Ambiguity and the Abstract Tact: A Signal Detection Analysis

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Four observers who had completed a formal course in projective test techniques were asked to discriminate House-Tree-Person (H-T-P) drawings made by psychiatric patients from those made by nonpatients. A 4.5 kHz tone presentation was made contingent upon one of two classes of errors, failure-to-tact errors or false-tact errors, depending on the experimental condition in effect. The observers were instructed that a 2 second tone presentation would occur each time the experimenters disagreed with the observer. The duration of tone presentation was variable depending upon the number of disagreements that occurred after blocks of either 5 or 10 responses. All observers showed some degree of abstractional control by the set of patient drawings. The likelihood of a correct tact was shown to vary as a function of the consequences contingent upon each type of error for 3 of the 4 observers. However, the discriminability index d' remained unchanged for all observers throughout all experimental conditions.

A tact: a verbal response under control of a nonverbal stimulus where there is no point-to-point correspondence between the stimulus and the response.

While essentially correct, this apparently simple definition does not fully convey the complexity of this basic verbal unit. For example, Skinner (1957) and others writing about the tact have suggested that it may be a product of multiple sources of control; it may be "distorted" by punishment contingencies or made "impure" by certain deprivation variables; it may be accompanied by autoclitic verbal elements (Layng & Andronis, 1984; Skinner, 1957); it may be established through rule-based or instructional procedures (Goldiamond, 1966; Markle, 1969; Markle & Tiemann, 1973), contingency shaping or stimulus fading (Goldiamond, 1964, 1966), or contingency

adduction (Layng & Andronis, 1984); and its probability may be altered as a function of reinforcing or punishing alternative verbal relations (Goldiamond, 1964; Layng & Andronis, 1984). Consequently, the study of the tact is a complex undertaking with many subtleties and nuances (see Sundberg, 1991).

This complexity is even further increased when extended tacts are considered. Skinner made the distinction between a tact controlled by a generally invariant stimulus, (e.g., saying "Mona Lisa" in the presence of the collection of properties that comprise that painting or in the presence of a print of that painting), and a tact controlled by varying stimuli, (e.g., saying "Impressionist" in the presence of a new example of Impressionist art [Tiemann & Markle, 1990]). Skinner (1957) called the former a simple tact; he called the latter an extended tact. One form of extended tact is the abstract tact; exemplified by the "Impressionist" example given above. Abstract tacts are those tacts that are under

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control of properties or features of a stimulus rather than the entire stimulus itself, that is, the brush strokes and subject matter which define Impressionism rather than the individual painting itself. While many abstract tacts may be controlled by a single property of a stimulus others may be controlled by a "subcollection" of properties, all of which, however, must be present. Abstract extension requires that a speaker be able to distinguish between paintings that are examples of Impressionism and those that are not, even where they share some Impressionistic properties. This final requirement distinguishes abstract extension from generic extension which does not have the latter requirement (Skinner, 1957).

One set of variables which may make the analysis of abstract tacts difficult are those related to ambiguity. That is, there are conditions under which the verbal community or the individual emitting an extended abstract tact are uncertain about which properties of a stimulus event are guiding (after Donahoe & Palmer, 1994) the tact. These abstract tacts may be guided by stimuli lacking in salience, by stimuli that have properties or features that overlap with other stimuli, or by stimuli that are primarily defined by agreement with a vague standard. Skinner (1957) suggested that "beauty" was one such abstract stimulus. Skinner notes that one interpretation of the abstract tact "beauty," or "yes" to the query, "Isn't that beautiful?" involves coming under the control of aspects or properties of beauty that may be hard to define or share with someone else. Such a response may reflect a very special history of reinforcement for tacting beauty in the world, or perhaps it may reflect reinforcement for simply agreeing that something is beautiful.¹

Part of the difficulty in explaining why something is or is not beautiful may not be related to control by obscure properties, but instead to the difficulty in rationalizing why it is tacted as beautiful when those properties are absent or not very salient. Further, such ambiguity in tact (stimulus control) relations makes it difficult for the verbal community to reinforce responses to

specific instances of agreement or to punish disagreements (Skinner, 1957). Since many of these abstract tacts may be, therefore, the product of complex rules and instructions arranged by the verbal community, the issue of the sensitivity to contingent consequences may also be raised.

