THE EFFECT OF MANIFEST ANXIETY ON VERBAL CONDITIONING
OF SUBJECTS WITH SUPERIOR INTELLECT

by

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A DISSERTATION

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CHAPTER I

Introduction and Need for Research

Within the discipline of counseling and guidance, there are numerous counseling approaches which ultimately lead toward similar goals. The behavioral approach, which is presently receiving much attention, defines the role of the therapist as one who manipulates and controls the therapy situation by his knowledge and use of learning techniques in a social reinforcement situation (Krasner, 1967). Since the primary phenomenon with which counselors work is behavior, this study investigated the merit of that avenue which Michael and Meyerson (1962) have succinctly labeled the "behavioral approach to counseling and guidance." This approach is based on Skinner's theory of operant conditioning, i.e., the shaping of behavior through the reinforcement of spontaneous behavior which approximates the desired response, and gradually elicits and differentially rewards responses as they more closely
approximate the desired response (Skinner, 1957). The basic assumption from which a study of this nature must originate is implicit in Michael and Meyerson's (1962) statement that:

A behavioral approach to counseling and guidance does not consist of a bag of tricks to be applied mechanically for the purpose of coercing unwilling people. It is part of a highly technical system, based on laboratory investigations of the phenomena of conditioning, for describing behavior and specifying the conditions under which it is acquired, maintained, and eliminated [p. 382].

This approach specifies that the variable of primary importance within counseling is observable behavior, and that it is the only criterion against which the outcome of the counseling process can be evaluated. Two basic assumptions within this area were shown by Krasner (1967) to be: (1) psychotherapy is a lawful, predictable, and directive process which can be investigated most parsimoniously within the framework of a reinforcement theory of learning; and (2) the variables which affect the therapy process are the same as those in other interpersonal situations which involve the reinforcement, control, manipulation, influencing, or redirection of human behavior. This would imply
that the counselor has available a series of reinforcement techniques to influence the probability of selected behavioral changes in the client. Also, that the effectiveness of the reinforcement process can be maximized by appropriate interaction of the counselor, situation, and client variables.

Within an investigation of counseling as a process which involves reinforcement procedures, the major task of the researcher becomes that of investigating the conditions under which the reinforcement procedure is most effective. Since the interview is relied upon as the primary vehicle of counseling interaction, such conditions must be predicated on the fact that it is the verbal behavior of the client that is directly affected (Strong, 1964). This idea is inherent in Skinner's (1957) definition of verbal behavior as "... behavior reinforced through the mediation of other persons [p. 2]." An elaboration of the general question of the amenability of verbal behavior to systematic behavioristic treatment was extended by Strong (1964):
Does verbal behavior respond to systematic treatment in the same manner as other behavior? Does it respond in a lawful manner? What is the effect of different schedules of reinforcement? What are reinforcing stimuli? What stimuli are associated with the emission of different classes of verbal behavior? What other variables affect verbal behavior and conditioning [p. 661]?

Recent researchers (Kanfer, 1961; Krasner, 1958) have regarded counseling as a verbal interaction process in which verbal behavior is subject to lawful modification by appropriate reinforcement procedures and extinction techniques which are in no way qualitatively different from those used with other behaviors (Grossberg, 1967). The underlying proposition of verbal conditioning is that modification of the verbal response of one individual in an interpersonal relationship is a direct function of the other individual in that situation. The counselor's behavior results from the assumption that his reactions, behavioral techniques, and attitudes will affect and influence the behavior of the client. The verbal behavior of the client, therefore, is modified through the behavior of the counselor. The relatedness of this approach to the counseling interview was explicitly shown by Krasner (1967)
when he stated, "The conditioning of verbal behavior is developing as a major technique for systematically exploring variables of interpersonal situations [p. 195]."

Greenspoon has suggested (Bachrach, 1962) that a primary usage of the verbal paradigm may be in the area of interviewing as he stated:

... the results of the research in verbal conditioning strongly suggests that the therapist may bring the verbalization of the patient under his control by the judicious usage of certain contingent stimuli. If subsequent research tends to support this contention, it may mean that the psychotherapist will be in a position to test various hypotheses about the patient at his discretion. For example, if the psychotherapist hypothesizes that sexual difficulties are involved in the behavior disorder of the patient, he may be able to control the verbal behavior of the patient so that this hypothesis may be tested [p. 548].

Other researchers (Holder, Carkhuff, & Berenson, 1966) have begun to explore the possibility of verbal behavior modification through direct counselor control of the stimulus conditions of the interview. It has been shown by Kanfer (1968) that the verbal conditioning process is based upon the rudiments of operant conditioning, namely: (a) operant conditioning is characterized by an initial
lack of congruence of the response with a particular eliciting stimulus. Therefore, any response class can be chosen if it has a moderate rate of occurrence in an environment, even when the eliciting stimulus is unknown; (b) response classes of varying sizes can be chosen with reference to their functional similarity, as long as it is known that they have the potential for increase; (c) response frequencies can be changed by administration of any stimulus known to have reinforcing properties, closely following emission of the critical-response; and (d) empirical relationships can be described in terms of the systematic application of reinforcing stimuli and response rate, generally with the assumption that no other systematic changes occur in the subject during acquisition.

Through presentation of stimuli which result in desired verbal behavior and differentially reinforcing verbal responses to establish new operants and new stimulus-control conditions, counselors should then be able to extinguish verbal behavior deemed "situationally-inappropriate," and to replace it with that regarded as "situationally-acceptable." An attempt was made in this
study to examine the appropriateness and implications of such an approach to counseling, with the specific intention of contributing further to the research dealing with modification of verbal behavior within the counselor-client interaction.

To investigate verbal interaction and conditioning within counseling would necessitate the establishment of conditions comparable to those of the counseling interview. If an actual interview were not the method employed, precautions should be taken to ensure that the experimental situation not only closely approximated the interview, but included many of the vital qualities of such a relationship. The physical setting, method, and procedures of this study have been chosen as the means of investigating the experimenter (counselor)-subject (client) verbal interaction, within a setting closely resembling the counseling interview. The following reasons seem adequate to justify such a study: (a) both are basically a one-to-one relationship; (b) both are primarily concerned with verbal behavior; and (c) within each setting, one of the two individuals assumes the initiative for
determining the direction of the interaction within the relationship.

**Purpose of the Study**

In verbal conditioning, the subject is required to emit verbal behavior as part of a given task, and the experimenter reinforces a preselected class of the subject's verbal behavior by carefully controlled verbal and/or non-verbal cues (Krasner, 1967). The methodology and techniques employed in previous verbal conditioning attempts have been extremely diversified. This study differed from previous research in that: (a) the subjects were chosen from a highly intelligent population; (b) the highly intelligent subjects were grouped according to anxiety level; (c) whereas all subjects initially received continuous reinforcement, half the subjects were later randomly selected to receive reinforcement on a variable-ratio schedule, while the other subjects were maintained on the continuous schedule; (d) verbal reinforcement stimuli from several studies were employed; (e) the response class included only self-referential statements; and (f) during
reinforcement and extinction phases, initial sessions were
given to the increment of learning, with the remaining
sessions concentrating on performance level.

The purpose of this study, therefore, was not
simply a series of attempts to condition the subjects'
verbal behavior within an experimenter-subject interaction
which closely approximated the counseling interview, but
to determine: (a) whether there were significant relation-
ships between intelligence, anxiety, and conditionability;
and (b) whether this highly intelligent group conditioned
in the same manner as subjects employed in previous verbal
conditioning studies.

**Limitations of the Study**

1. The population from which the experimental
subjects were drawn was comprised of the
freshman and sophomore residents of Mallet
Hall, a men's residence hall at the University
of Alabama, Tuscaloosa, Alabama. Residents of
this hall are chosen on the basis of ACT Com-
posite scores and may live there only by
special invitation. The mean ACT Composite score for the freshman residents was 29.59 (national rank: 98th percentile), as compared to a mean of 22.77 (55th percentile) for the 1968-69 University of Alabama freshman class. The norm of 83,161 entering freshmen from 1965-67 at level IV colleges or universities, i.e., those schools offering the Ph.D. and prerequisite degrees, was 22.05 (Hoyt & Munday, 1968). Since the sophomores were chosen for this particular residence hall on the same basis as the freshmen, they were deemed qualified for inclusion within this highly select population.

The mean ACT Composite score for the subjects used in this study was 29.75 and ranked at the national 98th percentile on this test of scholastic aptitude (ACT). Anastasi (1968, p. 231) described this test as one "focusing on the basic intellectual skills required for satisfactory performance in college." It was
on this basis, therefore, that this group was referred to as highly intelligent subjects.

Only male subjects were used in an attempt to control the number of variables which would have to be considered in analyzing the findings of this study.

2. Only those students receiving a Composite of 28 or higher on the ACT were included within the population from which the experimental group was chosen.

3. Only four subjects were included within each of the three manifest anxiety categories (see item 4, Procedures). Since the counseling interaction is primarily concerned with individual behavior, it was felt that this number of subjects would allow optimal scrutiny of the behavior of the individuals involved.

4. Within each manifest anxiety subgroup (see item C, Phase III, Procedures) only two schedules of reinforcement were employed, i.e., the variable-ratio (hereafter referred to as variable)
schedule of reinforcement and continuous reinforcement. Research has shown (Fattu & Mech, 1955; Grossberg, 1956; Spivak & Papajohn, 1957) that partial reinforcement schedules produce greater resistance to extinction than continuous reinforcement. Kanfer (1954; 1958) has shown that continuous reinforcement results in a higher initial rate of responding at the beginning of extinction, while subjects receiving variable reinforcement were less susceptible to extinction. This study attempted to determine whether the variable and continuous schedules of reinforcement, when applied to a highly intelligent group with varying anxiety levels, would produce similar effects to those found in previous research.

Anticipated Outcomes

The hypotheses which were tested by the experiment were:

Hypothesis I: Verbal conditionability of highly
intelligent subjects, as measured by increments and decrements in frequency of the critical-response, is a function of both the level of anxiety and the nature of reinforcement stimuli.

Corollary I: The higher the anxiety level, as measured by the Taylor Manifest Anxiety Scale, the more conducive the subject would be to verbal conditioning.

Corollary II: Subjects receiving continuous reinforcement would evidence a higher degree of conditionability than those receiving variable reinforcement.

Hypothesis II: Ability to extinguish particular subject responses, as measured by decrements in frequency of the critical-response, is a function of both the level of anxiety and the nature of reinforcement stimuli.

Corollary I: Once conditioning is evidenced, the higher the level of anxiety, the less susceptible the subjects would be
to extinction attempts.

**Corollary II:** Subjects reinforced on a variable schedule would be less susceptible to extinction attempts than those receiving continuous reinforcement.

**Definitions of Terms**

**ACT:** The American College Testing Program examination, i.e. a four-part test (Mathematics, Social Studies, English, and Natural Sciences) which results in four scores and an overall Composite score. This examination overlaps traditional aptitude and achievement tests, focusing on the basic intellectual skills required for satisfactory performance in college (Anastasi, 1968).

**Awareness:** The ability of the subject to recognize the stimulus-response contingency, i.e., the relationship between response class, reinforcement stimuli, and schedules of reinforcement.

**Base Rate of Responding or Operant Baseline:** The
ongoing behavior, or continuous and continuing performance of a single individual which serves as a point of reference from which to measure the effects of experimental operations (Sidman, 1960).

**Conditionability:** Susceptibleness of the subject to attempts to condition his behavior.

**Continuous Reinforcement:** A schedule of reinforcement whereby every critical-response is reinforced (Sidman, 1960).

**Critical-Response:** The response designated to receive reinforcement when the acquisition of a stimulus-response contingency is being investigated and non-reinforcement when its extinction is being studied (Spence, 1956).

**Emission Rate:** The frequency of critical-responses emitted by the subject during each experimental session.

**Extinction:** The reduction in probability or rate of a particular response class due to the withholding of a reinforcement previously contingent
upon that response (Ferster & Skinner, 1957).

**Manifest Anxiety:** The overt symptoms of a pervasive state of apprehension stemming directly from the subject's general drive level. Anxiety of this nature is assumed to be rooted in emotional responsivity which, in turn, contributes to drive level (Taylor, 1953).

