CARLSON, Carl Gilbert, 1944-
EXTINCTION OF CONDITIONED MEANING: SUPPORT
FOR A CLASSICAL CONDITIONING MODEL OF WORD
MEANING.

University of Hawaii, Ph.D., 1970
Psychology, experimental

University Microfilms, A XEROX Company, Ann Arbor, Michigan
EXTINCTION OF CONDITIONED MEANING: SUPPORT
FOR A CLASSICAL CONDITIONING MODEL
OF WORD MEANING

A DISSERTATION SUBMITTED TO THE GRADUATE DIVISION OF THE
UNIVERSITY OF HAWAII IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY
IN PSYCHOLOGY
SEPTEMBER 1970

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ABSTRACT

A major theoretical proposition has been that the emotional meaning response elicited by a word will be conditioned to other verbal stimuli with which the word is paired. Considerable evidence of higher-order conditioning of meaning has been found. At the same time, however, several lines of contradictory data have developed: the possible role of awareness in determining meaning change; the absence of an interstimulus interval effect; and the absence of extinction. A review of the three issues suggested that the apparent lack of extinction effects constituted the most crucial empirical challenge.

A more detailed analysis suggested that prior extinction studies had used specific values of several parameters of the conditioned meaning procedure which may have: (1) promoted the occurrence of labeling responses to the CS-UCS contingencies; and (2) reduced appropriate attentional behaviors. Both these variables might obscure or negate the effects of extinction.

The present study was an attempt to better test the possibility of the extinction of conditioned attitudinal (meaning) responses by modifying the basic Staats' higher-order conditioning procedure so as to control for some possible confounding effects present
in earlier studies. The procedural changes included the use of: a larger number of nonsense syllables; fewer conditioning trials; a partial reinforcement schedule; a reduced correlation of particular syllables with specific classes of evaluative words; a single assessment phase; and a moderate number of extinction trials.

Using the modified procedures, subjects in Experiment I received 0, 5, or 15 extinction trials with each conditioned stimulus nonsense syllable after receiving higher-order conditioning trials. The same procedures were used in Experiment II, with the exception that a two-week delay was interpolated between conditioning and extinction trials. Conditioning was indexed by evaluative ratings of the syllables on a semantic differential scale by only those subjects presumed to be unaware on the basis of a questionnaire.

The results provided some support for a classical conditioning model of word meaning. In Experiment I, the strength of conditioned meaning responses was reduced after 5 and 15 nonreinforced presentations of each verbal conditioned stimulus, although the number of extinction trials did not produce a differential effect. Experiment II did not provide the conditions sufficient to test the hypothesis. When conditioning was measured after a two-week delay, there was no evidence of a significant degree of conditioning in any group.
Thus, this investigation presents evidence to suggest that extinction of classically conditioned attitudinal responses established in a higher-order conditioning procedure can occur under certain conditions.
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CHAPTER I

WORD MEANING AS A CLASSICALLY CONDITIONED RESPONSE

Introduction

Theoretical conceptions of word meaning as a classically conditioned implicit mediating response have a long history. Basically the analysis suggests that certain "detachable" components of the total response elicited by a stimulus, when conditioned to a word through appropriate pairing of the word with the eliciting stimulus, constitute the meaning of the word. The acquisition of word meaning can be the product of either first- or second-order conditioning. In the former case the original eliciting stimulus demonstrates its response-evoking property on an unlearned basis; in the latter, the stimulus "transferring" the response to the word has previously acquired its potential for response evocation through prior pairings with another eliciting stimulus. The significance of this meaning response lies in its inferred potential property to serve as a functional stimulus controlling other behaviors, either through subsequent direct learning experience or through generalization.

An early suggestion of this learning mechanism was provided by Cofer and Foley (1942) in their review of
the evidence on semantic conditioning and generalization. Briefly, the semantic conditioning literature has involved three variations of a conditioning-generalization procedure: object-word, object-object, and word-word transfer (Gormezano and Moore, 1969). In all three situations, a response is conditioned to one stimulus, followed by testing generalization of the conditioned response to other stimuli that have little or no physical similarity to the conditioned stimulus. Cofer and Foley attributed generalization under such circumstances to the elicitation of a previously established conditioned response common to both the conditioned stimulus and the test stimulus. During the conditioning phase, concurrent elicitation of the mediator with the presentation of the conditioned stimulus will occur, and the conditioned response established to the conditioned stimulus will also come to be elicited by the stimulus properties of the mediational response. The presentation of the verbal test stimulus will elicit a similar previously established mediational response. The conditioned response will occur by generalization from the stimulus properties of the mediator evoked by the conditioned nonverbal stimulus to the stimulus properties of the word-evoked mediator. The basis for such an analysis was implied in prior Hullian conceptions, particularly in the postulation of "pure stimulus acts," i.e., responses
that function in behavioral sequences only as controlling stimuli for subsequent responses (Hull, 1930).

Osgood (1953) specifically acknowledged the contribution of previous Hullian propositions in the development of his account of the "representational mediation process" as the implicit mediator constituting the meaning of a word. While explicitly avoiding any speculation as to the nature of the mediational response, a major effort was extended to delineate the distinct dimensions of word meaning responses through the factor analysis of semantic differential ratings of words (e.g., Osgood & Suci, 1955; Osgood, Suci, & Tannenbaum, 1957).

At the same time, additional theoretical and empirical extensions were made, stressing the significant role of classically conditioned meaning responses in various aspects of language and conceptual behavior. For example, Mowrer (1954) characterized several aspects of communication as a classical conditioning process in which higher order conditioning of meaning responses from word to word occurs within sentences. In addition, Staats (1961) has provided further extensions, suggesting that basic concepts can be considered as "verbal habit families" composed of various classes of meaning responses established through classical conditioning with stimuli having common characteristics.
The most direct evidence available on the study of word meaning as a classically conditioned response is found in studies employing first-order and higher-order conditioning paradigms. Supportive data will be presented below, while negative evidence will receive a detailed treatment in Chapter II.

**First-order Conditioning of Word Meaning**

Direct study of first-order conditioned meaning has been restricted to the use of affective or emotional meaning responses. That is, the unconditioned stimuli have been appetitive and aversive stimuli.

A number of studies (Brotsky, 1968; Maltzman, Raskin, Gould, & Johnson, 1965; Staats, Staats, & Crawford, 1962) have used shock and noise as unconditioned stimuli to develop a conditioned response to a word. The development of a negative emotional response elicited by the word was reflected by two indices. Using a seven-point pleasant-unpleasant semantic differential scale, the conditioned verbal stimulus was rated more intensely negative than control words not paired with aversive stimulation. Moreover, the words paired with the aversive unconditioned stimulus later elicited a conditioned GSR. As an example, Brotsky (1968) paired instances of a concept (i.e., words eliciting a common meaning response) with white noise. The number of
conditioning trials and the number of different concept instances paired with the aversive stimulus were varied in independent groups. The GSR was monitored both during conditioning trials and during a generalization test, presenting either another instance of the concept or the concept name. Reliable conditioning of the GSR occurred to the words paired with noise, and the degree of conditioning was a positive function of the number of learning trials. Furthermore, generalization of the GSR to the other words eliciting a similar meaning response was also obtained. Identical results were found for the semantic differential data; the words paired with aversive stimulation, as well as similar words, were rated more negatively on an evaluative meaning semantic differential scale. As well as demonstrating the conditioning of an affective meaning response to a class of verbal stimuli, these data support the use of rating scale procedures as indirect indices of conditioned meaning responses.

While there have been few contemporary attempts to directly study the first-order conditioning of positive emotional responses, some earlier studies corroborate a conditioned word meaning analysis. For example, Razran (1938, 1940) paired complex verbal stimuli (political slogans and socially labeled pictures) with food consumption or noxious olfactory stimulation. Subsequent
postexperimental ratings of the verbal stimuli revealed significant shifts in evaluation in a direction appropriate to the nature of the unconditioned stimulus previously paired with the picture and slogans.

Higher-order Conditioning of Meaning

Much of the research on higher-order conditioned meaning responses has employed a conditioning procedure initially presented in Staats and Staats (1957). Most studies have investigated the conditioning of connotative meaning, particularly evaluative or attitudinal meaning, although there have also been demonstrations of conditioning of denotative (sensory) meaning responses (e.g., Staats, Staats, & Heard, 1961).

The basic procedure involves pairing one stimulus with a set of words having positive evaluative meaning and a second stimulus with words of negative evaluative meaning. These trials are presented under the guise of an investigation of the learning of different types of materials under different modes of presentation. Typically the stimuli are nonsense syllables that are presented visually, and the evaluative meaning words are presented auditorily. Frequently additional syllables are presented and paired with words with no systematic meaning. Subjects are instructed to learn the syllables only by looking at them and to learn the words by hearing
pronouncing them. After the presentation of the syllable-word pairings, the subjects are asked to rate the syllables on one or more of the semantic differential scales that have a high loading on evaluative meaning (e.g., pleasant-unpleasant, good-bad) under the pretext that the attitudes of the subjects toward these syllables may have influenced the learning of the syllables. Generally, the syllable paired with positive evaluative words is found to be rated more positively than the syllable paired with negative words even when the subjects are unable to report in a post-experimental questionnaire a systematic relation between syllables and words.

Staats has considered this change in the rated meaning of the syllables to be the product of classical conditioning. In this viewpoint, words of positive and negative evaluative meaning are assumed to elicit characteristic emotional (attitudinal) responses. When neutral stimuli are appropriately paired with such words in a classical conditioning operation, the originally neutral stimuli will come to elicit a similar emotional response. Such responses are further assumed to mediate various instrumental behaviors, including ratings on an evaluative semantic differential scale.