Whereas behavior analysts may have not yet formally investigated many of these variables, other investigators interested in a variety of biobehavioral processes have developed procedures relevant to the investigation of some of these relations. One such set of procedures is subsumed under the methods used to investigate perceptual behavior characterized by Signal Detection Theory (SDT) (Green & Swets, 1973; Swets, 1964). In SDT the stimuli investigated are often quite ambiguous; rules or instructions are often (but not always) used to establish stimulus control; experimental subjects are usually well trained observers; consequences may be made contingent on the correctness or incorrectness of the observer's responses; and autoclitic processes may be evaluated through the use of confidence interval rating systems. Accordingly, these procedures may be of great value in investigating issues surrounding tact governance.

This report uses SDT procedures to begin to experimentally analyze some of the variables governing abstract extended tacts in the category of Skinner's "beauty". The stimuli chosen were drawings of houses, trees, and persons made by both hospitalized adult psychiatric patients and adult nonpatients. Experimental subjects were asked to tact the presence or absence of H-T-P (house, tree, person) drawings made by patients with a psychiatric diag-

¹Tacts of beauty may also be guided by variables related to yet other behaviors. This is illustrated, in part, by the story of an Italian army officer trying to lead his men out of a deep foxhole and into battle (G. Presti, personal communication). He draws his sword, steps to the first step of the ladder leading out of the foxhole and yells, "Avanti!" He goes to the next step, raises his sword still higher and yells, "Avanti!" Seeing no response he climbs to the top of the foxhole where he draws a deep breath, thrusts his sword even higher, and in his best baritone voice calls out, "Avaaaanti!" At this, one soldier in the foxhole looks to another and with obvious admiration says, "Oh, what a beautiful voice!"

nosis. Presumably the presence or absence of "indicators of psychopathology" in the drawings may guide such tacts (Buck, 1948; Hammer, 1958). These stimuli are of interest because of their necessary ambiguity, and for their inclusion in the domain of projective psychological tests.

This report sought to experimentally analyze: a) whether observers who successfully completed a full semester course on projective principles, which specifically included the clinical application of the H-T-P test, could tact patient H-T-P drawings; b) whether the observers would be sensitive to the effects of consequences indicating disagreement with the experimenter contingent on "patterns of incorrect tacts" rather than on "discrete instances of incorrect tacts"; c) whether the use of prescribed autoclitics accompanying each abstract tact would affect observer sensitivity to the imposed consequential arrangements, and d) the effects, if any, of those consequences on sharpening tact stimulus control topographies (after Ray & Sidman, 1970), or on altering tact frequencies (after Goldiamond, 1964).

METHOD

Overview

A sample of one hundred H-T-P drawing forms (completed by 50 psychiatric patients and 50 nonpatients) was presented to each of four art therapy graduate students. The drawing forms were presented one at a time. After viewing each H-T-P drawing form, the observer made two classes of responses: 1) a tact, either a "Yes" or "No" verbal response, that indicated whether the drawing was made by a current psychiatric patient or a nonpatient, and 2) an autoclitic response (Skinner, 1957) in the form of a spoken rating as to certainty of the tact. After a baseline period of several sessions, a tone was sounded after each block of five or ten trials in each session to indicate occurrences of observer errors in those blocks. The effects of tone presentations on stimulus control (discriminability), frequency of "Yes" responding

(response bias), and percent correct tacting of patient drawings were assessed.

Observers

The observers were four female art therapy graduate students whose ages ranged from 23 to 40 years old. Three of the observers had completed their first year in a two year program, the fourth had one semester to complete before graduating. All had completed a graduate course in projective principles, and all were volunteers.

