

CONCEPT CONDITIONING IN THE
HUMAN ORGANISM

By

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CHAPTER I

STATEMENT OF THE PROBLEM

Purpose of the Study

The purpose of this study was to investigate the effects of using positive, undetected, verbal reinforcement, consisting of "mmm hmm" and "That's good," to instrumentally condition the perceptual learning of an ambiguous perceptual task. (Of specific interest were the following questions. (1) To what degree, if any, does undetected, verbal reinforcement instrumentally condition meaningful perceptual structuring of an ambiguous stimulus as demonstrated through consequential behavior; (2) If undetected, verbal reinforcement does have an effect upon the meaningful structuring of the percept of an ambiguous stimulus does the effect operate only in one direction or can it also operate in the opposite direction.) That is, if verbal reinforcement can influence, through instrumental conditioning, the meaningful structuring of perception of an ambiguous stimulus as being one of two things, can it, being selectively applied in the opposite direction, influence the meaningful structuring of the percept as being the other of the two things. Thus, it was the specific intent to investigate whether positive reinforcement in the form of "mmm hmm" and "that's good" both of words with abstract and concrete meaning would result in the subject's perceptually learning to respond with choices of words having abstract or concrete meaning concomitant with the reinforcing

condition.

This meaningful structuring of a percept (figure) in the cognitive process has been identified by Sherif and Sherif (1956) as being the interpretive contribution of the frame-of-reference.

That is, the percept is interpreted in accordance with whatever frame-of-reference exists in the cognitive field. Frame-of-reference is defined by them as follows:

a system of functional relations among factors operative at a given time which determine psychological structuring and hence behavior. (Sherif and Sherif, 1956, p. 80).

Thus, when a stimulus is presented, its perceptual structuring is determined by the referent setting or frame-of-reference present. Basically, we were interested in finding whether it was possible, through instrumental conditioning, for subjects to learn a particular frame-of-reference (abstract or concrete) from which perceptual structuring of the presented stimuli would be interpreted in the reinforced direction.

The term "undetected" was defined as unawareness on the part of the subject as to the method and purpose of the study. He was unable, when interrogated, to verbalize either the investigation's intent or to state or identify the contingency between response and reinforcement. Positive, verbal reinforcement was defined as a general, spoken approval of a particular categorical response. An ambiguous stimulus is regarded as a sense impression which for lack of contextual cue(s) can be logically or equally well interpreted in two or more categories of meaning or frames-of-reference. In this study, the two frame-of-reference categories were concrete meaning and

abstract meaning. The perceptual task involved is the solving of the ambiguity of the sense impression through assignment of the initially ambiguous stimulus to one of two equally possible frame-of-reference categories (concrete or abstract) of meaning. Ambiguous stimuli used were in the form of homonyms of the English language which are in common usage and, in general, neutral in value affect.

From evidence derived from the research literature, it was expected that through the selective application of a perceptual learning paradigm utilizing undetected verbal reinforcement of the "mmm hmm" and "that's good" variety that it would be possible to structure the frame-of-reference of the sense impression in the intended meaningful manner. It was further expected that the effect of undetected, verbal reinforcement will operate equally well in the perceptual learning of the frame-of-reference for a quantitative (concrete) category as well as of a qualitative (abstract) category and that the manner and category can be predicted in terms of overt response in a forced choice situation between categories of quantitative (concrete) and qualitative (abstract) stimuli. This study will empirically test these expectations.

Theoretical Orientation

The psychological investigation of both learning and perception are significant areas which are used in the formulation of more general systems of psychological theory. Underlying the consideration of perceptual learning, as it is effected by undetected, verbal reinforcement, is the dynamic interaction between the effects of learning

on perception and the effects of perception on learning. This interaction is further modified by the organism's environment in producing behavior. As Sherif and Sherif (1956) have stated, psychological structuring is jointly determined by external and internal factors.

Perception is conceptualized as a process whereby sensory input (sense impressions) is related to behavioral output. Dember (1960) describes this as a "perceptual system" which is a dynamic, interactive process involving sensory feedback and continuous, ongoing modification of the relationship between input and output. Helson (1957) envisages perception as a functional process in the business of living or as a factor in the adaptation of the organism to its surroundings. To Helson, the process of perception involves the apprehension of and reaction to the qualities and properties of objects and events as they interact with the organism. Perception, learning and the effects of the organism's environment are conceptualized as interacting to produce a unity. This has been stated by Sherif and Sherif (1956) as their first postulate of a conceptual approach to social psychology, "Experience and behavior constitute a unity." Dember (1960) specifies a physical aspect and an informational aspect to sensory input. The formal, autochthonous, physical aspect is not of primary concern in this investigation. It is the functional, informative, feedback aspect as it acts as a determinant in behavior that is germane.

Although learning theorists in general lack complete agreement on what constitute the basic factors in human learning, they are in general agreement that the vast majority of human behavior is learned.

Solley and Murphy (1960) conceptualize the dynamic interactions of perception, learning and environment in the determination of psychological structuring as the process of perceptual learning. Perceptual learning is defined by Solley and Murphy as follows:

a change in the status of a logically inferred perceptual state or process as a result of successively applied operations of a learning paradigm.