A number of studies have tended to support the classical conditioning interpretation of meaning change.
Not only has acquisition of meaning been frequently shown, but there have also been demonstrations of generalizations (Das & Nanda, 1963; Franks & Mantell, 1966; Miller & Barsness, 1969; Miller & Clark, 1969; Paivio, 1964; Phelan, Hekmat, & Tang, 1967; Staats, Staats, & Heard, 1959), as well as differential effects of the number of conditioning trials (Gerstein, 1961; Staats & Staats, 1959), and schedules of reinforcement (Gerstein, 1961; Miller & Barsness, 1969; Staats, Staats, & Heard, 1960). Acquisition of conditioned meaning responses has been found with a wide range of verbal stimuli employed as conditioned stimuli, including: nonsense syllables (Abell, 1969a, 1969b, 1969c; Blanford & Sampson, 1964; Franks & Mantell, 1966; Miller, 1966a, 1966b, 1967; Staats & Staats, 1957); meaningful words (Staats, Staats, Heard, & Nims, 1959); personal names (Staats & Staats, 1958); group names (Das & Nanda, 1963; Freeman & Suedfeld, 1969; Staats & Staats, 1958); and letters of the alphabet (Coles & Leonard, 1969). There have also been many classes of verbal stimuli employed as the unconditioned stimulus in the higher-order conditioning paradigm including evaluative meaning words (Abell, 1969a, 1969b, 1969c; Blanford & Sampson, 1964; Freeman & Suedfeld, 1969; Miller, 1966a, 1966b, 1967; Staats & Staats, 1957); denotative meaning words (Staats et al., 1961); famous names (Blanford & Sampson, 1964);
personality trait adjectives (Stalling, 1970); and interest inventory items (Gross, 1970). Furthermore, as Coles and Leonard (1969) indicate, a UCS-intensity effect may also be inferred from the fact that stimuli paired with words having relatively high factor loadings come to be rated similarly, while stimuli paired with words not having such loadings do not show any change in meaning. These results, in conjunction with the procedural similarity to typical classical conditioning operations, are in accordance with predictions based on a classical conditioning model.

A Word Association Conception of Word Meaning

An alternative conception of the nature of word meaning has also evolved from research on human learning derived from classic associationistic theory (Creelman, 1966). Noble (1952) extended the application of meaningfulness measures to words, defining meaningfulness, $m$, as the average number of associations to a word (or sign) emitted in one minute of continued free association. The rationale for this index was based upon Hullian learning theory. In extensions of this work (e.g., Bousfield, Cohen, & Whitmarsh, 1958), it has been argued more explicitly that the meaning of a word resides in the type of word associates the word evokes. Considerable
research (see Creelman, 1966) has been devoted to systematically delineating the mediational properties of word associates in a wide range of verbal learning tasks. Controversy quickly developed over the independence of word meaning and word associational processes (Osgood et al., 1957). For proponents of the independent existence of word meaning responses, a fundamental relationship demanding explanation was the frequent high correlation between intensity of word meaning and association measures (Jenkins & Russell, 1957; Noble, 1958; Staats & Staats, 1959). Staats and Staats (1959) suggested the simultaneous establishment of both types of learning through the one operation of pairing the words. The pairing of two words will result in the conditioning of the meaning of the response word to the stimulus word; but the stimulus word will also tend to elicit the response word as a direct associate. Staats and his associates pursued the implication of this analysis that independent manipulations of meaning and number should be possible. Direct support for this hypothesis was provided by Staats, Staats, Finley and Heard (1963) in which: a meaning response was conditioned to nonsense syllables while the number of associates to each syllable was held constant; and conversely, the number of associates to a syllable was demonstrated to increase without a change in syllable meaning. Indirect support was also
generated by the finding that conditioned meaning could be obtained even when there is greater commonality of word associates between classes of evaluative meaning words serving as unconditioned stimuli than within a particular class of UCS words (Staats, Staats, Finley, & Minke, 1963).

A Pluralistic Conception of Word Meaning

Perhaps the most meaningful resolution of the issue is found in a pluralistic conception of word meaning (Staats, 1968, pp. 180-184). The analysis of word meaning would profit from distinguishing between the variety of functional relations to which this term has been applied. Staats indicates several distinct classes of word meaning are evident, including: (1) the discriminative control of nonverbal motor behaviors by a verbal stimulus; (2) discriminative control of verbal responses by a verbal stimulus (traditional word associations being a relatively simple example of this type of relationship); (3) elicitation of an emotional response by a verbal stimulus; and (4) elicitation of sensory responses by a verbal stimulus. It is obvious that such distinctions do not negate the significance of the study of any one of these "mechanisms." However, the pluralistic conception of meaning does suggest that it may be disadvantageous for analyses to be restricted to the study of one type of
language learning to the exclusion of the others. Perhaps, as is implicit in the pluralistic conception, more rapid progress will result if attention is drawn to the potential application of basic learning principles and their interactions in the analysis of these various phenomena. In Staats' own theoretical extensions of such learning analyses to broad aspects of human behavior, classically conditioned responses are of central importance in the understanding of the development of the multiple functions of a stimulus in the determination of behavior. Defined by the verbal nature of the eliciting stimulus, word meaning responses are included as a smaller, but significant, subclass of classically conditioned responses. As the next chapter will indicate, the conditioned meaning literature reveals several apparent inconsistencies with a classical conditioning account. The development of learning theories of language which employ classical conditioning principles (e.g., Staats, 1968) requires some resolution of these inconsistencies. It is the general purpose of the present study to begin the necessary investigations.
CHAPTER II
SOME INCONSISTENCIES

As the previous chapter indicated, a number of theorists have given major status to the process of classical conditioning and the role of classically conditioned responses in the determination of behavior. Furthermore, justification for the extrapolation of classical conditioning principles in the analysis of various aspects of complex human behavior has been based to a considerable extent on the results of research employing Staats' conditioned meaning procedure. While the prior chapter outlined much of the supportive evidence, several studies have pointed out possible insufficiencies in the classical conditioning account of meaning change, at least with the basic Staats and Staats (1957) task. The major apparent inconsistencies which have developed are: (a) evidence that the subject's awareness of the relation between the syllables and the associated words is necessary to produce changes in the rated meanings of the conditioned stimuli; (b) the absence of differential effects of manipulations of the interstimulus interval; and (c) an inability to demonstrate extinction of conditioned meaning.
Awareness

The most popular objection to the classical conditioning interpretation of meaning change has been that little or no conditioning is found with subjects who are unaware of various aspects of the experiment (Cohen, 1964; Freeman & Suedfeld, 1969; Gerstein, 1961; Hare, 1964, 1965; Insko & Oakes, 1966; Page, 1969; Paivio, 1964; Rozelle, 1968). The inference is that the conditioning effect is primarily or entirely attributable to the influence of "higher-level" symbolic or cognitive activities on the part of aware subjects. The nature of these intervening activities has been conceptualized with various degrees of complexity. For example, some investigators have inferred a more or less direct relation between the extremity of a subject's ratings of the conditioned specific syllables and distinct classes of evaluative words (Cohen, 1964; Freeman & Suedfeld, 1969; Gerstein, 1961; Paivio, 1964). Other accounts have proposed more elaborate mechanisms, emphasizing the influence of additional mediational constructs such as the subject's intentions, his hypotheses regarding the purpose of the experiment, and his impressions of the expectations of the experimenter (Hare, 1964; Page, 1969; Rozelle, 1968). Many of the more complex arguments reflect Orne's (1962)
earlier cautionary note regarding the potential influence of implicit experimental demand characteristics. The question of the role of awareness in the classical conditioning of meaning obviously reflects a more general state of affairs which has developed into an enduring controversial issue between behavioral positions and the proponents of various sorts of cognitive mediators. The primary empirical confrontation has been within the area of verbal operant conditioning (e.g., Dulany, 1968; Kanfer, 1968; Maltzman, 1966; Maltzman & Brownstein, 1967; Speilberger, 1962, 1965; Speilberger & DeNize, 1966).

The literature on the "learning without awareness" issue contains numerous accounts of the relation between verbal reports and concurrent behaviors. Recently, Bandura (1969, pp. 564-568) has reviewed and classified the various interpretations. The nonmediational view, as Bandura describes it, emphasizes the immediate and direct action of the reinforcing event in producing behavior change. The ability to describe relevant contingencies "...is a resultant rather than a precondition of change" (Bandura, 1969, p. 565). Bandura cites Skinner (1953) and Thorndike (1933) as proponents of this position.

The "independent response systems" theory considers the verbal report and the learned behavior of
concern in a particular study to be different response classes whose correlation will depend upon the reinforcement contingencies in effect for each class. In most studies the same terminal contingency is in effect for both responses resulting in a systematic correlation between the two sets of events. Verplanck (1962) has demonstrated the dissociation of these events in studies which apply different reinforcement contingencies to the separate response classes.

As Bandura indicates, a marked contrast has been found in various cognitive interpretations (e.g., Dulany, 1968; Speilberger, 1962, 1965; Speilberger & DeNike, 1966). The emphasis shifts to a concern with various classes of complex behavior usually of a covert nature. The development of hypotheses, strategies, and rules, generally in conjunction with intentional and motivational states, precede and determine any changes in overt behavior. Reinforcement effects are considered to be of secondary importance, fulfilling an informational or confirmatory function.

Bandura names the fourth logical position "reciprocal interaction" theory, attributed to Farber (1963) and to Postman and Sassenrath (1961). In this view both processes are given a determining function. Generally, as behavior changes develop through the subject's
experiences with the contingencies, there will be the concurrent occurrence and selective strengthening of verbal mediators, resulting in a supplementary determination (usually an enhancement) of the overt performance.

Recent reviews (Bandura, 1969; Greenspoon & Brownstein, 1967; Kanfer, 1968; Krasner, 1967; Williams, 1964) of the literature on verbal operant conditioning indicate that many studies support both a mediational and nonmediational interpretation. The consensus has been that the data are inclusive, due to the empirical discrepancies and certain methodological difficulties. Several points stemming from the learning-awareness controversy do, however, have particular relevance for the study of conditioned meaning, and deserve more detailed consideration.

The most frequent empirical referent of the awareness construct has been the subject's postexperimental verbal report regarding various aspects of the experiment. The behavioral position tends to emphasize the empirical status of the verbal report as a class of behavior, its methodological status as a dependent variable in most studies, and limitations on its epistemological status with respect to antecedent covert states. In contrast, cognitive theorists have treated the verbal report as an acceptable, although imperfect,
index of inferred antecedent states of the subject during the experiment proper. Obviously the actual postexperimental behaviors cannot be ascribed any degree of causality with respect to antecedent events. Even when a closer temporal approximation to the presumed sequence of events is attempted through the use of intermittent awareness assessments throughout the course of learning (including the extreme of trial-by-trial measures), it has been argued (Bandura, 1969, p. 567; Kanfer, 1968, p. 274) that attribution of causality remains confounded, since the possible effects of the immediately preceding learning experience cannot be dissociated.

