

An Experimental Analysis of Ongoing Verbal Behavior: Reinforcement, Verbal Operants, and Superstitious Behavior

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Four adult humans were asked to be asked to "find" and talk about a particular topic to a person in an adjoining room, and were instructed that they would hear a short beep (the only form of reply from the other person) when they were talking about the topic, or were "close" to the topic. In Session 1, the experimenter in the adjoining room presented the beeps in the manner of shaping, or the differential reinforcement of successive approximations, "toward" the designated topic. In Session 2, the same conditions were in effect but the experimenter was unable to hear the subject and the beeps were presented noncontingently in a way that roughly matched the frequency and distribution of presentations in Session 1. In Session 3, shaping conditions were again in effect but with a different topic than that designated for Session 1. Audio recordings were transcribed in a way that was designed to show the progress of shaping over time. These and additional forms of supporting data and accompanying rationale are presented and discussed in detail. Issues raised by the methodology and results of the experiment include the nature of the verbal operant, superstitious verbal behavior, and a variety of methodological issues relevant to the experimental analysis of ongoing or continuous verbal behavior.

One of the many research themes which have been developed in the functional analysis of verbal behavior has concerned the laboratory control of the ongoing verbal behavior of the speaker. Beginning with the classic study by Greenspoon (1955), a number of researchers began reporting studies designed to demonstrate the effects of reinforcement contingencies in relatively naturally-occurring verbal behavior as observed in a controlled laboratory setting. Innovative programs were developed, for example, by William Verplanck (e.g., Verplanck, 1955; Wilson & Verplanck, 1956), Kurt Salzinger, (e.g., Salzinger, Portnoy, Zlotogura, & Keisner, 1963; for an overview see Salzinger, 1991), and Willard Day (Day, 1971/1992; Dougherty, 1980). While such programs were not without methodological complexities (e.g., Azrin, Holz, Ulrich, &

Goldiamond, 1961; cf. Holz & Azrin, 1966; Michael, 1984), they nevertheless represented pioneering and important inroads to a laboratory analysis of verbal behavior. Despite the burgeoning interest in such laboratory preparations, however, reports of such studies had become scarce by the mid-1960s as these researchers turned to alternative methodological strategies or to other research themes (see Leigland, 1989; Moore, 1991; Salzinger, 1991; Verplanck, 1992). Nevertheless, interesting methodological proposals for the functional analysis of verbal behavior continue to appear in the behavior analytic literature (e.g., Drash & Tudor, 1991; Hayes, 1986; Hyten & Chase, 1991; Place, 1991).

The purpose of this report is to describe further developments in a methodological variation which was introduced in an earlier paper (Leigland, 1989), and to examine a variety of the empirical and methodological issues that have emerged from the analysis. The methodology itself involves a basic-research application of behavior shaping to the ongoing verbal behavior of the individual speaker in a laboratory con-

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text. The topics to be explored in the study to be reported include reinforcement, shaping, and superstitious behavior in the context of ongoing verbal behavior. Methodological issues to be addressed include those involving data presentation where there is an interest in continuous verbal behavior in contact with controlling contingencies, as well as issues of measurement and reliability.

A distinguishing characteristic of the methodological strategy to be described here is a specific interest in issues arising from a direct analysis of records of ongoing, continuous, or "freely-occurring" verbal behavior in contact with experimentally-controlled contingencies. While the general experimental preparation is clearly a descendant of the pioneering research noted above, many of the particular tactics to be reported have perhaps been most directly influenced by the practices of Skinner's early research program in the experimental analysis of behavior (e.g., Skinner, 1932, 1938). While much of Skinner's writings involve the interpretation of behavior, verbal or otherwise, in terms of contingencies (e.g., Skinner, 1931, 1945, 1957, 1969, 1974, 1989), the principal methodological characteristics of Skinner's early experimental research program could be seen throughout his research career (e.g., Ferster & Skinner, 1957; Skinner, 1976, 1986).

These characteristics could be summarized in the following way: an emphasis upon (a) the behavior of the individual, intact, freely-moving organism, (b) observed under controlled laboratory conditions, in which (c) direct records could be made of the behavior over time and conditions, and (d) the manipulation of environmental variables and contingencies could be achieved, such that (e) orderly changes in behavior over time could be observed, recorded, and analyzed as a function of the contingencies arranged and manipulated in the experimental space. For Skinner, of course, the results of such experiments were characteristically presented by way of the cumulative response record, which provided a moment-to-moment record of

both the response class under investigation as well as the environmental events to which such responding could be related. Skinner advocated the use of the cumulative record because such records made the relevant temporal properties of behavior "visible" and open to direct inspection (e.g., Skinner, 1956, 1976).

In the case of verbal behavior, it is not difficult to construct a laboratory arrangement with the characteristics described above. That is, the ongoing verbal behavior of an individual, "freely-speaking" person may be recorded in a laboratory context in which environmental contingencies are controlled and similarly recorded. There would seem to be little doubt that experimental procedures could be developed that would be effective in the control of the ongoing verbal behavior of a speaker in such a laboratory situation, and a complete audiotape record of the verbal behavior could be conveniently arranged at little cost. Despite its apparent analytic simplicity, however, a number of fundamental questions may be raised concerning such a procedure. For example, what are the verbal "units" under investigation, and what sort of measure is to be used (e.g., frequency, duration, etc.)? More generally, how are the data to be presented, and how is objectivity to be assured in the analytic process? Some of these issues have been discussed previously (Leigland, 1989).

The notion of response class was central to the development of Skinner's systematic analysis of behavior; namely, the notion that response classes be defined in functional rather than physical (i.e., mechanical) terms (e.g., Skinner, 1935, 1938, 1957; see also Catania, 1992; Leigland, 1989, 1993). The general question of behavioral "units" concerns those discriminable properties of behavior that show orderly relations to contingencies of reinforcement (e.g., Catania, 1992; Skinner, 1938). Since the contingencies are mediated by the behavior of other people in the case of verbal behavior, however, the notion of a "unit" becomes exceedingly complex. The great variety of verbal units that may be defined functionally has been discussed by

Salzinger (1991; also Skinner, 1957), and this work illustrates the complexity of the dimensions of verbal behavior that may be discriminated. Of interest to the present research is a complex dimension of ongoing verbal behavior which is described by the term, "topic." The term "topic" is not being proposed as a technical term, but rather occurs here simply in a descriptive sense. It is possible, for example, for observers within a verbal community to discriminate and identify the occurrence of topic changes, and to identify particular "topics" in terms of other descriptors, and so on.

In this experiment, brief tones (or "beeps") were used in the shaping of a particular "topic" in the verbal behavior of a speaker in a laboratory context (Leigland, 1989). The reinforcement function of the presented beeps was examined over three sessions. A preselected topic was chosen for shaping in Session 1, the beeps were presented noncontingently in Session 2, and a second topic was designated for shaping in Session 3. The resulting analysis emphasized the characteristics of the verbal behavior thus differentiated.

METHOD

Subjects

The subjects were five undergraduate students who were enrolled in a general psychology course. Data from four of the subjects are reported, as one subject (for whom English was a second language) declined written permission for further analysis of the collected tapes during post-experimental debriefing. Subject 1 was a 45 year old female returning student, Subject 2 a 19 year old female student, Subject 3 was a 52 year old male returning student, and Subject 4 was a 20 year old female student.

Apparatus

Experimental sessions were conducted in a small room, which included a chair and a small table. Subjects were seated next to the table and faced a fourth-floor window with a view primarily of sky. On

the table was a tape recorder, and taped underneath the table surface was a microphone which was connected to a speaker system in an adjoining room. Also connected to the underside of the table surface was a small tone generator that was connected to a handswitch in the adjoining room. A stopwatch was used for the timing of events during the experimental session.

Procedure

Upon arrival to the lab, the subject was introduced to the experimenter and the assistant, and shown to the experimental room. The subject was seated on the opposite side of the room from the window and given the following instructions in written form (after a few introductory sentences that the study concerns language and is not a test or evaluation of any kind):

The period will be divided into three short "sessions," each lasting about 10 minutes. There will be a short break between each session. The instructions for each session are the same. The sessions will be tape recorded, but your identity and participation will remain confidential in any subsequent dealings with the tapes or results of the study.

