

*APPLICATION OF A SIMPLE RECORDING SYSTEM TO
THE ANALYSIS OF FREE-PLAY BEHAVIOR IN
AUTISTIC CHILDREN¹*

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An observational system, which has been developed to facilitate recording of the total behavioral repertoire of autistic children, involves time-sampling recording of behavior with the help of a common Stenograph machine. Categories which exhausted all behavior were defined. Each category corresponded with a designated key on the Stenograph machine. The observer depressed one key at each 1-sec interval. The observer was paced by audible beats from a metronome. A naive observer can be used with this method. The observer is not mechanically limited and a minimum of observer training is required to obtain reliable measures. The data sampled during a five-week observation period indicated the stability of a taxonomic instrument of behavior based upon direct, time-sampling observations and the stability of spontaneous autistic behavior. Results showed that the behavior of the subjects was largely nonrandom and unsocialized in character.

Observational studies of autistic behavior in children have generally been designed to compare the ratings made of arbitrarily selected behaviors, such as consummatory behavior (Wolf, Risley, and Mees, 1964), cooperative behavior (Hingtgen, Sanders, and DeMeyer, 1965), crying (Harris, Wolf, and Baer, 1964), destructive behavior (Bucher and Lovaas, 1967; Lovaas, Freitag, Gold, and Kassorla, 1965a), physical contact and vocal responses (Hingtgen and Trost, 1964), repetitious behavior (Ferster, 1961; Soroskey, Ornitz, Brown, and Ritvo, 1968), speech (Lovaas, 1967; Risley and Wolf, 1964), and tantrums (Wolf *et al.*, 1964), before and after experimental treatment. These studies have generally used a single-subject design. Little attempt has been made to determine whether these selected behaviors are the most frequent or relevant in relation to the total behavior patterns. No study has thus far attempted to enumerate the total spontaneous behavioral repertoire of these children. This is possibly a result of methodological difficulties encountered when attempting to describe and record the wide

range of behavior demonstrated by these children.

The present study describes a method developed to obtain a "complete" enumeration of the items of behavior in a unit of time and, with sample data, illustrates some of the advantages of this ecological approach to the analysis of the autistic syndrome.

METHOD

Observational System

A number of observational systems might have been utilized in the present study (Heyns and Lippitt, 1954; Lovaas, Freitag, Gold, and Kassorla, 1965b), but previous work by the investigator (Boer and Davis, 1968), concerned with several behavioral syndromes in sub-human primates and involving the use of a simple but highly reliable time-sampling method, prompted the use of that system. This method, which has been described in detail by Heimstra and Davis (1962), makes use of a standard Stenograph machine.² A key on the machine represents a given category of behavior. When the observed individual was engaged in this type of behavior, the key was depressed at 1-sec intervals as marked by

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²The Stenograph was a Reporter Machine (Cat. #20), manufactured by Stenographic Machines, Inc., Skokie, Illinois, 60078. The listed retail price is \$167.

the beat of an electrical metronome. Recordings were made on a paper tape that advanced each time a key was depressed. The frequencies of observations recorded for each of the selected behavior categories were used for analysis.

In any type of investigation that requires categorizing of behavior, the most important factor is a clear definition of the type of behavior to be included in any particular category. Obviously, the behavior categories will vary according to the particular situation in which the subject to be observed is placed. The present subjects were observed in a free-play situation. During the observations, the subjects were in a room containing numerous toys, a sandbox, and a record player. The subjects were also free to interact with two therapists who were present at all times. Consequently, it was necessary to utilize behavioral categories that encompassed a potentially wide range of behavior.

Based on the previous work by the investigator, it was concluded that gross behavior can best be divided into categories according to its descriptive object involvement, or the absence of descriptive object involvement. In the present study, the behavior object involvement for each subject could clearly be differentiated in three ways: the subject's behavior could either be directed toward himself, another person, or an inanimate object. Second, if the behavior lacked object involvement it could be defined as visual scanning, repetitive motor acts, locomotion, or resting. The following behavior categories were defined for use in this investigation:

1. *Adult-directed behavior.* Any behavior directed to an adult. This included such activities as playing with the therapist, looking at the therapist, and touching the therapist.

2. *Child-directed behavior.* Any behavior directed to a child. This included such activities as playing with the other children or with any one child and touching or inspecting any other child or children.

3. *Self-directed behavior.* In any way manipulating the self. This included such behavior as chewing, banging the head, manipulating the clothes, circling the body, or flapping of the hands.

4. *Inanimate object manipulation.* Manipulation, inspection, licking, or chewing of inanimate objects. Merely holding on to a toy

or chair while doing something else was not included.

5. *Rapid energy expenditure.* Fast repetitive motor acts which were not directed at a particular social or inanimate object. This included pacing, running, and repetitive jumping.

