A Functional Analysis of Mentalistic Terms in Human Observers

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This paper, and the following paper by M.J. Dougher (1989), were originally given as part of a symposium presented at the 1984 meeting of the Association for Behavior Analysis (R. Schnaitter, Chair). The symposium included two other papers on the same theme by Diane Spooner and Diane Mercier, and the discussant was Willard Day. The concept of the symposium was to use the following paper (Leigland) as a basis for a demonstration of what has been termed the "Reno methodology," a method for the interpretation of verbal behavior developed by Willard Day and his students at the University of Nevada, Reno. Essentially, the project may be described in the following way: the controlled environment-behavior interactions of a pigeon in an operant chamber gave rise to explanatory verbal behavior on the part of observing human subjects, and the controlling relations with respect to the latter gave rise to the verbal behavior contained in Leigland's report. The controlling relations to be discriminated with respect to Leigland's verbal behavior were then the subject of Dougher's analysis in the report that follows. Dougher's report, then, uses Leigland's report as a source of verbal behavior to be interpreted, using the practices developed by the Reno group as a method.

The radical behaviorist view of verbal behavior states that psychological phenomena subsumed under the term "language" may be analyzed in terms of identified classes of interactions between organism and environment, as with other types of psychological phenomena. One of the many interesting implications of such a view is that the "meaning" of a term is not a property of the term itself, but rather may be associated with the conditions under which the term is characteristically emitted in the behavior of the speaker. Thus, for example, a relatively simple term such as "water" would have different "meanings of usage" depending upon whether its occurrence was a function

of water deprivation (on the part of the speaker) or whether the occurrence of the term was controlled by the presence of water in the speaker's immediate environment.

The analysis holds for more complex types of verbal operants as well (i.e., verbal units controlled by numerous or subtle environmental conditions). For example, the term "thinking" may occur under a great variety of conditions. When a speaker says, "I'm thinking," the term may be controlled in part by the private events of the speaker. However, "that person is thinking" may be controlled by discriminable environment-behavior interactions of individual in the presence of the speaker.

It may be of considerable interest to determine some of the functional environment-behavior interactions which give rise to certain kinds of "psychological" verbal behavior. Such an analysis might (1) demonstrate the relevance of radical behaviorism to the development of an empirically-based epistemology, (2) demonstrate more clearly the view that the scientist is also a behaving organism under complex environmental control (with special relevance to issues of the "inference of mental processes" from behavior), and (3) add to the methodological base for the functional analysis of verbal behavior in general.

This paper is dedicated to the remembering of Willard F. Day, Jr. The method reported in the paper bears similarities to a method developed independently by Brian Lahren (1978) in an unpublished doctoral dissertation (University of Nevada, Reno). Special thanks are due to Diane Mercier, and especially to Diane Spooner, who originally suggested the concept of the project. Special thanks are also due to Michael Kivitz, Executive Director of Adelante Development Center, Inc. (Albuquerque, NM), and to the Psychology Department of the University of New Mexico. Thanks also to Ray Rommel, Suzanne Kozlowski, and Kathy Brock for assistance in preparation of the figures.

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The idea for such an analysis is certainly not new. Skinner, for example, proposed an analysis of this sort while he was a graduate student at Harvard (see Skinner's 1945 paper, "The operational analysis of psychological terms"). More recently, the late Willard Day and his students at the University of Nevada, Reno, focused a great deal of productive energy into the development of methodologies relevant to such analyses.

The definition and development of effective and productive methodologies, however, appears to be a dominant issue for the functional analysis of verbal behavior. One possible approach may be found in a strategy analogous to that which Skinner adopted when faced with the complexity of operant behavior in general. The strategy is familiar and common to scientific practices in other fields: experimental analysis in a controlled setting. Thus his early strategy to examine a relatively simple and presumably representative operant response allowing for automatic recording (the lever press) in a relatively simple organism (the rat) in a controlled setting (the now-standard "experimental space") allowed him to make the effects of controlling variables *visible* in the individual organism through the use of the cumulative record.

To follow the analogy to verbal behavior, it might be advantageous to simplify the types of environment-behavior interactions which might control the "psychological" verbal behavior of human observers, as well as limiting (or "tagging") the types of verbal responses of interest for analysis. In addition, the use of written verbal responses could provide a kind of "automatic" recording of verbal behavior, avoiding the tedious and time-consuming transcription of tape-recorded verbal responses.