The procedures for the sessions are as follows. Your task in the study is simply to talk to the person in the next room. They will not be able to talk to you directly, but they will be able to communicate with you by way of a small "beeping" device.

There is a particular "topic" that we would like you to talk about, but instead of telling you what it is, we would like you to find the topic (or figure out what it is) and then talk about it. You will hear a short "beep" when you are talking about the topic that we have in mind, or are close to the topic. The "beeps" represent points, and we would like you to collect as many points as possible during the sessions (we will count them for you). The topic may or may not be the same for each of the three sessions.

Again, the study concerns language as a form of communication. It is important that you try to find the topic and talk about it, and to collect as many points ("beeps") as possible.

Before the session begins, an "Informed Consent" will be made available to you for signing, and will be explained by the experimenter. Thank you for your participation!

Any questions regarding the instructions were answered by restating the relevant parts of the instructions. Any questions such as "How do I begin?" or, "But how do I find the topic?" were answered with the

statement, "Any way that you would like to do it would be fine."

The beeps were said to "represent points" for the purposes of counting only. At no point during recruiting nor during the instructions was it implied that money could be earned by participation in the experiment. The term "points" was employed in case any subject were to inquire as to how his/her performance compared to other subjects generally. Such information was available, but in no case did any subject inquire in any way about the "points" after the experiment.

Before the session began, the subject was shown the adjoining room and relevant equipment, and was presented with one or two "sample" beeps upon return to the experimental room. Finally, subjects were told that they could begin when they heard the first beep, and the tape recorder was set to record.

In Session 1, the experimenter employed a standard shaping operation as applied to the subject's ongoing verbal behavior (e.g., Catania, 1992; Martin & Pear, 1992). That is, a preselected topic served as the verbal "target" for the differential reinforcement of successive approximations of verbal responding. Brief presentations of the tone (or the "beeps") served as the putative reinforcer as the experimenter listened to the subject speaking. The character of the shaping operation had much in common with more standard, nonverbal preparations; for example, it was frequently necessary to reinforce quite "distant" variations in verbal behavior before "closer" approximations would appear, and so on (Leigland, 1989). During Session 1, the assistant recorded the frequency of the presented beeps in 15-sec intervals throughout the session. Each session lasted from seven to 10 minutes, and at the completion of each session, a short break of a few minutes was given before beginning the next session.

In Session 2, upon returning to the adjoining room, the experimenter disconnected the speakers which had been connected to the microphone in the experimental room. A stopwatch was started and

beeps were presented without regard to the subject's behavior, with the number of beeps in each successive 15-sec interval matched to the frequency of beeps presented in the successive intervals of the previous session. Within each 15-sec interval, the beeps were simply presented in an irregular manner by the assistant.

In Session 3, the same procedures were followed as in Session 1, but with a different predesignated "target" topic. The brief beeps (0.5-1.0 sec) were presented manually via handswitch and were clearly audible.

For Subjects 1-3 to be presented below, the predesignated topic for Session 1 was the subject's "hometown," and the topic for Session 3 was the subject's "leisure activities." For Subject 4, the order of these topics was reversed. Earlier studies (e.g., Leigland, 1989) had indicated that these topics were "general" enough and were sufficiently "at strength" to serve the purposes of investigating the variation and selection of verbal operant behavior given the various constraints of the laboratory preparation.

At the completion of Session 3, the subject was given a brief post-experimental survey. Space was provided for answering the following questions:

(1) Please name the topic that you were trying to "find and talk about" (or, please give your best guess as to what the topic was) for each of the sessions as indicated below:

First Session:

Second Session:

Third Session:

(2) How would describe the effects of the "beeps" upon you as you attempted to find and talk about the topic? Did these effects change for the different sessions?

Data Presentation and Rationale

The most direct and complete way of presenting the results of the sort of verbal behavior study reported here would be to simply provide complete transcripts of the sessions with the placement of the beeps located within the textual material. Of course, a great deal of transcribed material would have to be included, since even one

10-min session can produce a great deal of verbal behavior. For the sake of convenience and efficiency, the goal was to devise a type of summary of the sessions, short of complete transcription but with relevant properties of the verbal behavior and other events displayed. The "cumulative verbal record" (CVR) was an attempt to provide such a summary, and will constitute one of the primary forms of data presentation. A more complete rationale for this method of data presentation may be found in Leigland (1989).

To illustrate with an analogous situation, suppose one were interested in a detailed analysis of the shaping process and had videotaped a session in which a rat had been shaped to press a lever in the standard operant preparation. The videotapes would constitute the most complete record of experimental results, but for purposes of presentation a succession of videotape frames may be more convenient (e.g., Epstein, 1985). If one were attempting to select the minimum number of frames from the shaping session with which to show the progress of the shaping process, the case could be made that this would be accomplished by selecting those frames that showed the successive response variations that had led the experimenter to present a reinforcer at that moment. The resulting record would be selective, but the selection would be of those successive moments in which variations in response topography made contact with the contingencies of reinforcement (as mediated by the person shaping).

The same strategy was applied here, in that a record was constructed by the selective transcription of those moments in which the verbal behavior of the subject evoked a beep presentation from the experimenter. The transcription process was carried out by the person who had engaged in the shaping operation, and involved the identification of the passage or terms that had led to the presentation of a given beep, as taken from the audio tapes. The temporal placement of the particular beep within the session was also noted via stopwatch. An example of the

resulting record may be seen in the top panel of Figure 1, which shows the record from Subject 1, Session 1. The session was approximately 10-min in length, with the lower portion a continuation of the upper portion of the record. Each of the "steps" in the record indicates the relative location of a particular beep within a session, and the preceding verbal behavior which is relevant to that presentation has been transcribed and placed on that "step." The "cumulative" nature of record allows for a relatively efficient use of space in the presentation of the transcribed excerpts. Some abbreviations are found, and specific names and places are generally omitted in order to preserve confidentiality. A complete listing of conventions used in the construction of the CVRs is found in Table 1.

The overall patterns of temporal placement of the beeps may be summarized for the three sessions of a given subject in a reduced composite figure, which are shown for each of the four subjects in Figure 5. In these figures the CVRs are reduced such that each of the three session appears as a single line, with the top, middle, and bottom lines showing Sessions 1-3, respectively. While the transcribed verbal material is not the focus in this case, the reduced composites present the larger picture of patterning within and between the three sessions for purposes of convenient comparison (the preservation of the lines of text on the reduced figures serve as additional markers for particular locations within a session through their relative lengths, when compared to the respective CVR). The strategy is similar to that of Ferster and Skinner (1957), in that these researchers presented their cumulative records in a variety of ways (e.g., as reduced entire sessions, "collected segments," enlarged portions of a given session, and so on) in order to display a variety of effects on varying scales.

CVR Construction for Session 2 In Session 2, the beeps were presented noncontingently with respect to the subject's behavior. In constructing the sort of CVR described above, the first question concerns the "transcribed unit" to be selected

Table 1

Markers and codes used in the construction of cumulative verbal records (CVRs).