6. *Visual survey.* Visual scanning when the subject was stationary. If the child looked at an adult, other children, himself, or inanimate objects, Categories 1, 2, 3, or 4, respectively, were recorded.

7. *Locomotion.* Making shifts in location such as walking from one corner of the room to another. Behavior mentioned under Category 5, was of course, excluded.

8. *Resting.* A complete lack of observable behavior, e.g., if the subject sat in a corner with closed eyes and without making any movement.

The above eight categories of behavior were mutually exclusive and exhausted all behavior demonstrated. It should be pointed out that with categories such as these, the behavior is enumerated without qualitative interpretation. This reduces the hazards of the "anecdotal" approach to description of behavior. It is much more parsimonious merely to indicate that Subject No. 1 mouths a toy than to infer that he viciously attacks the toy. Furthermore, there is high agreement between observers when behavior demonstrated by the subject is categorized as manipulation of an inanimate object. Undoubtedly, there would be less agreement between observers rating the degree of affectionate relation (to the object) involved in such an act.

Subjects

Four disturbed children, three male and one female, ranging in age from 4 to 5 yr, were used. All were patients in the Southeastern Mental Health Center, Sioux Falls, South Dakota. The children had been diagnosed by the Center's staff as either autistic or autistic-symbiotic.

Observations

The children were observed in a free-play situation during the second hour of a 2-hr therapy period. They participated in play therapy three times a week; Monday, Wednesday, and Friday from 10 A.M. until 12 noon. Two therapists were present and carried out

their normal activities. The therapists were not informed of the nature of the investigation and were told only that the children would be observed periodically. This was not unusual, since the children were frequently observed by medical interns and graduate students in psychology. All observations were made through a one-way mirror, which permitted the observer to view the children and the therapists without being seen by them.

The observations were made of each child on an individual basis while all four children and the two therapists were present in the room. Each child was observed for a 5-min period between 11 and 11:30 A.M. The children were observed in a predetermined random order. Observations were recorded over a five-week period. Thus, each child was observed for a total of 75 min.

The observer was a secretary without previous training in behavioral research or scientific methodology. She was trained by the investigator during a series of practice observation sessions. The training procedure included the following steps. First, the trainee was given a list of the behavior categories as defined above and was asked to learn the categories on the list. Second, the trainee and the investigator observed the children in their free-play setting and defined the behavior of the children in terms of the categories on the list. This training period consisted of observing the children's behavior without making any records. Since the trainee did not have to perform any recording function, she had an opportunity to discuss with the investigator the criteria which defined the behavior she observed in terms of the categories on the list. This procedure helped clarify the shifts of a child's behavior from one category to another. For instance, if a child was looking at an object which he was rotating, his behavior was classified as "Inanimate Object Manipulation", but when he stopped the rotation and looked at another child, even though he would still have the object in his hand, his behavior was classified as "Child-directed Behavior". Third, during the next training day the trainee recorded the behavior by means of the Stenograph, while at the same time verbally classifying behavior according to the defined categories. Whenever the trainee made an erroneous categorization she was verbally corrected by the investigator. This procedure was

followed for three 15-min sessions on three successive training days, *i.e.*, on a Friday, Monday, and Wednesday. During the next training session (Friday), the trainee recorded the behavior of the four children with the Stenograph without any verbal classification. At the same time, the investigator recorded the behavior of each child with another stenograph. This procedure guaranteed that two records were made from the same behavior without the observers receiving cues from each other as to which category symbols they depressed at a particular 1-sec beat. At the end of that session, the agreement of the frequency of category symbols of the observer and the investigator exceeded 90%.

The reliability of the system was further determined as follows: on three observation days (Days 3, 6, and 9) the behavior of the children was recorded on a closed circuit TV recording tape. Six weeks later the observer completed Stenograph recordings of the TV play-back. Agreement of frequency of category symbols between original and play-back observations by the same observer was over 95%. Two other observers were also trained by the above described procedure. Agreement between these two other observers who recorded from the TV play-back was over 93%.

RESULTS AND DISCUSSION

It is important to note that the data are intended to demonstrate the time-sampling observation technique. They illustrate how autistic behavior can reliably and meaningfully be sampled with an inexpensive, simple method. The method involves careful sampling of behavior. It does not involve the sampling of subjects. Since the sampling of subjects is a key determinant of how findings can be generalized, these data are not presented as general norms of autistic behavior.