As a first step, this paper outlines a simple procedure which may qualify as a sort of "operant chamber" analysis of verbal behavior, and which shows some promise in making controlling relations visible at the level of the individual person. The procedure involves a human observer making "explanatory" statements under the control of a pigeon behaving in a controlled setting. Thus the environment-behavior interactions serving a discriminative function over the observer's verbal responses are controlled, while the focus of analysis is a verbal response class

which may be identified as "mentalistic terms" (as discriminated by the experimenter) emitted by the observer in the experimental setting.

METHOD

Seven introductory psychology students were subjects in each of two experiments. The stimulus field for each experiment was a pigeon responding under certain reinforcement contingencies to an illuminated response key in a standard operant chamber. One wall of the chamber was clear plastic to allow for observation.

Subjects in both experiments were given the following instructions (the same pigeon was used in both experiments):

In this experiment your task is to observe behavior and explain it in any way you like. The behavior I'd like you to explain is the behavior of pecking the response key on the left-hand side of the panel the pigeon is facing. You may use any kind of explanation of his pecking behavior that you like, using whatever terms or phrases feel "comfortable" to you. There are absolutely no right or wrong explanations for the behavior; whichever kind of explanations you choose will be fine. I'm more interested in "explanation" than simple "description" of the behavior, except insofar as your descriptions of the behavior may aid you in your explanation. The term "explanation" may mean different things to different people, but whatever it means to you is what I'm looking for. You will be sitting in a chair facing the pigeon's chamber, and you'll be given paper on a clipboard and a pen (shown to the subject). Simply jot down whatever explanations that occur to you as you're observing, as often as you like. You may want to write a sentence or two, perhaps a phrase, or perhaps just a word; write whatever kind of explanatory statement that you like as it occurs to you.

There are two things to remember: (1) number your explanatory statements as you make them on the paper, so that each separate entry has its own number. So your first entry will be next to "1." and you may then observe for a while, so your next entry will be next to "2." and so on; (2) you will also be given a handswitch — please hold the switch closed with your other hand whenever you are writing (this is demonstrated for the subject). Are there any questions? (The subject was reminded of these latter two points when taken in to the observation area and seated, and the handswitch operation was again demonstrated.) The session will last approximately 30 minutes.

The handswitch controlled the event pen of a cumulative recorder which also recorded the pigeon's key-pecking rates on the response pen (the recorder was located in an

adjoining room). The event pen was deflected as long as the observer held the switch closed. The purpose of the numbered entries on the provided paper was to allow the later matching of the written entries to the "events" marked on the cumulative record. This in turn allowed the mapping of the verbal responses onto the pigeon's recorded response rates for the record from each session.

In Experiment 1 ("VB1"), the bird was trained on a fixed-interval (FI) 4-min schedule of food reinforcement with the key constantly illuminated red, except during 3-sec food presentations. This schedule was chosen initially for three reasons: (1) its relative simplicity, (2) the FI schedule characteristically produces differential responding over time without corresponding changes in exteroceptive stimuli, and (3) it was thought that such a schedule might produce such common mentalistic "explanations" as "anticipation" and related terms in the observers. The bird that was chosen for this experiment had an extensive history in a number of other experiments, most involving variable-interval schedule contingencies in some form. Presumably for this reason, somewhat prolonged training on the FI schedule produced moderate but somewhat inconsistent patterning which turned out to be quite variable both within and between the observation sessions. In any case, the data from this experiment was responsible for my choice of contingencies for the second experiment.

In the second experiment ("VB2"), in part because of the nondifferential responding which sometimes occurred by the bird in VB1, it was decided to impose explicit antecedent stimulus control over the key-pecking response. Thus in VB2, the color on the response key changed from red to green according to a variable-time (VT) 1.5-min schedule, and food presentations occurred on a fixed-ratio (FR) 12 in the presence of green. This produced rather precise discriminative stimulus control over the key-peck response which served as the stimulus field for observers in the second experiment.

RESULTS AND DISCUSSION

The instructions to the subjects emphasized the "explanation" of the behavior un-

der observation. While a procedure of this sort might generate verbal behavior which could be analyzed in any number of ways, the focus of the analysis was "mentalistic terms" which may have occurred in the context of such "explanatory" statements. It was thought that the search for order in the data should begin with the simpler behavioral dimensions. Thus the search for order involved (1) the discrimination of a class of verbal responses which might be identified as "mentalistic terms," and (2) mapping such responses onto discriminable environment-behavior interactions under observation, as traced by the cumulative record.