The dynamic processes of perception (functional aspect) and learning influenced by the effect of undetected verbal reinforcement acting in a direct and automatic manner will follow the principles (postulates) as set forth by Sherif and Sherif (1956) and presented in the next section of this chapter.

The concept of reinforcement in this study is considered in the Dollard and Miller frame-of-reference. Dollard and Miller (1950) propose that the effects of reinforcement can be direct, automatic, and unconscious. Greenspoon's (1950) study on undetected, verbal conditioning is cited as evidence and strong support for their proposal. As a definition of the concept of reinforcement, the "weaker law of effect," as proposed by Meehl (1950), seems most appropriate. Under this law, reinforcers are defined as being those events or operations which have been found experimentally to be reinforcing. Thus, a common generalized reinforcer is "approval." Approval may be little more than a nod of the head or a smile on the part of someone who characteristically is identified as supplying a variety of reinforcements. One variety of this is "mmm hmm" and "that's good" and are considered to be approval as expressed by the experimenter.

Thus, the theoretical orientation of this study can be summarily

stated as a point of view of perceptual learning (as conceptualized by Solley and Murphy) in which the process of perception and learning are dynamically interacting (according to the postulates of Sherif and Sherif) and subject to the effects of reinforcement acting in a direct, automatic and unconscious manner (as proposed by Dollard and Miller). The experimental effect of undetected, verbal reinforcement on perceptual learning of an intended frame-of-reference in the human organism will be tested and interpreted within this theoretical frame-of-reference.

Review of the Literature

The effect of verbal conditioning has been defined by Skinner (1957) as the releasing of a response through the achievement of arranging a contingency between a verbal response and a generalized conditioned reinforcer. Any event which characteristically precedes many reinforcers can be used to bring behavior under control of appropriate stimulation. Earlier it was stated that approval is considered a common generalized reinforcer. Because signs of approval frequently precede specific reinforcements, the behavior they reinforce is likely to be in strength most of the time. Hurlock (1924) in evaluating the effect of incentive upon schoolwork found that verbal praise and reproof significantly effected classroom performance. The basic experimental work in investigation of undetected verbal reinforcement was done by Thorndike (1930) and Thorndike and Rock (1935) using generalized approval reinforcers of "right" and "wrong" as differential reinforcement for specific categories of words

as responses in a free association word test. They found that undetected, verbal reinforcement increased the frequency of reinforced categories. Philbrick and Postman (1955) substantiated the effect as described by Thorndike and Rock (1935) by demonstrating significant learning without awareness in the pairing of words with numbers using generalized approval reinforcement of "right" and "wrong." Greenspoon (1954) using an operant conditioning paradigm in which the reinforcement stimulus is defined as a stimulus introduced following a response that increases the probability of occurrence of that response found that "mmm hmm" significantly increased the frequency of plural noun responses and that "huh uh" decreased the frequency of plural noun responses. Verplanck (1955) used undetected, verbal reinforcement in successfully conditioning the content of conversation in which no subject reported awareness of either the reinforcement or of its contingency to a particular response category. Verplanck reports that he himself was unwittingly conditioned by one of his graduate students while discussing the phenomenon. Wilson and Verplanck (1955) further substantiated the findings of Thorndike and Rock, Greenspoon and Verplanck by successfully using undetected, verbal reinforcement to instrumentally condition the response frequency of "travel" words. They concluded that the "Greenspoon effect" is valid and easily reproduced. Weide (1959) demonstrated the "Greenspoon effect" using affect relevant words. Matarazzo, Saslow and Pareis (1960) failed to achieve the effect with plural nouns but were successful with human related response words. They reasoned that the negative results were due to the normally high

free emission rate in normal conversation of plural nouns (16.9%) over human related words (6.9%). The frequency of human related response words increased as a result of undetected conditioning but the frequency of plural nouns being already high in pre-testing did not significantly change. They suggest that it would be well to determine in advance the free operant rate of word response categories prior to attempting to instrumentally condition through the use of undetected, verbal reinforcement. They also conclude that there exists a differential susceptibility of various response classes to undetected, verbal conditioning which is a function of both free emission rate and of the difficulty of the conceptual level of the words as considered in terms of concept formation. They state as reasonable to predict that simpler conceptual forms should be easier to condition than abstract conceptual forms. Sullivan and Calvin (1959) failed to achieve learning through verbal conditioning when the response class was large and the responses within the class were not conceptually related. They concluded that unconscious learning through undetected, verbal reinforcement is a function of three specifics: (1) specificity of the response class; (2) the subject's unconscious perception of the stimulus as being truly rewarding; and (3) being able to relate the reinforcement to the response. Levin (1961), in review, finds that the concept of undetected, verbal reinforcement as used in instrumentally conditioned unconscious learning is a valid one. However, he cautions that the determination of subject unawareness is of critical importance in establishing this validity.

Levin enumerates two fundamental criteria for the evaluation of awareness: (1) awareness of reinforcement and (2) awareness of the contingency of response to reinforcement, both of which must be verbalized by the subject in postexperimental interview. Greenspoon (1955) employs the following four question open-end questionaire technique to determine awareness:

1. What do you think it was all about?
2. Did you notice any change in the kinds of words you were saying?
3. How long do you think you were saying words?
4. What do you think the purpose of "mmm hmm" was?