Another difficulty with the use of the verbal report as an index of awareness is the susceptibility of the report to the influence of additional experimental variables, including the specificity of the awareness measure as well as subject, experimenter, and task characteristics (Krasner, 1967). The typical awareness assessment employed by proponents of the cognitive position consists of a set of questions which become increasingly more specific with respect to the contingencies in effect and the purpose of the experiment. Frequently, many of the subjects who do learn will be judged aware when these more extended questionnaires are used. The most extreme objection to inferences of the functional role of awareness in determining the performance of such
subjects is the possibility that the awareness reports may be entirely a product of the postexperimental assessment itself. For example, Staats (1969) has recently argued that such awareness measures could "...effectively program (the subject) to the desired position—if he has made some of the necessary observations and can recall them." In fact the cognitivist's insistence of the greater validity of more extensive questionnaires is to some extent inconsistent with the basic assumptions of a demand characteristic position. In addition, the basic nonmediational argument remains tenable, that is, a number of subjects may well be able to describe (with minimal prompting) stimulus-reinforcement relations and changes in their behavior after the learning trials are completed, although these observations had no functional relation to the preceding performance changes. The point that awareness may frequently be a product of conditioning has been stressed by Staats (1967, 1969) and supported by a conditioned meaning study (Staats & Staats, 1959) in which awareness reports occurred only after a number of conditioning trials sufficient to produce conditioned meaning were administered.

Even when criticisms of the logical status of verbal reports are suspended, several lines of evidence from conditioned meaning studies are difficult to incorporate within an awareness or demand characteristic
account (see also Staats, 1969). In the first-order conditioned meaning studies mentioned in the previous chapter it was found that the strength of conditioned meaning as indexed by semantic differential ratings was significantly related to the strength of the conditioned automatic response elicited by the verbal conditioned stimulus (Staats et al., 1962; Maltzman, et al., 1965). These data are consistent with a classical conditioning model, while it is not clear how awareness states would be predicted to mediate such correlations, particularly in independent groups of subjects (as in Maltzman et al., 1965). Furthermore, a recent study (Zanna, Kiesler, & Pilkonis, 1970) demonstrated first-order conditioning and generalization of meaning in the absence of any reports of awareness of demand characteristics.

Studies of retention of conditioned meaning (Minke & Stalling, 1970; Yavuz & Bousfield, 1959), using what is essentially a higher-order classical conditioning paradigm, have found that subjects continue to rate the verbal conditioned stimuli in a manner consistent with their prior experimental learning experiences, even when there is no recall of any of the words associated with the syllables. Minke and Stalling (1970) specifically questioned their subjects about the reasons for their ratings, but found no statements suggesting the operation of implicit demand characteristics.
Other data not easily reconcilable with an awareness interpretation are the results of studies using compound conditioned stimuli. Staats (1969) cites an unpublished experiment by Pecjak and Smith in which it was found that the conditioned response to a compound conditioned stimulus was a direct function of the specific type of conditioning established with the separate component stimuli. That is, two positively conditioned stimuli when combined elicited the largest positive attitudinal response, two negatively conditioned stimuli when combined elicited the greatest negative attitudinal response, while stimulus combinations including neutral paired components produced responses of intermediate strength. It should be added that Grings and Uno (1968) provide physiological evidence for such effects with conditioned autonomic responses.

Finally, a "bimodality" argument cited in support of the awareness analysis (Page, 1969) may be disputed on two counts: the existence of a plausible theoretical alternative (Staats, 1969), and recent contradictory data (Gross, 1970). Page's argument is that any evidence of conditioned meaning is entirely the result of the performance of subjects who are aware of the contingencies and tend to conform to the implicit demand characteristics. Such subjects will tend to use the extreme ends of the rating scales and thus show a high degree of apparent
conditioning, while any unaware subjects will generally give the "conditioned stimuli" similar neutral ratings, and show no sign of conditioning. Page's distribution of conditioning scores revealed a bimodal distribution, with the upper mode consisting almost entirely of scores from subjects he considered to be aware and cooperative. Statistical evidence for an overall conditioning effect in the group was attributed to the inclusion of aware subjects in the analysis.

Staats (1969) has indicated that such data are not necessarily incompatible with a classical conditioning account if more careful consideration is given to the details of the experimental situation. In order for a CS-UCS pairing to constitute a functional conditioning trial, it is necessary that the subject execute certain precurrent behaviors with respect to the different components of the conditioning paradigm. If any of these attentional behaviors fail to occur, or if the subject engages in any additional behaviors that distort the sequential and temporal relations within the conditioning paradigm, failures to find conditioning might be expected. Furthermore, without explicit training to shape and maintain such attentional responses, subjects would be expected to differ in the extent to which such behaviors reliably occur over a number of conditioning trials. It could be that the subjects who show the
greatest degree of conditioning are those who most consistently executed the necessary attentional behaviors, while the subjects who demonstrate less evidence of conditioning reflect the effects of a reduced number of actual conditioning trials, produced by less frequent attentional responses.

The importance of such attentional processes has been emphasized in a series of studies by Maltzman and his associates (e.g., Maltzman, 1968; Raskin, 1969), in which various indices of the orienting reflex are found to be positively related to the strength of the conditioned response. A particularly good example of the necessity for the occurrence of appropriate attentional behaviors as a precursor to successful conditioning is provided by Lovaas, Freitag, Kinder, Rubenstein, Schaeffer, and Simmons (1966). Attempts to establish a verbal stimulus as a conditioned reinforcer through multiple pairings with food were unsuccessful in work with severely disturbed children. A prominent deficit in attentional responses in such autistic children is inferred from frequent reports of marked insensitivity to a wide range of stimuli, notably social stimuli. Following operant discrimination training in which the child was trained to respond only after the verbal stimulus was presented, the verbal stimulus was found to function as a reinforcer.
Recent data (Gross, 1970) from a higher-order conditioned meaning study also contradicts the more elaborate demand characteristics interpretation. After exclusion of aware subjects on the basis of a post-experimental questionnaire, the statistical analysis revealed a significant conditioning effect. More important, however, was the fact that none of the subjects in the experiment, regardless of the content of their verbal reports, made extreme ratings of both the positive and negatively conditioned syllables. Furthermore, the most extreme rating differences were in a direction opposite to the subject's experimental conditioning history. Contrary to Page's assertion, Gross found no evidence of bimodality, no extreme ratings on both syllables, but a significant conditioning effect; that is, the overall group conditioning effect seemed to reflect a moderate degree of conditioning in a majority of the subjects. In sum, awareness arguments in many conditioned meaning studies have found little empirical support.

Interstimulus Interval

The interstimulus interval, the length of time between the onset of the conditioned stimulus and the onset of the unconditioned stimulus, is known to be an important determinant of numerous classically conditioned responses (Kimble, 1961; Beecroft, 1966; Gormezano &
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Moore, 1969). Typically the greatest degree of conditioning is obtained with the interstimulus interval set at a certain minimal value. Any further changes in the temporal separation of the conditioned and unconditioned stimuli will result in weaker conditioning; although it should be noted that the specific value of the interstimulus interval that will produce maximal conditioning depends to some extent on the particular response system (Gormezano & Moore, 1969). If meaning responses are established through a classical conditioning process, then these responses should show analogous changes with manipulations of the interstimulus interval. Coles and Leonard (1969) tested this hypothesis in a higher-order conditioned meaning study, using letters of the alphabet as conditioned stimuli and evaluative meaning words as unconditioned stimuli. Two groups were run in a forward conditioning procedure with either a 1 second or 2 second CS-UCS interval, while another two groups were given backward conditioning trials at the same intervals. In contrast to the apparent predictions from a classical conditioning model, all four groups showed a significant and equal degree of conditioning. When a subsequent data analysis excluded all subjects who were able to report that positive words had been paired with one letter and negative words with another letter, conditioning was found only in the forward conditioning group with
a 2 second interstimulus interval. Coles and Leonard concluded that there was little evidence of conditioning without awareness, and no evidence for differential effects of interstimulus interval manipulations. Both these conclusions suggested to the authors that word meaning responses may not be appropriately described as classically conditioned responses.

More detailed consideration of the design of the experiment indicates that Coles and Leonard may not have provided as rigorous a test as they imply. As discussed in the preceding section of this chapter, awareness-learning relations established on the basis of postexperimental questionnaires do not constitute definitive data for any interpretation. Furthermore, when exceedingly familiar and simple stimuli, such as single letters of the alphabet, serve as the conditioned stimuli, it is not surprising to find that subjects will often be able to state that certain letters had been paired with certain kinds of words. More frequent observations of this sort would be expected regardless of the nature of the relation between such statements and the conditioned meaning responses. An alternative suggestion is that Coles and Leonard failed to sample a wide enough range of intervals. Related to this point is the possibility that the subjects may have engaged
in a number of covert CS-UCS repetitions during the rather long (10 second) intertrial interval. There are at least two possible ways in which covert pairings could override differential conditioning effects produced by the formal trials. First, covert trials may increase the overall strength of conditioning by increasing the total number of functional conditioning trials. Secondly, increased conditioning could also result from the occurrence of covert trials at a more efficacious interstimulus interval. The data from the backward conditioning "control" groups are not very informative since the theoretical status of the paradigm remains questionable (Gormezano & Moore, 1969) and since Brewer and Gross (1969) have provided some evidence for the acquisition of conditioned meaning responses with a backward conditioning procedure.

Perhaps the most serious objection is that it is very difficult to insure that conditioning actually does occur at the nominal interstimulus interval, without some rather radical changes in the procedure. There is a strong possibility that following the onset of the conditioned stimulus a human subject may generate some mediator (e.g., subvocal repetition of the conditioned stimulus) that would reduce the functional CS-UCS interval. Kimble (1962, pp. 40-41) reports evidence of verbal mediators attenuating interstimulus interval effects in first-order classical conditioning. In the light of
these apparent problems present in Coles and Leonard's study, it appears that much greater methodological care will be necessary to produce unequivocal results regarding interstimulus interval effects with conditioned attitudinal responses.