To give an example of typical sorts of entries, the following are the first three and last three entries for the first subject in VB1 (FI):

1. frightened of me (as new observer)
2. Appears to be aware of movements & noise
3. is observing its environment. Not pecking at light
24. pecking behavior increasing
25. after food — almost immediately as tense as before food.
26. pecking behavior definitely increasing. At both lights.

These entries are quite typical of the responses from subjects in VB1, and include typical statements which might be termed "descriptive" (as in 24. and 26., although in 26. it is not clear whether "both lights" was under the control of the keylight and the unlit and unused key, or under the control of the keylight and the houselight, which was constantly illuminated) as well as those including "mentalistic terms" (as in 1. and 2.). Regarding the identification of the latter, the question might be raised as to what criteria were used in the selection of such mentalistic terms. However the "criteria" are difficult to specify, as the discrimination of the terms identified as "mentalistic" was a function of my own membership and history in a verbal community in which such terms occur. That is, I simply identified such terms as I saw them from the perspective of my combined histories in the lay and (behavioral) technical verbal communities. The identification of such terms I found not to be difficult, with perhaps two exceptions ("observing" and "waiting") which I finally decided not to include as "mentalistic." I also found, after

examining the data from the first subjects in VB1, that I could make further discriminations among the terms identified as mentalistic, such as between those terms which might be called "cognitive" (e.g., "aware," "indecisive," "interested," "expecting," "wondering") and those which might be called "emotional" (e.g., "frustrated," "angry," "nervous," "jumpy," "at ease"). Further discriminations will become evident as the analysis proceeds.

Table 1
Mentalistic terms by subject in Experiment 1. The first number in parentheses indicates the total number of entries, the second indicates the number of identified mentalistic terms.

S1 (26/16) frightened aware getting used to me maybe used to me frustrated less interested getting frustrated jumpy indecisive bother him jumpy jumpy frustrated tense	S2 (17/11) aware no longer interested realizes frightened unconcerned frighten want out attention checking on me senses that bothering	S3 (17/15) wondering wondering irritated wondering upset frustrated "where's the food?" tired of waiting thinks wondering frustrated aggressive known mad thinks
S4 (35/21) interested expecting frustrated nervous satisfied anxious expecting seems to know anxious hungry expecting satisfied anxious hungry expecting satisfied bored satisfied loses interest anxious lost interest	S5 (14/1) never knows S6 (40/13) frightened feels hardly knows frustrated frustrated frustrated curiosity at ease to "show off" frustrated not afraid frustrated wants	S7 (22/16) hoping figure out hoping hoping figure out discouraged hoping frustrated hoping figure out debating decides anxious figure out hoping must figure

Table 2
Mentalistic terms by subject in Experiment 2. The first number in parentheses indicates the total number of entries, the second indicates the number of identified mentalistic terms.

S1 (17/1) curious	S2 (6/0) —	S3 (21/1) hungry
S4 (22/3) can sense anxious wants food	S5 (6/3) hungry seems to know restless	S6 (12/12) tell the difference high anxiety notices paying attention hungry enjoys doesn't like afraid more afraid hungry wants perplexed
S7 (12/11) calm hunger inquisitive curious bored apprehensive lonely unconcerned hungry nervous his main concern		

A total list of mentalistic terms for each subject in VB1 is shown in Table 1, and the terms for each subject in VB2 is shown in Table 2. At the top of each list is a pair of numbers, the first of which is the total number of separate entries written for the subject during the session, and the second shows the number of identified "mentalistic terms" from the same session (it was rare that more than one occurred in a given entry). While the word "terms" may indicate individual words, in some cases several words were included, usually where it was felt that the additional words would clarify either the particular usage of the word, or would more generally point to the identified "mentalistic" character of the word (e.g., "tired of waiting," "figure out," "getting used to me," etc.). The basic method of analyzing the data involved the mapping of the discriminated verbal responses of interest (the mentalistic terms) onto the cumulative record, thus

making it possible to search for relations between the environment-behavior interactions under observation and the resulting verbal behavior of the observer. The top record of Figure 1 shows the data from the first subject ("S1") in VB1 (FI 4-min). The event pen (the lower of the two) indicates the times during the session that the subject made written entries (they were holding the "event" switch closed whenever they were writing). The numbers indicate the subsequent matching up of the successive "events" with the written "explanatory statements." The upper pen shows the responding of the pigeon under the FI 4-min reinforcement schedule (the downward pips indicate food presentations). After the mentalistic terms were identified for the subject from the written entries, vertical lines through the pigeon's cumulative response record were drawn from the beginning of the "event" (indicating the corresponding written entry) in which it occurred. The terms were then simply placed on the record above the vertical line, along with any other verbal material associated with the term which may be of interest (in parentheses).