 >out what the topic is here!
 I need to figure>
 (two arrows: continuation of line)

(interactions w/ parents) as I was growing up!
 (parentheses: summary of previous material; any material included in double brackets indicates a summary of subsequent material which is included for verbal context)

>>
 we all enjoy skiing!
 (double arrows: continued on next section of record)

_____/ /
 and later we moved back!
 (double slash: end of session)

(after/summer) moved into...the city!
 ("...": intervening material in verbatim section; single slash in parentheses: two sections of summarized previous material)

 Is it an object? Is it an activity?|
 (Two sentences on a line: additional verbal context provided by the inclusion of a statment preceding the statement selected, where the punctuation indicates a pause between statements)

>An activity?|
 Is it an object or an activity?|
 (single arrow: the next line contains a continuation of the verbal material; i.e., the next statement made, regardless of the length of the intervening pause, if any; the absence of such an arrow indicates that some additional verbal material occurred between the transcribed statements)

 I grew up in [Town Name 1!]
 (brackets: a proper name of a person or location; omitted for the purpose of confidentiality)

for inclusion in the record, since the beeps were presented without regard to behavior. In the analogous case of the standard rat/lever operant preparation, if a shaping session was followed by a session of non-contingent presentations of food pellets, the interest would be in whether there were changes (i.e., decreases, if the interest was in food pellets as a type of reinforcement) in the response class targeted for

shaping in the first session; namely, the leverpress. Similarly, the strategy in the present case would be to select instances of the same response class in Session 2 that may have been "strengthened" through the reinforcement operation in Session 1. Procedurally, this amounted to having the experimenter who had shaped in Session 1 simply listen to the recorded products of Session 2, and stop/mark/transcribe the

tape in any instance that would have constituted an instance of the reinforced response class from Session 1. Thus, the experimenter would perform the same operation on the Session 2 tape that had been performed in Session 1, and include the transcribed entries in the presented CVR, along with markers for the locations of the presented beeps. The general effect may be seen in the middle panel of Figure 2, which shows Session 2 data for Subject 2. Here the temporal placements of the presented beeps are indicated by pip marks, and the selected instances of "topic" or "approximations" are indicated as transcribed entries on the record.

Supporting Data The methodological issue of interest here is the nature of the contingencies governing the selection process for Session 2 data. That is, it is in Session 2 data selection that the contingencies might favor selection *against* instances to be included, since a demonstration of "reinforcement" might depend upon fewer instances of the topic (or its approximations) in Session 2 compared to Session 1. If the CVRs were the sole method of data presentation, one might justifiably question whether the experimenter had omitted Session 2 entries which others might have included. Additional forms of data would therefore be useful in monitoring the selection process of Session 2 CVR entries.

One rather simple type of data presentation is provided by an irregular sampling of the verbal material from Session 2. Such irregular sampling may be based upon the presentation of the noncontingent beeps, such that the verbal segment that preceded each of the presented beeps would be transcribed in sequence and presented in the form of a table. An example may be seen in Table 3, which shows such selected transcriptions for Session 2 from Subject 1. While the transcribed segments are based upon a sampling of the full session, in this case the basis of sampling is independent of the discriminations of the experimenter. The sampling of verbal segments displayed in the tables of selected transcriptions show something of the continuity and structure of the verbal material

throughout the session, and may also be used to trace the development of superstitious verbal behavior.

Another way of summarizing certain verbal properties of the full transcripts for the three experimental sessions is as follows. First, certain key terms may be identified from Session 1. These terms would be "members" of the verbal response class that was targeted for shaping in Session 1, or could be seen as "approximations" to that response class. Further, these terms would be visible to the reader in the Session 1 CVR in that the terms would be apparent by the end of the shaping session. Next, with the full transcripts on computer file, a word search command would be used to simply count the frequency of the term or class of terms. The resulting number would be expressed as a percentage of the total number of words for each of the three experimental sessions. Such key terms could be identified separately for the targeted "topics" of Session 1 and 3, for example, and also for "topics" appearing as a result of adventitious contingencies occurring in Session 2. Such a summary would be somewhat crude, of course, but could be accurately and easily done on a word processor. The particular terms selected would be identifiable from the relevant CVRs, and in the case of Session 2, the table of selected transcriptions. An example of the resulting graph may be seen in Figure 6 (Subject 1), which will be described in detail below.

To summarize, the primary data presentation involves the cumulative verbal records, the reduced composite figures, and the post-experimental surveys. Supporting data will be provided by the tables of selected transcriptions from Session 2, and the quantitative transcript summaries. Full transcripts for all sessions were included for editorial review, and are available upon request.

RESULTS

For Subjects 1-3, the preselected topics were the subject's "hometown" for Session 1 and the subject's "leisure activities" for Session 3. The sequence of these two topics

Table 2

Summary of topics, written responses to the post-experimental survey, and terms used in quantitative transcript summaries for the three sessions for each subject.

Subject 1

Session 1 (Reinf. 1)

Designated Topic: hometown

Subject Survey: "Family relationships, past & present."

QTS/Terms: family, growth, development (& derivatives).

Session 2 (NCP)

Designated Topic: (none)

Subject Survey: "weather, specifically sun & rain evolving into energy."

QTS/Terms: weather.

Session 3 (Reinf. 2)

Designated Topic: leisure activities

Subject Survey: "the sport of skiing, individually and as a family."

QTS/Terms: sports.

Subject 2

Session 1 (Reinf. 1)

Designated Topic: hometown

Subject Survey: "town"

QTS/Terms: town.

Session 2 (NCP)

Designated Topic: (none)

Subject Survey: "??"

QTS/Terms: topic.

Session 3 (Reinf. 2)

Designated Topic: leisure activities

Subject Survey: "me and basketball"

QTS/Terms: basketball, play(ed).

Subject 3

Session 1 (Reinf. 1)

Designated Topic: hometown

Subject Survey: "Family or life also home or locations"

Session 2 (NCP)

Designated Topic: (none)

Subject Survey: "Appeared to involve life, training and toward the end poorly enunciated words or gaps in the conversation."

Session 3 (Reinf. 2)

Designated Topic: leisure activities

Subject Survey: "Seemed to deal with recreation, personal time or activities."

Subject 4

Session 1 (Reinf. 1)

Designated Topic: leisure activities

Subject Survey: "Walking for some reason, and for some purpose."

Session 2 (NCP)

Designated Topic: (none)

Subject Survey: "No topic-to my knowledge."

Session 3 (Reinf. 2)

Designated Topic: hometown

Subject Survey: "Has to do w/ an activity taking place from birth to age 1 and then again in 5 yrs."

was reversed for Subject 4. Table 2 provides a listing of the preselected topics, the verbatim response to the post-experimental survey question regarding the identification of the topic, and the key terms selected for the quantitative transcript summaries (where identified) for each subject and session.

Cumulative Verbal Records

Subject 1 The cumulative verbal records (CVR) for Subject 1 are presented in Figure 1. The record for Session 1 (top panel) shows the early occurrence of the topic of "family," which was followed by the third beep presentation as an approximation to "hometown." Subsequent variations regarding family concerned such themes as family growth and development, but further specifications of family origins regarding location (which would have allowed further differentiation "toward" the topic of hometown) did not occur in the session time remaining. Nevertheless, variations concerning family in the context of the "past" may be seen approximately midway through the session, with passages including "growing up" occurring in the latter part of the session. In response to the post-experimental survey question, "name or guess" the topic, Subject 1 wrote, "Family relationships, past & present" (Table 2).

Session 2 is shown in the middle panel of Figure 1. In this session the beeps were presented without regard to the subject's behavior. Very shortly after the start of Session 2 a heavy rainstorm began quite suddenly. The transcript from the beginning of the session is as follows (a double asterisk indicates a beep presentation):

Well, here we go again, the time to find out what we are supposed to be talking about. Nothing else, the rain has started again ** and the rain is something that either can be soothing or distressing, and, ooh, it's really pouring, it's nurturing, it's a sign of growth, and refreshment that's for sure. Some people hate the rain. Sometimes weather is, is nothing but a pain in the neck to people. For, I think for me the rain ** is something that signals a change if nothing else, it's that time when Mother Nature says, you know, that somebody else is in control...

The early occurrence of verbal behavior controlled by the presence of the rain

appears to have set up adventitious contingencies that favored the selection of talk about weather-related issues. The passages identified on the middle panel of the CVR were the only occurrences that could be considered related to such topics as "hometown" or "family relations."

Session 3 is shown in the bottom panel of Figure 1. The designated topic for shaping was "leisure activities," and Subject 1 mentioned sports early in the session, producing the first beep presentation. Session 3 was a continuous description of a variety of sports and leisure activities, but the majority of the session was devoted to skiing. In the post-experimental survey, the topic was identified by Subject 1 as follows: "the sport of skiing, individually and as a family."