Extinction

Perhaps the most surprising empirical inconsistency has been the failure to find any evidence for extinction of conditioned meaning (Insko & Oakes, 1966; Miller & Barsness, 1969; Miller & Clark, 1969; Miller, Gimml, & McCrimmon, 1969). Specifically, studies using the conditioned meaning paradigm have found that the ratings of the conditioned stimuli by subjects who have been administered extinction trials are no less extreme than either the pre-extinction (postconditioning) ratings by the same subjects or the ratings of separate subjects following conditioning trials only. This failure to find loss of meaning has occurred with a varying number of extinction trials for each conditioned stimulus, ranging from 4 (Miller & Clark, 1969) to 48 (Miller et al., 1969). Since extinction is frequently cited (Deese & Hulse, 1967; Hall, 1966; Kimble, 1961) as one of the most basic characteristics of learned responses, the implication has been that meaning responses reflect the operation of a more complex process which has only superficial similarity to classical conditioning.
Two different extinction operations have been employed. One of these is "unpaired" presentations, in which the conditioned verbal stimulus is presented alone without the appearance of meaningful words of any class (Miller & Barsness, 1969; Miller & Clark, 1969; Miller et al., 1969). The second procedure consists of "neutral" pairings, in which the conditioned stimulus is paired with a different neutral evaluative word on each extinction trial (Insko & Oakes, 1966; Miller & Clark, 1969). The data of these four experiments consistently suggest that persistence of meaning is independent of the specific extinction operation employed. It should be noted, however, that such a conclusion should await further study in the light of proposed methodological deficiencies in the extinction studies and the existence of a contradictory hypothesis. The questionable status of the extinction data constitutes a focal point of this dissertation and will be treated in detail later. Minke and Stalling (1970) have suggested in the case of unpaired extinction trials, under conditions in which the conditioned stimulus elicits verbal associates of the same class of evaluative meaning, initial extinction trials would tend to maintain the strength of the conditioned meaning response through higher-order conditioning, and thus extend the course of extinction. It would seem that neutral pairings
would be less susceptible to this effect, and would be the preferred operation in studies in which the focal concern is the demonstration of extinction, rather than the study of possible differential effects of different extinction operations. Regardless of which procedure permits a more ideal test of extinction, the results under both procedures are incompatible with a simple extrapolation of the principle of extinction—when a conditioned stimulus is repeatedly presented without additional pairings with the unconditioned stimulus, the strength of the conditioned response elicited by the conditioned stimulus should diminish.

In addition to the apparent incompatibility with the concept of word meaning as a classically conditioned response, it is worthwhile noting that the extinction data suggest other conceptual difficulties, a point largely ignored in the extinction discussions by Miller and his associates and Insko and Oakes. If the awareness arguments are presumed to have some validity, i.e., if at least some of the subjects label the CS-UCS contingencies accurately during the course of the experiment, the apparent effects of such observations are at variance with the available data on the effects of experimentally provided instructions regarding reinforcement contingencies in classical conditioning. In particular, statements to subjects that the unconditioned stimulus
will no longer be presented typically result in a markedly rapid extinction of the conditioned response (Bridger & Mandel, 1965; Grings & Lockhart, 1963; Wickens, Allen, & Hill, 1963). If analogous observations can be made by the subject during the course of conditioning and extinction trials in a conditioned meaning study, it is curious that his ratings of the syllables do not show a similar reduction in intensity. Of course it can be argued that this discrepancy further supports the contention that the acquisition of meaning responses involve a process distinct from that of classical conditioning, but arguments will be presented which suggest the persistence of meaning results from the confounding effects of another type of verbal mediator.

The conditioned meaning studies also bear an interesting relationship to the literature on semantic satiation. To briefly follow the major points in reviews of the topic (Amster, 1964; Esposito & Pelton, in press; Fillenbaum, 1967; Lambert, 1967a), semantic satiation refers to a loss in the meaning of a verbal stimulus following the subject's oral or written repetition or prolonged visual inspection of the stimulus. Several researchers (Kanungo & Lambert, 1963; Lambert, 1967b) have conceptualized this change as an extinction effect. There have been several measures of meaning change: subjective reports, semantic differential ratings,
commonality of associates, number of associates, visual search time, as well as performance in verbal learning and problem solving tasks. If one acknowledges that there is some procedural similarity between the unpaired extinction procedure in conditioned meaning studies and the repetition of a word followed by a rating of the word in one variation of the semantic satiation method, it is not clear what could account for the difference in results, i.e., persistence of meaning after extinction trials and loss of meaning after a satiation treatment. It is important to note that a current review (Esposito & Pelton, in press) seriously questions the status of the basic satiation phenomenon on the basis of unreliable and contradictory results, frequent lack of appropriate controls, and an alternative theoretical model.

Before much theoretical effort is expended in delineating the implications of the extinction studies, attention should be drawn to the question of how well these studies represent an adequate test of the extinction hypothesis. A more detailed consideration of the specifics of the experiments and their relation to several of the issues raised in earlier portions of this chapter suggests that the negative evidence included the confounding influence of additional variables that would be expected to obscure or negate the effects of
extinction operations. In particular, it is proposed that the previous extinction studies used specific values of several parameters of the conditioned meaning procedure that would both promote the occurrence of covert behaviors and reduce appropriate attentional behaviors.

As the earlier discussion of the awareness issue indicated, the use of the conditioned meaning procedure does not guarantee that the subjects will not engage in additional covert activities that could influence the indirect postexperimental measure of conditioned meaning. Again, however, the degree to which such responses occur and the extent to which they exert control over other behaviors of the subject should depend on the complexity of the experimental conditions, including instructions and the relation of such instructions to the actual details of the experiment. The lack of an extinction effect may be in part attributable to the development of a verbal label to the CS-UCS relation during the conditioning trials. If, for example, the subject notes that a nonsense syllable is always paired with positive words, this verbal "label" may then mediate subsequent ratings of the CS. Variables in the conditioned meaning procedure that could contribute to the development of such labels (or the more extended implicit verbal sequences) include the number of conditioned stimuli, the number of meaning assessments, the
number of conditioning trials for each conditioned stimulus, as well as the interrelationships between the schedules in effect for each conditioned stimulus. The specific parametric values of these variables that were employed in the extinction studies seem to have inadvertently been ones that would facilitate the development of such labeling responses. The specific methodological objections follow.

1. **The use of a minimal number of conditioned stimuli during the conditioning and extinction manipulations.** The studies of extinction have modified the original Staats procedure which used 6 nonsense syllables as conditioned stimuli; one syllable paired with positive words, one paired with negative words, and four syllables paired with words of no systematic meaning. In contrast, the extinction studies have used 2 (Miller & Barsness, 1969; Miller et al., 1969), 3 (Insko & Oakes, 1966), and 4 (Miller & Clark, 1969) nonsense syllables. Two of the syllables in the Miller and Clark (1969) study were never paired with words at all, in an attempt to create a procedure analogous to discrimination training. When only a small number of different syllables are presented it is likely that subjects will be able to label the relationship between specific syllables and word classes.
2. **Repeated assessment of the meaning of the nonsense syllables during the course of the experiment.** Earlier studies of conditioned meaning used a single assessment phase; subjects would rate the meaning of the syllables after the conditioning manipulation. Most of the extinction studies (Miller & Barsness, 1969; Miller & Clark, 1969; Miller et al., 1969) have included ratings of the syllables prior to conditioning, after conditioning, and after extinction. These repeated assessments would reduce the plausibility of the cover story generally used to justify the necessity for ratings of the syllables, i.e., a control measure for the possible influence of a person's feelings about the syllables on his learning of the syllables. The repeated ratings, and the probable reduction in the credibility of the expressed purpose of the experiment, could produce a variety of effects in the subjects, e.g., a tendency toward greater consistency across ratings, more frequent speculation as to the purpose of the experiment, and greater sensitivity or attention to implicit demand characteristics in the experiment.

In more general terms, the objection is that repeated ratings may produce some systematic effect on the ratings that is confounded with the influence of the conditioning and extinction operations. There are no conclusive data on this point available from conditioned
meaning studies. A comparison of postextinction ratings (Miller & Barsness, 1969) between subjects who rated the syllables after conditioning and those who did not is not particularly revealing since the analysis still included the possible effects of preconditioning ratings gathered from all groups. Semantic satiation studies which have used semantic differential ratings as the dependent variable have demonstrated that the assessment design is an important task variable (Esposito & Pelton, in press). Loss of meaning seems to be found only when the stimulus is rated both before and after the satiation treatment. That the repeated assessment procedure is followed by loss of meaning in satiation studies, but yields persistence of acquired meaning in extinction experiments suggests to some extent the possible operation of different demand characteristics.

3. The presentation of a large number of conditioning trials for each conditioned stimulus. Although Miller and Barsness (1969) did not report these data, all extinction studies apparently used a minimum of 16 pairings of each syllable with unconditioned stimulus words in the conditioning phase. This actually constitutes a relatively large number of conditioning trials, at least under a continuous reinforcement schedule, since Staats has been able to obtain conditioning with as few as 8 trials (Staats & Staats, 1959). If, as Staats
proposes, awareness does occur with a high degree of conditioning, it would be expected that many of the subjects in the extinction studies could label the contingencies.

4. The reinforcement schedule in effect for each conditioned stimulus and the relations between the various schedules in effect for the different syllables. Awareness of reinforcement contingencies would be especially likely when (1) a continuous schedule of reinforcement is employed, e.g., a particular syllable is always paired with positive words, and (2) any other syllable is always paired with negative words. There may not be too great a reduction in the contrast between schedules with a shift to partial schedules, i.e., the relation between the syllables and word classes remain relatively consistent and distinct. Generally, when partial schedules have been used (Gerstein, 1961; Rozelle, 1968; Staats et al., 1960), each syllable is paired with a neutral word on nonreinforced trials, and the positively and negatively conditioned syllables are the only syllables paired with positive and negative evaluative meaning words. After conditioning, then, it would not be unusual if a considerable number of subjects were found to be aware of the reinforcement contingencies when positive words were paired (although intermittently) only with one syllable, negative words were (intermittently) paired only with a second syllable, and additional
syllables were paired solely with neutral words. Such discriminations with human subjects should not be surprising when nonverbal organisms have been found to respond differentially to a stimulus as a function of its correlation with the occurrence of an unconditioned stimulus (Rescorla, 1967). All the extinction studies have included one of the types of syllable-word correlations described above.

It would also be expected that the influence of these factors would be additive; that is, the more mediational determinants that appear in an experiment, the greater the probability of a labeling response, both in terms of the number of subjects and the extent to which an individual subject will engage in labeling activities across trials.