The bottom record of Figure 4 shows a similar figure for S1 from VB2 (S^D). Here, on the response pen, the downward deflections indicate those times (VT 1.5-min) when the response key turned from red to green (S^D), during which a FR 12 would produce food. Thus in this case we see quite precise stimulus control, with short response runs occurring in the presence of green and at no other time. This record also shows only one mentalistic term ("curious") as occurring for this subject out of a number of written entries (17). Occasionally during VB2 it was difficult to match up the written entries to the "events" marked on the record. In such a case the indicated number at bottom will be in parentheses, and/or there will be a horizontal line connecting the possible "events" in which the term occurred (as in the case of "curious" with S1). The remainder of the Results/Discussion will be organized in the following way. First, "Initial Discriminations" will be presented for each of the two experiments. This will involve the identification of controlling environment-behavior interactions over the verbal responses for each subject in VB1 (Figures 1-3, and the top record of Figure 4), and then VB2 (the bottom

record of Figure 4, and Figures 5-7). These will be in the form of listed statements of interest for each subject (not necessarily in sequence) identified by the number (on the record) of the "event" in which the verbal response occurred. Second, there will be a section called "Abstracted Discriminations" in which an attempt is made to make more general statements regarding stimulus classes (environment-behavior interactions of the pigeon) and the control of such events over the verbal behavior of the observers. The paper will conclude with comments on the findings and methodology, as well as possible areas for further analysis.

Initial Discriminations: VB1 (FI)

As noted earlier, the responding of the pigeon under the FI 4-min schedule was relatively undifferentiated in most of the seven sessions of VB1, lacking in the patterning which characterizes FI schedule control (i.e., the familiar "scallop"). This is probably due in part to the bird's extensive history on variable-interval schedule contingencies. In any case, the instances where patterning did or did not occur will be evident on the cumulative record, and will be of interest to some of the verbal responses which occurred.

Subject 1 (Figure 1, top record)

1 & 2 — Tacts of environmental variables and their effects upon the pigeon's behavior, where "frightened" and "aware" may be viewed as behaviors incompatible with pecking the response key.

5 & 6 — The change from "getting used to me" to "maybe used to me" apparently controlled by the beginning of key-pecking and the first food presentation.

8 — Similar to 1 & 2, but the shift in controlling variables over the pigeon's responding (characterized in the terms of "interest") is noted after low-rate pecking (and two food presentations) is observed by the subject.

10 — Post-reinforcement pause, and again relative control is noted in terms of "interest."

17 — Note "indecisive" as following an alternating period of brief pauses and response bursts (as noted by the "step-like" passage on the response record).

25 — Here, responding soon after the delivery of food evokes "...almost immedi-

Fig. 1. Session records for Experiment 1, S1 (top) and S2 (bottom).

ately as tense as before food," where the short burst of responding after food looks similar (on the record) to a series of such bursts occurring just before the food. However, the term "tense" may have also been occasioned by other behaviors of the pigeon than key pecking (such as general activity level, etc.).

Subject 2 (Figure 1, bottom record)

1 — As in the case of S1 (1 & 2), this seems to be a tact under the control of an environment variable ("stranger") controlling behaviors of the pigeon ("aware of") which are incompatible with pecking the key.

3 — Post-reinforcement pause as controlling "no longer interested."

4 — The controlling relations here might be summarized as follows: (1) the irregular relation between pecking and food presentations controls "... there is not a direct relation between pecking and food ..." (2) the irregular rate of pecking controls "... is not trying too hard to peck consistently," (3) and the relationship between these two variables controls "seems that the animal realizes that..."

7 & 11 — In both cases, a period of non-responding (to the key) following some identified event was associated with the term "frighten(ed)."

Subject 3 (Figure 2, top record)

1, 3, 5, & 13 — "Wondering" as having an unclear relation to rates of responding (as seen on the cumulative record). However, in these instances the term does seem to be a function, at least in part, of the observer (1), a food presentation (3), and the operant response class selected by food presentations (5 & 13).