Stimuli and Signal-Noise Distribution

Signal Detection Theory (Green & Swets, 1973) requires a minimum of two states of the environment which can be responded to in at least two ways. In most instances, the signal (the item to be detected, in this case indicators of psychopathology) is superimposed on a background of noise (here, the normal variation in drawings resulting from differing drawing skill, technique, etc.). The task for the observer is to decide whether a stimulus presentation contained the signal (signal plus noise, SN), or if the noise alone (N) was presented, and to indicate the presence of the signal by saying "Yes" (or some other indicator response) and the absence of the signal by saying "No." This creates a two by two matrix, with at least four possible outcomes: 1) "Yes" when the signal is present (a true tact, or "Hit"); 2) "Yes" when the signal is absent (a false tact, or "False Alarm"); 3) "No" when the noise alone is present (another type of true tact, or "Correct Rejection"); and 4) "No" when the signal plus noise is present (a failure to tact, or "Miss").

The noise distribution comprised 50 nonpatient drawing forms. They were obtained from persons ranging in age from 17 to 59 years old. The signal-plus-noise distribution comprised 50 drawings by hospitalized adults with a current psychiatric diagnosis. These diagnoses included borderline syndrome, chronic and acute schizophrenia, manic-depression, depression, and obsessive-compulsive disorder. Patients' ages ranged from 17 to 55 years

old. All of the patient and nonpatient drawings were obtained on a voluntary basis by one of the experimenters trained in the H-T-P projective technique. The administration of all of these drawing forms followed the specifications of the H-T-P test as described by Hammer (1958).

Apparatus

The observer was seated at a table facing a room partition. An experimenter was seated at a table on the opposite side of the partition. A sonalert module which produced a tone of 4.5 kHz was mounted on the partition in front of the observer, one meter above the table. An experimenter presented the tone by depressing a telegraph key which closed a switch connected to a power supply in an adjoining room.

The H-T-P drawing forms were individually encased in transparent plastic. The 100 drawing forms were placed on the table in front of the observer. The experimenter scored the observer's responses on a score sheet by first circling a "Y" for "Yes" response, or "N" for "No" response, and then recording the number of the observer's rating score. At no time was the observer able to see the experimenter while the session was in progress, but the partition allowed for the observer's verbal response to be audible to an experimenter.

Procedures

Observer response. Observers each made three types of responses to each H-T-P drawing form presented. First, they verbally reported the number of the drawing form. After viewing the drawing form, they verbally responded "Yes" or "No," and made a verbal rating of certainty of their response. The ratings ranged from 1 = no, very certain to 6 = yes, very certain (see Appendix).

Experimental treatments. Three experimental treatments were used and each observer underwent all three. They were as follows:

Baseline. The drawing forms were presented and the observers made the responses described above. Since tone pre-

sentation was to be used as a consequence potentiated by instructions, random tones were programed into the baseline sessions to assess their effects when presented non-contingently.

Tone presentation contingent on false-tact error patterns. A response of "Yes" in the presence of an N drawing form was defined as falsely tacting a nonpatient drawing as a patient drawing. After blocks of five or ten responses, a tone of varying duration was presented contingent on the total number of false-tact errors which occurred during that block of responses. A two-second tone was presented for each false tact, thus determining the duration of the tone. If only one "Yes" response occurred per block of five, and that "Yes" response was made in the presence of an N drawing form, then the experimenter extended the block to ten responses so as to reduce the probability of an observer memorizing which drawings were SN and which drawings were N.

Tone presentation contingent on failure-to-tact error patterns. The procedure was the same as that described above, except that a tone presentation of varying duration was presented contingent on the total number of failure-to-tact errors which occurred during that block of responses. A failure-to-tact error was defined as a "No" response when an SN drawing form was present.

Sequence of experimental treatments. Single organism strategy was employed, requiring stabilization of behavior before a new treatment was introduced. Stability was defined when a minimum of four consecutive sessions showed no clear upward or downward trend in SDT discriminability measures for a given condition. Observer ratings were used to determine $p(\text{Yes} \mid \text{patient drawings})$ values and $p(\text{Yes} \mid \text{nonpatient drawings})$ values used in plotting ROC (see below) curves for individual sessions (Green & Swets, 1973). The ROC curves were used to determine the discriminability measure d' (pronounced dee-prime-e, a non-parametric measure of discriminability or sensitivity) for each

experimental session (Green & Swets, 1973).