**Operant:** A unit of behavior defined by a contingency of reinforcement. A class of responses, all members of which are equally effective in achieving reinforcement under a given set of conditions (Ferster & Skinner, 1957).

**Reinforcement Stimuli:** Stimuli that are contingent upon a response or response class, which is followed by a modification in the frequency of that response occurrence (Skinner, 1957).

**Response Class:** A group of responses which have in common the fact that any of them can be substituted for any other, according to some criterion (Salzinger, 1959).

**Schedule of Reinforcement:** The system or program,
according to which reinforcement is delivered (Sidman, 1960).

**TMAS:** The Taylor Manifest Anxiety Scale, a 50-item subscale (At) of the Minnesota Multiphasic Personality Inventory (MMPI). The function of this scale (TMAS) is to select subjects differing in anxiety (general drive or emotional responsiveness) level (Taylor, 1956).

**Variable-Ratio Schedule:** A schedule of intermittent reinforcement under which reinforcements are programmed according to a random series of ratios having a given mean and lying between arbitrary extreme values (Ferster & Skinner, 1957).
CHAPTER II

Review of Related Research

Initial research within the area of verbal conditioning was conducted by Greenspoon (1951, 1954, 1955). This research was designed to create an experimental situation in which to examine verbal behavior within an operant conditioning framework (Greenspoon, 1962). Greenspoon employed the verbal reinforcing stimulus "mmm-hmm" and the verbal extinguishing stimulus "huh-uh" to increase and decrease the frequency of plural nouns. In contrast to Greenspoon's "free-operant situation" (i.e., the subjects were not instructed to speak in any prescribed manner nor on any given topic), Taffel (1955) used a "restricted-operant" setting in which subjects were required to make up sentences using one of six pronouns and a verb (Ince, 1965). Through employment of the verbal reinforcer "good," Taffel was able to increase the critical-response. It was suggested by Kanfer (1968) that Taffel utilized this
modified operant conditioning paradigm as a test of the assumption that verbal behavior in clinical interviews is subject to modification by conditioning. Taffel's position was further accentuated by his usage of a psychiatric subject population.

The populations used in early research were primarily undergraduate students in introductory psychology classes or hospitalized schizophrenics (Krasner, 1958), with the former group receiving greater attention. Recent research, however, has included subjects comprising other groups--children, normal subjects as opposed to schizophrenics, neurotics, etc., and volunteers (Baer & Goldfarb, 1962; Erickson, 1962; Lanyon & Drotar, 1967; Slechta, Gwynn, & Peoples, 1963).

According to Williams (1964, pp. 386-387) early research was concerned with demonstrating the acquisition of a verbal response as a function of both the type of response and the type of reinforcement employed; more recent research, however, has investigated such questions as the effect of resistance to extinction as a function of acquisition trials (Senko, Champ, & Capaldi, 1961) and

Extensive reviews of the literature from Greenspoon's original research through 1964 have been presented by Krasner (1958), Salzinger (1959), Greenspoon (1962), and Williams (1964). The review of literature in this study concentrated primarily on research concerning verbal behavior with regard to experimenter-subject interaction (which approximates counselor-client interaction). This review concentrated on four integral factors in this interaction: (a) reinforcement stimuli; (b) response class; (c) anxiety; and (d) intelligence. Because of the approach of this study (Procedures), research concerning learning and performance was included in this review.

Reinforcement Stimuli

On the premise that verbal behavior is reinforced through the mediation of another individual, Skinner (1957) stated:

A common generalized conditioned reinforcer is "approval." It is often difficult to specify its physical dimensions. It may be little more
than a nod or a smile on the part of someone who characteristically supplies a variety of reinforcement. Sometimes . . . it has a verbal form: "Right!" or "Good!" Because these "signs of approval" frequently precede specific reinforcements appropriate to many states of deprivation, the behavior they reinforce is likely to be in strength much of the time . . . [pp. 53-54].

Particular reinforcement stimuli may have properties which serve a directive function in conveying information to the subject about the task at hand; or they may serve as an energizing function in increasing the probability of responding without revealing additional information about the task (Kanfer, 1968).

As reported by Krasner (1958) and Salzinger (1959), much research has been done concerning verbal reinforcement stimuli of a "positive statement of approval" nature. Studies employing the verbal sound "mmm-hmm" were conducted by Ball (1952), Daily (1953), Greenspoon (1955), Fattu and Mech (1955), Hildum and Brown (1956), Wilson and Verplanck (1956), and Sarason (1957). "Good" has been used as a reinforcer by Daily (1953), Cohen, Kalish, Thurston, and Cohen (1954), Klein (1954), Hartman (1955), Taffel (1955), Grossberg (1956), and Marion (1956). Other verbal
reinforcers have included "right" (Spivak & Papajohn, 1957), "yes" (Salzinger & Pisoni, 1958), and "fine" (Wilson & Verplanck, 1956). Contrary findings were reported by experimenters who attempted to condition the subject's verbal behavior through employment of positive approval verbalizations. On the one hand experimenters reported success in conditioning the subject's verbal behavior, while on the other such attempts were unsuccessful.

In conclusion, the results of verbal reinforcement stimuli research are as varied as the stimuli employed. On the basis of extensive disparity within the research, the approach of this study was to employ stimulus words used by several different researchers. This study attempted to determine the effect of the reinforcement stimuli group, induced according to two schedules of reinforcement, on the verbal behavior of highly intelligent subjects with varying levels of anxiety.

Response Class

Characteristics of response classes selected for reinforcement have varied widely. Greenspoon (1962) noted
that some negative results in conditioning studies probably stem from the fact that the basis for discrimination of the critical-response is not sufficiently defined to enable the subject to make the discrimination.

Response classes most frequently employed have included plural nouns, non-plural words, verbs, and "human words" (e.g., teacher, psychologist). These response classes were the result of five general methods:

(a) Taffel's "make up a sentence" method; (b) the "autokinetic" method; (c) Greenspoon's "say separate words" method; (d) the "tell me a story" method; and (e) the "interview and conversation" method (Strong, 1964). Investigators who have used the personal pronoun as the "to be reinforced" response class generally followed the pattern of Taffel (1955) in the use of first person singular and plural personal pronouns (Greenspoon, 1962).

Whereas many investigators have reinforced response classes of single words or sentences, Williams (1964, p. 390) reported that investigators were becoming increasingly interested in the conditioning of "more molar types of verbal behavior," such as expression of opinion
(Verplanck, 1955), group therapy behavior (Ullmann, Krasner, & Ekman, 1961), and attitude change (Scott, 1957). Experimenter-subject interaction has been the primary focus of these studies.

The problem of generalizing from experimental to non-experimental behavior on the basis of the reinforced verbal response class has generated much discussion; yet research evidence is inconclusive. In a clinically-oriented study, Rogers (1960) attempted to show that the frequency of self-reference statements could be modified by reinforcement, and that reinforcement could alter the self-concept as measured by personality tests. Thirty-six male students from an introductory psychology class at Stanford University were asked to describe themselves spontaneously in a series of brief interviews. Positive self-references were reinforced for one experimental group and negative ones for the other. Only the negative group showed a conditioning effect. One of Rogers' primary conclusions, therefore, was that the influence of reinforcement was limited to the interview. Rogers' inability to generalize the experimental response class was consistent with the
findings of Deering (1958), Carpenter (1959), and Weide (1959). Contrary to these studies, Sarason (1958), Scott (1958), Timmons (1959), Greenspoon and Thompson (1959), and Simpkins (1961) reported generalization of the experimental response class (Greenspoon, 1962).

According to Williams (1964, p. 391), studies which investigated the effects of verbal conditioning on later group behavior (Ullmann, Krasner, & Collins, 1961; Ullmann, Krasner, & Ekman, 1961) reported that groups who were verbally reinforced for the use of emotionally toned words in story-telling sessions gained significantly on ratings of adequacy in interpersonal relationships following the conditioning procedure.

In summary, there is evident disagreement concerning generalization of experimental to non-experimental behavior. Further disagreement concerning verbal conditioning has stemmed from contradictory research regarding level of anxiety and conditionability.

**Anxiety**

In addition to reinforcement stimuli and response
class, anxiety as an integral verbal conditioning factor has been investigated in numerous studies. Because of contradictory reports of previous research, the relationship between the subject's level of anxiety and conditionability is inconclusive.

Basic to the present study is the theoretical foundation of anxiety (or drive) level formulated by Hull (1943). According to his theory, all habits (H) activated in a given situation combine multiplicatively with the total effective drive state (D) operating at the moment to form excitatory potential E \([E = f(H \times D)]\). Total effective drive, in the Hullian system, is determined by the summation of all extant need states, primary and secondary, irrespective of their source and their relevancy to the type of reinforcement employed. Since response strength is determined in part by E, the implication of varying drive level (anxiety level) in any situation in which a single habit is evoked is: the higher the drive level, the greater the value of E and ultimately of response strength. Therefore, in simple noncompeetitional experimental arrangements involving a single habit tendency (e.g., the present
study) the performance level of high-drive subjects should be greater than that of low-drive groups (Taylor, 1956).

The first anxiety inventory to come into general use in verbal conditioning was developed by Taylor (1953). The Manifest Anxiety Scale is one of a number of inventories of different kinds taken from the Minnesota Multiphasic Personality Inventory. Taylor was interested in developing a measure of general drive in accordance with the Hullian theory rather than a measure of clinical anxiety as such (Levitt, 1967). The purpose for development of the scale was implicit in Taylor's (1956) statement:

The construction of the test was not aimed at developing a clinically useful test which would diagnose anxiety, but rather was designed solely to select Ss differing in general drive level. Thus the question of the scale's "validity" (i.e., its agreement with clinical judgments) is in a sense irrelevant to the experimental purposes for which the test was developed [p. 303].

Taylor's basic hypotheses held that: (a) the total effective drive strength of a subject was, in part, a function of the level of internal anxiety or emotionality of the subject, and (b) the level of this internal emotional state would, in turn, be reflected by the responses made
in a test of so called manifest anxiety (Taylor & Spence, 1952). On the assumption that anxiety-provoking stimuli evoke internal emotional responses (which, in turn, increase drive level), the TMAS was devised as one method of selecting subjects differing in emotional responsiveness (Spence & Spence, 1966). Taylor (1956) elaborated on the rationale behind this selection process:

The use of the MAS to select groups that are postulated to differ in drive level in an experimental situation has rested on the assumption that scores on the scale are in some manner related to emotional responsiveness, which, in turn, contributes to drive level. Two alternative hypotheses have been entertained concerning the conditions under which emotionality is evoked. One is that test scores reflect differences in a chronic emotional state so that individuals scoring high on the scale tend to bring a higher level of emotionality or anxiety "in the door" with them than do Ss scoring at lower levels. . . . A second alternative conception is the MAS scores reflect different potentialities for anxiety arousal, high scoring Ss being those who tend to react more emotionally and adapt less readily to novel or threatening situations than do low scorers [p. 306].

While Taylor and Spence advocated a relationship between conditionability on a respondent conditioning task and an individual's test score on the TMAS, several experimenters by the use of operant conditioning procedures have
investigated the relationship between TMAS scores and level of conditioning and have reported contradictory findings. In comparing ten verbal conditioning studies, Ogawa and Oakes (1965, p. 554) have shown that three of the studies (Buss & Gerjuoy, 1958; Jantz, 1959; Moore & Vidulich, 1962) reported a significant negative relationship between the TMAS scores and verbal conditioning, i.e., low anxiety subjects conditioned better than high anxiety subjects. Two of the studies (Taffel, 1955; Rosenblum, 1959) reported a significant positive relationship between TMAS scores and verbal conditioning, i.e., high anxiety subjects conditioned more readily than low anxiety subjects. The other five studies (Daily, 1953; Zedek, 1959; Matarazzo, Saslow, & Pareis, 1960; Ebner, 1961; Oakes, 1963) reported no significant relationship between TMAS scores and verbal conditioning.