4, 7, 9, 14, 15, & 16 — Such terms as "irritated," "upset," "frustrated," "aggressive," and "mad," may be members of a general class of terms which have a tendency to appear late in the intervals and/or after a relatively gradual increase in response rate to the key.

More on 15 — "Very aggressive pecking just before reward — must have known time was near," where "known" shows the combined effects of a sharp increase in rate followed by presentation of food.

Subject 4 (Figure 2, bottom record)

1 & 4 — In a fashion similar to S1 (8), the momentary control exerted by the key over the pigeon's pecking in turn occasions "interest" in the verbal behavior of the observer.

5, 16, & 22 — "Getting nervous" (5), and "anxious (hungry?)" (16 & 22) appear controlled by very sharp increases in rate of key pecking (although this is less clear in the case of "anxious" in 8), and while the increase in responding is more difficult to see (from the record) in the case of 33, the verbal response nevertheless provides a tact of such an increase ("movements increasing. Anxious—still increasing") although it is not clear whether "movements" is controlled by key-pecking or by other movements of the bird.

6, 21, 25, 30, 31, & 35 — The post-reinforcement pause controls "satisfied" and "loses interest" in a number of instances (27 is a possible inclusion into this class of verbal responses as well).

Fig. 2. Session records for Experiment 1, S3 (top) and S4 (bottom).

Fig. 3. Session records for Experiment 1, S5 (top) and S6 (bottom).

Subject 5 (Figure 3, top record)

6 — At this point the bird had been responding to the key at a rate which was relatively undifferentiated by FI schedule contingencies, and part of the verbal response here is controlled by the response rate itself ("... it pecks constantly and at an even pace") while part is controlled by the relationship between the constant response rate and food presentations ("seems as though the bird never knows quite when it will be rewarded. . .").

Subject 6 (Figure 3, bottom record)

2, 5 & 9 — These three entries, "frightened" (2), "more at ease" (5), and "hardly knows I'm here" (9) form a sequence which appears to be controlled by a continuum of increasing rate of responding on the part of the bird (as shown on the record). Later in the session, when the bird's keypecking rate had stabilized, we also see 32 ("much more

at ease") and 36 ("certainly not afraid anymore").

11, 15, 18, 35, & 39 — "Frustrated" as occasioned by (a) responding late in the interval (e.g., 11, 35, 38), (b) a discriminated increase in responding (e.g., 18), or (c) a combined influence of these (perhaps as in 15). Note the similarities of these relations to S3 (4, 7, 9, 14, 15, & 16).

Subject 7 (Figure 4, top record)

3, 6, 8, 11, 14, & 21 — Apparent multiplicity of control over "hoping"; in some instances the term appears controlled by maintained pecking at the key (e.g., 3, 6, & 11), and in other instances by responding immediately after food (e.g., 14 & 21).

5, 9, 15, 16, 20, & 22 — Maintained responding throughout the intervals occasions a number of verbal responses which might be grouped under the general heading of "problem solving" on the part of the pigeon (e.g., "trying to figure out. . .").

10 — note lack of responding late in the interval and occurrence of "discouraged."

Initial Discrimination: VB2 (S^D)

As noted above, the stimulus control over the pigeon's pecking behavior was well established, and is clearly seen on the cumulative records (the response records; Figure 4, bottom record, and Figures 5-7). The only exception to this precise stimulus control is shown in the bottom record of Figure 7, where the pigeon's record shows a number of delays in responding after the change in key color from red to green (the S^D).

It will also be seen that far fewer "mentalistic terms" were observed in the written entries from subjects in VB2 compared with VB1 (93 in VB1 compared with 30 in VB2). The total number of entries was also somewhat less (171 in VB1 and 96 in VB2; cf. Tables 1 and 2).

Subject 1 (Figure 4, bottom record)

1 — The only mentalistic term found in the

17 written entries was "curious," which was apparently controlled by behaviors of the pigeon not directly related to keypecking. The rest of the entries were of a "descriptive" nature (e.g., 5 — "He pecks for about 3 or 4 seconds each time").

Subject 2 (Figure 5, top record)

No mentalistic terms were found among the 6 written entries (example: 5—"The bird is always looking at the light to spot a change at all times.").