Subject 2 The CVRs for Subject 2 are shown in Figure 2. In contrast to Subject 1, whose verbal behavior in each of the three sessions could be described as continuous and descriptive in character, the verbal behavior of Subject 2 could be characterized as a series of questions punctuated by brief statements and pauses. For Subject 2, Session 1 (Figure 2, top panel) began with the following questions: "Is it an animal? Is it a place?*" Is it in Europe? Is it in Australia, Africa, South Africa, China area, United States?*" Shortly after the start of the session, the term "town" was selected, and it may be seen from the CVR that the remainder of the session consisted largely of questions concerning the specific name or location of the town. Since the name and location of the subject's hometown was unknown to the experimenter, a complex interaction occurred in which questions regarding the town were well maintained throughout the session but in relatively undifferentiated fashion, as may be seen in the following passage taken from approximately mid-session:

"Is the specific location in the eastern region? In the western? [pause] In the southern? Um, how about the southeast? The northeast? [pause] Is there a way to figure out which town you're talking about?*" There is."* Am I close to it? Obviously not. Um, um [pause]..."

If questions regarding the town's location can be considered a class of verbal

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>> an ability to look at their past experiences |
      (grandparents) and appreciation of the past and |
a friend from (Foreign Country) that comes and stays with us often |
      (elements of growth) certainly can happen because of their extended family |
      (development happens at all different levels) in a family and |
      (starteds way back with me) with my family |
      (changes/family can be) exciting experiences of |
      (family) its always moving and changing |
      (take care of) my family |
      (started way back with me) with my family |
      (find) what the topic is here |
      (info re the past) to use it as we learned and cropped and grew |
      (and we have much more of a sense of family once again) |
      (something I know) the process of growing up |
      (and) as I was growing up |
      (sister) as we were growing up |
      (we're all part) of a big network of |
      (clues) develop into better adults by looking at the past |
      >and how our parents went through different stages |
      (always have to be) looking at what happened before us |
      (solar energy) as my daughter learned about it |
      (the sun (ishua)will my daughter is |
      >> (he) knows how to trim the edges, how to wax |
      my husband learned to tune skis which is |
      (ski tuning) not only involves getting on the skis, and executing turns but |
      (son/snowboarding) a new skill that he is attempting and fine-tuning |
      (skiing/my kids) they re both racing and |
      (rewarding) even though I (skiing/my kids) was 5 years old |
      (ability to ski) the joy of taking lessons again |
      (as fall/into winter) we then find the mountains |
      (in the mountains/at night) and the peace and the quiet |
      >we play lots of soccer together |
      >and just kind of general fitness with my family |
      >easy jogging |
      >namely, bicycle riding |
      >(walking/daily) with other sports |
      >(walking a) good exercise for us |
      >(evolved into) a daily adventure |
      (sports) for me, has |
      just walking around the block |
      (sports/vital) in general at |
      >sports is always |
      (something to do with the afternoon) >
      (health) and yet, didn't take a lot of time or money |
      (walking/jogging/bicycling) could do very inexpensively |
      (as time & money to spend on them) namely skiing |
      (learned/many sports) really fun to do it as a family |
      >the sports that really hit home for us are base |
      >(golf) something we can do as a family many nights during the summer |
      >we'll always be able to enjoy the sense of the mountains and |
      (skiing) a wonderful sport that we can take with us for years |
      (skiing) something you can take with you for years |
      (skiing) and, physical development |
      (grew out of) these funny boards on your feet |
      >(evolving) bigger group of ski friends |
      (skiing) can share w/other people |
      (different groups) associating w/i a sport |
      (skiing/sharing) with our friends |
      (respect) skiing in a whole new light |
      (skiing) the technology....is fantastic |
  
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Fig. 1. Cumulative verbal records for Subject 1 for Session 1 (reinforcement, topic A; top panel), Session 2 (noncontingent presentations; middle panel), and Session 3 (reinforcement, topic B; bottom panel). See text and Table 2 for details.

responses (see the "mand" relation; Skinner, 1957), then this response class seemed to be maintained by beep presentations following statements that confirmed the availability of the town's location to the subject. Specific response variations specifying the location of the subject's hometown did not occur, however, preventing further differentiation of the topic. In the post-experimental survey, Subject 2 identified the topic of Session 1 simply as "town" (Table 2).

Session 2 is shown in the middle panel of Figure 2. In this session the questions concerned the topic to be discovered. Selections were made throughout Session 2 of verbal responses that could have been considered appropriate for the shaping of the topic designated for Session 1, in this case "hometown." For example, a verbal passage such as "Is it the same topic?" was selected for the Session 2 CVR not because the same topic was in effect (there was no pre-designated topic for Session 2), but because if it had been in effect, this passage would have been selected as an "approximation" in the shaping process.

Session 3 is shown in the lower panel of Figure 2. Here the shaping contingencies were again in effect, and the targeted topic was "leisure activities." This record shows that it took approximately one-third of the session for Subject 2 to identify herself as the subject of the topic in question, even though most of the answers to the preceding series of questions involved self-description (see also Subject 2 in Leigland, 1989). From the point where Subject 2 identified herself as the subject of the topic, a series of questions led to the further differentiation of the topic, from "activities," to "sports" and then variations of the topic of "basketball," which was maintained for the remainder of the session. In the post-experimental survey, the topic was identified as "me and basketball."

Subject 3 The CVRs for Subject 3 are shown in Figure 3. For all three sessions, the verbal behavior of Subject 3 could be described as relatively continuous and fluid. Subject 3 began the Session 1 (with the pre-designated topic of "hometown";

top panel) with some general descriptions of his current living situation, family, and recent visits. Several "digressions" occurred until variations again appeared related to "family." These variations were maintained intermittently until Subject 3 spoke of his own family background (lower segment of the CVR). At this point the rate of beep presentations increased as Subject 3 spoke in continuous fashion of the area in which he grew up and had recently visited. In the post-experimental survey, Subject 3 identified the Session 1 topic as "Family or life also home or locations" (Table 2).

Session 2 is shown in the middle panel of Figure 3. This session could be described as a running narrative of Subject 3's early career (see the first statement of the session and CVR). Again, the beeps were presented in noncontingent fashion and the CVR shows transcribed passages that were selected on the basis of the procedures and designated topic from Session 1; namely, "hometown" and relevant approximations. During the latter part of the session, Subject 3 "digressed" from the more frequent specification of locations to describe some general problems facing contemporary North American native cultures. At the segment of the record marked "a," Subject 3's verbal behavior began to decrease and eventually stopped altogether. He returned to the topic of his early career and successive moves at the very end of the session.

Session 3 is shown in the lower panel of Figure 3. The pre-designated topic that had been targeted for shaping in this session was "leisure activities," and the first part of the session shows a continuation of the verbal material from the previous session. Few beep presentations occurred during this interval and these were presented primarily for the purposes of maintenance. A sharp increase occurs following the point where attending hockey games was mentioned (see "Gretsky"), and during this segment a number of variations occurred that could be regarded as falling within the general topic of "leisure activities."