For Observers 1 and 2, the order of presentation was baseline, tone presentation contingent on false-tact error patterns, then tone presentation contingent upon failure-to-tact error patterns. For Observers 3 and 4, the sequence was baseline, tone presentation contingent upon failure-to-tact error patterns, then tone presentation contingent on false-tact error patterns. The sequence of H-T-P drawing forms was changed after each session.

Instructions. Instructions were read to each observer at the beginning of each experimental condition. (Instructions are included in the Appendix.) Practice trials were run until the experimenters judged that the observer understood the experimental procedures.

Sessions

A minimum of twelve sessions of 100 presentations was agreed upon by each observer with the maximum number depending on how quickly their behavior stabilized at any given treatment condition. Observer 1 was run for 15 sessions; Observer 2 was run for 19 sessions; Observer 3 was run for 17 sessions; and Observer 4 was run for 16 sessions. One to three sessions occurred on any given day, and the day varied according to the observer's schedule.

RESULTS

The results of this study will be presented in two sections: (a) ROC curves; and (b) percent of drawings correctly tacted.

ROC Curves: Discriminability and Response Bias

Receiver Operating Characteristic (ROC) curves were plotted from the correct-tact rates and the false-tact rates for each of the last three sessions in each condition. The correct-tact rate is the "conditional probability of a 'yes' given 'patient drawing'" or $p[\text{Yes} | \text{patient drawing}]$; the false-tact rate is the "conditional probability of a 'yes' given 'nonpatient drawing'" or $p[\text{Yes} | \text{nonpatient drawing}]$. To produce

an ROC curve, the correct tact rate is plotted against the false-tact rate at several criterion points for a single observer. Points which fall along the same ROC curve indicate that the observer has a stable discriminability index; that is, the observer's ability to discriminate the signal plus noise (patient drawing) from the noise (nonpatient drawing) does not change even though the observer's overall likelihood of saying "yes" or "no" may change. Changes in where the criterion points fall along the ROC curve indicate changes in the frequency of the "Yes" response. Points that fall above the negative diagonal (see Figure 1) indicate a response bias toward saying "Yes" to the stimulus; points that fall below the negative diagonal indicate a response bias toward saying "No."

If the underlying N and SN distributions are normal, then the ROC curve fits a straight line when plotted on probability-probability paper. If the slope of this line deviates from 1.00, then the underlying distributions of N and SN are not of equal variance. When the slope of the ROC curve does not equal 1.00, the measure of $d'e$ (Green & Swets, 1973) may be used as an index of observer discriminability since $d'e$ makes no assumption of equal variance. This measure, $d'e$, is taken from the point of no bias, where the ROC curve crosses the negative diagonal. Since the empirical ROC curves obtained in this study deviated from a slope of 1.00, the measure $d'e$ was used. As determined from a table provided by Swets (1964), a $d'e$ of 0.00 indicates chance responding; a $d'e$ of 4.64 indicates near perfect discriminability.

ROC curves for Observers 1, 2, 3, & 4 are shown in Figure 1. On each ROC curve the criterion points for each of the three conditions are indicated separately. The baseline condition is indicated by the closed squares; the tone presentation contingent upon false-tact error patterns condition is indicated by closed triangles; and the tone presentation contingent upon failure-to-tact error patterns condition is indicated by closed squares.

Fig. 1. ROC curves for Observers 1, 2, 3, & 4 derived from the last three sessions in each experimental condition. Points falling above the major diagonal, depicted by the thick diagonal line, indicate greater than chance discriminability. Points falling to the left of the minor diagonal, depicted by a thin diagonal line, indicate a bias toward saying "Yes"; points falling to the right of the minor diagonal indicate a bias toward saying "No." Closed circles represent baseline conditions; closed triangles represent tone presentation contingent upon false-tact error patterns; closed squares represent tone presentation contingent upon failure-to-tact error patterns.