The preceding discussion indicated procedural factors that could influence the occurrence of several classes of verbal behavior. These behaviors could conceivably persist through an extinction manipulation and subsequently attenuate any extinction effect as reflected by semantic differential ratings. There is another variable that could obscure or negate extinction effects: the total number of trials presented to the subject during the experiment. Since the experimental task is rather simple, boring, and tedious, there may well be a reduction in the frequency of appropriate attentional
responses to the conditioned and unconditioned stimuli when an extended number of trials are administered. Staats (1969) previously made this general point, although not specifically in regard to the extinction issue. But the argument seems to be relevant to any operation which increases the total number of trials, i.e., a large number of conditioning and/or extinction trials. For those studies which used a large number of trials, the absence of extinction may be attributable at least in part to a discrepancy between the nominal number of extinction trials and those in which the subject actually executed the necessary attentional behaviors. The result would be an apparent persistence of conditioned meaning, when the lack of change may actually reflect the occurrence of an insufficient number of extinction trials. In the same article, Staats suggests that attention is attenuated to some extent even with the original conditioning procedure using 108 trials, while subjects in Insko and Oakes' (1966) most extreme extinction condition were administered a total of 210 trials. While Miller and his associates used fewer trials, the concurrent use of a small number of different syllables, in conjunction with a considerable (at least 16) number of trials for each syllable, should also increase the repetitive nature of the task.
Statement of the Problem

A major theoretical proposition has been that the emotional meaning response elicited by a word will be conditioned to other verbal stimuli with which the word is paired. Considerable evidence of higher-order conditioning of meaning has been found. At the same time, however, several lines of contradictory data have developed: the possible role of awareness in determining meaning change; the absence of an inter-stimulus interval effect; and the absence of extinction. The tenability of the classical conditioning theory of meaning would seem to demand some resolution of these inconsistencies. A review of the three issues has suggested that the most crucial empirical challenge lies in the apparent lack of extinction effects.

A more detailed analysis of the procedures used in the extinction studies, in conjunction with a consideration of related conceptual issues, has suggested that it is premature to conclude that extinction of conditioned meaning responses does not occur. A valid test of the effects of extinction operations would have important implications for the conception of word meaning as a classical conditioning process. To this end, the present investigation is an attempt to provide a better test of the extinction of conditioned attitudinal (meaning) responses. The basic Staats' procedure
will be modified to control for several variables that might have obscured possible extinction effects in prior studies. In attempting to provide conditions that would presumably minimize the occurrence of verbal mediators, the current study does not deny the reality nor the importance of mediational influences under other circumstances. Rather, the immediate concern is with providing data that bear most directly on the question of the adequacy of a classical conditioning interpretation of word meaning responses under conditions in which the indirect index of such responses is less subject to the influence of additional determinants.

In response to the methodological objections raised earlier in the chapter, several procedural changes from the prior extinction studies were introduced. To increase the plausibility of the experiment to the subject, a larger number of nonsense syllables was presented. It should be noted that this variable could not be increased greatly without producing an undesirable increase in the total number of trials. The number of pairings of each conditioned stimulus with unconditioned stimulus words was reduced to provide a less intense degree of conditioning and thereby hopefully gain a correlated reduction in the frequency of awareness statements. A partial reinforcement schedule was also employed for each conditioned stimulus to insure a
reduction in strength of conditioning, as well as to reduce the correlation between specific syllables and classes of evaluative words. An attempt was made to further reduce the "transparency" of the syllable-word correlation by pairing the "filler" syllables, i.e., syllables which were not paired primarily with either positive or negative words, with words from all three classes of evaluative meaning. In addition to the probable reduction in awareness of extinction contingencies through the use of a partial schedule during conditioning (Insko & Oakes, 1966), only a single assessment phase was conducted in order to minimize the development of implicit demands for change or consistency in ratings. The problem of a reduction in attention with increased trials was partially controlled by the selection of more moderate numbers of extinction trials.

By selecting specific values of several parameters of the conditioned meaning procedure which should minimize the development of covert mediators, the rating index of conditioning should provide an improved measure of the influence of extinction operations. With a dependent variable not confounded with the effects of such cognitive mediators, a reduction in the strength of the conditioned meaning response was predicted to follow nonreinforced presentations of the conditioned stimulus.
This analysis, and the procedural changes derived from it, constitute the basis for Experiment I. Three groups of subjects were run in this experiment, which incorporated the suggested procedural changes. All subjects were initially given higher-order conditioning trials. Four nonsense syllables were presented in this phase. One nonsense syllable was paired on most trials with different positive evaluative words, a second syllable was paired primarily with negative words, and each of two additional syllables was paired with positive, negative, and neutral words. One group rated the pleasantness of the syllables immediately after conditioning, while the other two groups received 5 or 15 additional pairings of each of the four syllables with neutral words prior to rating the syllables. If extinction of conditioned meaning responses does occur, subjects receiving extinction trials consisting of syllable-neutral word pairings should rate the syllables paired primarily with positive and negative words less extremely than subjects who receive conditioning trials only.

To provide an adequate test of this hypothesis, it would be necessary to obtain conditioned meaning in a group of "unaware" subjects, that is, subjects who do not label the CS-UCS relationships. The procedures employed in Experiment I were designed, in part, to provide such a group.
Consistent with this purpose, a second study was conducted, in which a delay between conditioning and extinction trials was imposed prior to the assessment of conditioned meaning. The rationale for Experiment II was as follows. It has been found that evaluative meaning responses will persist over time (Minke & Stalling, 1970; Yavuz & Bousfield, 1959) in subjects who, after the delay, are unable to recall any of the positive and negative words that were paired with the syllables. Minke and Stalling also found that the number of direct CS-UCS associates recalled by a subject was a decreasing function of the number of weeks from the time of conditioning. Secondly, it is possible that some subjects who are conditioned may be excluded from the data analysis because they can recall some of the words that were paired with the syllables (Staats, 1969). There is evidence that some recall of associates does occur after conditioning (Pollio, 1963). It is important to note that Pollio also found that even when the word associates were not the words that had been paired with the syllables, the associates had the same meaning as the meaning conditioned to the syllable. Pollio concluded that the conditioned meaning had mediated the recall of these associates and perhaps the words that had been paired with the syllables as well.
These considerations suggested that the use of a delay period might provide an improved estimate of conditioning in unaware subjects. That is, if the delay resulted in the weakening of any CS-UCS associations that might have been weakly established during conditioning, it would help prevent the type of labeling awareness that has been discussed. Fewer of the conditioned subjects would have to be eliminated from the study because of awareness. It thus might be possible to obtain a greater degree of conditioning over the group and a more sensitive test of the effects of extinction. Experiment II therefore involved the use of the conditioning procedures already summarized, with the addition of a two-week delay between conditioning and extinction.

One other objective of the experiments should be indicated. It was also of interest to test any possible differences in the CS-UCS word associates that might arise from the experimental procedures. Therefore, after the conditioning ratings the subjects were asked to recall any of the words that the syllables had been paired with. Whether or not there were differences between the groups receiving extinction trials and the group with no extinction trials could then be ascertained.
CHAPTER III

METHOD

Experiment I

Subjects

A total of 79 students, 29 males and 50 females, was drawn from the introductory psychology courses at the University of Hawaii. Each subject volunteered to serve either to satisfy a course requirement or to obtain an additional point on his final course grade. Assignment to the six independent treatment conditions was made by randomly assigning one of each consecutive set of six subjects on the appointment schedule to different treatment conditions.

Materials

Nonsense syllables. Four nonsense syllables were selected: GIC, QEH, VUP, and POJ. These syllables were drawn from a sample of 200 trigrams with association values between 13 and 20 (Archer, 1960) which had been previously rated on a pleasant-unpleasant semantic differential scale by an independent group of 100 subjects at the University of Hawaii (Minke & Stalling, 1970). The mean rating of the 4 syllables was 3.98, with no syllable deviating from 4.00 by more than .05. Twenty slides of each of the four syllables were prepared
with one syllable on each slide. Twenty independent random orders of the four syllables were generated, with the constraint that the first syllable of any order could not be the same as the last syllable of the preceding order. The 80 slides were arranged in this order in a Kodak Carousel projector (Model 850). The same order of 80 syllables was employed for the development of the syllable-word lists for conditioning and extinction.

**Syllable-word pairings for conditioning.** Conditioned meaning was included as a within-subjects variable. For each subject, one syllable (the positive conditioned stimulus) was paired primarily with positive evaluative words, a second syllable (the negative conditioned stimulus) was paired primarily with negative evaluative words, and the remaining 2 neutral syllables were paired mostly with neutral words. The number of pairings of each syllable with words from the three classes of evaluative meaning is illustrated in Table 1. For the positive and negative syllables, the data in Table 1 describe the specific partial reinforcement schedule employed in this experiment. The correlation between the occurrence of specific syllables and classes of evaluative words during conditioning was reduced from earlier studies by pairing both positive and negative words with each of the neutral (filler) syllables on an intermittent schedule. The total number of words
TABLE 1

Number of Pairings of Each Syllable with Words of Three Classes of Evaluative Meaning in Conditioning Lists.

<table>
<thead>
<tr>
<th>EVALUATIVE WORD CLASS</th>
<th>Positive</th>
<th>Neutral</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SYLLABLE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive Syllable</td>
<td>14</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Negative Syllable</td>
<td>0</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>Neutral Syllable 1</td>
<td>4</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Neutral Syllable 2</td>
<td>4</td>
<td>10</td>
<td>4</td>
</tr>
</tbody>
</table>
from each class of evaluative meaning may also be calculated from Table 1, i.e., 22 positive, 22 negative, and 28 neutral words. An additional 60 neutral words were necessary for the maximum extinction condition, resulting in a total requirement of 88 neutral words. The words were drawn from a variety of sources (Brotsky, 1968; Jenkins, Russell, & Suci, 1957; Minke & Stalling, 1970; Osgood & Suci, 1955; Pollio, 1963; Snider & Osgood, 1969; Staats & Staats, 1957; Staats et al., 1962), and are listed in Appendices 1, 2, and 3.

Two conditioning lists of 72 syllable-word pairings were generated. In List 1, GIC was the positive conditioned stimulus, and QEH was the negative conditioned stimulus. In List 2 the word pairings for these 2 syllables were reversed, with QEH as the positive syllable and GIC as the negative syllable. The order of nonsense syllables in the 72-item conditioning lists was identical to the order of the first 72 slides in the projector slide tray. The following method was employed to determine the specific words paired with each syllable and the order of word pairings. For the positive and negative syllables, Trials 3, 7, 12, and 16 were nonreinforced trials, i.e., on those trials a neutral word would be presented. For each of the two neutral syllables, a neutral word was presented in Trials 1, 3, 4, 6, 8, 10, 12, 14, 16, and 18. Syllable-
word pairings and trial position were then randomly determined, with one constraint on the two filler syllables. On the trials in which each neutral syllable was to be paired with either a positive or negative word, the other neutral syllable was paired with a word of the opposite evaluative meaning. Conditioning List 1 is presented in Appendix 4.