In a review of numerous studies dealing with level of anxiety (as measure by the TMAS) and conditionability of subjects, Shorkey (1968) likewise reported contradictory findings (Table 1).
TABLE 1

Studies Dealing with Level of Anxiety and Conditionability of Subjects

<table>
<thead>
<tr>
<th>Author</th>
<th>Subjects</th>
<th>Task</th>
<th>Reinforcement</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rogers (1960)</td>
<td>36 University Students</td>
<td>Verbal (free association)</td>
<td>Mmm-hmm and Head Nod</td>
<td>No significant relationship was found between level of anxiety and level of conditioning.</td>
</tr>
<tr>
<td>Matarazzo et al. (1960)</td>
<td>160 College Students</td>
<td>Verbal (free association)</td>
<td>Good, That's good</td>
<td>No significant relationship was found between level of anxiety and level of conditioning.</td>
</tr>
<tr>
<td>Gelfand &amp; Winder (1961)</td>
<td>26 Patients at State Hospital</td>
<td>Sentence Construction</td>
<td>Good</td>
<td>No significant relationship was found between level of anxiety and level of conditioning.</td>
</tr>
<tr>
<td>Rowley &amp; Keller (1962)</td>
<td>90 Children ages 9-12</td>
<td>Sentence Construction</td>
<td>Good</td>
<td>No significant relationship was found between level of anxiety and level of conditioning.</td>
</tr>
<tr>
<td>Ebner (1965)</td>
<td>36 VA Hospital Patients</td>
<td>Sentence Construction</td>
<td>Good</td>
<td>No significant relationship was found between level of anxiety and level of conditioning.</td>
</tr>
<tr>
<td>Taffel (1955)</td>
<td>90 Psychiatric Patients</td>
<td>Sentence Construction</td>
<td>Good</td>
<td>Ss in the high and medium anxiety groups conditioned significantly better than the Ss in the low anxiety group at the .05 level.</td>
</tr>
<tr>
<td>Spielberger et al. (1965)</td>
<td>48 Psychiatric Patients</td>
<td>Sentence Construction</td>
<td>Good</td>
<td>Ss in the low anxiety group conditioned significantly better than Ss in the high or medium anxiety groups at the .01 level.</td>
</tr>
<tr>
<td>Buss &amp; Gerjuoy (1958)</td>
<td>45 Psychiatric Patients</td>
<td>Sentence Construction</td>
<td>Good</td>
<td>Ss in the medium and low anxiety groups conditioned significantly better than Ss in the high anxiety group at the .05 level.</td>
</tr>
</tbody>
</table>

Note.—Reprinted from an article by Clayton T. Shorkey published by the Center for Research on Language and Language Behavior, Ann Arbor, Michigan, 1968.
Contradictory findings in previous research could stem, in part, from two possibilities which are frequently overlooked. First, an inherent difficulty has been a lack of agreement as to whether the TMAS measured drive which was presumed to be responsible for performance discrepancies between low and high anxiety groups, or whether such discrepancies resulted from non-motivational variables (Weitzner, Stallone, & Smith, 1967). According to Spence and Spence (1966, p. 292), subjects in extreme anxiety groups differ in a number of characteristics; therefore the resulting performance differences between these groups cannot be explained only in terms of drive level. Second, within the framework of Hull-Spence drive theory, Taylor (1956, pp. 304, 306) suggested two conditions under which low anxiety subjects might prove more susceptible to conditioning than high anxiety subjects: (a) whereas in a simple task with no competing responses, high anxiety subjects, because of their higher drive level, would be expected to condition more readily than low anxiety subjects, the inverse is true on a complex task which could evoke a number of competing tendencies including the
correct one; and (b) under conditions of stress, low anxiety subjects tend to condition more readily than highly anxious subjects.

In an attempt to develop a systematic formulation of the effects of anxiety on complex tasks, Spence (1958) emphasized the importance of specifying additional variables relevant to the process under investigation. Spence's theory of anxiety and performance, therefore, was extended to include, among other variables, individual differences in intelligence (Denny, 1966).

**Intelligence**

Basic issues concerning anxiety and intelligence with regard to verbal conditioning include: (a) the relationship between level of anxiety and intelligence; and (b) the relationship of awareness (as a function of intelligence) to conditioning. Studies which found significant correlations between anxiety level and measures of intelligence reported only negative correlation (Matarazzo, Ulett, Guze, & Saslow, 1954; Calvin, Koons, Bingham, & Fink, 1955; Grice, 1955; Kerrick, 1955). Since the present study dealt
with college students, it should be noted that the studies by Matarazzo et al. and Calvin et al. employed such subjects; however, the Grice and Kerrick studies involved only military personnel. Studies which used college subjects (Schulz & Calvin, 1955; Mayzner, Sersen, & Tresselt, 1955; Klugh & Bendig, 1955; Sarason, 1956; Dana, 1957) found no significant relationship between the two variables.

In reviewing research concerning college students' anxiety and intelligence, Farber and Spence (1953) concluded:

The authors have, in fact, been unable, over a period of years, to find any relation between A-scale scores of college students and conventional measures of intelligence, such as entrance-examination scores and grade-point averages [p. 10].

A reasonable assumption on the basis of previous research, therefore, is that there is no positive correlation between anxiety and intelligence.

Contradictory research was likewise reported concerning the second issue, i.e., whether awareness (as a function of intelligence) is significantly related to conditioning. The unresolved issue concerns the subject's
verbal report of awareness of the response-reinforcement contingency. In an investigation of the position that the utility and correlates of reports of awareness cannot be taken for granted but must be empirically determined for each particular set of subjects and experimental circumstances, Lanyon and Drotar (1967) reviewed more than 200 studies of verbal conditioning published between 1953 and 1964. It was found that reported awareness seemed to be related to several independent variables, the most significant being the subject employed. The greater awareness reported by college subjects (as opposed to non-college) could result from several possibilities. One is their presumed superiority in intelligence or, more specifically, in verbal ability. The higher the subject's degree of problem-solving ability, therefore, the more likely he would be to verbalize awareness (Lanyon & Drotar, 1967, p. 234). The present study regarded awareness as a function of the subject's intelligence, and attempted to determine the level of awareness within a group of highly intelligent subjects.

Sensitivity of the measure used in assessing
awareness could possibly account for contradictory findings. According to Spielberger and DeNike (1962), research which reported learning without awareness based this conclusion on relatively brief and superficial interviews, often conducted after a series of extinction trials. Recent research (Gorsuch & Spielberger, 1966, p. 338) has shown that in experiments of verbal conditioning employing sensitive measures of awareness, only subjects who verbalized a correct or correlated response-reinforcement contingency have shown performance gains (e.g., Matarazzo et al., 1960; Levin, 1961; Dulany, 1961, 1962; Spielberger, 1962; DeNike, 1964; Spielberger & DeNike, 1966). Inversely, this same body of research has shown that sensitive measures of awareness have repeatedly demonstrated that subjects unaware of the contingency are not influenced by reinforcement.

In an extensive review of studies on learning and awareness, Adams (1957) contended that evidence for learning without awareness is equivocal. He concluded (p. 385) that research which has reported conditioning of behavior without awareness included one or more of the following
limitations: (a) alternative explanations were plausible; (b) negative results have been obtained upon replication by other experimenters; (c) no replication has been reported; or (d) the effects were so minimal that the question of whether certain statistical assumptions were precisely satisfied became critical.

In conclusion, considerable agreement of current research findings regarding awareness is concisely stated by Dulany (1962):

A few years ago my associates and I set out to obtain a stable finding of verbal conditioning without awareness so that we could investigate its parameters. . . . We have yet to find it [p. 103].

. . . we repeatedly find no evidence of verbal operant conditioning without awareness [p. 126].

**Learning and Performance**

The conclusion that learning has taken place in verbal conditioning studies is usually based on observed increments in the rate of emission of some reinforced response class (Spielberger, 1962). This process was referred to as "selective learning" by Spence (1956) in his statement:
In selective learning, one of the responses is reinforced and all others are not. The aim of the experimenter is to arrange for the occurrence of but a single response which is followed by reinforcement when the acquisition of an S-R relation is being studied and by non-reinforcement when its extinction is being investigated [p. 37].

The same procedure was referred to by Kanfer (1965) as "discriminative learning."

Periods of learning increment have been referred to by other researchers (Thune, 1951; Sidman, 1960; Postman, 1969) as "warm-up." The role of warm-up in increasing efficiency of performance during experimentation was inherent in Postman's (1969) concept of warm-up as development of a set required for the efficient performance of a given task. This set, he contended, is established and maintained as long as the task continues, and it results in development of appropriate adjustments for reception of stimuli and for an optimal rhythm of responding. Such adjustments, therefore, facilitate performance of prescribed responses under given experimental conditions.

The primary purpose of the learning period in the present study was to enable the subjects to make appropriate
adjustments to the variations employed within each phase in reference to stimuli and reinforcement schedules. Such a period, it was assumed, should enable each subject to accelerate toward an "optimal rhythm of responding," i.e., toward a consistent performance level.

Summary

From this review of related research has evolved one primary conclusion, i.e., that the extensive research concerning verbal conditioning has resulted not in conclusiveness but in contradiction. Contrary reports cited concerned: (a) ability to generalize from experimental to non-experimental behavior; (b) correlation between level of anxiety and conditionability; (c) correlation between level of anxiety and intelligence; and (d) relationship between awareness and conditionability.

This review of research attempted to offer a concise report of divergent methods employed by experimenters in attempting to control subject verbalization. Because of the contradictory reports of the literature, a need was seen for further research concerning experimenter-subject
interaction during an attempt toward verbal conditioning. The uniqueness of this study stemmed from its inclusion of a number of variables pertinent to such research, namely: (a) intelligence level of the subjects; (b) categorization of each subject according to anxiety level; (c) reinforcement procedures employed; (d) reinforcement stimuli used; (e) employment of the self-referential response class; and (f) analysis of learning and performance levels.
CHAPTER III

Procedures

Procedures for selecting the students to be used in this study included:

1. Obtaining ACT scores on all University of Alabama freshman and sophomore residents of Mallet Hall during the 1969-70 academic year.

2. After selecting this group, and determining their willingness to participate in the experiment, the MMPI was administered on a group basis. Only the Taylor Manifest Anxiety Scale (TMAS), i.e., the At Scale of the MMPI, was considered in this study.

3. On the basis of each individual's TMAS score, the students were categorized as evidencing:
   (1) low manifest anxiety (a TMAS score of zero to 24); (2) average manifest anxiety (a TMAS score of 25 to 34); or (3) high manifest
anxiety (a TMAS score of 35 to 50).

4. From each manifest anxiety category, 4 students were selected, resulting in a total of 12 subjects. In order to increase variation between the TMAS scores of the subjects within the three manifest anxiety categories, individuals were randomly selected from those scoring zero to 10 and 25 to 28. Since only four persons scored 35 or above, randomization was not necessary in assigning them to the high manifest anxiety category.

It was with this group of 12 subjects, all held to be of superior intelligence and categorized according to low, average, or high manifest anxiety, that the experiment was conducted in order to examine the effect of manifest anxiety on the verbal conditionability of such students.

Procedures for introduction, explanation, and performance of the experiment included:

a. One group session, with all 12 subjects, which required approximately 45 minutes for a discussion of the areas of scheduling, length of
individual sessions, promptness, absences, confidentiality, and follow-up procedures.

b. Individual sessions were held Sunday through Thursday from 10:00 p.m. to 12:00 p.m., and on Friday from 11:00 a.m. to 2:30 p.m. for a period of four weeks (including 24 experimental sessions). The initial session consisted of:

(1) a 2-minute period for instructions, questions, and clarification; and (2) a 10-minute period of presentation of the experimental stimuli. Each ensuing session consisted of a 5- to 10-minute period for this purpose.

Apparatus

The apparatus consisted of:

1. Two hundred forty transparent stimulus cards — prepared for use with an overhead projector.

---

1 On the bottom line of each transparent stimulus card, a different simple past tense verb was printed in upper-case letters. Above the verb, printed in upper-case letters on a single line, were the pronouns I, You, We, He, She, They. These pronouns were arranged in 120 different orders. The orders were duplicated, resulting in 240
2. A cover sheet—a sheet of matboard, used to cover the projection table of the overhead projector, with a center window through which the cards were projected individually onto the wall.