Figure 1 compares the performance of each child on all categories of behavior except adult-directed behavior and resting. The former category was not included because adult-directed behavior was in every instance initiated by the therapists and therefore would not be an indicant of the children's spontaneous behavior while the latter category did not occur during the sampled periods. Adult-initiated behavior constituted 10.07% of the children's sampled repertoire. The data were

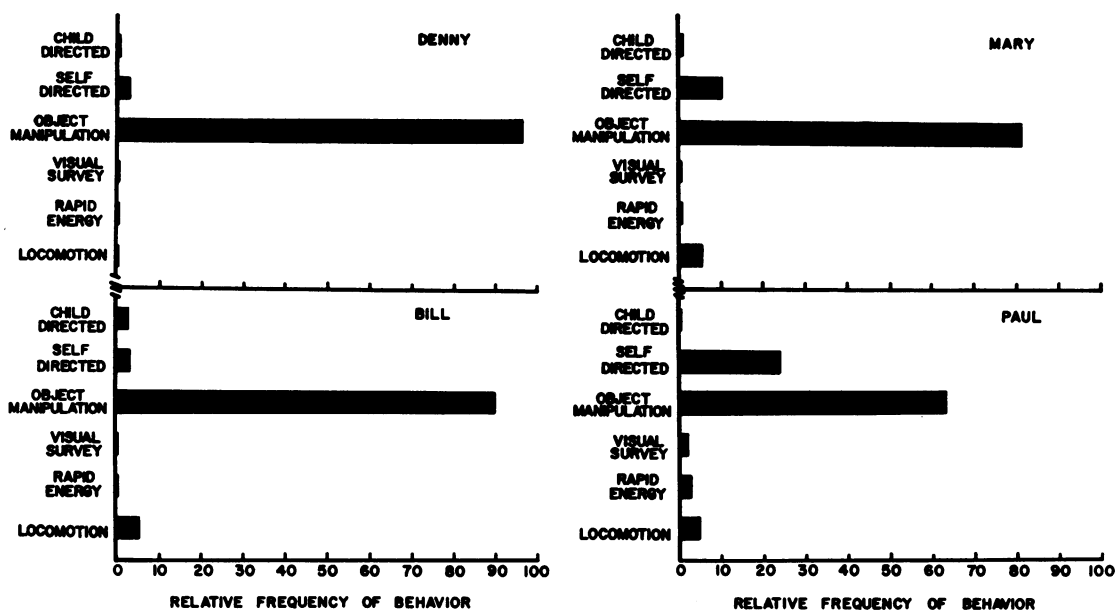


Fig. 1. The frequency of child-directed behavior, self-directed behavior, inanimate object manipulation, visual survey, rapid energy expenditure, and locomotion as a percentage of total spontaneous behavior in four autistic children.

treated in terms of relative, rather than absolute, frequencies in order to get at effects other than those directly controlled by the therapists. The relative frequency for a particular category and a particular child was calculated by dividing the total frequency for that category and that child by the total frequency for all categories for all children.

Unsocialized behavior is one of the most agreed upon characteristics of the autistic syndrome. Figure 1 shows a quantification of this characteristic for the children observed in this experiment. Of the children's spontaneous behavior, almost 83% was directed toward an inanimate object. Moreover, only 1.33% of the children's spontaneous behavior was social in nature. Figure 1 shows that Bill was primarily responsible for the group performance in child-directed behavior. The other three children engaged in social behavior on only six observation days and for only a few seconds during the observation periods.

Figure 2 shows the stability of the spontaneous free-play behavior of the subjects. The functions are presented as group means per observation days for object manipulation, self-directed behavior, and child-directed behavior. The two horizontal broken lines in each graph delimit the range of group mean variability during the five weeks of observation (three ob-

servation days per week). If one considers that these group means represent only a 5-min sample of each child's free-play behavior, the stability of these data becomes striking. Analysis of variance for each category of behavior showed that there were no significant differences between the daily measures taken during the five weeks of observation. There were significant individual differences, but this has often been found in the case of reliable measures of performance and may further attest to the fruitfulness of careful sampling and measurement of freely occurring behavior of autistic children.

Inspection of Fig. 1 shows that manipulation of objects was the most frequent behavior for each subject. This category also had the largest amount of variability between subjects. Figure 3 shows the reliability of these individual differences between the children's behavior from week to week. A weekly measure for each child represents the mean of the three 5-min samples taken each week for each child. The graph clearly shows that during each week, Denny engaged in more object manipulation than any of the other children, Mary was second, Bill third, and Paul spent less time on the manipulation of objects than any other child. Categories that occurred infrequently, and had a small group variance,