Syllable-word pairings for extinction. The sequence of nonsense syllables for the extinction trials was derived from the randomized 80-syllable sequence. The first two syllable orders in the extinction series were the last 2 syllable orders of the 80-syllable sequence. The remainder of the extinction syllable sequence was identical to the arrangement of the first 52 syllables of the original 80-syllable sequence. The 60 neutral words that had not been selected in the construction of the conditioning lists were set into a random order. The extinction order of 60 syllables was then paired with the randomized order of 60 neutral words to generate a single list of syllable-neutral word pairings for extinction. This list is presented in Appendix 5.

Syllable rating-recognition booklets. A 6-page syllable rating-recognition booklet was prepared for each subject. Each page of the booklet contained a different nonsense syllable printed above a 7-point
pleasant-unpleasant semantic differential scale and a question to test syllable recognition. An example of a syllable rating-recognition sheet is provided in Appendix 7. The syllables included the 4 syllables from the conditioning lists as well as DAX and XOR. A 6 x 6 Latin square for syllables and positions was generated, and 6 separate sets of booklets were prepared. Each of these sets contained one of the six syllable sequences specified by the Latin square, and the 6 rating orders are presented in Appendix 8. Partial counterbalancing for possible position and order effects on syllable ratings was then provided by randomly assigning one of the 6 different booklets to one of the first 6 subjects in each combination of treatment conditions (extinction trials x conditioning list). Additional subjects in each condition were then randomly assigned booklets with the restriction of no repetition of a rating order.

Procedure.

The subjects were randomly assigned to one of six conditions generated by a 3 x 2 factorial design. The design included three treatments (conditioning only, and 5 or 15 extinction trials) and two different conditioning lists. Prior to the administration of extinction trials and/or the conditioning assessment, all subjects served in an initial conditioning phase in which half
the subjects in each treatment condition were presented Conditioning List 1, and the other half received Conditioning List 2.

Each subject was run individually in a small experimental room containing the Carousel projector mounted on a table behind and to the side of the subject. During slide presentations, the experimenter would stand behind the subject to start the projector and read the words. After the subject was seated, he was told that this was a learning experiment in which he was to learn two different types of material under two different types of stimulus presentation, nonsense syllables would be flashed on the wall, and words would be spoken aloud by the experimenter. The instructions further indicated that each word was to be learned by repeating it aloud once after the experimenter and then continuing to repeat the word silently until the syllable on the wall changed. The syllables were to be learned by just looking at them. The verbatim instructions for the conditioning phase are presented in Appendix 6. Relevant sections of the instructions were repeated if any questions arose.

The syllables were presented by means of the projector in the same randomized order as the order of the syllables in the conditioning lists. Each syllable was exposed for 5 seconds with an intertrial interval of less than 1 second (the mechanical operation time to
effect a slide change). The words were read by the experimenter from the appropriate conditioning list assigned to a given subject. Each word was spoken aloud by the experimenter approximately 1 second after the onset of the syllable. While looking at the syllable on the wall, the subject repeated the word aloud once. It was assumed that the instructions were sufficient to promote the subject's appropriate subvocal repetitions of the word. No attempt was made to monitor the extent of covert repetitions during the slide presentations.

When the 72 trials of the conditioning phase were completed, subjects in the 0-EXT group were immediately given the assessment tasks, while subjects in 5-EXT and 15-EXT conditions were administered extinction trials prior to assessment. For the extinction groups, the extinction trials were continuous with the conditioning trials, i.e., there was no temporal break in syllable-word presentations. The procedure for presentation of the syllable-word pairings during extinction was identical to the conditioning procedure. In the 5-EXT group, the first 20 syllables of the extinction list were presented and paired with the corresponding neutral words. This condition provided 5 pairings of each of the conditioned stimulus syllables with neutral words as well as pairing each of the 2 filler syllables with 5 neutral words. Similarly, in the 15-EXT group,
all 60 syllable-word pairings from the extinction list were presented, resulting in 15 extinction trials for each of the conditioned stimuli.

Assessment phase. After the completion of the conditioning and extinction phases appropriate to each experimental condition, subjects were given a syllable "rating-recognition" task. The verbatim instructions are given in Appendix 9. Briefly, the subject was told he was to be first tested on his learning of the syllables. At the same time he was asked to indicate how he felt about each of the syllables, on the pretense that such measures are necessary to control for the possible effects of such attitudes on the learning of the syllables. Instructions were then given as to the use of the semantic differential scale and the appropriate scoring of recognition responses, while an example was presented on a chart. Each subject then received the 6-page booklet. Following completion of the booklet, the subject was given a word recognition task. This test consisted of a list of 24 words contained in Appendix 10. The subject was asked to circle all the words he recalled hearing during the experiment. A time limit of 1 minute was set for this task. Word recognition was followed by an initial awareness probe, detailed in Appendix 11. Responses to the probe were recorded on the back of the word recognition test sheet.
The fourth part of the assessment phase was a modified association test. The subject received a booklet with one of the 6 syllables printed in the center of each page, and was asked to write down all the words that he remembered being presented with each syllable during the experiment. The order of syllables in the association booklet was the same as the syllable order in the rating-recognition task for each subject.

While the subject was completing the association test, the experimenter inspected the responses to the initial awareness question. If the report contained no clear statement about the relation between certain syllables and words of different evaluative meanings, a second awareness question was employed, asking the subject about his reasons for rating the syllables. It was hypothesized that placing this question in a more casual context might reduce the frequency of "false positives" that could result from implicit demand characteristics contained in an extended line of questioning. Appendix 12 presents the wording of the second awareness probe.

Experiment II

Subjects

An additional 65 subjects, 26 males and 39 females, were drawn from the same introductory psychology subject
pool. Individual assignment to experimental conditions was again randomly determined. The basis for participation and the method of assignment were identical to the conditions of Experiment I.

**Procedure**

With the exception of the administration of two additional pseudotests and the imposition of a temporal delay between conditioning and extinction trials, the materials and procedures of the second study were identical to those employed in the first experiment. For all subjects in Experiment II, the 72 conditioning trials were followed immediately by two "cover" tests. These tests are presented in Appendices 13 and 14. In the first test, the subjects were given 30 seconds to circle all the nonsense syllables they remembered seeing in the experiment. The only syllables included from the conditioning list were the 2 filler syllables. In the second test, the subject was asked to circle all the words he heard during the experiment, and was given a 1 minute time limit. None of the unconditioned stimulus words which had been paired with the positively and negatively conditioned syllables were included in the word list for this test. These tasks were included to preserve the credibility of the expressed purpose of the experiment so that subjects could be plausibly dismissed prior to recall for extinction manipulations and assessment.
All subjects were recalled approximately 14 days after their first participation. Some subjects were not available to serve in the second session exactly 14 days after their first appearance, but were scheduled for the closest possible date for which they reported their availability. The actual length of the delay period ranged from 13 to 19 days. The second appointment was arranged by a different experimenter in an attempt to conceal the relation between the two sessions until the subject's return. In the second session, subjects in the O-EXT group were immediately given the syllable rating-recognition booklets after the initial instructions. The content of these instructions was slightly modified from those of Experiment I to incorporate a justification for a second participation. These modified instructions are contained in Appendix 15. The remainder of the assessment sequence was identical to that of Experiment I, i.e., word recognition test, first awareness probe, association test, and, when necessary, second awareness probe.

For subjects in the 5-EXT and 15-EXT conditions, the second session began with the administration of the appropriate number of extinction trials. Again the initial instructions were modified to justify the additional learning trials. Appendix 16 presents this version of the instructions. The extinction procedures, however,
were identical to those employed in the respective groups in Experiment I. Since subjects in the 5-EXT and 15-EXT groups were exposed to two discrete sets of trials, it was necessary to request recall of material from both sessions for the recognition and association tests after the second session. With the exception of this slight change in the instructions, the assessment procedures were identical to those in Experiment I.

For Experiment II, then, the same 3 x 2 factorial design was employed, with three different treatments and two different conditioning lists. In Experiment II, however, all subjects received extinction trials and/or conditioning assessment two weeks after the conditioning trials.

In both experiments, any subject whose responses to either of the awareness probes included statements which indicated there had been some relationship between certain syllables and words of different classes of evaluative meaning was classified as aware, and his data were excluded from the statistical analyses. Any statement which referred to an association, pairing, or grouping of multiple words of similar meaning with specific syllables was scored as an aware response. Appendix 17 presents the proportion of aware subjects in each treatment group who had been judged aware on the basis
of their responses to the second awareness probe. Additional subjects were randomly assigned to replace aware subjects.
CHAPTER IV
RESULTS

Experiment I

Conditioning Data

The mean semantic differential ratings of the positively and negatively conditioned syllables, standard deviations, and sample sizes are presented in Table 2. For purposes of statistical analysis, a conditioning score for each subject was calculated by subtracting his rating of the syllable paired primarily with positive evaluative words during conditioning from his rating of the syllable paired primarily with negative evaluative words. The means and standard deviations of the conditioning scores for the six experimental groups are presented in Table 3. The means for the three experimental conditions are also included in this table.

To determine if a significant degree of conditioning existed following conditioning trials, an independent t test was conducted in the O-EXT condition to determine if the mean conditioning score was significantly greater than zero. The result indicated that a significant degree of conditioning had been established in subjects who did not receive extinction trials
TABLE 2
Mean Semantic Differential Ratings in Experiment I of Conditioned Stimuli, Standard Deviations, and Sample Sizes of Treatment Groups.

<table>
<thead>
<tr>
<th>Experimental Condition</th>
<th>Conditioning Only</th>
<th>Extinction 5 Trials</th>
<th>Extinction 15 Trials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive CS</td>
<td>Negative CS</td>
<td>Positive CS</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>List 1</td>
<td>3.11</td>
<td>1.36</td>
<td>3.89</td>
</tr>
<tr>
<td></td>
<td>4.22</td>
<td>1.56</td>
<td>4.33</td>
</tr>
<tr>
<td>n</td>
<td>9</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>List 2</td>
<td>3.30</td>
<td>2.00</td>
<td>3.70</td>
</tr>
<tr>
<td></td>
<td>4.20</td>
<td>1.48</td>
<td>2.80</td>
</tr>
<tr>
<td>n</td>
<td>10</td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>
TABLE 3

Means and Standard Deviations of Conditioned Meaning Scores in Experiment I.