The effect of experimenter influence has been treated by Kanfer (1958). He suggests that some verbal response classes are sensitive to a number of concurrent controlling stimuli such as the prestige, status and physical characteristics of the experimenter whose influence can reduce or enhance the direct relationship between reinforcement and response class. Hall (1960) further reports that with a task of minimal, marginal or ambiguous cue(s) the subject may be expected to pay attention to and search for some kind of cue(s) from the experimenter indicating the purpose of the task and the proper direction to take. In a task which is highly structured; that is, makes sense to the subject, the subject is much less likely to pay attention to the experimenter who may be attempting to shape his behavior in the task through undetected verbal reinforcement. When the ambiguous nature of the task arouses within the subject a desire for certain cue(s) from the experimenter, the behavior of the experimenter becomes highly significant in determining experimental set. Under this condition the use of "mmm hmm" and "that's good" are more

consistently effective as reinforcers. Krasner (1958) states that the more ambiguous a situation becomes the greater the need to seek cue(s) as to what to do. In all studies reviewed by Krasner the subject was given a specific task such as make up a story, make up a sentence, answer specific questions, describe a picture. He had little obvious need to seek cue(s) as to what to do. Krasner (1958) found no investigations which utilized the apparent advantages of minimal, marginal or ambiguous cue(s) in verbal conditioning of a perceptual task.

The review of the literature pertinent to this investigation has, thus far, traced the experimental study of verbal conditioning from its experimental inception by Thorndike and Rock (1935) up through Greenspoon (1954) and Verplanck (1955) to the current work of Hall (1960) and Levin (1961). The experimental evidence indicates that the phenomenon is a valid one and occurs under conditions of unawareness of either reinforcement or what is being learned. It apparently acts in the direct, automatic and unconscious manner proposed by Dollard and Miller (1950). Similarly the effect of approval as a generalized reinforcer has been traced from Hurlock (1924) up to the present as a recurring and valid phenomenon. Specifics noted as being important in the undetected, verbal reinforcement effect upon perceptual learning are (1) the importance of determination of the free operant response rate of a response class prior to attempting verbal conditioning, (2) the differential susceptibility of various response classes to verbal conditioning as a function of the word's conceptual level in terms of difficulty of concept formation, (3)

specificity of the response class, (4) the necessity of unconscious perception of the response as being related to the reinforcement, (5) the recognition of the reinforcement by the subject as being truly rewarding, (6) the criticality of determining awareness on the part of the subject and (7) the importance of the behavior of the experimenter under conditions of minimal, marginal or ambiguous cue(s).

Sherif and Sherif (1956) have investigated the basic facts and principles of psychological structuring in a conceptual approach to social-psychological problems. The principles have been stated in concise form as postulates which constitute a conceptual frame-of-reference emphasizing the dynamic interaction of perception and learning in the determination of psychological structuring as demonstrated by consequential overt behavior. Two principles are stressed as crucial in the determination of psychological structuring (1) psychological selectivity and (2) the relative effects of structured and unstructured stimulus situations. The consequences of loss of stable anchorages and conflicting anchorages as postulated by Sherif and Sherif have direct applicability in this investigation of the effects of undetected verbal reinforcement upon unconscious perceptual learning. The psychological selectivity of subjects has been instrumentally conditioned through undetected, verbal reinforcement in the unconscious perceptual learning of an ambiguous perceptual task. The use of ambiguous stimuli in the perceptual task has been deliberately employed to produce the conditions of loss of anchorages and conflicting anchorages as postulated by Sherif and Sherif. Therefore the following postulates of Sherif and Sherif (1956) are of central importance to the

ideation, experimentation, and interpretive results of this study.

Postulate 2. Behavior follows central psychological structuring.

Postulate 3. Psychological structuring is jointly determined by external and internal factors.

Postulate 6. Structured stimulus situations set limits to alternatives in psychological structuring.

Postulate 7. In unstructured stimulus situations, alternatives in psychological structuring are increased.

Postulate 8. The more unstructured the stimulus situation, the greater the relative contribution of internal factors in the frame-of-reference.

Postulate 9. The more unstructured the stimulus situation, the greater the relative contribution of external social factors in the frame-of-reference.

The foregoing empirically derived postulates of Sherif and Sherif form the theoretical substance to which the hypotheses of this study are unalterably tied.

Statement of Hypotheses

In general, it was the concern of this study whether undetected, verbal reinforcement would operate selectively to determine the perceptual learning of an intended frame-of-reference in the human organism, such that an ambiguous stimulus would be perceived in the intended direction of meaning. Specifically, it was expected that undetected, verbal reinforcement of the "mmm hmm" and "that's good" variety would act to condition instrumentally the unconscious perceptual learning of either a quantitative (concrete) or a qualitative (abstract) frame-of-reference category in responding to an ambiguous stimulus. This involved a forced choice response between words of concrete or abstract meaning. It is further expected that the perceptual learning of concrete and abstract categories by use of

undetected, verbal reinforcement will be significantly greater than the perceptual learning of concrete and abstract categories under conditions of no reinforcement. In conclusion it is expected that the perceptual learning, under conditions of undetected, verbal reinforcement, for either concrete response words or abstract response words will not vary significantly from one another.