Subject 3 (Figure 5, bottom record)

20 — "Hungry" occurs in the context of a statement explaining the observed relations, however another kind of "non-mentalistic" explanatory statement occurred in 13 — "I feel he is conditioned for this task."

As with S1 and S2 of this experiment, most of the 20 written entries for S3 consisted of what might be called more "pure" tacts, in the sense that the entries are typically quite simple and straightforward "descriptive"

Fig. 4. Session records for Experiment 1, S6 (top) and Experiment 2, S1 (bottom).

Fig. 5. Session records for Experiment 2, S2 (top) and S3 (bottom).

Statements (e.g., 1 — “When the left-hand signal turned green he began to peck at it,” and 15 — “He seems to be close to the light whenever it turns green. He does not peck at anything else but the green light not even the same light when red.”).

Subject 4 (Figure 6, top record)

6 — “Again the green light came on and he pecked away at it and then got something to eat. It seems that he can sense when it is going to happen, because he first looks at the hole and pecks at it.” It appears that “can sense” is controlled in part by the observation of differential stimulus control of the keypeck response and in part by control exerted by the contingencies (perhaps temporal) over other aspects of the pigeon’s behavior.

20 — Here “anxious” is occasioned by the effects of some unidentified noise over some unidentified behaviors of the pigeon.

22 — It is apparent from this entry that the nature of the controlling relation over the pigeon’s keypecking behavior has not gained any clear control over the “explanatory” verbal behavior of the observer (“... Maybe he’s being shocked. Or maybe he just wants food.

But why doesn’t he peck at other times to get food?”).

Subject 5 (Figure 6, bottom record)

2 — As with S3 of this experiment (20), “hungry” occurs in the context of a general explanatory statement under the control of the environment-behavior relations observed.

4 — As with S4 of this experiment (6 — “... seems that he can sense when...” the green light to come on), again a statement occurs which is apparently controlled by the contingencies governing the scheduled key-light change from red to green, and the effects of these contingencies upon some aspect of the pigeon’s behavior (“The pigeon seems to know when the light is going to turn green.”)

Subject 6 (Figure 7, top record)

3 — “Tell the difference” is controlled by differential discriminative stimulus control of the pigeon’s pecking behavior with respect to color.

4, 7, 8, & 10 — These entries are under the control of S-delta (red) interactions, where the lack of responding to the key has evoked

Fig. 6. Session records for Experiment 2, S4 (top) and S5 (bottom).

verbal behavior characteristically controlled by *aversive* contingencies (e.g., "...don't think he enjoys..." "...doesn't like..." "...afraid of...").

5 — "Notices" without "paying attention," where the former is controlled by precise stimulus control, and the latter is controlled by the position of the bird's head with respect to the key.

6 — As in the cases of S3 (20) and S5 (2), the term "hungry" again occurs in the context of an explanatory statement.

11 — Irregular responding in the presence of S^D (note the step-like pattern on the response record) as showing competing sources of control over aspects of the pigeon's behavior, where both sources of control ("afraid" as controlled by "my movements," and keypecking controlling relations occasioning "hungry") in turn control the emission of tacts by the observer.

Subject 7 (Figure 7, bottom record)

This subject had some difficulty in the

operation of the handswitch which made it nearly impossible to later match up the subject's written entries to the "events" on the cumulative record. In any case it would appear difficult to discriminate the environment-behavior interactions controlling the variety of mentalistic terms which occurred (e.g., "calm," "inquisitive," "curious," "bored," "apprehensive," "lonely," etc.). It may be noteworthy, however, that terms associated with "hunger" occur in the context of explanatory statements for this subject as well (as in the cases of S3, S5, S6) as shown above the "events" on the cumulative record tentatively identified as 2/3, 9, & 12.

Abstracted Discriminations

In the case of VB1, where a FI 4-min reinforcement schedule controlled relatively undifferentiated responding in the pigeon, the following statements may be made (very generally speaking) regarding general classes of "mentalistic terms" emitted by the observers and the general classes of

Fig. 7. Session records for Experiment 2, S6 (top) and S7 (bottom).

environment-behavior interactions under observation of which such terms appeared to be a function:

I. In general, the differential control of the keypecking behavior of the pigeon by discriminable environmental variables evoked statements concerning "interest" and related terms on the part of the observers, whether such differential control of keypecking was produced by reinforcement schedule contingencies (e.g., as in the case of the post-reinforcement pause) or other events (e.g., events occurring outside the experimental chamber).