Observers 1 & 2

Observers 1 & 2 began with a bias toward saying "Yes," as indicated by the filled circles which are all to the right of the negative diagonal in Figure 1. Random tone presentations appeared to have no discernible effects. Condition 2, which made tone presentation contingent upon false-tact error patterns, resulted in a definite shift, for both observers, toward saying "No," as indicated by the closed triangles which are all to the left of the negative diagonal. The third condition, which made tone presentation contingent upon failure-to-tact error patterns, resulted in a

shift in criterion back toward, but not reaching, baseline levels (indicating no clear bias for "Yes" or "No" responding), as is represented by the closed squares. The measure of discriminability or sensitivity (d'), determined by where the ROC curve crosses the negative diagonal at the point of no bias, was .72 for Observer 1, and .51 for Observer 2.

Observers 3 & 4

Observers 3 & 4 responded with a slight bias toward saying "Yes" in baseline sessions, as indicated by the filled circles, which are all to the right of the negative diagonal in Figure 1. Random tone presen-

tations appeared to have no discernible effects. As indicated by the filled squares in Figure 1, there was an increase in "Yes" responding for both Observers 3 & 4 during the second condition (tone presentation contingent upon failure-to-tact error patterns). As indicated by the filled triangles, tone presentation contingent on false-tact error patterns resulted in a substantial shift in response bias toward saying "No" for Observer 3, but resulted in no shift in response bias for Observer 4. A d' of .30 was obtained for Observer 3. A d' of .51 was obtained for Observer 4.

Discussion of ROC Results

The discriminability indices obtained in the present study, while not very high, were somewhat above chance (d' of 0.0) for all observers. Since a single best fit (least-squares) line could be drawn for all of the criterion points across all three conditions for all observers, discriminability did not appear to change in the various conditions. This indicates that the programmed consequences resulted in shifts in the likelihood of saying "Yes" or "No" (response bias) but did not result in shifts in the discrimination of patient from non-patient drawings, or perhaps, of "psychopathology." Abstractional control appeared to remain largely invariant throughout the experiment.

All observers responded with a bias toward saying "Yes" to the drawing forms during baseline sessions. When the tone presentation was made contingent upon false-tact error patterns, Observers 1, 2, and 3 notably increased their frequency of saying "No." Tone presentation contingent on failure-to-tact error patterns resulted in increases in "Yes" responding for all four observers. Observers 1 and 2, who had a prior exposure of tone presentation contingent on false-tact error patterns increased their "Yes" frequency, but did not return to baseline rates. Observers 3 & 4, who did not have that prior exposure, exceeded their baseline rates. The data suggest that history of prior exposure to tone presentation contingent on false-tact error patterns

may have affected "Yes" preference for Observers 1 & 2.

Percent of Drawings Correctly Tacted

Research investigating verbal behavior may not always separate whether observers are correctly tacting the S^D or correctly rejecting the S^Δ , or both (see Sidman, 1980, 1992). Measures of accuracy, such as percent correct, may provide an incomplete account of the stimulus control relations involved (Sidman, 1980). In this study no consequences were ever explicitly made contingent on correct tacts. That is, the consequences for saying "Yes" when patient drawings were present were never changed during the experiment. Only consequences for other verbal patterns, namely, false-tact error patterns, or failure-to-tact error patterns, were changed. Further, if consequences explicitly made contingent upon the failure-to-tact or false-tact error patterns are shown to affect correct tact occurrence, then, a full account of tact governance may require the consideration of the effects nonlinear contingency relations (Goldiamond, 1975, 1979, 1984).

Observer 1 & 2

During the last three baseline sessions, Observer 1 correctly tacted an average of 81% of patient drawings; Observer 2 correctly tacted an average of 73% of patient drawings. For the last three sessions of condition two (with tone presentation contingent on false-tact error patterns), the average of correctly tacted patient drawings for Observer 1 dropped to 46%; the average of correctly tacted patient drawings for Observer 2 dropped to 41%. For the third condition (with tone presentation contingent on failure-to-tact error patterns), the correct tacts of patient drawings for the last three sessions increased to an average of 66% for Observer 1; and to 57% for Observer 2.