Summary

In summary, this study is theoretically orientated toward the dynamic, interactive frame of reference in its consideration of perception, learning and organismic environment. Specifically the effects of undetected, verbal reinforcement in the instrumental conditioning of the perceptual learning of a perceptual task have been investigated. These investigations have shown the effectiveness of approval as an undetected, verbal reinforcer acting in a direct, automatic and unconscious manner in the instrumental conditioning of perceptual learning. It has been shown that perceptual learning can be conditioned using this method. The method has been referred to as the "Greenspoon effect." Important specifics of the method have been identified as experimenter influence, subject awareness and the relative structure of the perceptual task situation in terms of minimal, marginal or ambiguous cue(s). It has been pointed out that the principles of psychological structuring involved in perceptual learning and the solution of perceptual tasks under all conditions follow the principles postulated by Sherif and Sherif (1956).

In the next chapter, the methodology employed in this investigation of perceptual learning under conditions of undetected, verbal reinforcement and ambiguous stimulus situation will be detailed.

CHAPTER II

THE EXPERIMENTAL PROCEDURE

Method

The purpose of this study, as stated in Chapter I, was to investigate the effects of positive, undetected, verbal reinforcement consisting of "mmm hmm" and "that's good" on the instrumental conditioning of the perceptual learning of an ambiguous perceptual task. The variables of (1) subjects, (2) perceptual task, (3) measurement technique, (4) procedure, and (5) research design will be delineated in this chapter.

The experimental procedure utilized three equated groups of ten subjects each. Each group underwent different conditions of perceptual learning. The perceptual task involved the solution of a forced choice between a quantitative (concrete) or qualitative (abstract) word as a response to an ambiguous stimulus. Homonyms of the English language were used as ambiguous stimuli for the forced choice of either a concrete or abstract response word. The ambiguous stimulus (homonym) was presented verbally by the experimenter. The subject was then required to circle his response from paired concrete and abstract words in a forced choice manner. No alternative responses were available or permitted by the instructions. Response tempo was deliberately kept rapid; the experimenter presented each succeeding ambiguous stimulus immediately following the preceeding

response. Results were tabulated as the proportion of either concrete or abstract choices of the total number of responses.

Variables

The independent variable was positive, undetected, verbal reinforcement. There were two levels of the independent variable (a) 100%, positive, undetected, verbal reinforcement and (b) no reinforcement. The form of the independent variable was that of generalized social approval delivered verbally by the experimenter as "mmm hmm" and "that's good." The independent variable was selectively manipulated by the experimenter across the three groups. The control group received no reinforcement throughout the experiment. The two experimental groups received 100%, positive, undetected, verbal reinforcement as described. Group I received reinforcement for concrete response words and no reinforcement for abstract response words during the training session. Group II received reinforcement for abstract response words and no reinforcement for concrete response words during the training session. All groups were initially surveyed under conditions of no reinforcement and were tested under conditions of no reinforcement. The experimenter's manipulation of the independent variable (verbal reinforcement) was determined to be undetected by the subject.

The dependent variable was the effect of positive, undetected, verbal reinforcement upon the perceptual learning of an ambiguous perceptual task. There were two levels of the dependent variable (a) the proportion of concrete response words of the total response

words and (b) the proportion of abstract response words of the total response words. The measurement of the dependent variable was taken in concrete and abstract frequencies recorded during the test session. The test session comprised the presentation of 25 ambiguous stimuli to the subject with a forced choice response to words having either a concrete or abstract meaning. The recorded frequencies were transformed into proportions initially and finally into arcsin values for statistical treatment which will be discussed in detail in the next chapter.

Subjects

A survey of potential subjects was made of 170 students enrolled in Psychology 213, the first course in the Psychology curriculum and populated predominately by college sophomores. The survey instrument was a list of 100 stimulus words each having a forced choice response of either a word having a concrete meaning or a word having an abstract meaning.¹ Both response words (concrete and abstract) were, in general, considered to be an equally logical or meaningful choice for association with the stimulus word. The survey was conducted under conditions of no reinforcement. The subjects were not told the purpose of the survey or that further testing as an experimental subject might be involved. The words used to construct the survey instrument were words of common usage as determined by the Thorndike and Lorge (1944) word list. The words selected from Thorndike and Lorge were considered, in general, to be of neutral value affect.

¹Appendix A

A total of 30 subjects were selected using a criteria of .5 probability for making either a concrete or abstract word response to a neutral stimulus word under forced choice response conditions. The entire 30 fell within a probability range of .48 to .52 for making either response. The entire population was nearly normally distributed (Figure 1) with a slight negative skew evident. Of the 30 subjects selected 14 were responding precisely at the .5 probability level for making either a concrete or abstract word response. For the purpose of this study the subjects falling within the .48 to .52 probability range were considered to be responding at the chance level for making either a concrete or abstract word response. The subjects were randomly assigned to the control and two experimental groups by use of Steele and Torrie's (1960) table of random numbers.