Despite the relatively high rate of beep presentation during this segment, another

```

VBZ/S1/Session 1(Reinf.1)
>(summary training/to help others) in their handling of life's problems and their family difficulties|
>(summary) like I was one of five children and|
>(summary) we came from different family makeups|
>(summary) our earlier family associations have|
>and ah, I've one son in (City name 2) and one in Calgary|
>(Town name) a suburb of Edmonton|
>(Town name) and I also went back|
>ah that's where they were|
>and then travel by car to Calgary|
>in ah, fly directly to Calgary|
>(end of exams/I'll fly back to Canada) I'll be in|
>(a real pleasant kind of) trip that I made|
>(2 cousins of dad) haven't seen them for 40 years|
>(I've seen them) in (Town name) and ah|
>(I went from Edmonton through to (City name 1) Ontario|
>(predominant occupation) is agriculture on the prairies|
>(this is central Canada|
>(Thinking about my own family background|
>(China for example) family structures|
>(to work w/people) in their family life situations|
>(and that's where I was able to do the work that I was) striving to do|
>(later) sent me out to (Town name 4)|
>(after/summer) went into... Edmonton proper|
>(I was) transferred from there... went to Edmonton|
>(then we moved) (Town name 2)|
>(re family) that was a good place to be|
>(best place for) the growth of my family|
>(then/transferred) (Town name 5)|
>(it was) a nice place in our lives|
>(when Gretsky was playing hockey I was able to) get up there quite a bit|
>(from Edmonton) moved to (Town name 1) 90 miles south|
>(after 2 1/2 years I went with a member company|
>(really interesting|
>(we built communities) provide them with amenities|
>(cont'd work for land dev. company)|
>(and) good to use it productively|
>(our culture) more free time|
>(and) good to use it productively|
>(careers) had to...prioritize my time|
>(and even) to the musical that they had here at the|
>(I've been able to ah, go to movies|
>(and ah, and how we use that|
>(Getting back to ah...our leisure time|
>(which is, we all need to do that I think|
>(I like) fitness training|
>(so I expect to) take in a few sessions of skating|
>(City Park) I noticed that they have the ice surface|
>(I've seen them) in (Town name 3)|
>(and I watch the (City Hockey Team) a bit|
>(when son quit hockey) 1st year in 14 years that I wasn't going to, arenas|
>(kinda nice to keep a bit of a hand on 'em|
>(and providing a service; boys on ice get) retransfusions and|
>(it helped to keep me fit|
>(and ah, really enjoyed that|
>(put 3 boys through a hockey season|
>(I refereed hockey) for about|
>(when Gretsky was playing hockey I was able to) get up there quite a bit|
>(sales job) found the people...really interesting|
>(I liked that|
>(later) went into selling. And|
    
```

Fig. 3. Cumulative verbal records for Session 1 (reinforcement, topic A; top panel), Session 2 (noncontingent presentations; middle panel), and Session 3 (reinforcement, topic B; bottom panel). See text and Table 2 for details.

transition occurred as Subject 3 suddenly returned to the preceding topic, as may be seen in the following segment from the full transcript:

"And ah, besides that I've ah, ah throughout ah, the last dozen years I've been, active in jogging and,** I like ah, generally ah, fitness training** which is, we all need to do that I think,** and it helps us. Um, anyway my um, continuing ah, land development career ah, the ah, the work went, OK for ah, a short while after we lived in [Town Name 1] and the recession hit...."

The Session 3 CVR shows that few subsequent beep presentations were made as Subject 3 continued in the description of his career history. What could be described as the "coherence" of this particular unit of verbal behavior might be indicated by the fact that when his description of his career history was "concluded" by events leading up to and including his current university life, he then "returned" to the topic that had produced beeps at the higher frequency, as shown in the transcribed passage below (see the final segment of the CVR, Figure 3, lower panel):

"I think some, some people coming back to school have a harder time with that [i.e., preparations for assignments and exams]. Um it's only because my ah, job requirements, lend themselves to that that I, I, didn't find it too hard to adjust. [P...] Getting back to ah, our leisure time,** and ah, and how we use that,** I've been able to ah, go to movies,** and ah, ah gone to the symphony,** ah, even in ah, ah gone to ah, to the musical..."

This return to the topic of "leisure time...and how we use that" continued for the remainder of the session (Figure 3, lower panel). In the post-experimental survey, Subject 3 identified the Session 3 topic as follows: "Seemed to deal with recreation, personal time or activities" (Table 2).

Subject 4 For Subject 4, the predesignated topic for Session 1 was "leisure activities" and that for Session 3 was "hometown." After the Session 3 was completed it was discovered that the tape recorder had not operated properly during the session. The CVRs for the first two sessions for Subject 4 are shown in Figure 4.

Throughout Session 1 (Figure 4, upper panel) the verbal behavior for Subject 4 could be characterized as a relatively continuous series of questions. The CVR

shows that roughly the first quarter of the session is a progression which leads to self-identification, after which another series of questions leads to the identification of an activity that could serve as an example of or approximation to a leisure activity, namely "walking?*" The second half of Session 1 could be described as a series of questions regarding the function of the activity of walking for the subject. In the post-experimental survey, the Session 1 topic was identified by Subject 4 as "Walking for some reason, and for some purpose" (Table 2).

Session 2 is shown in the lower panel of Figure 4. The lack of contingency between Subject 4's verbal behavior and the presentation of the beeps produced effects relatively early in the session. Shortly after the statement, "Are the beeps still signalling when I'm correct?" the verbal behavior of Subject 4 ceased entirely for the remainder of the session.

With respect to Session 3, the only documentation that remains regard the progress of shaping is the post-experimental survey, in which Subject 4 (uninformed of the equipment problem) had identified the topic of the session as follows: "Has to do w/an activity taking place from birth to age 1 and then again in 5 yrs" (Table 2). The verbal behavior of Session 3 had been differentiated to the extent that a series of questions had been produced and maintained in the latter part of the session concerning early childhood, as these might have led to further approximations regarding locations and hometown.

Reduced Composite Figures

Subject 1 The reduced composite figure (RCF) for Subject 1 is shown in the upper-left panel of Figure 5. The pattern of beep presentations over the course of each session and between the three sessions can be seen in overview. The brief acceleration seen just past midway through Session 1 occurred when previous verbal responding concerning family and development became more specific regarding family in the context of the past. The general flatness of Session 2 indicates the joint effects of (a)

the lack of variations that could be viewed as approximations to the topic of hometown, and (b) the strength of the weather-related verbal behavior throughout the session, apparently selected and maintained through accidental relations between this property of verbal responding and the presented beeps. The general pattern for Session 3 is relatively steep and constant, after an initial acceleration during which the variations in verbal behavior "arrived" at the topic of leisure activities.

Subject 2 The RCF for Subject 2 is shown in the lower-left panel of Figure 5. Here both the rate and pattern of identification of the respective verbal response classes are similar for each of the three sessions. That Session 2 is similar to Session 1 might indicate that the presented beeps were not serving a reinforcement function with respect to the ongoing verbal behavior for Subject 2, but an examination of the verbal material shows systematic differences between the two sessions in terms of the verbal behavior produced. That is, either the "town" or "topic" variations could have been regarded as "approximations" leading to the designated topic of "hometown" in the case of Sessions 1 and 2, respectively.

Subject 3 The RCF for Subject 3 is shown in the upper-right panel of Figure 5. Session 1 (upper record) shows the portion of the session that began with the subject's "family background" (Figure 3) to be clearly seen in the abruptly increasing pattern toward the end of the session. Session 2 (middle record) shows the "leveling off" toward the latter part of the session as the topic changed from a continuation of a description of Subject 3's career to the eventual cessation of verbal behavior. Session 3 (lower record) clearly shows the two segments in which the topic of "leisure activities" occurred (i.e., in the abruptly increasing pattern preceding mid-session and a short segment at the end of the session), as well as the intervening segment during which Subject 3 "completed" a different topic.

Subject 4 The RCF for Subject 4 is shown in the lower-right panel of Figure 5. In

Session 1 (upper record), the larger discontinuities in the relatively constant rate of presentation correspond to shifts in topic. The lower record shows Session 2, where the decreasing frequency of the identified passages (regarding "approximations" to the Session 1 topic) corresponds roughly with the decreasing frequency of verbal responding overall.

Tables of Selected Transcriptions (Session 2)

Subject 1 The maintenance of weather-related issues which occurred for Subject 1 throughout (noncontingent) Session 2 may be seen in the table of selected transcriptions for this session (Table 3). The listed entries are transcriptions of the verbal behavior which happened to precede each of the successive noncontingent beep presentations throughout Session 2 (the designation ">>" at the beginning of a line indicates a continuation of the previous line). Variations on weather-related topics may be seen to occur throughout the session, as talk of rain (beginning with the occurrence of rain outside) evolved into such topics as the sun and artificial light, solar power, and so on. In the post-experimental survey, Subject 1 identified the topic as "weather, specifically sun & rain evolving into energy" (Table 2).