3. An overhead projector.

4. Twenty-one 3" X 5" note cards—containing the 14 reinforcement stimuli stimulus cards. Each card included a different verb in order to avoid repetitious responses. A careful search of the card catalog, available reference information, and cross-reference material was made within the libraries at the University of Alabama in quest of a dictionary of verbs or a listing of verbs. The most elaborate list of this nature was found in Svartvik's (1966) research concerning the English verb. From this list, 500 verbs were randomly selected and listed in the simple past tense. Each subject was asked, after completing the MMPI, to peruse the list and circle all words which he did not know, and with which he could not readily make a sentence. Eleven verbs were circled, resulting in a final list of 489 verbs which were readily familiar to all subjects (Appendix A). From this list, 240 verbs were randomly selected. Each verb, in turn, was randomly assigned to a stimulus card. Every stimulus card, therefore, had a different verb, even though the 120 orders of the six pronouns were duplicated (Appendix B).

This type cover sheet enabled the experimenter to further stabilize experimental conditions by controlling the noise-variable in operating the experimental apparatus. Also, the projection-location was centralized upon the wall.
patterns and the seven variable reinforcement schedules. These were taped to the back of the projection head of the projector so as to be readily available to the experimenter at all times but were not visible to the subjects.

5. A tape recorder--for recording subject responses and the ensuing reinforcement.

6. A chair--in which the student sat facing the wall (of the 12' X 13-1/2' experimental room) onto which the stimulus cards were projected.

7. A table--on which the overhead projector and tape recorder were placed.

8. A "Golfer's Pal"--a watch-like instrument, worn on the wrist, for tallying golf strokes. By silently recording hereon each critical-response emitted by the subject, the experimenter was aware at all times of the precise number of such responses emitted, and was alert
to induce immediate reinforcement whenever the appropriate response was made.

Instructions

The instructions by which the apparatus was introduced to each subject consisted of:

I am going to project, one at a time, a series of cards onto the wall which you are now facing. On the bottom line of each card, you will see a word. You are to make a sentence using that word. On the top line, you will see a group of other words. One of these words must be used to begin your sentence. (Pause.) Your sentences may be long or short, detailed or brief. The important thing is that you answer with the first sentence that enters your mind. This may not be easy, but if you will answer as quickly as possible, you will most likely give the first thing that comes into your mind. Any questions? O.K., let's begin.

Actual exposure time of each stimulus card was 10 to 20 seconds.

c. The 24 days employed in the performance of the experiment were divided into four operational phases:

1. Phase I—6 days, i.e., 6 individual sessions, were given to establishment of an
operant baseline. A mean response frequency was obtained with reference to the number of times the subject employed the first person singular pronoun "I" in self-referential statements. Each subject responded to 24 stimulus cards per session.

2. Phase II—7 days were given to reinforcement of the self-referential statements (hereafter referred to as the critical-response). All subjects received continuous reinforcement induced through random patterns of the statements of agreement, including:

(a) fine  (d) o.k.
(b) good  (e) right
(c) mmm-hmm  (f) yes

To reduce the possibility of the subjects memorizing the continuous reinforcement pattern, the stimuli were administered according to randomly selected arrangements (Appendix C).
3. Phase III—7 days were given to reinforcement on both a continuous and a variable schedule. Within each of the three manifest anxiety categories, subgroups included two subjects randomly selected to receive continuous reinforcement and two, so chosen, to receive variable reinforcement. This subgroup arrangement resulted in a design such as:

<table>
<thead>
<tr>
<th></th>
<th>Low Anxiety</th>
<th>Average Anxiety</th>
<th>High Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Reinforcement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Reinforcement</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The variable reinforcement schedules consisted of the following patterns:

1st day—3, 4, 9, 10, 11, 12, 14, 19
2nd day—1, 2, 4, 5, 7, 9, 12, 13
3rd day—7, 8, 10, 11, 15, 16, 18, 19
4th day—1, 3, 10, 13, 14, 15, 17, 20
5th day--1, 2, 3, 6, 14, 16, 18, 19
6th day--2, 4, 6, 11, 12, 13, 14, 19
7th day--1, 2, 3, 6, 9, 11, 21, 22

With those subjects receiving variable reinforcement, it was necessary to use an instrument (see item 8--Procedures) such as the "Golfer's Pal" to ensure that the experimenter was constantly aware of the precise number of critical-responses emitted. This instrument aided the experimenter in inducing immediate, rather than delayed, reinforcement. Continuous and variable reinforcement were administered according to randomly selected arrangements (Appendix D).

4. Phase IV--4 days were given to extinction through silence, i.e., no reinforcement was given whenever the critical-response was emitted.

In order to gain a more accurate measure of the performance level attained by each subject during Phases
II, III, and IV, each phase was divided into two periods: (a) learning, and (b) performance. During Phases II and III, the first four sessions were employed to measure each subject's mean learning increment. The first two sessions of Phase IV were used for this purpose. The remaining sessions, i.e., sessions 5, 6, and 7 of Phases II and III and sessions 3 and 4 of Phase IV, were used to measure individual performance level. It was assumed that the division of each phase into learning and performance periods would result in a more accurate indication of the subject's true level of performance than would be the case if all sessions were included in computation of a "mean performance level."

At the conclusion of the final session of Phase IV, each subject was asked five questions:

1. What do you think was being attempted during these sessions?
2. How did you go about deciding which of the words on the top line to use?
3. Which word do you think you used the most times?
4. Why did you choose that word?

5. Did you notice anything unusual about what I (the experimenter) did during each session?

The purpose of this questionnaire was to measure subject awareness of the stimulus-response contingency.

An Analysis of Variance Design (Lindquist Type I) was used to analyze the data in this study. This design was selected because of its appropriateness for employment of a pre- and posttest subject as his own control. The design is purported, in other words, to eliminate some of the intersubject variability which is a major source of error in behavioral research. Results were obtained by use of the IBM 360 Computer program, LINDQ1, written by Dr. Harry R. Barker, Professor of Educational Psychology at the University of Alabama. The $F$ ratio was employed to determine whether utilization of $t$ tests was warranted. The .05 level of confidence was selected as the level for which significance was required.
CHAPTER IV

Results and Analysis

The results and analysis of this study will be presented in the following manner: (a) comparisons of anxiety levels; (b) comparisons of reinforcement schedules; (c) learning and performance; (d) statistical treatment; (e) analysis of findings; and (f) supplementary observations.

Comparisons of Anxiety Levels

During Phase I, i.e., the sessions used to establish each subject's base rate of responding, no reinforcement was given for subject responses. This procedure to determine an operant baseline was continued until a constant critical-response frequency was obtained. It was previously determined that if the critical-response frequency of a given session deviated three or more, either below the lowest or above the highest frequency for other
sessions, it would be excluded from baseline computation. Such a procedure was prescribed to prevent a single session from distorting a subject's baseline by skewing the mean toward an extreme score. As a result, the emission rate for one session was deleted for 10 of the 12 subjects. Because of the lack of such deviation, the operant baseline for the two remaining subjects (Ss 3 and 6) was computed on the basis of response frequencies for all six sessions. Observation of the data showed that deviating sessions were scattered throughout the six-session phase; consequently, the investigator was unable to hypothesize causation.

Figures 1-12 (Appendix E), based on the compilation of subject response frequencies in Table 2, afford a graphic representation of subject consistency and variation within individual sessions of each experimental phase. Deviations in subject response frequency during the operant baseline period are evident, as are individual differences within and between sessions of the remaining phases.

Operant baseline scores (Table 3) were computed for subjects within each anxiety level group. No significant relationship was observed between the subjects'
TABLE 2

Subject Critical-Response Frequencies for Each Experimental Session

<table>
<thead>
<tr>
<th>Ss</th>
<th>ACT</th>
<th>TMAS</th>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
<th>Phase IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>29</td>
<td>3</td>
<td>4 2 0 0 3 0</td>
<td>1 1 0 1 0 2 1</td>
<td>2 2 2 0 2 1 1</td>
<td>1 1 0 0</td>
</tr>
<tr>
<td>2</td>
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<td>6</td>
<td>9 9 6 7 7 4</td>
<td>9 10 10 10 11 10</td>
<td>7 9 8 10 10 9 11</td>
<td>10 8 7 9</td>
</tr>
<tr>
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<td>7</td>
<td>8 6 9 7 8 6</td>
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<td>3 3 5 4</td>
</tr>
<tr>
<td>4</td>
<td>30</td>
<td>9</td>
<td>2 3 3 7 1 4</td>
<td>6 8 10 10 8 10 8</td>
<td>7 7 8 6 8 4 8</td>
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<td>0 0 0 0 4 0 0</td>
<td>0 2 0 0</td>
</tr>
<tr>
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<td>29</td>
<td>26</td>
<td>7 4 8 6 8 8</td>
<td>9 8 6 9 5 7 12</td>
<td>14 14 13 14 12 14</td>
<td>9 5 8 6</td>
</tr>
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<td>8 5 2 2 5 3</td>
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<td>16 24 24 24</td>
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<td>3 7 5 5 6 4 6</td>
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</tr>
<tr>
<td>10</td>
<td>29</td>
<td>35</td>
<td>4 5 7 6 9 7</td>
<td>10 13 11 12 13 13 23</td>
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<td>36</td>
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</tr>
<tr>
<td>12</td>
<td>33</td>
<td>36</td>
<td>2 4 5 8 5 3</td>
<td>9 8 14 23 23 24 24</td>
<td>19 24 24 24 24 24</td>
<td>24 19 24 20</td>
</tr>
</tbody>
</table>
operant baseline and anxiety level. The mean baseline of average anxiety subjects was lowest (4.43), followed by that of the low anxiety group (4.63), with the highest (5.20) belonging to the high anxiety group. Additionally, baselines of high anxiety subjects showed less variation than those of the other groups.

**TABLE 3**

Subject Mean Operant Baseline According to Anxiety Level

<table>
<thead>
<tr>
<th>Low Anxiety</th>
<th>Average Anxiety</th>
<th>High Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>S 1: 1.00</td>
<td>S 5: 5.40</td>
<td>S 9: 7.40</td>
</tr>
<tr>
<td>S 2: 7.60</td>
<td>S 6: 1.50</td>
<td>S 10: 5.80</td>
</tr>
<tr>
<td>S 3: 7.33</td>
<td>S 7: 7.40</td>
<td>S 11: 3.80</td>
</tr>
<tr>
<td>S 4: 2.60</td>
<td>S 8: 3.40</td>
<td>S 12: 3.80</td>
</tr>
<tr>
<td><strong>Group</strong></td>
<td><strong>Mean: 4.63</strong></td>
<td></td>
</tr>
</tbody>
</table>

Even though none of the subjects questioned the experimenter's silence during Phase I, three low anxiety subjects (Ss 2, 3, and 4) and one average anxiety subject
(S 8) verbalized awareness of change whenever the experimenter began administering continuous reinforcement. All subjects received continuous reinforcement, i.e., after each response beginning with "I," during the seven subsequent sessions (Phase II). Response frequencies varied from 0 to 9 during the initial phase; however, a variation of 0 to 24 was recorded during Phase II (Table 2). At the conclusion of this phase, comparisons were made (Table 4) between mean response frequencies with regard to anxiety level. Mean response frequencies for each anxiety group showed the following pattern: (a) low anxiety (6.47), (b) average anxiety (6.79), and (c) high anxiety (10.23). Group mean response frequency increments between the two phases, therefore, included: (a) low anxiety (1.84), (b) average anxiety (2.36), and (c) high anxiety (5.03). On the basis of previous research, such a pattern would be expected.

The pattern of increment in group mean response frequencies in Phase II was not evident in Phase III (Table 5), i.e., during the seven sessions in which half the subjects received continuous reinforcement and half
received variable. Differences between group mean response frequencies of Phases II and III were: (a) low anxiety (-1.04), (b) average anxiety (3.78), and (c) high anxiety (3.54). The average anxiety group showed a slightly higher mean increase than the high anxiety group.