Observers 3 & 4

During the last three baseline sessions, Observer 3 correctly tacted an average of 63% of the patient drawings; Observer 4 correctly tacted an average of 73% of the

patient drawings. For the last three sessions of condition two (with tone presentation contingent on failure-to-tact error patterns), the average of patient drawings correctly tacted increased to 80% for Observer 3; and to an average of 81% for Observer 4. For the last three sessions of condition three (with tone presentation contingent on false-tact error patterns), Observer 3 correctly tacted an average of only 33% of the patient drawings. Conversely, Observer 4 showed a slight increase, to an average of 85% of patient drawings correctly tacted.

Discussion of Percent Correct Results

During baseline sessions, all observers correctly tacted a high percentage of patient drawings. For Observers 1, 2, and 3, a far greater (nearly double) percent of correctly tacted patient drawings occurred during the condition when tone presentation was contingent on failure-to-tact error patterns than during the condition when tone presentation was contingent on false-tact error patterns. Although overall discriminability of the abstract stimulus (as measured by d') remained relatively constant for all observers throughout all conditions, the separate percentages of patient drawings correctly tacted varied systematically for three of the observers in all conditions and in two of the three conditions for the fourth observer. Further, these changes were observed even though a confidence interval rating system was used throughout the experiment. Confidence interval rating systems have previously been shown to have a mitigating effect on certain aversive consequences contingent on verbal behavior (see Goldiamond, 1964).

GENERAL DISCUSSION

Abstract tacts, saying "Yes" in the presence of drawings made by a psychiatric patient, and saying "No" in the presence of drawings made by a nonpatient, were shown to be both a function of the abstract properties of these ambiguous stimuli and of the consequences made contingent on false-tact error patterns and failure-to-tact

error patterns. The behavior of all observers showed a slight sensitivity to the differences in the drawings as measured by d' . It is not known what properties of the patient drawings as compared to non-patient drawings accounted for this sensitivity. The use of stimulus variation procedures (after Ray & Sidman, 1970) to investigate this question was beyond the scope of the present experiment. It is important to note, however, that abstractional control did not change throughout the experiment for any observer, even when the likelihood of emitting one type of tact versus another did change. Simple observation of the frequency of "tact" occurrence in the presence of a stimulus may be insufficient to infer that a verbal event is under the control of a nonverbal stimulus.

Consequences contingent upon "error patterns," either failure-to-tact error patterns or false-tact error patterns, had a sizable effect on the frequency of correctly tacting patient drawings for 3 out of 4 observers. Further, these consequences were never directly contingent upon a response, but instead they were contingent upon a pattern of responding. Variable tone presentation occurred after a block of responses, often following correct answers rather than incorrect answers. Instructions appeared sufficient to potentiate (after Goldiamond & Dyrud, 1968) or establish (after Michael, 1982) the programmed consequences, tone presentation in this case, as an aversive event, and to extend that control over a pattern of verbal responding. Data from this experiment suggest that instructions may not only make individual responses more sensitive to consequential contingencies (Chase & Danforth, 1991; Layng, 1991; LeFrancois, Chase, & Joyce, 1988), but may extend consequential contingency control to a pattern of responding in rather atypical ways (Andronis, 1991). At least under the conditions of this study, one class of verbal behavior, which was largely rule-established through a formal program of study, can, through the use of instructions, be made to be very sensitive to its consequences.

As noted earlier, this sensitivity was evident even though a rating "autoclitic" was required. The absence, in at least 3 out of 4 observers, of a pronounced autoclitic effect is of some interest. Perhaps making the duration of tone presentation contingent upon rating certainty would have generated different results (i.e., different frequencies of "Yes" responses). The ratings themselves, although appearing to have autoclitic characteristics, may not have been entirely true autoclitic verbal responses. For a verbal operant to be considered autoclitic, it must modify the effects other verbal behavior has on a listener. While expressions of uncertainty or certainty are usually considered to serve an autoclitic function (Skinner, 1957), in this experiment no such effect was explicitly programmed. Although, some autoclitic function was probably involved; that is, the ratings were not ignored by the observers, the ratings had no effect on tone presentation duration or frequency of occurrence. Making a required autoclitic unit explicitly consequential, removing, and then reinstating that contingency while maintaining consequential contingencies for other elements of a verbal episode may provide a basis for further exploration of autoclitic processes.