Evidence that the beeps might be serving a selective as well as a maintenance function might be seen from the sequence from #19 through #22 (Table 3). The 19th presentation (marked at "b" on the Session 2 CVR, Figure 1) happened to occur immediately following the term "solar," which occurred within the verbal context of several alternative terms. That subsequent verbal responding could be described in terms of the topic of solar power or solar energy might be attributed to a selective consequential effect of the beep. Another example may be seen in the occurrence of the term "artificial" in passages #12 through #14 (Table 3).

Another observation from Session 2 data concerns a verbal slip illustrating what appears to be an example of multiple control (Skinner, 1957). The location of the slip is marked on the CVR for Session 2 (Figure



Fig. 5. Reduced composite figures for all four subjects. The figures are reduced cumulative verbal records for the three sessions (Session 1, 2, and 3 are shown on top, middle, and bottom of each panel respectively) for each subject (Subject 1, top left panel; Subject 2, bottom left panel; Subject 3, top right panel; Subject 4, bottom right panel). See text for details.

Table 3

Table of selected transcriptions for Subject 1, Session 2 (noncontingent presentations).

-
- (1) Nothing else, the rain has started again **
- (2) (Sometimes...rain...pain in the neck to people). For, I think for me the rain **
- (3) (...the rain...) refresh the earth **
- (4) (...the rain...) can be predicted, but not necessarily **
- (5) I think the weather is something that **
- (6) Weather can take so many different faces, it can be devastating **
- ("a") [...Weather can be something that is, that destroys everything in its past, in its path...]
- (7) Personally, and on a huge scale, weather is something that ** has to be, it is part of our
- (8) >>daily life, something that enables us to really get up in the morning and **
- (9) (...rain subside...) I like to see the sun come out that there is always **
- (10) The sun is definitely something that we have to have, and have to, have to **
- (11) and life without the sun would be ** devastating...
- (12) I imagine life without the sun to be completely dark and artificial ** if at all...
- (13) (...artificial light...) certainly a close simile **
- (14) artificial light within our homes is **
- (15) that light within our homes can come in many different ways **
- (16) that energy and power is something ** we must protect...
- (17) ...because our resources are always something that are limited **
- (18) [other forms of energy]...power and energy running through them that light gives' us **
- (19)("b")(...what else?...)...resources....everything from power, to wind, to, solar **
- (20) (solar energy [challenges])...how do we use it,...how do we protect ourselves ** from it...
- (21) and have found solar powered energy often ** in the past...
- (22) (energy of the sun)...finite human concept of it is oftentimes ** a fraction of...
- (23) [the sun]...(into winter)...we often hear about the gray days that cause deep depression **

1) at "a" and the transcribed passage appears listed under this designation in Table 3. The passage is reproduced as follows: "Weather can be something that is, that destroys everything in its past, in its path..." While the phonetic similarity of the two terms is certainly a factor, the intrusion of the term "past" for "path" appears to be controlled in part by previous thematic material from Session 1.

Subject 2 The table of selected transcriptions for Subject 2 (Session 2) is shown in Table 4. In this table, the designation

"[P...]" indicates a pause of at least four seconds. In this session, the first two statements made by the subject happened to be followed relatively closely by beep presentations (Figure 2). Both of these statements concerned a continuation of the topic from Session 1. The next four beep presentations, however, occurred irregularly with respect to the verbal behavior of the subject. The remainder of Session 2 may be characterized as questions regarding the status of the current topic and/or the presentations of the beeps, and the variable

Table 4

Table of selected transcriptions for Subject 2, Session 2 (noncontingent presentations).

(1)	Is it the same topic? **
(2)	[P...] Are all the elements the same? **
(3)	[P...] It's still ** modern? ** **
(4)	[P...] **
(5)	Is it a a place? Is it a person? Is it a thing? [P...] **
(6)	Is it the same topic? **
(7)	[P...] **
(8)	Hmm, [P...] has anything **
(9)	[P...] **
(10)	Is the topic "beeping"? [P...] **
(11)	Is it an idea? [P...] Is it a p- **
(12)	Is there a point to this? **
(13)	Are you alive over there? **
(14)	Are you trying to tell me something? [P...] **
(15)	Was there a purpose to that beep? [P...] **
(16)	Are you going to be able to tell me anything? [P...] **
(17)	[P...] Is that an answer to my question? [P...] **
(18)	[P...] Can you speed up the old trigger-finger please? [P...] **
(19)	Is there a topic? [P...] **
(20)	Does it have to do with life? [P...] **
(21)	Does it have to do with time? [P...] **
(22)	[P...] ** [P...] ** [P...] Is there a topic? [P...] **
(23)	[P...] Is the topic life? [P...] **
(24)	[P...] Does it have to do with the old stages of life? [P...] **
(25)	[P...] **

delay between the verbal behavior and the beeps appeared to be an important factor in the occurrence of such questions (e.g., lines #14-#18, Table 4). In the post-experimental survey, the question that asked the subject to identify the topic (or guess as to what the topic might have been) was answered with "???" (Table 2).

Subject 3 Table 5 shows the selected transcriptions (Session 2) for Subject 3. Again, something of the organization of the verbal material may be seen through these selections, in that both the topics of "early career" and some of the locations involved may be seen, as well as portions of the later part of the session in which the verbal behavior began to decrease overall (and the resumption of verbal behavior on lines #28/#29). In the post-experimental survey, the topic for Session 2 was identified by Subject 3 in the following way: "Appeared to involve life, training and toward the end

poorly enunciated words or gaps in the conversation" (Table 2).

Subject 4 The full transcript for Session 2 is shown in Table 6. In this case, some presentations occurred in temporal proximity to various verbal responses, although the degree of proximity was quite variable. The sequence from line #5 to #7 shows a kind of blending of "human" and "animal" in a series of questions preceding the rapid decrease and cessation of verbal behavior (Table 6).

Quantitative Transcript Summaries

Subject 1 Table 2 lists the key terms selected for summarizing certain properties of the full transcripts for Subject 1. The terms selected for Session 1 were terms "family," "growth," and "development" and their derivatives (e.g., grow, grew, develop, developing, etc.); for Session 2, the single term "weather"; and for Session

Table 5

Table of selected transcriptions for Subject 3, Session 2 (noncontingent presentations).

-
- (1) (...early career...) I started in Vancouver, and ah, spent 4 months **
 (2) and then...I was posted back to Alberta, and **
 (3) I was there just...for 6 weeks and went back to Calgary, and ah **
 (4) (stationed in [TOWN NAME 1]...)...And that was like ah, small-town
 policing, **
 (5) >>kind of enjoyed that, ah **
 (6) >>I ah, worked with about **
 (7) then I was transferred to a place called [TOWN NAME 2], I worked **
 (8) (...transferred to...) a resort place for the summer months. And ah, **
 (9) (wasn't the kind of...policing [preferred]...) they recognized that and
 sent me out to [TOWN NAME 5], **
 (10) sometimes it was beautiful with all the snow and the trees and, **
 (11) though I was stationed in [TOWN NAME 5], um I **
 (12) they had a town policeman and, and I'd be the only other guy. **
 (13) one of my colleagues' wife, was in the hospital ** with (...my
 wife/having 1st child...)
 (14) we were there for, a couple of years and then, were transferred **
 (15) So ah, if I was going to be anywhere where we had 3 in diapers, ah, ha,
 and **
 (16) (...treaty Indians...) had to deal with a lot of their problems, and...they'
 kind **
 (17) ...they're poor, and they have a lot of stress, and they don't have the
 income. **
 (18) >>And so they ah, they ah, get into **
 (19) >>difficulty but not as much as, as ah their counterparts, as the white
 people **
 (20) ...usually their problems are just that ah, **
 (21) >>they drink, and ah, and might cause damage or **
 (22) ...they don't have anything but they share what they have, and ah,
 that's neat. **
 (23) >>So ah, **
 (24) >>[P...] well, I guess ah, **
 (25) >>ah, sometimes ah, in a lengthy ah, conversation, **
 (26) >>ah, kinda, stumble a bit, aren't able to ah, **
 (27) >>ah formulate our thoughts and so we, ** we pause and, and ah, have
 these ah, different ah words that trail off. [P...]
 (28) >>Well, anyway, ** ** ** ** [P...] **
 (29) >>[P...] After a bit we ah, we ** left [TOWN NAME 10], and ah we moved...
-

3, the single term "sports" (cf. Figure 1, Table 3).