**TABLE 4**

<table>
<thead>
<tr>
<th>Continuous Reinforcement Phase Mean Response Frequencies According to Anxiety Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Anxiety</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>S 1: 0.86</td>
</tr>
<tr>
<td>S 2: 10.00</td>
</tr>
<tr>
<td>S 3: 6.43</td>
</tr>
<tr>
<td>S 4: 8.57</td>
</tr>
<tr>
<td>Group Mean: 6.47</td>
</tr>
</tbody>
</table>
TABLE 5

Continuous and Variable Reinforcement Phase Mean Response Frequencies According to Anxiety Level

<table>
<thead>
<tr>
<th>Low Anxiety</th>
<th>Average Anxiety</th>
<th>High Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>S 1: 1.43</td>
<td>S 5: 4.29</td>
<td>S 9: a 5.14</td>
</tr>
<tr>
<td>S 2: a 9.14</td>
<td>S 6: a 0.57</td>
<td>S 10: a 24.00</td>
</tr>
<tr>
<td>S 3: a 4.29</td>
<td>S 7: a 13.57</td>
<td>S 11: 2.71</td>
</tr>
<tr>
<td>S 4: 6.86</td>
<td>S 8: 23.86</td>
<td>S 12: 23.29</td>
</tr>
<tr>
<td>Group Mean: 5.43</td>
<td>10.57</td>
<td>13.77</td>
</tr>
</tbody>
</table>

*Subjects who received continuous reinforcement (others received variable).

During Phase IV, the group mean response frequencies (Table 6) followed the pattern observed in Phase II. The differences between group mean response frequencies of Phases II and III were: (a) low anxiety (.93), (b) average anxiety (2.69), and high anxiety (3.39).

With the exception of the mean differences between the low and high anxiety groups in Phases II and III, the findings concerning progression of the three groups through
the four experimental phases were consistent with previous research which had shown that the higher the level of anxiety the more susceptible the subject was to conditioning. Comparisons between mean response frequencies for the anxiety groups (Table 7) during each phase gave further evidence of this finding.

**TABLE 6**

Extinction Phase Mean Response Frequencies According to Anxiety Level

<table>
<thead>
<tr>
<th>Low Anxiety</th>
<th>Average Anxiety</th>
<th>High Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>S 1: 0.50</td>
<td>S 5: 2.00</td>
<td>S 9: 4.50</td>
</tr>
<tr>
<td>S 2: 8.50</td>
<td>S 6: 0.50</td>
<td>S 10: 13.75</td>
</tr>
<tr>
<td>S 3: 3.75</td>
<td>S 7: 7.00</td>
<td>S 11: 1.50</td>
</tr>
<tr>
<td>S 4: 5.25</td>
<td>S 8: 22.00</td>
<td>S 12: 21.75</td>
</tr>
<tr>
<td>Group Mean: 4.50</td>
<td>7.88</td>
<td>10.38</td>
</tr>
</tbody>
</table>
### TABLE 7

Anxiety Group Mean Response Frequencies for Phases I-IV

<table>
<thead>
<tr>
<th></th>
<th>Operant Baseline</th>
<th>Continuous Reinforcement</th>
<th>Continuous and Variable Reinforcement</th>
<th>Extinction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Anxiety</td>
<td>4.63</td>
<td>6.47</td>
<td>5.43</td>
<td>4.50</td>
</tr>
<tr>
<td>Average Anxiety</td>
<td>4.43</td>
<td>6.79</td>
<td>10.57</td>
<td>7.88</td>
</tr>
<tr>
<td>High Anxiety</td>
<td>5.20</td>
<td>10.23</td>
<td>13.77</td>
<td>10.38</td>
</tr>
</tbody>
</table>
Comparisons of Reinforcement Schedules

Prior to the beginning of Phase III, two subjects from each anxiety level were randomly selected to receive variable schedules of reinforcement. Selected were Ss 1, 4, 5, 8, 11, and 12. The remaining subjects were maintained on a continuous schedule of reinforcement.

A comparison between increments in mean response frequencies of the two groups during Phases II and III revealed that subjects who received variable reinforcement showed an increase of 2.27, while those remaining on a continuous schedule had a mean increment of 1.92 (Tables 8 and 9). The variable reinforcement group reflected a greater increase in mean response frequency during Phase III; however, their decrement in mean response frequency during extinction (Phase IV) was less than that for the continuous reinforcement group (Tables 8 and 9). The extinction mean decrements for the two groups were: (a) variable reinforcement subjects (-1.58), and (b) continuous reinforcement subjects (-3.12).

An analysis of mean response frequencies for individual subjects within each reinforcement schedule group
showed that only two subjects in each group conditioned according to the expectations of the experimenter (Anticipated Outcomes). From each reinforcement group, subjects who conditioned had either average or high anxiety levels. Variable schedule subjects included Ss 8 and 12, while Ss 7 and 10 received continuous reinforcement.

TABLE 8

Mean Response Frequencies for Subjects on Continuous and Variable Schedules of Reinforcement

<table>
<thead>
<tr>
<th>S</th>
<th>Operant Baseline</th>
<th>Continuous Reinforcement</th>
<th>Variable Reinforcement</th>
<th>Extinction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.00</td>
<td>0.86</td>
<td>1.43</td>
<td>0.50</td>
</tr>
<tr>
<td>4</td>
<td>2.60</td>
<td>8.57</td>
<td>6.86</td>
<td>5.25</td>
</tr>
<tr>
<td>5</td>
<td>5.40</td>
<td>4.43</td>
<td>4.29</td>
<td>2.00</td>
</tr>
<tr>
<td>8</td>
<td>3.40</td>
<td>14.43</td>
<td>23.86</td>
<td>22.00</td>
</tr>
<tr>
<td>11</td>
<td>3.80</td>
<td>2.71</td>
<td>2.71</td>
<td>1.50</td>
</tr>
<tr>
<td>12</td>
<td>3.80</td>
<td>17.86</td>
<td>23.29</td>
<td>21.75</td>
</tr>
</tbody>
</table>

Group Mean 8.14 10.41 8.83
TABLE 9

Mean Response Frequencies for Subjects on a Continuous Schedule of Reinforcement

<table>
<thead>
<tr>
<th>S</th>
<th>Operant Baseline</th>
<th>Continuous Reinforcement</th>
<th>Continuous Reinforcement</th>
<th>Extinction</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>7.60</td>
<td>10.00</td>
<td>9.14</td>
<td>8.50</td>
</tr>
<tr>
<td>3</td>
<td>7.33</td>
<td>6.43</td>
<td>4.29</td>
<td>3.75</td>
</tr>
<tr>
<td>6</td>
<td>1.50</td>
<td>0.29</td>
<td>0.57</td>
<td>0.50</td>
</tr>
<tr>
<td>7</td>
<td>7.40</td>
<td>8.00</td>
<td>13.57</td>
<td>7.00</td>
</tr>
<tr>
<td>9</td>
<td>7.40</td>
<td>6.86</td>
<td>5.14</td>
<td>4.50</td>
</tr>
<tr>
<td>10</td>
<td>5.80</td>
<td>13.57</td>
<td>24.00</td>
<td>13.75</td>
</tr>
<tr>
<td>Group Mean</td>
<td>7.53</td>
<td>9.45</td>
<td>6.33</td>
<td></td>
</tr>
</tbody>
</table>

Learning and Performance

A comparison was made between the mean subject response frequencies for the learning and performance periods during Phases II, III, and IV according to continuous and variable reinforcement groups (Tables 10 and 11). Since all subjects initially received continuous reinforcement, the necessity for comparing learning and
<table>
<thead>
<tr>
<th>S</th>
<th>Baseline</th>
<th>Continuous Reinforcement</th>
<th>Variable Reinforcement</th>
<th>Extinction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Learning 1</td>
<td>Performance 1</td>
<td>Learning 2</td>
</tr>
<tr>
<td>1</td>
<td>1.00</td>
<td>0.75</td>
<td>1.00</td>
<td>1.50</td>
</tr>
<tr>
<td>4</td>
<td>2.60</td>
<td>8.50</td>
<td>8.67</td>
<td>7.00</td>
</tr>
<tr>
<td>5</td>
<td>5.40</td>
<td>4.25</td>
<td>4.67</td>
<td>4.75</td>
</tr>
<tr>
<td>8</td>
<td>3.40</td>
<td>8.00</td>
<td>23.00</td>
<td>24.00</td>
</tr>
<tr>
<td>11</td>
<td>3.80</td>
<td>3.00</td>
<td>2.33</td>
<td>2.75</td>
</tr>
<tr>
<td>12</td>
<td>3.80</td>
<td>13.50</td>
<td>23.67</td>
<td>22.75</td>
</tr>
</tbody>
</table>
TABLE 11
Learning and Performance Mean Response Frequencies for Subjects on a Continuous Schedule of Reinforcement

<table>
<thead>
<tr>
<th>S</th>
<th>Baseline</th>
<th>Continuous Reinforcement</th>
<th>Continuous Reinforcement</th>
<th>Extinction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Learning 1</td>
<td>Performance 1</td>
<td>Learning 2</td>
</tr>
<tr>
<td>2</td>
<td>7.60</td>
<td>9.75</td>
<td>10.33</td>
<td>8.50</td>
</tr>
<tr>
<td>3</td>
<td>7.33</td>
<td>5.50</td>
<td>7.67</td>
<td>4.50</td>
</tr>
<tr>
<td>6</td>
<td>1.50</td>
<td>0.25</td>
<td>0.33</td>
<td>0.00</td>
</tr>
<tr>
<td>7</td>
<td>7.40</td>
<td>8.00</td>
<td>8.00</td>
<td>13.75</td>
</tr>
<tr>
<td>9</td>
<td>7.40</td>
<td>7.50</td>
<td>6.00</td>
<td>5.00</td>
</tr>
<tr>
<td>10</td>
<td>5.80</td>
<td>11.50</td>
<td>16.33</td>
<td>24.00</td>
</tr>
</tbody>
</table>
performance means for those subjects maintained on the continuous schedule became as apparent as the need for comparing mean differences whenever the schedule of reinforcement was changed. This comparison revealed that: (a) within the group receiving only continuous reinforcement, two subjects (Ss 7 and 10) conditioned as expected; and (b) within the group receiving continuous and variable reinforcement, an equal number (Ss 8 and 12) conditioned according to expectations. The subjects within the latter group were not expected to be so susceptible to extinction attempts as were the others; yet, S 8 manifested an increase in mean response frequency during the extinction period (Table 10). In analyzing the response trends of these four subjects, it was observed that there was a relationship between the patterns of the learning and performance periods.

Further comparisons between mean subject response frequencies during only the performance periods (Tables 12 and 13) afford a closer examination of subject progression during each phase. These comparisons revealed the proximity of S 2 to the pattern established by Ss 7, 8, 10,
and 12. The data reveal, therefore, that 5 of the 12 subjects conditioned according to experimenter expectations. The two subjects (Ss 8 and 12) from the continuous and variable reinforcement group had average and high anxiety levels. The continuous reinforcement group, however, included subjects from each anxiety level (S 2, 7, and 10).

**TABLE 12**

Performance Mean Response Frequencies for Subjects on Continuous and Variable Schedules of Reinforcement

<table>
<thead>
<tr>
<th>S</th>
<th>Operant Baseline</th>
<th>Continuous Reinforcement Performance 1</th>
<th>Variable Reinforcement Performance 2</th>
<th>Extinction Performance 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.00</td>
<td>1.00</td>
<td>1.33</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>2.60</td>
<td>8.67</td>
<td>6.67</td>
<td>5.00</td>
</tr>
<tr>
<td>5</td>
<td>5.40</td>
<td>4.67</td>
<td>3.67</td>
<td>2.00</td>
</tr>
<tr>
<td>8</td>
<td>3.40</td>
<td>23.00</td>
<td>23.67</td>
<td>24.00</td>
</tr>
<tr>
<td>11</td>
<td>3.80</td>
<td>2.33</td>
<td>2.67</td>
<td>2.00</td>
</tr>
<tr>
<td>12</td>
<td>3.80</td>
<td>23.67</td>
<td>24.00</td>
<td>22.00</td>
</tr>
</tbody>
</table>
TABLE 13

Performance Mean Response Frequencies for Subjects on a Continuous Schedule of Reinforcement

<table>
<thead>
<tr>
<th>S</th>
<th>Operant Baseline</th>
<th>Continuous Reinforcement</th>
<th>Continuous Reinforcement</th>
<th>Extinction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Performance 1</td>
<td>Performance 2</td>
<td>Performance 3</td>
</tr>
<tr>
<td>2</td>
<td>7.60</td>
<td>10.33</td>
<td>10.00</td>
<td>8.00</td>
</tr>
<tr>
<td>3</td>
<td>7.33</td>
<td>7.67</td>
<td>4.00</td>
<td>4.50</td>
</tr>
<tr>
<td>6</td>
<td>1.50</td>
<td>0.33</td>
<td>1.33</td>
<td>0.00</td>
</tr>
<tr>
<td>7</td>
<td>7.40</td>
<td>8.00</td>
<td>13.33</td>
<td>7.00</td>
</tr>
<tr>
<td>9</td>
<td>7.40</td>
<td>6.00</td>
<td>5.33</td>
<td>3.00</td>
</tr>
<tr>
<td>10</td>
<td>5.80</td>
<td>16.33</td>
<td>24.00</td>
<td>11.50</td>
</tr>
</tbody>
</table>

**Statistical Treatment**

Statistical analysis of the above data was made by employing an Analysis of Variance Design (Lindquist Type 1). This design was selected because of its appropriateness for employment of a pre- and posttest subject as his own control. The $F$ ratio was employed to determine whether utilization of $t$ tests was warranted. The $.05$ level of
confidence was selected as the level for which significance was required.