Perceptual Task

The perceptual task was the psychological structuring of an ambiguous stimulus as a percept having either concrete or abstract frame-of-reference. The ambiguous stimulus was a homonym presented verbally by the experimenter. The subject was required to psychologically structure a percept as having either a concrete or an abstract frame-of-reference in a situation of forced choice word response between two equally logical and meaningful words having respectively concrete and abstract connotation. A list of 120 homonyms were selected from the Thorndike and Lorge word list as being in common usage and, in general, neutral in value affect. The concrete and abstract words selected as alternatives in the forced choice situation

RESULTS OF POPULATION SURVEY TO DETERMINE PROBABILITY OF GIVING
A CONCRETE OR ABSTRACT FORCED CHOICE RESPONSE TO
A NEUTRAL STIMULUS WORD



were chosen under the same criteria. The 75 homonyms judged to be most common and neutral were selected from the original list of 120. The following examples were taken from the training and test lists of ambiguous stimuli (homonyms) and are presented together, for illustrative purposes, with the forced choice response category words having either a concrete or abstract frame-of-reference.

TABLE I

ILLUSTRATION OF AMBIGUOUS STIMULI WITH
FORCED CHOICE FRAME-OF-REFERENCE

Ambiguous Stimuli (Homonyms)	Forced Choice Frame-of-Reference	
	Concrete	Abstract
Sole/Soul	Leather	Spirit
Urn/Earn	Vase	Deserve
Mail/Male	Postman	Masculine
Seam/Seem	Thread	Appear
Altar/Alter	Sermon	Modify

Two lists² were compiled; a training list² of 50 homonyms (of the 75) and a test list³. Appropriate forced choice word responses of concrete and abstract conceptual meaning were presented to the subject so that he could demonstrate his perception by circling his choice of frame-of-reference category (concrete or abstract) when given

²Appendix B.

³Appendix C.

the ambiguous verbal stimulus by the experimenter. All groups were given the same training and test lists but under differing experimental conditions. The perceptual task for all groups was the same. The subject was verbally given an ambiguous stimulus by the experimenter and selected from a forced choice situation either a concrete or abstract response category according to his psychological structuring of the perception of the ambiguous stimulus and the frame-of-reference meaning given to it as demonstrated by his overt behavior in circling a concrete or abstract category word.⁴

The control group performed the perceptual task in training and test under conditions of no reinforcement. The experimental group I performed the perceptual task in the training situation receiving positive, undetected, verbal reinforcement for making concrete category choices in response to the ambiguous stimuli. The experimental group II performed the perceptual task in the training situation receiving positive, undetected, verbal reinforcement for making abstract category choices in response to the ambiguous stimuli. Reinforcement was given by the experimenter in the form of "mmm hmm" and "that's good." All groups then performed the perceptual task in the test situation under conditions of no reinforcement. Performance for all groups in the test situation was recorded as frequencies of concrete and abstract category responses and tabulated for statistical analysis.

⁴Appendixes D and E.

Measurement Technique

The test situation consisted of the experimenter verbally presenting 25 homonyms (ambiguous stimuli) to each subject individually, who solved the perceptual task through the psychological structuring of the percept of the ambiguous stimuli as either concretely or abstractly meaningful and demonstrating this conceptualization by circling either a concrete or abstract word response in a forced choice situation. The number of responses were recorded as concrete or abstract frequencies for each experimental condition and the control. These frequencies were put into tabular format, converted to proportions and then to percentage values and finally transformed into arcsin values by reference to the appropriate table presented by Steele and Torrie (1960). The purpose and rationale of this procedure and the statistical analysis performed is more fully explained in the following chapter.

Procedure

All subjects were trained and tested under the same conditions by a single experimenter. Subjects were randomly assigned to respective groups. The subjects were not told the intent or purpose of the investigation. The subjects were not presented with a specific "learning" task; that is, they were not asked to learn a specific set or sequence of syllables or paired associates. The subjects were not told that learning was involved. All training and testing was accomplished in the same room with undisturbed arrangement and under relative isolation from extraneous distraction. The experimenter

gave brief instructions as to what was required of the subject until assured that the subject understood sufficiently to perform the task. The experimenter then presented the ambiguous stimuli (homonyms) in measured sequence delivering or withholding verbal reinforcement in the form of "mmm hmm" and "that's good" as dictated by the group designation of the subject. Testing was administered immediately following training. The time required to train and test one subject was approximately 0:15 minutes. Following the test the subject was asked four questions of the open-end questionnaire technique type employed by Greenspoon (1954).

1. What do you think the purpose of this experiment is?
2. Did the presence of the experimenter bother you in making your choices?
3. Did the presence of the experimenter influence your choice of words in any way?
4. Do you think the experimenter's presence or behavior could influence your decisions in choosing words?

This questionnaire was employed as a criterion in determining subject awareness of reinforcement and the contingency between response and reinforcement. A "yes" answer to any of the four questions was considered cause to reject the data gained from that subject. At the close of the run the subject was told that the intent and purpose of the proceedings would be fully explained at a later date. No other explanations were given. The data was compiled and statistically analyzed for significance and interpretation. The procedures and results are presented in the following chapter.