The quantitative transcript summary for Subject 1 is shown in Figure 6, where each category of term is expressed as a percentage of total words for each of the three sessions. It may be seen that the class of terms identified with family/growth/development in Session 1 is highest in this session, where the targeted topic was hometown.

The term "sports" is found with the highest percentage frequency in Session 3, where the targeted topic was leisure activities. In Session 2, where the weather-related verbal behavior appeared to be an example of superstitious behavior, the term "weather" itself occurs with the highest percentage frequency of the three sessions.

Subject 2 The terms selected for the quantitative transcript summary for Subject 2

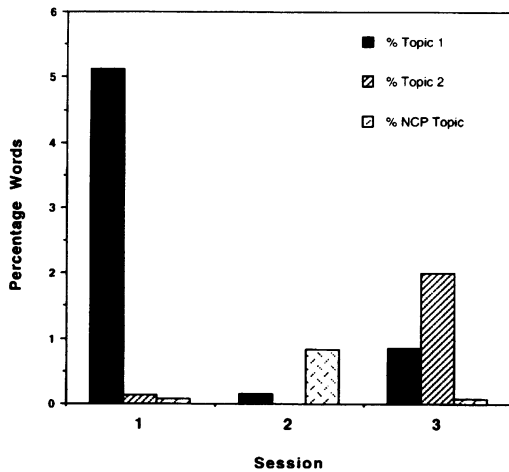


Fig. 6. Quantitative transcript summary for Subject 1. See text and Table 2 for details and verbal categories.

are listed in Table 2. For Sessions 1 and 2, the key terms selected were "town" and "topic," respectively, and for Session 3, the terms "basketball" and "play(ed)" were selected (cf. Figure 2).

The percentage frequency data for the terms in each of the three session are plotted in Figure 7. This figure shows that relatively few occurrences of "town" were found outside of Session 1, both "basketball" and "play(ed)" were found exclusively in Session 3, and the frequency of the term "topic" was highest in Session 2.

Subject 3 The results from Subject 3 demonstrated a possible limitation of the use of the quantitative transcript summary as described above. Given the complexity of the verbal material produced across the three sessions, identifying any term or set of terms that would serve as a convenient indication of the occurrence of a particular topic across those sessions proved to be difficult. For example, the range of terms that occurred in Session 3 in the context of "leisure activities" may be seen from the CVR (Figure 3). In this case, specific terms generally did not appear with sufficient frequency to make them useful in summarizing the occurrence or extent of a particular topic.

DISCUSSION

Reinforcement and Verbal Behavior

With respect to the analysis of reinforcement contingencies which may seem to affect verbal behavior, the goals of the experiment were to (a) support previous basic and applied studies (e.g., Braam & Sundberg, 1991; Drash & Tudor, 1991; Holz & Azrin, 1966; Michael, 1984; Salzinger, 1991, Verplanck, 1992) of verbal behavior which have moved from interpretation to the experimental laboratory in the analysis

Table 6

Full transcript for Subject 4, Session 2 (noncontingent presentations).

-
- (1) ** Are we, going to be talking about the same topic as before? A new topic?
- (2) Um, is the topic similar to ** the one, it is similar to the last topic?
- (3) Is it the same, as the last topic? It's different from the last topic.
- (4) Um, is the topic, ** Is the topic physical? Does it move? **
- (5) Does it breathe? ** Is the topic a human being? Is it an animal? **
- (6) Is the object myself? ** So, myself is not a human it's an animal. **
- (7) Are all human beings animals? ** OK. Um, is the subject** Is the
- (8) subject participating in an activity? ** ** ** [P...] ** ** ** ** ** ** ** **
- (9) [P...] Are the beeps still, signalling when I'm correct or are they
- (10) just randomly beeping? ** Um,** (hah) [P...] ** ** [P...] **
- (11) Is the topic any different from the first topic? [P...] ** If it is
- (12) different, is it majorly different? ** ** [P...] ** ** [P...] ** [P...]
- (13) ** [P...] ** ** [P...] ** [P...] ** [P...] ** ** [P...] ** **
- (14) [P...] ** [P...] ** [P...] [P...] ** ** [P...] ** [P...] ** ** **
- (15) [P...] ** [P...] ** [P...] ** [P...] ** [P...] ** [P...] ** ** [P...] ** [P...]
- (16) ** ** [P...] ** [P...] ** ** ** [P...] ** [P...] ** ** ** [P...]///
-

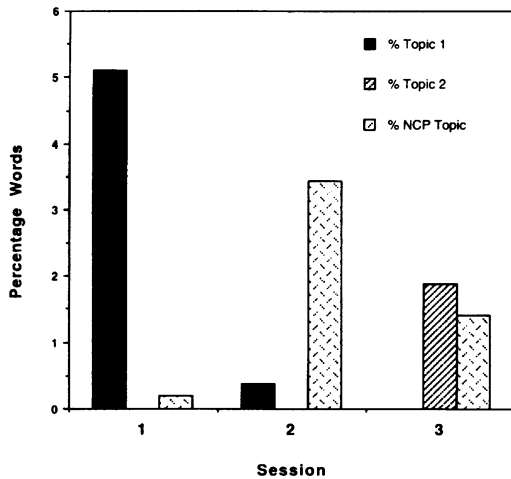


Fig. 7. Quantitative transcript summary for Subject 2. See text and Table 2 for details and verbal categories.

of such contingencies; (b) to extend such work with ongoing or "unconstrained" verbal behavior occurring in a relatively "natural" verbal context; (c) to make use of a method of data presentation that was designed to treat verbal responding over time as a record which may be made available in several ways for direct inspection, (d) to apply this method of data presentation to the verbal behavior of an individual speaker in a controlled laboratory setting, where a standard behavior analytic experimental strategy had been employed.

For three of the four subjects (Subjects 1, 2, and 4) there is evidence that the presented beeps had served a reinforcement function with respect to the ongoing verbal behavior of the subjects. The evidence may be seen in the "approach to" or "arrival upon" (to employ the spatial metaphors) a predesignated "topic" that had been selected for shaping contingencies for Session 1, the decrease or replacement of this topic in Session 2 where the beeps had been presented noncontingently with respect to the subjects' behavior, and the "arrival" and/or "approach" to a second topic that had been targeted for the shaping contingencies of Session 3. For Subject 3, there is some evidence that the beeps were serving a reinforcement function, but the effect appeared to be relatively small or intermittent, in part because of the relative strength of an alternative topic which could be seen to continue throughout the three sessions.

Superstitious Verbal Behavior

The conditions of Session 2 involved the noncontingent presentation of beeps, and thus it became possible that some properties of verbal behavior might be reinforced through adventitious contingencies (e.g., Herrnstein, 1966; Ono, 1987; Skinner, 1948). In this study, discussion of the possible effects of adventitious reinforcement contingencies will focus upon Subject 1. The task is to examine alternative accounts for the occurrence and persistence of the weather-related verbal behavior in Session 2, where the beeps were presented without regard to the behavior of Subject 1. First, the topic of weather was clearly not a continuation of the thematic verbal material from Session 1 (see Figure 1), and in fact may be related quite directly to what appears to be an evocative effect of the occurrence of a heavy rain at the beginning of Session 2.

Two sources of evidence provide indirect support for the effects of adventitious contingencies in Session 2. First, there was evidence of a "local" effect of reinforcement, where certain terms occurring in temporal proximity to a presented beep would be seen to occur several times shortly thereafter, and where such terms were generally not seen to occur at other times in that or the other experimental sessions. Second, the response to the post-experimental survey question asking the subject to "name the topic that you were trying to 'find and talk about' (or, . . . give your best guess as to what the topic was)," showed that Subject 1 identified the topic as "weather, specifically sun & rain evolving into energy" (Table 2). Although it is well known that responses to post-experimental surveys constitute complex verbal responses under multiple control, it is worth noting that the survey question instructed the subject to identify the topic which previous instructions had identified with the contingent presentation of beeps. It is possible that the beeps served a selective function only initially in Session 2, with the remaining presentations serving to maintain the topic throughout the session. Nevertheless, the findings from

Subject 1, taken as a whole, suggest the role of adventitious contingencies and warrant further experimental analysis.