Statistical treatment included three major analyses:

(a) analysis of mean response frequencies of low, average, and high anxiety subjects during the operant baseline phase and the performance periods of Phases II, III, and IV (Table 14); (b) analysis of mean response frequencies of low, average, and high anxiety subjects during the performance periods of Phases II, III, and IV (Table 15); and (c) analysis of mean response frequencies of low, average, and high anxiety subjects during the performance periods of Phases III and IV (Table 16). Significant F ratios were obtained in each analysis in reference to column effects (mean response frequencies for the operant baseline phase and the performance periods of Phases II, III, and IV). Non-significant F ratios, however, were found concerning row (anxiety level) effects. It was determined, therefore, that although variation between anxiety level groups was insignificant, there were significant differences between subject mean response frequencies during the various phases.
Analysis of Baseline and Phase II, III, and IV Performance Mean Response Frequencies by Anxiety Level According to Lindquist's Type I Design

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Rows</td>
<td>190.479</td>
<td>2</td>
<td>95.239</td>
<td>0.57^a</td>
</tr>
<tr>
<td>Error (Between)</td>
<td>1509.599</td>
<td>9</td>
<td>167.733</td>
<td></td>
</tr>
<tr>
<td>Total (Between)</td>
<td>1700.078</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Columns</td>
<td>199.245</td>
<td>3</td>
<td>66.415</td>
<td>3.08*</td>
</tr>
<tr>
<td>Rows X Columns</td>
<td>70.122</td>
<td>6</td>
<td>11.687</td>
<td>0.54^a</td>
</tr>
<tr>
<td>Error (Within)</td>
<td>583.075</td>
<td>27</td>
<td>21.595</td>
<td></td>
</tr>
<tr>
<td>Total (Within)</td>
<td>852.442</td>
<td>36</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

^a Not significant.

*Significant beyond .05 level of confidence (2.96).
TABLE 15

Analysis of Phase II, III, and IV Performance Mean Response Frequencies by Anxiety Level According to Lindquist's Type I Design

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Rows</td>
<td>240.529</td>
<td>2</td>
<td>120.265</td>
<td>0.55(^a)</td>
</tr>
<tr>
<td>Error (Between)</td>
<td>1958.664</td>
<td>9</td>
<td>217.629</td>
<td></td>
</tr>
<tr>
<td>Total (Between)</td>
<td>2199.193</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Columns</td>
<td>43.178</td>
<td>2</td>
<td>21.589</td>
<td>5.39(^*)</td>
</tr>
<tr>
<td>Rows X Columns</td>
<td>18.783</td>
<td>4</td>
<td>4.696</td>
<td>1.17(^a)</td>
</tr>
<tr>
<td>Error (Within)</td>
<td>72.082</td>
<td>18</td>
<td>4.005</td>
<td></td>
</tr>
<tr>
<td>Total (Within)</td>
<td>134.043</td>
<td>24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^a\)Not significant.

\(^*\)Significant beyond .05 level of confidence (3.55).
TABLE 16
Analysis of Phase III and IV Performance Mean Response Frequencies by Anxiety Level According to Lindquist's Type I Design

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Rows</td>
<td>194.396</td>
<td>2</td>
<td>97.198</td>
<td>0.65&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Error (Between)</td>
<td>1346.218</td>
<td>9</td>
<td>149.580</td>
<td></td>
</tr>
<tr>
<td>Total (Between)</td>
<td>1540.614</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Columns</td>
<td>40.041</td>
<td>1</td>
<td>40.041</td>
<td>6.12*</td>
</tr>
<tr>
<td>Rows X Columns</td>
<td>10.896</td>
<td>2</td>
<td>5.448</td>
<td>0.83&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Error (Within)</td>
<td>58.898</td>
<td>9</td>
<td>6.544</td>
<td></td>
</tr>
<tr>
<td>Total (Within)</td>
<td>109.835</td>
<td>12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>Not significant.

*Significant beyond .05 level of confidence (5.12).
Initial analysis, i.e., analysis of mean response frequencies of low, average, and high anxiety subjects during the operant baseline phase and the performance periods of Phases II, III, and IV (Table 14) resulted in a significant $F$ ratio. On the basis of this finding, $t$ tests were employed in an attempt to reveal significant differences between means of the four phases. Significant differences were found between subject mean response frequencies during the operant baseline phase and the performance period of Phase II, and between the operant baseline phase and the performance period of Phase III. Non-significance was found between subject mean response frequencies during the operant baseline phase and Phase IV (extinction).

Further analysis, i.e., analysis of mean response frequencies of low, average, and high anxiety subjects during the performance periods of Phases II, III, and IV (Table 15) revealed a significant $F$ ratio. Significant differences between subject mean response frequencies during the performance periods of Phases II and IV, and of Phases III and IV were determined, subsequently, by $t$ tests.
Non-significance was evidenced concerning variation between Phases II and III.

Final analysis, i.e., analysis of mean response frequencies of low, average, and high anxiety subjects during the performance periods of Phases III and IV (Table 16) resulted in a significant $F$ ratio. A significant difference between the means of the performance period of these two phases was revealed by the subsequent $t$ test.

The "between column" degrees of freedom for each of the three analyses were: (a) 36, (b) 24, and (c) 12. Significant $F$ ratios were obtained even when the degrees of freedom were reduced, and chances of sample error were increased.

**Analysis of Findings**

This study attempted to provide information relevant to the experimental hypotheses and corollaries posed earlier. This analysis of the findings relates the data presented above to these hypotheses.

**Hypothesis I:** Verbal conditionability of highly intelligent subjects, as measured by
increments and decrements in frequency of the critical-response, is a function of both the level of anxiety and the nature of reinforcement stimuli.

Because of extreme variation of mean response frequencies of subjects within each anxiety level group, it was impossible to obtain (by means of Lindquist Type 1 Design) significant differences between such groups (Tables 14, 15, and 16). In addition, groups with four subjects are less likely to reveal statistical significance than would be true of larger groups. A comparison, however, of the mean response frequencies of anxiety level groups during each phase (Table 7) seemed to indicate that the higher the anxiety level of the subject, the more susceptible was the subject to conditioning. A closer investigation, on the other hand, revealed that group means were greatly distorted by the extremely high mean response frequencies of those students whose behavior was conditioned.

Whenever subjects were analyzed on an individual rather than on a group basis (Tables 12 and 13), it was
observed that subjects who conditioned (Ss 2, 7, 8, 10, and 12) represented each anxiety level group: (a) low anxiety, 1; (b) average anxiety, 2; and (c) high anxiety, 2. This finding seemed to indicate that conditionability of the subjects included in this study is not a function of the level of anxiety. On the basis of these findings, Corollary I (the higher the anxiety level, as measured by the Taylor Manifest Anxiety Scale, the more conducive the subject would be to verbal conditioning) was rejected.

Since only 5 of 12 subjects conditioned according to expectations, and since two of these (Ss 8 and 12) received varied reinforcement, Corollary II (subjects receiving continuous reinforcement would evidence a higher degree of conditionability than those receiving variable reinforcement) was rejected. A comparison between the mean response frequencies of the two reinforcement groups (Tables 8 and 9) during Phases II and III revealed that subjects who received variable reinforcement showed an increase of 2.27, while those remaining on a continuous schedule had a mean increment of 1.92. Additionally, only 50 percent of the subjects receiving continuous
reinforcement showed any change. Significant $F$ ratios (Tables 14, 15, and 16) concerning differences between mean response frequencies of the various phases could be interpreted, however, to mean that the nature of reinforcement stimuli may be an important variable in the conditioning of highly intelligent subjects.

Hypothesis II: Ability to extinguish particular subject responses, as measured by decrements in frequency of the critical-response, is a function of both the level of anxiety and the nature of reinforcement stimuli.

This hypothesis was rejected on the basis that it held true for only the five subjects whose behavior was conditioned (Tables 12 and 13). Corollary I (once conditioning is evidenced, the higher the level of anxiety, the less susceptible the subjects would be to extinction attempts) was rejected on the basis of the performance of $S$s 2, 7, and 10 (Table 13). $S$s 7 and 10 proved equally as susceptible to extinction as $S$ 2.
Finally, Corollary II (subjects reinforced on a variable schedule would be less susceptible to extinction attempts than those receiving continuous reinforcement) held true for only Ss 8 and 12, whose behavior was conditioned (Table 12). The performances of these two subjects, however, reflected extreme deviation from other subjects in their group. Because of the magnitude of the deviation, an accurate measure of the group's performance was not obtained by a comparison between decrements in mean response frequencies (Table 8). A comparison between the two reinforcement groups during Phases III and IV (Tables 8 and 9) showed a mean decrement of 1.58 for the variable reinforcement group, while the continuous group decrease was 3.12. This corollary was rejected, therefore, primarily on the basis that it was applicable to only 33 percent of the subjects reinforced on a variable schedule.

In summary, Hypotheses I and II were rejected on the basis of results of this research. Hypothesis II and its second corollary held true for only those subjects whose behavior was conditioned. From the data in this study, therefore, it was observed: (a) that there were no
significant relationships between the subjects' intelligence, anxiety, and conditionability; and (b) that this group of highly intelligent subjects did not condition in a manner comparable to that of subjects employed in previous research in verbal conditioning.

Supplementary Observations

Since the present study was the first research dealing with verbal conditioning of highly intelligent subjects of varying anxiety levels, it seemed appropriate to include observations made by the experimenter which were not reported in the data. Whereas these were generally of a non-quantitative nature, a discussion of them may prove useful to experimenters who undertake similar investigations in the future.

A distinct difference was observed in the sentence structure, content, and rate of emission between the responses of highly anxious subjects and those of subjects with low and average anxiety. Sentences emitted by subjects with high anxiety were consistently more elaborate and detailed. The speed with which such subjects emitted
their responses was much greater than that of the low and average groups. The majority of low and average subjects tended to emit sentences of approximately four or five words, the meanings of which were not always clear.

All subjects in the experimental group expressed the desire to "move into something different" or to "get on with the experiment" prior to completion of the baseline phase. The common attitude was frequently voiced by means of three questions: (a) "Is this all there is to it?"; (b) "When do we get started?"; and (c) "Aren't we going to do more?" Due to the fact that the subjects were unaware of what was to take place during the experiment, an increasing apprehension was evidenced during the operant baseline phase. The subjects' anxiety could likewise have been increased by the experimenter's complete silence during the six sessions of Phase I. Another possibility is that subject hostility could have resulted from the silence of the experimenter during this phase.

In observing behavioral patterns with reference to keeping appointments, it was noted that S_12 consistently arrived at least 5 minutes prior to the beginning of his
session. Such a compulsion, but to a lesser degree, was observed in the behavior of $S_{10}$. It was not surprising that both of these subjects had high levels of anxiety.