Experimental Design

The experimental design follows Lindquist's (1953) type I design (simple random design) in which each treatment was independently

administered to a different sample of subjects all of whom were drawn at random from the same parent population. There were two experimental groups and one control group. Each group received treatment (or no treatment as in the control group) independently of one another. Reasonably normal distribution in the parent population was determined by the conduction of a pilot survey prior to sampling the experimental population. Experimenter influence was held constant through the employment of a single experimenter for all subjects. Extraneous distraction was controlled by training and testing under the same physical conditions for each subject in an atmosphere of relative isolation. In the next chapter the data obtained is reported and statistically analyzed.

CHAPTER III

RESULTS

Population Survey

In this chapter, the results of the investigation are presented and statistically analyzed. In preparation to gathering data on the effect of undetected, verbal reinforcement on the perceptual learning of an ambiguous perceptual task under conditions of minimal cue(s) a survey of the population was conducted to sample those individuals having a chance level, .5 probability, response to ambiguous stimuli in the manner in which they psychologically structured the percept as existing in either a concrete or abstract frame-of-reference. A probability range of .48 to .52 for structuring the ambiguous stimuli in either a concrete or abstract frame-of-reference was established as chance level for the purposes of this study.

Treatment by Groups

A total of 30 subjects were assigned to one control group and two experimental groups. Experimental group I received undetected, verbal reinforcement for concrete structuring of the frame-of-reference and experimental group II received undetected, verbal reinforcement for abstract structuring of the frame-of-reference. The control group received no reinforcement. All groups were tested under conditions of no reinforcement and the data gathered in the form of response frequencies for concrete and abstract response words to homonyms

(ambiguous stimuli).

Statistical Analysis

The small sample size, 10, made it desirable to employ Student's *t* test in comparing the control with each of the experimental groups for significant effect of the treatments. In order to facilitate the use of Student's *t* the data were converted into proportions and from proportions into percentages so that the arcsin table could be utilized to transform the data into inverse sine values. There are several advantages to this procedure; (1) it tends to normalize the data; (2) it makes the means and variances independent; (3) it makes the variance stable, and (4) it makes valid the application of tests for significance which requires that the experimental error be independently and normally distributed with a common variance. The data was transformed by reference to the arcsin percentage transformation table presented by Steele and Torrie (1960). Significance between the control group and each experimental group and between experimental groups was tested through the application of Student's *t* test for significance of differences between means. The confidence level for rejection of the null hypothesis was arbitrarily established at the .01 level. The data as obtained from the investigation are presented on the following page with the conversions of the frequencies to proportions with transformation into arcsin values identified. The results of the tests of significance are indicated on the following page for each comparison made.

TABLE II

STATISTICAL COMPARISON OF CONTROL GROUP (CONCRETE)
WITH EXPERIMENTAL GROUP I (CONCRETE)

Control (Concrete)			Experimental I (Concrete)		
freq.	p	arcsin	freq.	p	arcsin
10	0.40	39.23	21	0.84	66.42
14	0.56	48.45	19	0.76	60.67
12	0.48	43.85	19	0.76	60.67
15	0.60	50.77	18	0.72	58.05
14	0.56	48.45	18	0.72	58.05
13	0.52	46.15	17	0.68	55.55
11	0.44	41.55	15	0.60	50.77
11	0.44	41.55	18	0.72	58.05
13	0.52	46.15	16	0.64	53.13
14	0.56	48.45	17	0.68	55.55

 $\alpha = 0.01$ $t = 6.6975$ $P < 0.01$

TABLE III

STATISTICAL COMPARISON OF CONTROL GROUP (ABSTRACT)
WITH EXPERIMENTAL GROUP II (ABSTRACT)

Control (Abstract)			Experimental II (Abstract)		
freq.	p	arcsin	freq.	p	arcsin
15	0.60	50.77	17	0.68	55.55
11	0.44	41.55	15	0.60	50.77
13	0.52	46.15	18	0.72	58.05
10	0.40	39.23	23	0.92	73.57
11	0.44	41.55	18	0.72	58.05
12	0.48	43.85	19	0.76	60.67
14	0.56	48.45	19	0.76	60.67
14	0.56	48.45	20	0.80	63.44
12	0.48	43.85	19	0.76	60.67
11	0.44	41.55	21	0.84	66.42

 $\alpha = 0.01$ $t = 7.0875$ $P < 0.01$

TABLE IV

STATISTICAL COMPARISON OF EXPERIMENTAL GROUP I (CONCRETE)
WITH EXPERIMENTAL GROUP II (ABSTRACT)

Experimental I (Concrete)			Experimental II (Abstract)		
freq.	p	arcsin	freq.	p	arcsin
21	0.84	66.42	17	0.68	55.55
19	0.76	60.67	15	0.60	50.77
19	0.76	60.67	18	0.72	58.05
18	0.72	58.05	23	0.92	73.57
18	0.72	58.05	18	0.72	58.05
17	0.68	55.55	19	0.76	60.67
15	0.60	50.77	19	0.76	60.67
18	0.72	58.05	20	0.80	63.44
16	0.64	53.13	19	0.76	60.27
17	0.68	55.55	21	0.84	66.42

$$\alpha = 0.01$$

$$t = 1.2920$$

$$P < 0.11$$

Summary

The results of the application of Student's t test for significant differences show; (1) a significant difference in concrete frame-of-reference perceptual learning between the control group and the experimental group; (2) a significant difference in abstract frame-of-reference perceptual learning between the control group and the experimental group; (3) no significant difference between the two experimental groups. A discussion and interpretation of the results are presented in the following chapter.