"Rule-Governed" Behavior

Another issue to be addressed concerns the possible abstraction of "rules" by the subjects in this study, and how such verbal processes or interactions may affect conclusions regarding the effects of the presented beeps as a type of reinforcement. That is, it might be argued that the present procedures do not provide a representative analysis of reinforcement contingencies since the verbal behavior observed may have more to do with the ongoing formulation or abstraction of rules by the subjects, and thus may be a case of "rule-governed" as opposed to "contingency-shaped" behavior (for discussions of rule-governed behavior, see e.g., Catania, 1992; Hayes, 1989; Skinner, 1969).

It is worth emphasizing, however, that the occurrence of "rule-governed" behavior is regarded as a function of reinforcement contingencies as well (e.g., Hayes, Zettle, & Rosenfarb, 1989; Skinner, 1969, 1989). With respect to the procedures reported here, it may indeed be possible to describe the subjects as "abstracting rules" during the experimental sessions, but this would not mean that ongoing reinforcement contingencies were therefore inoperative. It is possible, for example, that the "rules" that were formulated or abstracted during the session were selected, shaped, or maintained by the ongoing reinforcement contingencies. In other words, the question may not be one of the functioning of reinforcement as it is a question regarding the nature of the verbal operant undergoing selection by consequences. These are questions for further study.

Verbal Operants

This study raises certain issues regarding the concept of the verbal operant. For example, when reinforcement contingencies are arranged for the selection of a particular topic, what is the relationship between the concept of a "topic" and that of a verbal operant? Standard examples of

verbal operants may be found in Skinner's (1957, 1989) taxonomy of controlling contingencies; the mand, tact, intraverbal, and so on. This taxonomy is particularly useful in illustrating the relative influence of different types of reinforcement contingencies in the control of verbal behavior. As to the issue of verbal "units," however, research has shown that a variety of different "units" may function as verbal operants. In summarizing some of this research, Salzinger (1991) has noted, "that any number of different agglomerations of sounds, letters, syllables, phonemes, words, phrases, sentences, and much larger collections of verbal behavior can, under various conditions, act as units of response" (p. 188).

In general, an operant may be described as an observed correspondence between two kinds of response classes: (a) one class defined in terms of the differential effects upon the environment of response variations; and (b) another class which is defined by the variations of responding which are produced by the reinforcement contingencies. The nature of the functional definitions of behavior analytic technical terms requires both a distinction (or a discrimination on the part of the observer) and an interaction (or an observed correlation or correspondence; e.g., Skinner, 1931) between (a) the environmental contingencies and (b) the behavioral effects produced by those contingencies (e.g., Catania, 1992; Skinner, 1938, 1953, 1969, 1989).

The essential properties may be seen in the famous quote from Skinner's *The Behavior of Organisms* (1938) where it was proposed that "a specification [of a functional unit of behavior] is successful if the entity which it describes gives smooth curves for the dynamic laws" (p. 37). Skinner's original laboratory preparation allowed for (a) a precise specification of the environmental contingencies within the experimental chamber and other relevant conditions (i.e., involving lever, food pellets, current feeding regimen, and so on), and (b) Skinner's cumulative records provided the "smooth curves for the dynamic

laws"; namely, the demonstration that the specified unit varied in orderly ways as a function of reinforcement (or "conditioning") and extinction operations (Skinner, 1938). Skinner's functional approach to the definition of operants made it unnecessary to confront the formidable task of precisely describing the variations of responding which made up the response class under analysis, since "the number of distinguishable acts on the part of the rat that will give the required movement of the lever is indefinite and very large. They constitute a class, which is sufficiently well-defined by the phrase, 'pressing the lever'" (Skinner, 1938, p. 37; Catania, 1992).

Similarly, a "topic" may qualify as a verbal operant if the occurrence of the identified topic can be shown to vary in orderly ways as a function of contingencies of reinforcement. But lacking any "physical" (i.e., "mechanical") operandum as medium of contact, how is the "topic" to be designated, identified, or described? In general, the most precise descriptive terms available to members of the common verbal community would generally suffice for the purposes of specification. That is, we might use terms such as "leisure activities" as a way of identifying a topic as a functional unit in a way similar to Skinner's (1938) use of the phrase, "pressing the lever" in the passage quoted above (although Skinner was able to provide additional information regarding the physical dimensions involved in the response requirements; see also Catania, 1992, pp. 127-128). The terms "leisure activities" may be used in a descriptive sense to specify a class of verbal responses which may be discriminated by observers/listeners with an appropriate history of contact with the relevant verbal community, and contingencies of reinforcement may be arranged on that basis (and of course, more specific designations of the "topic" may be given as well).

Conclusions

The development of the methodological strategy reported here involved the follow-

ing steps: (a) set up laboratory conditions that allow for the control of the ongoing verbal behavior of individual human subjects; (b) control verbal behavior in the experimental setting, recording all of the verbal behavior and all of the events to which the control might be attributed; (c) develop ways of displaying the controlling relation visually through transcription and the relative placement of controlling events in time; (d) more specifically, develop a way of displaying the data such that the nature of the control is made conspicuous, while at the same time making the display concise enough for standard experimental reports; (e) review the data analysis and presentation process at every point for contingencies that might raise the issue of experimenter bias or other methodological problems; (f) provide sufficient supplementary data which are designed to counteract biasing contingencies and to illustrate additional properties of the controlling relation; and (g) provide full transcripts as a complete record of the experimental sessions for the purposes of critical review, and possibly for the purposes of an archival verbal behavior database.

The experimental preparation reported here may be readily developed into a research program capable of exploring the effects of a variety of variables known to enter into a controlling operant contingency. Variables influencing reinforcement and discriminative stimulus functions, establishing operations, conditional stimulus control and the effects of instructions may be manipulated in a controlled setting and their effects assessed with respect to continuous or "freely-occurring" verbal behavior. The results of this experiment suggests a number of empirical questions regarding such topics as adventitious contingencies, rule-governed behavior, and the specification of verbal operants.

A variety of methodological extensions and refinements are possible as well. The basic procedures may be extended in a number of ways to the application of reinforcement contingencies to the ongoing verbal interaction between two people, for example, or consequences might be deliv-

ered by way of a computer monitor in the real-time analysis of written verbal behavior, and so on. Of the many possible methodological refinements, it has been noted that extraordinarily detailed transcription techniques are available from the field of conversation analysis in ethnomethodological sociology (e.g., Place, 1991). Advances in the science and technology of shaping may also find application in the context of verbal behavior (e.g., Galbicka, 1994). In addition, some of the advances in computer technology reported in the cognitivist literature show considerable promise as research tools for behavior analysts (e.g., Simon & Kaplan, 1989). While these programmatic advances were developed in the context of the theoretical goals of cognitive research, some appear to be easily adaptable to the goals of a functional analysis of verbal behavior (see also Hayes, 1986).

As to the question of applied science, the study of contingencies involved in the control of continuous or ongoing verbal behavior might be most directly relevant to the practices of psychotherapy (e.g., Skinner, 1957). The important and complex verbal interactions which characterize psychotherapy have been the subject of a considerable amount of interpretive work by behavior analysts (e.g., Cordova & Koerner, 1993; Ferster, 1979; Kohlenberg & Tsai, 1991, 1994; Rosenfarb, 1992; Skinner, 1953, 1957). For example, some of the ways in which the real-time, contingency-governed shaping of verbal behavior may enter into the psychotherapeutic interaction have been described by Rosenfarb (1992). Such clinical practices would be among the applied areas to benefit from basic research designed to analyze the contingencies involved in ongoing verbal interactions between speaker and listener.

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