Another unexpected occurrence was that half of the subjects, i.e., $S_1, 3, 5, 6, 9, \text{ and } 11$ (two from each anxiety level), showed a decrease in mean response frequency between Phase I (operant baseline) and Phase II (continuous reinforcement). Not only did the reinforcement fail to increase the subjects' critical-response frequency, but each of these subjects evidenced a decrement in performance. This occurrence could have stemmed from a vacillation of anxiety during the former phase because of unfamiliarity with the experimental conditions and task.

In answer to Item 3 of the brief questionnaire administered at the conclusion of the experiment, i.e., "Which word do you think you used the most times?," none of the subjects chose "You." Three subjects ($S_2, 5, \text{ and } 10$) stated that they experienced extreme difficulty in attempting to employ "You," and that it generally did not seem appropriate to the verbs used on the stimulus cards.
Nine of the 12 subjects expressed awareness of the stimulus-response contingency (all except Ss 5, 6, and 11) through the manner in which they answered the questionnaire. Of the nine, however, only five evidenced changes in verbal behavior (Tables 12 and 13). The above observations concerning anxiety and hostility were possibly supported by the performance of the subjects whose behavior was not conditioned.

Finally, half of the subjects with high levels of anxiety (Ss 10 and 12) were susceptible to attempts to condition their verbal behavior, while the others (Ss 9 and 11) were not. Since Hullian theory equated reinforcement with drive-reduction, it could be deduced that the effect of the reinforcement stimuli varied with each of the four subjects.
CHAPTER V

Summary, Conclusions, and Recommendations

Summary

The major objective of this study was to compare the performance of highly intelligent subjects with varying levels of anxiety during an attempt to condition their verbal behavior in a setting which closely approximated the counseling interview. Through such a comparison, the experimenter sought to ascertain: (a) whether there were significant relationships between intelligence, anxiety, and conditionability; and (b) whether this group of highly intelligent subjects would condition in a manner comparable to that of subjects employed in previous research in verbal conditioning.

The group of subjects was composed of nine freshmen and three sophomores at the University of Alabama. Selection was based on ACT Composite scores. The mean group Composite score was 29.75 (national rank: 98th percentile).
Subjects were grouped (four per group) according to anxiety level, as measured by the Taylor Manifest Anxiety Scale. The three groups included subjects who manifested low, average, and high anxiety.

Subjects received reinforcement according to continuous and variable-ratio schedules. The stimulus-response contingency included a response class of self-referential statements and reinforcement stimuli of six agreement verbalizations. The experiment consisted of four phases (which included 6, 7, 7, and 4 sessions, respectively): (a) Phase I—establishment of operant baseline; (b) Phase II—continuous reinforcement of all subjects; (c) Phase III—variable-ratio schedule of reinforcement for half of the subjects, and continuous reinforcement for the others; and (d) Phase IV—extinction (no reinforcement of responses). At the conclusion of the final session of Phase IV, each subject answered a 5-item questionnaire designed to measure awareness of the stimulus-response contingency.

Hypotheses basic to the study were:

Hypothesis I: Verbal conditionability of highly
intelligent subjects, as measured by increments and decrements in frequency of the critical-response, is a function of both the level of anxiety and the nature of reinforcement stimuli.

**Corollary I:** The higher the anxiety level, as measured by the Taylor Manifest Anxiety Scale, the more conducive the subject would be to verbal conditioning.

**Corollary II:** Subjects receiving continuous reinforcement would evidence a higher degree of conditionability than those receiving variable reinforcement.

**Hypothesis II:** Ability to extinguish particular subject responses, as measured by decrements in frequency of the critical-response, is a function of both the level of anxiety and the nature of reinforcement stimuli.

**Corollary I:** Once conditioning is evidenced, the higher the level of anxiety, the
less susceptible the subjects would be to extinction attempts.

**Corollary II**: Subjects reinforced on a variable schedule would be less susceptible to extinction attempts than those receiving continuous reinforcement.

An Analysis of Variance Design (Lindquist Type 1) was employed to analyze the data for statistical significance. This statistic afforded maximum scrutiny of each subject, which was one of the basic objectives of the study.

**Conclusions**

On the basis of the findings of this study, it was concluded that the verbal behavior of the highly intelligent subjects showed no significant relationships between intelligence, level of anxiety, and susceptibility to attempts to condition their verbal behavior. This group did not condition in a manner comparable to that of subjects in other research which had found that subjects with higher levels of anxiety were more susceptible to conditioning.
Because this study was unable to find significant differences between anxiety level groups, it was concluded that subjects of all levels were equally susceptible to attempts to condition their verbal behavior.

Because of the significant differences between the mean response frequencies of the operant baseline phase and the performance periods of Phases II, III, and IV, it appeared that the treatment of the subjects in reference to reinforcement stimuli was highly effective. However, upon further examination it was found that only 5 of the 12 subjects experienced change in verbal behavior. It was concluded, therefore, that those subjects whose behavior was conditioned showed such extreme changes that they affected the mean group response frequency for each phase.

In summary, all experimental hypotheses and corollaries were rejected on the basis of the findings of this study. A final conclusion, therefore, was that the performance of this group of highly intelligent subjects showed little resemblance to that of subjects in previous studies.
Recommendations for Further Research

Based on the findings of this study and related research, the following recommendations for further research are made:

1. That a minimum of two anxiety indicators be used to assess the subject's level of anxiety. The anxiety level of each subject in the present study was based on the findings of only one anxiety indicator, i.e., the Taylor Manifest Anxiety Scale. By employing two or more such measures, the possibility of establishing a more reliable estimate of the subject's true level of anxiety would be increased. Other instruments which might be used include the Anxiety Index, IPAT Anxiety Scale, S-R Inventory of Anxiousness, Affect Adjective Check List, and Freeman Manifest Anxiety Test.

2. That similar research be conducted on a 7-day-per-week schedule with equal time occurring between each experimental session. The present study was conducted on a 6-day-per-week basis
with a lapse of approximately 60 hours between the concluding session of 1 week and the initial session of the ensuing week. Even though no empirical evidence of extinction was observed, it was impossible to determine whether subject performance was affected by this time lapse.

3. That a strict interval schedule for presentation of each stimulus card be enforced. In order to increase the proximity of the experimental interaction process to that normally experienced by the subject, this study allowed each subject to progress at his own rate of speed in responding to stimulus cards. The subjects were allowed a 12 minute maximum for emission of 24 responses. The time required for completion of this task varied with each subject and each session.

4. That an attempt be made to determine precisely which stimuli are most successful in reinforcing subjects with low, average, or high
levels of anxiety. This investigation did not attempt to establish exactly which reinforcement stimuli were most effective in shaping subject verbal behavior.

5. That lists of verbs deemed appropriate for similar research be developed. During the 12 daily experimental sessions of this study, it became readily apparent that certain verbs were more conducive to the critical-response than others. Particular verbs appeared most appropriate to "I" statements, while others were never matched with the critical-response.

6. That an investigation be made concerning responses given most frequently by experimental subjects. This recommendation pertains primarily to research which would employ response classes similar to the one used in the present study. One subject in this research consistently chose "She" from the response class of six pronouns.

7. That sufficient stimulus cards be provided in
order to eliminate effects of repetitious stim-
uli. Stimulus cards employed in the present re-
search were repetitious to the extent that the
120 response class orders were duplicated, and
in that each subject viewed approximately half
the cards three different times and the other
half twice.

8. That longer periods of time be allocated for
comparable phases of similar experimentation.
An extension of the length of time spent in each
phase could possibly result in findings not evi-
denced in the present study.

9. That experimentation in a setting which approxi-
mates the interview employ various counseling
approaches with subjects comparable to those
used in this study. Since the subjects' per-
formance during verbal conditioning attempts in
a setting which approximated the interview re-
sulted in rejection of the hypotheses, other
approaches and techniques could result in find-
ings different from those of the present study.
REFERENCES
References


Daily, C. M. Verbal conditioning without awareness. 


APPENDIX A

STIMULUS VERB LIST
Stimulus Verb List

compressed rejected served
sacked expected raised
dictated censured complicated
awaited rejected rejected
sent watched
inhibited stopped
felt defeated
changed accompanied
initiated alerted
painted injured
overwhelmed practiced
massacred scored
symbolized handled
adopted converted
acquired excluded
appreciated retained
financed evaluated
evoked met
attempted limited
debated retarded
permitted exposed
followed roused
lost indicated
lost added amused
added carried
cooled lined
spoke predicted
fashioned dug
tested rode
suggested had
followed exposed
supported drank
extended proved
revised endorsed
permitted received
initiated selected
served suggested
suggested devised
sent received
sent pressed
rotated  mentioned  strengthened  reserved  offered  recorded  fenced  divided  cautioned  valued  talked  killed  disrupted  examined  increased  caused  educated  divulged  passed  tackled  cleared  cared  outplayed  fixed  obtained  framed  published  undertook  studied  organized  missed  created  showed  named  produced  moved  butchered  lifted  supplemented  affected  distributed  dangled  faced  introduced  corrected  interchanged  gauged  recited  submerged  knew  concluded  explained  summed  objected  foresaw  proposed  emphasized  tuned  imprinted  abolished  hung  reported  played  preached  regarded  kept  fascinated  noted  discounted  designed  buried  generated  threatened  forecasted  bore  transformed  dissected  achieved  furthered  accommodated  joined  prescribed  required  delayed  removed  thought  hoped  surpassed  impressed  wrapped  recalled  duplicated  wanted  cornered  patched  drove  protected  combined  disturbed  induced  established  smuggled  misconstrued  reconstructed  discovered  overcame  seized  claimed  revealed  coined  incorporated  characterized  employed  ran  scrutinized  disciplined  murdered  granted  ignored  dismissed
respected  answered  blackmailed  calculated  transmitted  renegotiated  demonstrated  punished  evaporated  invited  broadcasted  emancipated  expressed  stopped  approached  isolated  dried  believed  entered  flew  modernized  addressed  repaid  interpreted  led  maintained  flogged  condemned  imposed  washed  implemented  submitted  rumored  conceded  smashed  remodeled  explored  caught  refined  troubled  justified  replenished  confiscated  promised  discussed  exceeded  checked  connected  assumed  controlled  transferred  absorbed  wished  overruled  reached  cemented  committed  conquered  lived  projected  solved  restated  founded  described  dwelt  counted  grasped  provided  observed  repeated  smothered  bungled  chased  renewed  hindered  abandoned  resolved  exercised  attracted  knocked  relieved  resisted  represented  excavated  prolonged  judged  built  shot  identified  cheered  understood  reviewed  probed  damaged  revised  held  ascertained  criticized  surrounded  interrupted  formulated  inferred  worked  phrased  repaired  elected  paid  restored  broke  restrained  disguised  applauded  sought  outvoted  discarded  regretted  recognized  sang  touched  uprooted
treated  
influenced  
altered  
deduced  
radiated  
modified  
marked  
compensated  
used  
feared  
implied  
determined  
left  
quoted  
evolved  
comprehended  
did  
rebuilt  
executed  
took  
plotted  
dealt  
measured  
constructed  
displayed  
computed  
occupied  
destroyed  
surprised  
considered  
pruned  
governed  
shook  
commissioned  
forgot  
won  
inspected  
needed  
revived  
bowled  
thrashed  
paired  
pursued  
installed  
stimulated  
stated  
penetrated  
umasked  
reintroduced  
returned  
hired  
warmed  
dominated  
started  
sorted  
presented  
told  
trained  
detained  
arranged  
cancelled  
attacked  
posted  
conducted  
matched  
placed  
learned  
persecuted  
gave  
convinced  
allowed  
heated  
elaborated  
helped  
assisted  
saw  
formed  
reduced  
defined  
overturned  
aided  
penalized  
blazed  
demanded  
advised  
refused  
substantiated  
entertained  
launched  
registered  
closed  
denied  
asked  
depicted  
listed  
developed  
revoked  
mistook  
neglected  
preceded  
marred  
ignored  
arrested  
discredited  
favored  
nursed  
performed  
taught  
wasted  
detected  
satisfied  
supplied  
prevented  
found  
feared  
administered  
advanced  
opened  
summoned  
eliminated
punctuated
reinforced
startled
deciphered
planned
ordered
furnished
viewed
curtailed
opposed
brought
filmed
wrote
embarrassed
transacted
accomplished
regenerated
blocked
APPENDIX B