CHAPTER IV

DISCUSSION AND CONCLUSIONS

As has been previously pointed out in the earlier chapters, as well as in literature not cited, instrumental conditioning of motor responses, paired associates, serial learning responses and specific content responses have all been successfully accomplished through use of positive reinforcement. The question whether concept conditioning, in the form of learning a particular, instrumentally conditioned frame-of-reference from which a meaningful structuring of an ambiguous percept would derive interpretation, can be so conditioned is an intriguing and vital one. It is rather easy to see that a specific response, verbal or otherwise, can be conditioned to a specific stimulus, in view of the extensive literature relevant. But, the much more complex conditioning of the frame-of-reference from which interpretation of a stimulus would be derived has received no attention in the literature. It was this complex, instrumental conditioning problem with which we were concerned.

Selecting thirty college students who indicated on a pre-test that they had no significant preference toward a concrete-oriented or abstract-oriented frame-of-reference, we randomly assigned them to three groups of ten each. Fifty homonyms were presented individually to each of which the subjects could respond only with either a concrete or abstract word choice which were provided. The control group received no reinforcement. Experimental Group I received positive

reinforcement for all word choices which were concrete. Experimental Group II received positive reinforcement for all word choices which were abstract. A learning test was administered immediately following each subject's training period. Thus, the three learning situations for a frame of reference toward the concrete concept, toward the abstract concept, and toward a neutral concept were provided.

✓ The results show very clearly that a frame-of-reference toward the concrete concept or toward the abstract concept can be instrumentally conditioned by the process of administering positive reinforcement to the appropriate response of each concept category. Since none of the subjects indicated any awareness of the purpose of the experiment, of any undue influence by the experimenter, or of any contingency between the response and reinforcement, it can be interpreted that this learning was unconscious. It was noted that a few stimulus words (steer and hail, for example) evoked a previously learned regional response toward the concrete concept. However, they were not sufficient to effect significantly the results.

The implications of the results, particularly if substantiated by further studies using other concepts such as bigness-smallness, tallness-shortness, lightness-weightness for instrumentally conditioning a frame-of-reference, appear to be of considerable value. For, no longer can learning theorists be concerned solely with specific, content conditioning of the percept, but now they must also be concerned with conditioning of the frame of reference or referent setting within which the percept exists.

In summation, it was apparent that the significance of the obtained results was due, at least in part, to several design advantages.

These design features took cognizance of errors encountered in previous verbal conditioning studies that were reported in the literature.

Matarazzo (1960) in failing to achieve verbal conditioning of plural nouns points to a differential free operant rate between some word categories. He suggests that categories having a normally high or disproportionate free operant rate as compared to other categories will not condition significantly. He suggested a pre-experimental determination of the categories free operant rate prior to attempting verbal conditioning. This was accomplished in the population survey of this study described in Chapter II. Krasner (1958) points out in his review that the vast majority of verbal conditioning studies utilize a highly structured task which due to stimulus binding effects negate to a large extent the effects of verbal reinforcement given by the experimenter. By utilizing an ambiguous perceptual task with minimal cue(s) this study was able to unstructure the experimental situation to a considerable degree allowing the undetected, verbal reinforcement to instrumentally condition effectively the conceptual frame-of-reference of the percept of the ambiguous stimulus. Hall (1960) has pointed out the theoretical efficacy of such a procedure in his consideration of reinforcement and experimenter influence. In order to avoid the confounding effects of prior learning experiences of the subjects the stimuli and response category words employed in this study were drawn from the Thorndike and Lorge (1944) word list as being both common in usage and, in general, neutral in value affect. It is felt that consideration of the factors of (1) free operant rate, (2) structure of the perceptual task and (3) value affect of the words in the design of this study contributed in large

degree to the significance of the results.

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APPENDIX

APPENDIX A

SAMPLE FIRST PAGE OF THE 100 QUESTION FORCED CHOICE
RESPONSE POPULATION SURVEY INSTRUMENTInstructions

1. Rapidly read each word and circle either of the two choices.
2. Do not look for definitions, meanings or best response. There are no correct or most correct choices.
3. Follow your first impression.
4. Again, there are no right, wrong or best choices; simply work rapidly circling your first choice.