II. The post-reinforcement pause, as an effect upon the behavior of the pigeon produced by FI schedule contingencies, was of the clearest variables controlling the occurrence of such terms as "interest" and, in the case of one subject in particular, "satisfaction."

III. The lack of a post-reinforcement pause, that is, responding immediately after a food presentation, controlled the occurrence of

mentalist terms in a number of the observers, such as "tense" and "frighten," as well as "wondering" and "hoping." While these two sets of terms may be commonly controlled by different kinds of observed contingencies, they are presumably also controlled in some cases by the observation of certain behaviors which are characteristic of such contingencies. The latter may be the variable controlling the differential occurrence of these types of terms in the present case (that is, "hoping" versus "frightened" may have occurred as a joint function of responding immediately after a food presentation as well as other collateral behaviors of the pigeon which are not necessarily a function of the immediate schedule contingencies).

IV. A frequently-occurring mentalistic term was "frustrated." This term and related terms (e.g., "upset") appeared to be a function of a discriminable increase in responding to the key, particularly if the increase occurred in the second half of the fixed interval (i.e., after 2 min from the last food presentation).

V. As distinguished from the more gradual increases in the pigeon's response rate noted above, short response bursts to the key occasioned such terms as "aggressive" and "anxious."

VI. It is also noteworthy that in two of the observers a lack of differential responding on the part of the pigeon's keypecking behavior produced statements regarding a lack of "knowledge" of the contingencies, or a "realization" of a lack of order or regularity of the contingencies.

In the case of VB2, where precise discriminative stimulus control was established over the pigeon's keypeck responding, the nature of the controlling relations (for the pigeon) combined with the less frequent occurrence of mentalistic terms on the part of the observers make it rather more difficult to make general statements regarding controlling relations with respect to the verbal behavior obtained. The most general statements which can be made are as follows:

I. The most common mentalistic term which occurred in the context of the explanatory written entries was "hungry."

II. Two observers noted that the bird "can sense when" or seems "to know" when the keylight change will occur (the S^D), although the variables controlling such statements are not clear. Possibilities include the bird's proximity to the key over time, position of the bird's head with respect to the key over time, and so on.

III. In general, most of the written entries from subjects in this experiment were of a straightforward "descriptive" sort, lacking in the frequency and character of mentalistic terms which characterized the verbal behavior seen in VB1.

With respect to my own discriminative behavior as an "observer of functional relations," it is of interest how the methodology evolved over the course of the two experiments. Of particular note was the fact that I found myself making essentially two different types of statements about the functional relations that I was able to discriminate. That is, I found that my discriminative behavior was a function of two classes of variables. The first was when I made statements about functional relations which could be seen in both the written entries of the observers and the pigeon's cumulative record (for example,

see VB1: S4 - 6, 21, 25, 30, 31, & 35, and S7 - 10), and the second occurred when I made statements about variables controlling verbal behavior based upon the verbal response itself (for example, see VB1: S1 - 1 & 2, S2 - 1, and also VB2: S6 - 5). The former statements about functional relations were the originally-proposed analytic method, while the latter statements were something I found myself doing as I came into closer contact with the data. The latter kind of statements about functional relations most closely illustrate the sort of analytic methodology which had been under development by Willard Day and his students at the University of Nevada, Reno, and which was termed "behavioral phenomenology."

Concluding Remarks

By way of conclusion, the following things may be said about the methodology in general: (1) it is simple, in that it is simple to do, requires little equipment, requires no transcription, and enables one to focus upon specified functional units of verbal behavior (such as "explanation"), (2) it does in fact does in fact make certain controlling relations visible with respect to verbal behavior, even when the "stimulus dimension" is represented on something as simple and two-dimensional as a pigeon's cumulative record, (3) it also had the effect of refining somewhat my own discriminative repertoire with respect to the functional analysis of verbal behavior.

Regarding areas for further analysis, it would be interesting to manipulate the conditions of the two experiments on an individual subject basis. While comparisons between subjects in the two experiments are difficult, it is perhaps tantalizing that fewer mentalistic terms and more "pure facts" occurred when the subjects observed behavior under conspicuous and precise stimulus control. Further analysis may show that complex and subtle variables controlling relatively undifferentiated responding may be an occasion under which "mentalistic terms" are likely to occur as part of the "explanation" of the behavior. In any case, further analyses such as these are possible with the expansion of the methodology.

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