<table>
<thead>
<tr>
<th>EXPERIMENTAL CONDITION</th>
<th>Conditioning Only</th>
<th>Extinction 5 Trials</th>
<th>Extinction 15 Trials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>LIST 1</td>
<td>1.11</td>
<td>2.15</td>
<td>0.44</td>
</tr>
<tr>
<td>LIST 2</td>
<td>0.90</td>
<td>2.08</td>
<td>-0.90</td>
</tr>
</tbody>
</table>

Mean 1.01  -0.26  -0.32
(t=2.12, 18 df, p<.025, one-tailed test). This result indicates that the conditioned meaning procedures developed for the present study were effective in producing conditioning when aware subjects were excluded from the analysis. On the other hand, one-tailed t tests provided no evidence of conditioning in subjects who had received either 5 (t<1, 18 df) or 15 (t<1, 18 df) extinction trials on each conditioned stimulus after conditioning.

A 3 x 2 analysis of variance using an unweighted means solution was conducted to assess the effects of experimental condition and conditioning list on the mean conditioning scores. The results of this analysis are summarized in Table 4. To test the overall hypothesis that strength of conditioned meaning will be reduced following extinction, an a priori contrast was formed between the mean conditioning score of the 0-EXT group and the mean of the mean conditioning scores of the 5-EXT and 15-EXT groups. The predicted difference was significant (F=4.09, 1,49 df, p<.05). Thus, subjects who were administered conditioning trials but no extinction trials showed a greater degree of conditioning than subjects who received extinction trials after conditioning.

To test the possibility that mean conditioning scores would vary as a function of the number of extinction
### TABLE 4

Analysis of Variance Summary Table of Conditioned Meaning Scores for Experiment I.

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Treatment Condition)</td>
<td>20.962</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast 1</td>
<td>20.891</td>
<td>1</td>
<td>20.891</td>
<td>4.09</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Contrast 2</td>
<td>0.071</td>
<td>1</td>
<td>0.071</td>
<td>&lt;1</td>
<td></td>
</tr>
<tr>
<td>B (List)</td>
<td>0.985</td>
<td>1</td>
<td>0.985</td>
<td>&lt;1</td>
<td></td>
</tr>
<tr>
<td>AB</td>
<td>10.021</td>
<td>2</td>
<td>5.01</td>
<td>&lt;1</td>
<td></td>
</tr>
<tr>
<td>S (AB)</td>
<td>250.412</td>
<td>49</td>
<td>5.11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
trials administered, a second a priori contrast was formed between the mean conditioning scores of the 5-EXT and 15-EXT groups. This analysis revealed no difference in conditioned meaning as a function of number of extinction trials conducted after conditioning ($F<1$, $1,49$ df). Neither the conditioning list nor the Conditioning List x Treatment Condition interaction was found to be a significant source of variance in the conditioning scores.

The results of these analyses indicate that subjects who receive extinction trials do have a lower conditioning score than subjects who do not receive extinction trials after conditioning. However, there is not a differential effect of the number of extinction trials.

**Association Data**

A UCS associate to a conditioned stimulus nonsense syllable was defined as a subject's correct recall on the association test of an unconditioned stimulus word that had been paired with that syllable during the conditioning trials. The mean number of UCS associates recalled in each treatment group is presented in Table 5. As these data indicate, average recall in each group was less than one UCS word per syllable. Regardless of the treatment condition a subject had been exposed to, he recalled very few words that had been paired with
TABLE 5

Mean Number of UCS Associates in Experiment I to Each CS for Each Experimental Condition.

<table>
<thead>
<tr>
<th></th>
<th>Conditioning Only</th>
<th>Extinction 5 Trials</th>
<th>Extinction 15 Trials</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Positive CS</strong></td>
<td>0.42</td>
<td>0.37</td>
<td>0.18</td>
</tr>
<tr>
<td><strong>Negative CS</strong></td>
<td>0.42</td>
<td>0.26</td>
<td>0.41</td>
</tr>
</tbody>
</table>
the conditioned stimulus nonsense syllable. In order to perform a statistical comparison, a total UCS recall score for each subject was determined by adding the total number of UCS associates recalled for the positively conditioned stimulus to the total number of UCS associates recalled for the negative syllable. A Kruskal-Wallis one-way analysis of variance was conducted on the mean rank orders of the total number of UCS associates recalled in the three treatment conditions. The results of this analysis revealed no significant differences in total UCS associate recall as a function of the treatment conditions. 

$H$ (corrected for ties) $< 1, 2 \text{ df})$.

Experiment II

Conditioning Data

Mean ratings of the positive and negative conditioned stimuli, standard deviations, and sample sizes for the six treatment conditions are presented in Table 6. The means and standard deviations of the conditioning scores are shown in Table 7.

First, there was no evidence that the conditioning method, in conjunction with a delay, produced a significant level of conditioned meaning. Although in the appropriate direction, the mean conditioning score for the O-EXT group was not significantly greater than zero ($t = 1.32, 19 \text{ df}, p < .11$). There was also no evidence of
### TABLE 6
Mean Semantic Differential Ratings in Experiment II of Conditioned Stimuli, Standard Deviations, and Sample Sizes of Treatment Groups.

<table>
<thead>
<tr>
<th>EXPERIMENTAL CONDITION</th>
<th>Conditioning Only - Positive CS</th>
<th>Conditioning Only - Negative CS</th>
<th>Extinction - 5 Trials Positive CS</th>
<th>Extinction - 5 Trials Negative CS</th>
<th>Extinction - 15 Trials Positive CS</th>
<th>Extinction - 15 Trials Negative CS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M 3.60</td>
<td>4.30</td>
<td>M 3.60</td>
<td>3.80</td>
<td>M 3.33</td>
<td>3.88</td>
</tr>
<tr>
<td>LIST 1</td>
<td>SD 0.70</td>
<td>1.57</td>
<td>SD 1.35</td>
<td>1.48</td>
<td>SD 1.87</td>
<td>1.83</td>
</tr>
<tr>
<td>n</td>
<td>10</td>
<td></td>
<td>10</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M 4.00</td>
<td>4.50</td>
<td>M 3.11</td>
<td>3.67</td>
<td>M 4.00</td>
<td>4.30</td>
</tr>
<tr>
<td>LIST 2</td>
<td>SD 2.40</td>
<td>2.50</td>
<td>SD 1.69</td>
<td>1.41</td>
<td>SD 1.41</td>
<td>1.25</td>
</tr>
<tr>
<td>n</td>
<td>10</td>
<td></td>
<td>9</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE 7

Means and Standard Deviations of Conditioned Meaning Scores in Experiment II.

<table>
<thead>
<tr>
<th>EXPERIMENTAL CONDITION</th>
<th>Conditioning Only</th>
<th>Extinction</th>
<th>Extinction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>LIST 1</td>
<td>0.70</td>
<td>1.89</td>
<td>0.20</td>
</tr>
<tr>
<td>LIST 2</td>
<td>0.50</td>
<td>2.27</td>
<td>0.56</td>
</tr>
<tr>
<td>Mean</td>
<td>0.60</td>
<td></td>
<td>0.37</td>
</tr>
</tbody>
</table>
conditioning in either of the groups that received extinction trials \( t(5-\text{EXT}) < 1, 18 \text{ df}; t(15-\text{EXT}) < 1, 18 \text{ df} \).

A 3 x 2 analysis of variance, summarized in Table 8, revealed no significant main effects or interactions in the conditioning scores. As would be expected on the basis of the absence of significant conditioning in the O-EXT group, the a priori contrast between the O-EXT group and the mean of the mean conditioning scores in the 5-EXT and 15-EXT groups indicated a nonsignificant difference. That is, when subjects who received only conditioning trials show no evidence of conditioning, their conditioned meaning scores are not different from subjects who received extinction trials after an identical conditioning experience. An a priori contrast between the 5-EXT and 15-EXT groups indicated no difference in conditioned meaning scores as a function of the number of extinction trials. As in Experiment I, there was no evidence of a general effect of conditioning list, nor did conditioning lists interact with the experimental conditions.

**Association Data**

Table 9 presents the mean number of UCS associates to each conditioned stimulus syllable in each treatment condition after a two-week delay. Again, there was little recall of specific evaluative words that had been paired with each syllable. Even when subjects did not receive
### TABLE 8

Analysis of Variance Summary Table of Conditioned Meaning Scores for Experiment II.

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Treatment Condition)</td>
<td>0.520</td>
<td>2</td>
<td>0.49</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Contrast 1</td>
<td>0.49</td>
<td>1</td>
<td>0.49</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Contrast 2</td>
<td>0.03</td>
<td>1</td>
<td>0.03</td>
<td>&lt;1</td>
</tr>
<tr>
<td>B (List)</td>
<td>0.009</td>
<td>1</td>
<td>0.009</td>
<td>&lt;1</td>
</tr>
<tr>
<td>AB</td>
<td>1.109</td>
<td>2</td>
<td>0.554</td>
<td>&lt;1</td>
</tr>
<tr>
<td>S (AB)</td>
<td>268.746</td>
<td>52</td>
<td>5.168</td>
<td></td>
</tr>
</tbody>
</table>
TABLE 9

Mean Number of UCS Associates in Experiment II to Each CS for Each Experimental Condition.

<table>
<thead>
<tr>
<th></th>
<th>Conditioning Only</th>
<th>Extinction 5 Trials</th>
<th>Extinction 15 Trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive CS</td>
<td>0.42</td>
<td>0.37</td>
<td>0.18</td>
</tr>
<tr>
<td>Negative CS</td>
<td>0.42</td>
<td>0.26</td>
<td>0.41</td>
</tr>
</tbody>
</table>
extinction trials, they still recalled less than one evaluative word for each nonsense syllable. A Kruskal-Wallis one-way analysis of variance on the mean rank orders of the total number of UCS associates recalled in the three treatment groups again indicated that there were no differences in UCS recall as a function of the treatment conditions ($H_{\text{corrected for ties}} < 1, 2 \text{ df}$).
The results of this investigation provide some support for a classical conditioning analysis of the development and change of word meaning. If word meaning responses are established and modified on the basis of classical conditioning principles, similar changes in behavior should result from the manipulation of basic parameters of classical conditioning. Extinction is one such fundamental phenomenon found for a wide range of classically conditioned responses. If a verbal stimulus does come to elicit an emotional response through either first-order or higher-order conditioning, the conditioned response to that stimulus should diminish in strength after repeated nonreinforced presentations of the conditioned stimulus. In earlier research employing a higher-order procedure, meaning responses were found to be peculiarly resistant to the effects of extinction operations. However, a more detailed analysis of prior procedures was presented earlier which suggests that these data could reflect the influence of several variables which would be expected to obscure extinction effects.