- | | | | |
|----------|-------------------|------------|----------------------|
| 1. Hard | Rock - Difficult | 9. Even | Smooth - Number |
| 2. Fire | Ember - Warmth | 10. Cook | Prepare - Food |
| 3. Bed | Sleep - Furniture | 11. Red | Color - Brick |
| 4. Mouth | Oral - Tongue | 12. Cry | Sorrow - Tear |
| 5. Space | Room - Explore | 13. Knight | Romance - Roundtable |
| 6. Food | Meal - Hunger | 14. Day | Calendar - Light |
| 7. Silk | Stocking - Soft | 15. Horse | Sport - Polo |
| 8. Door | Entrance - Open | | |

APPENDIX B

TRAINING LIST

- | | | |
|-------------------|-------------------|------------------|
| 1. AIR / HEIR | 24. SURGE / SERGE | 47. NOTE |
| 2. PAIR / PEAR | 25. MISS | 48. SALE/SAIL |
| 3. REIGN / RAIN | 26. HALE / HAIL | 49. FAIR/FARE |
| 4. VANE / VAIN | 27. SORE / SOAR | 50. CARROT/KARAT |
| 5. MAZE / MAIZE | 28. FELT | |
| 6. SHEER / SHEAR | 29. CORE / CORP | |
| 7. BAWL / BALL | 30. AUNT / ANT | |
| 8. LOCK / LOCH | 31. BLEW / BLUE | |
| 9. OR / ORE | 32. STEER | |
| 10. OUR / HOUR | 33. DO / DEW | |
| 11. HIM / HYMN | 34. TEEM / TEAM | |
| 12. SOUL/ SOLE | 35. SHOW | |
| 13. BEAU / BOW | 36. FLEW / FLUE | |
| 14. EARN / URN | 37. SOW / SEW | |
| 15. DOWN | 38. OH / OWE | |
| 16. ADD / AD | 39. TEA / TEE | |
| 17. BELLE / BELL | 40. BORE / BOAR | |
| 18. TIDE / TIED | 41. COLOR | |
| 19. SHOOT / CHUTE | 42. RODE / ROAD | |
| 20. MALE / MAIL | 43. BARON / BAREN | |
| 21. WAY / WEIGH | 44. BARE / BEAR | |
| 22. DONE / DUN | 45. MADE / MAID | |
| 23. SEEM / SEAM | 46. ALTER / ALTAR | |

APPENDIX C

TEST LIST

- | | |
|--------------------|-------------------|
| 1. MEDAL / MEDDLE | 14. MEET / MEAT |
| 2. FLEE / FLEA | 15. RIGHT / WRITE |
| 3. COARSE / COURSE | 16. ATE / EIGHT |
| 4. REAL / REEL | 17. STAIR / STARE |
| 5. DIE / DYE | 18. STEEL / STEAL |
| 6. PALE / PAIL | 19. ROLL / ROLE |
| 7. SEA / SEE | 20. ARC / ARK |
| 8. PAIN / PANE | 21. SCENT / CENT |
| 9. BEAT / BEET | 22. DEER / DEAR |
| 10. BE / BEE | 23. GREAT / GRATE |
| 11. HERD / HEARD | 24. ALE / AIL |
| 12. TALE / TAIL | 25. KNOT / NOT |
| 13. MANE / MAIN | |

APPENDIX D

TRAINING FORCED CHOICE LIST

- | | | |
|--------------------------|---------------------------|--------------------|
| 1. Breathe - Son | 24. Suit - Throb | 47. Pad - Observe |
| 2. Dual - Fruit | 25. Error - Girl | 48. Bargin - Yacht |
| 3. King - Fall | 26. Storm - Healthy | 49. Ticket - Equal |
| 4. Selfish - Weathercock | 27. Glider - Tender | 50. Diamond - Grow |
| 5. Cereal - Intricate | 28. Hat - Emotion | |
| 6. Transparent - Sheep | 29. Marine - Center | |
| 7. Tennis - Cry | 30. Picnic - Kin | |
| 8. Scotland - Secure | 31. Sky - Gusty | |
| 9. Rather - Miner | 32. Direct - Cattle | |
| 10. Possess - Midnight | 33. Moisture - Accomplish | |
| 11. He - Choir | 34. Swarm - Player | |
| 12. Leather - Spirit | 35. Actor - Display | |
| 13. Tie - Date | 36. Soar - Chimney | |
| 14. Vase - Deserve | 37. Button - Scatter | |
| 15. Under - Feather | 38. Surprise - Debt | |
| 16. Newspaper - Sum | 39. Fairway - Brew | |
| 17. Telephone - Beauty | 40. Swine - Caliber | |
| 18. Bound - Ocean | 41. Shade - Crayon | |
| 19. Hunt - Skydiver | 42. Carry - Map | |
| 20. Postman - Masculine | 43. Aristocratic - Desert | |
| 21. Metrecal - Manner | 44. Kodiak - Empty | |
| 22. Bill - Finished | 45. Built - Servant | |
| 23. Appear - Thread | 46. Sermon - Modify | |

APPENDIX E

TEST FORCED CHOICE LIST

- | | |
|---------------------------|-----------------------|
| 1. Decoration - Interfere | 14. Steak - Encounter |
| 2. Escape - Insect | 15. Letter-- Justice |
| 3. Route - Crude | 16. Number - Consumed |
| 4. Film - True | 17. Steps - Gaze |
| 5. Stain - Perish | 18. Metal - Rob |
| 6. Bucket - Dim | 19. Rotate - Pastry |
| 7. Tide - Look | 20. Boat - Curved |
| 8. Glass - Hurt | 21. Odor - Penny |
| 9. Vegetable - Win | 22. Precious - Faun |
| 10. Exist - Honey | 23. Bars - Immense |
| 11. Audible - Flock | 24. Sick - Beer |
| 12. Wag - Fable | 25. Shoelace - Never |
| 13. Primary - Lion | |

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