This study is yet another demonstration of the potential usefulness of SDT procedures for the study of verbal behavior (Critchfield, 1993a, 1993b; Goldiamond, 1962, 1964). Further, it demonstrates the complex nature of tact governance in the so-called "real world" where stimuli are often ambiguous. One such area of complexity is the role of consequences contingent not only upon a single verbal relation, but also upon alternative verbal relations. As with many other more "purely" psychophysical studies (Goldiamond, 1962, 1964, 1966), this study has shown that behavior may be a function of not only linear relations, but of nonlinear relations as well (Layng & Andronis, 1984; Goldiamond, 1974, 1975, 1984). That is, the occurrence of a correct tact in one situation may be a function not only of the consequences of the tact in that situation, but of

the consequences of "falsely tacting" in other situations (see Goldiamond [1975] & Layng & Andronis [1984] for a discussion of those situations where a verbal operant that results in an aversive event may have to occur if another verbal unit, in a different situation, is to be reinforced. Chance [1988] refers to this phenomenon as "Goldiamond's Paradox").

Accordingly, this experiment may have implications for the clinic where ambiguity may be more the rule than the exception. It suggests that a least one class of verbal behavior may be altered by nonlinear consequential relations. Verbal behavior which may appear to be "out-of-sync" with observed "reality" may instead be the sensible outcome of unobserved (by the clinician and the client) nonlinear consequential contingencies. Second, it suggests that a client may be perfectly able to discriminate one event from another, even where there appears to be a discrepancy in how the client sees the world versus how the therapist sees it (see Layng & Andronis, 1984). Where nonlinear consequential relations are overlooked, there may be a tendency to explain what appears to be pathological or maladaptive behavior through the postulating of defective self-instructions, abnormal schema, the effects of rule-governed behavior, governance by private events, or some other inferred process (Goldiamond, 1974, 1984; Layng & Andronis, 1984).

The apparent complexity involved in understanding verbal relations, especially in the context of nonlinear contingency relations, suggests a cautious approach to the interpretation of variables governing verbal behavior outside of the laboratory. This study sounds this note of caution, and suggests one way of addressing the complexity posed by nonlinear relations for the study of verbal behavior.

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APPENDIX

Instructions

General. "Look at each House, Tree, then Person. Decide if they were drawn by a person who is a psychiatric patient or by a person who is a nonpatient. Respond first by calling the number printed on the label beside the Person drawing. Next, Respond "Yes" or "No," "Yes" = psychiatric patient, "No" = nonpatient. The final response will be a number which indicates certainty: 1, 2, or 3 will be used with the "No" response; 4, 5, or 6 will be used with the "Yes" response. The rating system is printed and mounted on the wall before you. Drawings were done by persons aged 17-59 years old. A tone, which will be used for feedback later in the experiment, will be presented randomly throughout these baseline sessions."

Tone presentation contingent on false tact error patterns. "We are now going to use a tone to indicate when we disagree about what is a drawing by a psychiatric patient. The amount of tone you receive will be based on the number of times you say "Yes" to a picture drawn by a non-patient. Sometimes you will receive the noise after blocks of ten responses and sometimes you will receive noise after blocks of five responses; usually it will be after every five. The amount of tone after each block will be based on the number of errors; the more errors, the longer you will hear the tone. Your task is to try to be as

accurate with your decisions as you can and eliminate the tone."

Tone contingent on failure to tact error patterns. "We are now going to use a tone to indicate when we disagree about what is a drawing by a nonpatient. The amount of tone you receive will be based on the number of times you say "No" to a picture drawn by a patient. Sometimes you will receive the noise after blocks of ten responses and sometimes you will receive the noise after blocks of five responses; usually it will be after every five. The amount of tone after each block will be

based on the number of errors; the more errors, the longer you will hear the tone. Your task is to try and be as accurate with your decisions as you can and eliminate the tone."

Rating System

6 = yes, very certain

5 = yes, certain

4 = yes, not certain

3 = no, not certain

2 = no, certain

1 = no, very certain