CONTENTS OF STIMULUS CARDS
Contents of Stimulus Cards

They, She, I, You, We, He—Penalized
He, I, We, She, They, You—Resisted
She, You, I, We, He, They—Condemned
They, He, She, I, You, We—Committed
She, They, He, I, You, We—Tackled
I, He, They, You, We, She—Prejudged
They, We, You, He, She, I—Judged
I, They, We, He, She, You—Proved
They, We, She, I, You, He—Pruned
She, They, He, I, You, We—Destroyed
He, She, They, I, You, We—Suggested
I, He, She, They, You, We—Surrounded
They, I, We, He, She, You—Carried
We, He, You, She, They, I—Reconstructed
They, She, He, I, You, We—Achieved
He, I, She, They, You, We—Drove
He, They, I, You, We, She—Excavated
You, He, We, She, They, I—Scored
I, You, She, They, We, He—Flogged
I, You, They, We, He, She—Dwelt
We, He, She, They, I, You—Occupied
He, You, They, I, We, She—Devised
They, He, You, We, She, I—Probated
They, You, He, She, I, We—Advised
They, You, We, He, She, I—Revealed
She, We, He, They, I, You—Investigated
She, We, I, You, He, They—Openend
He, You, We, She, They, I—Ignored
We, He, I, You, She, They—Objected
They, We, You, He, She, I—Talked
We, She, You, He, They, I—Cooled
They, We, She, I, You, He—Grasped
He, We, They, I, You, She—Endorsed
I, She, You, We, He, They—Repeated
He, I, You, We, She, They—Employed
They, I, You, We, He, She—Listed
He, You, We, She, They, I—Printed
We, They, You, He, She, I--Reorganized
She, We, You, He, They, I--Fashioned
She, He, I, You, We, They--Overturned
You, She, They, I, We, He--Retained
She, You, I, We, He, They--Repaired
You, He, They, I, We, She--Computed
They, We, He, She, I, You--Comprehended
She, We, They, I, You, He--Educated
I, She, They, You, We, He--Replenished
I, He, You, We, She, They--Defined
He, They, You, We, She, I--Returned
He, We, You, She, They, I--Repaid
I, You, She, They, We, He--Scrutinized
You, She, They, I, We, He--Represented
They, She, You, We, He, I--Governed
I, We, He, She, They, You--Stored
We, She, They, I, You, He--Feared
I, He, She, They, You, We--Complicated
I, He, We, She, They, You--Dried
He, We, She, They, I, You--Justified
I, He, We, She, They, You--Regarded
She, They, We, He, I, You--Chained
She, He, They, I, You, We--Dismissed
You, He, We, She, They, I--Rewarded
He, She, I, You, We, They--Sang
He, They, We, She, I, You--Detained
They, He, We, She, I, You--Examined
She, I, You, We, He, They--Framed
She, You, They, I, We, He--Reinforced
They, She, We, He, I, You--Brought
We, You, She, They, I, He--Said
I, She, He, They, You, We--Suspended
We, You, I, He, She, They--Evoked
They, I, He, She, You, We--Evaluated
She, We, They, I, You, He--Discredited
You, They, We, He, She, I--Altered
We, He, I, You, She, They--Interpreted
You, They, I, We, He, She--Startled
They, She, He, I, You, We--Phrased
You, He, I, We, She, They—Conceded
I, He, They, You, We, She—Supplied
We, I, He, She, They, You—Bought
He, She, We, They, I, You—Caught
She, They, I, You, We, He—Defeated
He, I, They, You, We, She—Smashed
You, She, We, He, They, I—Corrected
They, I, She, You, We, He—Varied
You, She, We, He, They, I—Predicted
They, You, He, She, I, We—Proposed
He, They, She, I, You, We—Mounted
We, They, I, You, He, She—Described
I, She, We, He, They, You—Plotted
They, She, I, You, We, He—Treated
He, She, We, They, I, You—Imprinted
They, You, She, I, We, He—Recognized
We, You, She, They, I, He—Modernized
She, You, He, They, I, We—Established
I, We, You, He, She, They—Did
They, She, We, He, I, You—Renegotiated
I, You, He, She, They, We—Found
You, We, She, They, I, He—Quoted
I, You, We, He, She, They—Displayed
He, They, You, We, She, I—Limited
She, I, We, He, They, You—Understood
They, You, We, He, She, I—Explored
He, We, I, You, She, They—Produced
I, They, You, We, He, She—Added
We, They, You, He, She, I—Punished
I, They, You, We, He, She—Refused
He, You, She, They, I, We—Protected
You, They, We, He, She, I—Nursed
I, She, They, You, We, He—Cared
He, We, You, She, They, I—Alerted
We, You, He, She, They, I—Accompanied
I, She, He, They, You, We—Trapped
I, He, You, We, She, They—Wished
You, She, He, They, I, We—Followed
They, You, I, We, He, She--Transferred
We, I, She, They, You, He--Removed
He, You, She, They, I, We--Reached
We, I, You, He, She, They--Applauded
She, I, He, They, You, We--Shook
He, She, You, We, They, I--Formed
She, You, We, He, They, I--Advanced
I, We, They, You, He, She--Saw
You, I, She, They, We, He--Passed
I, You, They, We, He, She--Initiated
She, They, I, You, We, He--Thrashed
They, I, He, She, You, We--Disrupted
He, We, They, I, You, She--Felt
She, I, They, You, We, He--Satisfied
We, He, They, I, You, She--Touched
I, We, They, You, He, She--Permitted
You, They, He, She, I, We--Required
They, We, I, You, He, She--Pulled
We, You, I, He, She, They--Presented
She, I, He, They, You, We--Broke
We, She, I, You, He, They--Isolated
He, I, You, We, She, They--Served
You, We, I, He, She, They--Recorded
He, She, I, You, We, They--Left
I, She, We, He, They, You--Forgot
You, He, They, I, We, She--Launched
You, He, I, We, She, They--Sought
You, I, They, We, He, She--Impressed
We, She, You, He, They, I--Duplicated
You, She, I, We, He, They--Cancelled
They, We, I, You, He, She--Radiated
They, He, You, We, She, I--Favored
You, They, I, We, He, She--Rode
You, I, He, She, They, We--Mentioned
You, I, She, They, We, He--Amused
I, We, She, They, You, He--Learned
He, I, They, You, We, She--Dominated
We, They, He, She, I, You--Restored
We, I, She, They, You, He--Respected
We, They, I, You, He, She—Implied
He, They, We, She, I, You—Butchered
They, She, You, We, He, I—Killed
You, They, She, I, We, He—Identified
You, They, He, She, I, We—Expected
He, You, I, We, She, They—Granted
I, We, She, They, You, He—Ran
We, I, You, He, She, They—Converted
You, We, He, She, They, I—Introduced
You, We, She, They, I, He—Dealt
We, They, He, She, I, You—Curtailed
I, We, He, She, They, You—Helped
He, You, They, I, We, She—Interchanged
We, They, She, I, You, He—Misled
We, She, He, They, I, You—Outplayed
You, We, They, I, He, She—Fixed
She, They, You, We, He, I—Reduced
She, I, We, He, They, You—Taught
We, You, They, I, He, She—Uprooted
You, I, He, She, They, We—Massacred
They, You, I, We, He, She—Punctuated
You, We, They, I, He, She—Bit
He, She, You, We, They, I—Evaporated
They, I, You, We, He, She—Excluded
They, He, We, She, I, You—Handled
You, They, She, I, We, He—Patched
You, I, We, He, She, They—Lost
I, They, He, She, You, We—Knocked
She, They, We, He, I, You—Tuned
He, We, I, You, She, They—Fascinated
You, I, We, He, She, They—Appreciated
I, You, We, He, She, They—Stimulated
She, We, I, You, He, They—Paired
We, She, He, They, I, You—Aided
She, He, We, They, I, You—Wrote
He, They, She, I, You, We—Improved
I, We, You, He, She, They—Picked
We, She, I, You, He, They—Retarded
I, You, He, She, They, We—Confirmed
She, He, You, We, They, I--Dangled
We, He, She, They, I, You--Changed
You, I, They, We, He, She--Undermined
We, I, They, You, He, She--Hired
We, He, They, I, You, She--Dispersed
I, They, She, You, We, He--Overthrew
She, He, They, I, You, We--Lined
You, He, She, They, I, We--Censured
She, We, He, They, I, You--Withdrew
She, You, We, He, They, I--Stopped
We, You, He, She, They, I--Acquired
She, I, You, We, He, They--Painted
He, You, I, We, She, They--Watched
We, They, She, I, You, He--Executed
We, You, They, I, He, She--Promised
She, He, We, They, I, You--Extended
I, They, We, He, She, You--Dug
They, I, We, He, She, You--Hindered
He, We, She, They, I, You--Concluded
We, He, You, She, They, I--Trained
She, He, I, You, We, They--Regenerated
We, I, They, You, He, She--Performed
I, She, You, We, He, They--Remodeled
We, She, They, I, You, He--Elected
She, We, You, He, They, I--Reserved
She, You, He, They, I, We--Forecasted
They, He, She, I, You, We--Warned
You, He, She, They, I, We--Sent
We, I, He, She, They, You--Counted
They, He, I, You, We, She--Furthered
You, She, I, We, He, They--Measured
You, She, He, They, I, We--Ascertained
I, They, He, She, You, We--Mistook
She, He, You, We, They, I--Lifted
He, I, We, She, They, You--Modified
She, I, They, You, We, He--Matched
They, I, She, You, We, He--Wasted
They, He, I, You, We, She--Misconstrued
I, They, She, You, We, He--Obtained
They, You, She, I, We, He--Inferred
She, You, They, I, We, He--Showed
They, We, He, She, I, You--Reintroduced
He, They, I, You, We, She--Bowled
He, She, They, I, You, We--Spoke
She, They, You, We, He, I--Thought
He, I, She, They, You, We--Shot
You, We, He, She, They, I--Smothered
APPENDIX C

CONTINUOUS REINFORCEMENT PHASE PATTERN
Continuous Reinforcement Phase Pattern

<table>
<thead>
<tr>
<th>First Day</th>
<th>Second Day</th>
<th>Third Day</th>
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<th>Fifth Day</th>
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APPENDIX D

CONTINUOUS AND VARIABLE REINFORCEMENT PHASE PATTERN
<p>| Continuous and Variable Reinforcement Phase Pattern |
|----------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Seventh Day                     | good   | good   | mm-hmm | right  | good   | o.k.   | fine   | yes    | yes    | mm-hmm | fine   |
| Sixth Day                       | o.k.   | good   | o.k.   | fine   | good   | fine   | o.k.   | mm-hmm | yes    | yes    | fine   |
| Fifth Day                       | mm-hmm | good   | mm-hmm | mm-hmm | right  | mm-hmm | fine   | fine   | yes    | o.k.   |
| Fourth Day                      | o.k.   | right  | fine   | fine   | mm-hmm | o.k.   | good   | mm-hmm | yes    | o.k.   | yes    |
| Third Day                       | good   | o.k.   | fine   | fine   | o.k.   | mm-hmm | o.k.   | mm-hmm | fine   | wt   |
| Second Day                      | o.k.   | o.k.   | right  | o.k.   | fine   | fine   | mm-hmm | fine   | yes    | mm-hmm |
| First Day                       | mm-hmm | fine   | o.k.   | fine   | fine   | fine   | fine   | yes    | yes    | fine   | good   |</p>
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123
APPENDIX E

SUBJECTS' TOTAL CRITICAL-RESPONSE FREQUENCY

PER EXPERIMENTAL SESSION
Fig. 1. S1—Total response frequency per experimental session.
Fig. 2. S 2—Total response frequency per experimental session.
Fig. 3. S 3—Total response frequency per experimental session.
Fig. 4. S 4--Total response frequency per experimental session.
Fig. 5. S 5—Total response frequency per experimental session.
Fig. 6. S6—Total response frequency per experimental session.
Fig. 7. S 7—Total response frequency per experimental session.
Fig. 8. **S**8--Total response frequency per experimental session.
Fig. 9. S 9--Total response frequency per experimental session.
Fig. 10. — Total response frequency per experimental session.
Fig. 11. S 11--Total response frequency per experimental session.
Fig. 12. **S 12**—Total response frequency per experimental session.