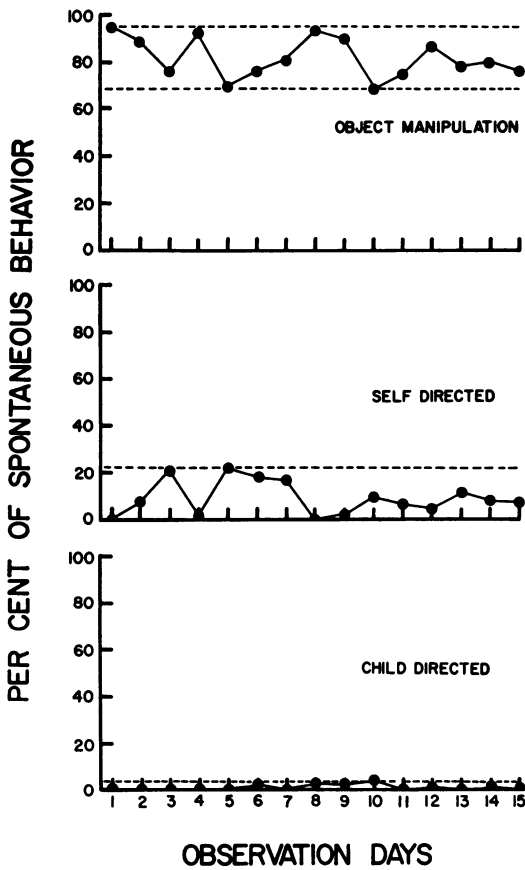


Fig. 2. The relative frequency of inanimate object manipulation, self-directed behavior and child-directed behavior during each observation day in a group of autistic children.

showed no such reliable individual differences. For example, Rapid Energy Expenditure showed no indication of reliable individual variability because Denny, Mary, and Bill never engaged in this behavior during the sampled observation periods.

The lack of randomness of the spontaneous behavior demonstrated by the autistic children is striking. Over 94% of the spontaneous behavior of these autistic subjects was oriented toward social, inanimate, or self objects. These obviously oriented and nonrandom behaviors were connected by visual survey and locomotion, but only an extremely small proportion of the behavior (rapid energy expenditure), exhibited by only one subject (Paul), appeared continually to lack orientation. This suggests that no matter how bizarre and unlawful the freely occurring behavior of these autistic children appears to the casual onlooker, it is nev-

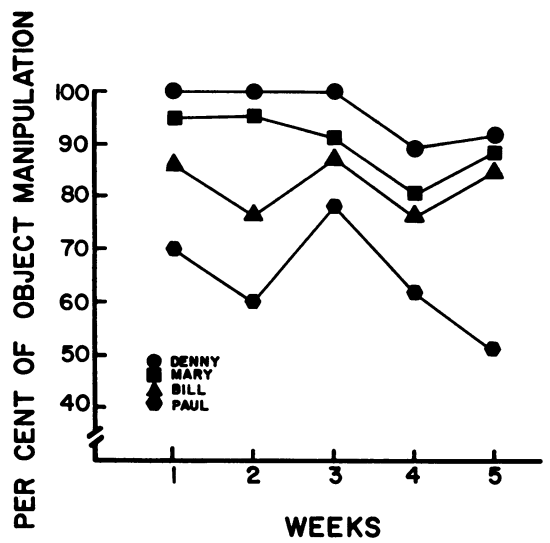


Fig. 3. The relative frequency of each weekly sample of inanimate object manipulation for each of four autistic children.

ertheless nonrandom. This implies that its lawful functions can, at least potentially, be studied and identified.

Results of behavior modification techniques have usually been presented in terms of acquisition or extinction of specific responses (See Risley, 1968; Lovaas, 1967; Wolf *et al.*, 1964). Such presentation is a necessary part of any behavior modification technique. However, the direct observation of spontaneous behavior before and after the application of such techniques can be an excellent indicant of how the manipulation of specific responses has affected total spontaneous behavior. In order to evaluate fully the generalized effects of specific behavior modification or treatment programs, workers in almost any applied setting, *i.e.*, those who have access to a secretary and Stenograph machine, can easily supplement their programs of formal training and testing with a program of direct observation of their subjects' total behavioral repertoire.

The extent to which this approach has any scientific usefulness is determined by two considerations that relate to the adequacy of this conceptual scheme. The first is that the behavior studied is *meaningful*—that is, whether the properties ascribed to the results were adequately reflected in the behavioral events that were included in the conditions that defined the measures. When describing the behavior of these autistic children as “unsocialized”, we

have provided that concept with an "operational" definition by carefully defining which behavior was included in each category. The second consideration is whether it is *fruitful*—that is, whether on the basis of the sampling of free-play behavior in terms of gross categories, we can predict new events and thereby generate additional research. The stability and nonrandomness of the measures suggest that this bizzare appearing, free-play behavior is lawfully controlled. This finding may generate further research with gross behavior categories as dependent variables. Thus, the utility of this approach rests with new research that it may generate and which should serve, if in agreement, to promote the generality of the conceptualizations of autism, and, if in opposition, to spur us on to appropriate modifications of theoretical thinking or to new and hopefully better conceptualizations of the behavior variability which we now call autism.

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