95 to 100% range produced. Although we are not happy with occurrence reliabilities around 67%, and strive for 90% or above, we find that agreement on two of three incidents of a behavior that occurs once or less a day is still valuable for treatment and often very difficult to improve upon. We usually find oc-

currence reliability varies according to how frequently the behavior occurs, tending to be lower when the behavior occurs less than once or twice per day. For example, the two lowest occurrence reliabilities in the table are for: (1) "Inappropriate laughing and giggling", 67%, three detections in 23 observations over two days and, (2) "Inappropriate verbal behavior", 75%, four detections in 87 observations of six different patients.

The investigators believe that this master data matrix and card system is an efficient and accurate way of recording individualized as well as standard behavioral measures. Even though individualizing contingencies opens up the possibility of bulky data, this system has circumvented many of the problems and involves a relatively small amount of time in summarizing and retrieving information.

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