In contrast to previous extinction studies, the results of Experiment I showed evidence of extinction
of conditioned meaning, and, at the same time, did not provide evidence of the persistence of meaning. In this experiment, the strength of conditioned meaning responses was reduced after 5 and 15 nonreinforced presentations of each conditioned stimulus. These data suggest that extinction of conditioned meaning can occur under conditions designed to retard the development of verbal mediators which might produce antagonistic changes in the indirect measure of conditioning.

The general finding of an extinction effect in conditioned word meaning may be tempered by the fact that there was no differential effect due to the number of extinction trials, a finding contrary to what is typically found in conditioning studies. This suggests the possibility that the loss of meaning found in Experiment I may be the result of a process other than the extinction of classically conditioned responses. While this remains a possibility, neither the present study nor the discussions in earlier extinction experiments offer any suggestions as to the nature of such a process. As an alternative explanation, the present data do indicate that extinction was essentially complete after five trials. If this were so, then additional extinction trials could have little further effect.

The findings of essentially complete extinction following five trials also requires some discussion, given
that there were 14 acquisition trials. This apparent rapid rate of extinction in Experiment I may be attributable to a relatively low degree of conditioning established during the learning trials. The small magnitude, i.e., a one-point difference, of the mean conditioning score for the Q-EXT group of Experiment I supports the inference of an initial low level of conditioning. Some reduction in response strength was expected to result from the use of a partial reinforcement schedule and relatively few conditioning trials. Furthermore, the interaction of a partial schedule with relatively few trials may attenuate any tendency to increased resistance to extinction following conditioning on a partial schedule (Gormezano & Moore, 1969, p. 167). It should also be noted that relatively stringent selection criteria were employed to exclude "aware" subjects. Not only were increasingly direct questions asked, but the opportunity for the subject to inspect his recall of specific syllable-word pairings may also have generated hypotheses that would not have occurred otherwise. If any of these aspects of the assessment procedure did serve to "program" some unaware subjects to an awareness report, then the resulting sample of unaware subjects included in the data analyses actually provides an underestimate of the extent and strength of conditioning.

It is of interest to note that inspection of the mean conditioning scores of aware subjects in Experiment I
revealed a drop in conditioned meaning after 15 extinction trials. The mean conditioning score and number of aware subjects in each experimental group for the two experiments is presented in Appendix 18. A similar trend was apparent in Experiment II, although the sample sizes were substantially smaller. These differences, if reliable, are not in accord with previous predictions of the influence of awareness states on syllable ratings.

At any rate, the more important point is that the performance of unaware subjects demonstrated a significant decrement after the presentation of extinction trials. This is the first evidence to suggest that extinction will occur in a higher-order conditioned meaning procedure. The finding of extinction does demand replication, and further study of additional parameters, such as the number of extinction trials is, of course, appropriate. However, the possibilities of design changes to increase the degree of conditioning in unaware subjects seem limited. Most manipulations, e.g., increasing the ratio or number of conditioning trials, would be expected to increase awareness reports and/or reduce attentional behaviors in later trials.

The support of the extinction hypothesis in Experiment I under the modified experimental conditions also increases the viability of the methodological objections raised against the extinction studies that showed
persistence of meaning. That is, it was suggested that changes in word meaning after extinction operations would depend upon the selection of specific values of certain parameters of the conditioning procedure. The loss of meaning obtained in Experiment I after changes in these parameters furnishes indirect evidence that these variables are important determinants of verbal mediation. In this light, attention to these parameters is of importance in two ways. First, future research that is directed toward the study of classical conditioning variables in word meaning responses (to the exclusion of other influences) should carefully consider the parameters described in this investigation. In this regard, the results of the methods of the present study suggest their usefulness in future research. The present procedures were designed to minimize awareness under relatively stringent criteria. The results indicate that the methods were effective in producing conditioning, and recommend themselves for use in further investigations. Secondly, if studies of word meaning are directed toward more complex analyses of the interaction between classical conditioning processes and other sources of control, it would be important to consider the results of the systematic manipulation of the parameters specified in this study.
The methods of Experiment II did not provide the conditions sufficient to test the extinction hypothesis. Without conditioning, there is no opportunity to demonstrate reductions in response strength. When the conditioning measure was taken after a two-week delay, there was no evidence of a significant degree of conditioning in any of the groups. Nevertheless, the mean conditioning scores were slightly smaller after extinction, and inspection of the means of the three groups suggests an effect similar to that found in Experiment I. The results, then, were in the expected direction, but were not large enough to permit conclusive statements.

Given the fact of conditioning in Experiment I with similar procedures, the failure to find conditioned meaning in Experiment II might be attributed to some attenuation of the conditioned response. Learned responses are known to demonstrate "spontaneous regression," i.e., some loss of response strength does occur with the passage of time (Kimble, 1961, pp. 297-299). With the apparent weak degree of conditioning found in the 0-EXT group in Experiment I, it would not require too large a loss over the two-week delay to yield nonsignificant conditioning scores. While less likely, conditioning measures under delayed conditions may reflect some attenuation of response strength from generalization of extinction. Analogous to stimulus generalization effects,
once the response to a specific stimulus is weakened through extinction, other stimuli will also show reduced tendencies to elicit the response as a function of their similarity to the originally extinguished stimulus (Kimble, 1961, pp. 92-93, 333-334). To the extent that stimuli with some degree of similarity (e.g., words, letters, letter combinations, sounds) to the stimulus components of the conditioned nonsense syllables appear in extinction contingencies during the delay interval, some generalization of extinction may occur to the syllables. Small as they may be, the effect of either factor (or their cumulative effect) could perhaps be sufficient to reduce the initially slight conditioning to a nonsignificant level.

Also, the data of the O-EXT group in Experiment II do not repeat Minke and Stalling's (1970) finding of retention of conditioned meaning responses with delays up to 4 weeks after conditioning. This difference is probably the result of the large procedural variations between the two studies. The most prominent distinctions stem from Minke and Stalling's use of a traditional paired-associates learning procedure. With the paired-associates task, each syllable was always paired with an unconditioned stimulus word of a single class of evaluative meaning, and a larger number of pairings was presented. The effect of the word associates established
would be much greater. Moreover, the use of a continuous schedule of reinforcement and a larger number of conditioning trials should have established a stronger conditioned response. With a response of initially greater magnitude, attenuation produced by delay-related factors would have a relatively smaller effect on estimates of conditioning. Whatever the determinants, the combined use of a delay period in conjunction with the procedures employed in this study does not appear to generate strong enough conditioning to provide an effective test of the manipulation of additional variables such as extinction.

In sum, this investigation has demonstrated that, under certain conditions, word meaning responses established in a higher-order conditioning paradigm are attenuated after extinction trials. While not definitive, this demonstration lends additional credence to the analysis of word meaning as a classically conditioned response.
APPENDIX 1

Positive Evaluative Words

ART
BEAUTY
BREAD
BROTHER
COMFORT
CONSIDERATE
ENTHUSIASTIC
FLOWER
GIFT
HAPPY
HEALTHY

HOME
HOUSE
LAMP
LOVE
MUSIC
PEACE
PIANO
SLEEP
SMOOTH
SUCCESS
WISE
APPENDIX 2

Negative Evaluative Words

ACCIDENT          HURT
ANGER             INDIFFERENT
BITTER            ROUGH
BLIND             SICK
COLD              SORRY
DISTANT           SOUR
FAT               STINGY
FEAR              THIEF
GRIEF             UGLY
HOSTILE           WAR
HUNGRY            WEARY
APPENDIX 3

Neutral Evaluative Words

| ARCHED | CORD | MOMENT | SECTION |
| ARGON  | CUBE | NAIL   | SHIRT   |
| BAG    | DISH | NEXT   | SOFA    |
| BASE   | DRESS| NUMBER | SOUND   |
| BELT   | ENTER| OBVIOUS| SPHERE  |
| BLOCK  | EVERY| PACK   | SQUARE  |
| BOOK   | FLOOR| PAGE   | STICK   |
| BOTTLE | FOOT | PAPER  | STORE   |
| BOULDER| FRAME| PEN    | SUDDEN  |
| BOX    | GLASS| PENCIL | TABLE   |
| BRICK  | GLOBE| PERSON | THREAD  |
| BRIDGE | GROUND| PICTURE| TILE    |
| BRUSH  | GROUP| PIPE   | TOWN    |
| BULB   | HAT  | PLACE  | TRAILER |
| BUS    | HINGE| PLANT  | TRIANGLE|
| BUTTON | INTERMITTENT| PLASTER| TRUCK  |
| CARPET | IRON | REPORT | WAGON   |
| CARRIAGE | KEY | ROOM   | WALL    |
| CENTURY | LETTER| ROUND | WHEEL   |
| CHAIR | LONG | SALT   | WINDOW  |
| CIRCLE | MAGAZINE| SAND | WOOD    |
| CLAY | MALLET | SAUCER | WORD    |
APPENDIX 4

Conditioning List 1

VUP SOUND QEH BLOCK POJ BRIEF
POJ NEXT POJ BREAD QEH WISE
QEH MUSIC GIC PAPER VUP HOUSE
GIC BITTER VUP HUNGRY GIC FAT
QEH LOVE GIC ANGER QEH HOME
VUP BEAUTY POJ SUDDEN GIC BLIND
POJ DISTANT QEH COMFORT POJ PEN
GIC SICK VUP LETTER VUP WAGON
POJ DISH GIC UGLY POJ LAMP
GIC BOOK VUP ENTHUSIASTIC VUP STINGY
VUP CHAIR QEH SMOOTH GIC COLD
QEH SALT POJ SOUR QEH SUCCESS
VUP PLACE GIC ACCIDENT VUP SPHERE
GIC ROUGH POJ LONG POJ BOULDER
QEH BROTHER VUP WOOD GIC TOWN
POJ CIRCLE QEH CONSIDERATE QEH MOMENT
GIC FEAR VUP INDIFFERENT POJ SORRY
QEH GIFT QEH HAPPY QEH PEACE
VUP HOSTILE GIC WAR GIC THIEF
POJ ART POJ HEALTHY VUP PIANO
QEH FLOWER GIC MALLET QEH SLEEP
GIC HURT VUP BOTTLE VUP CENTURY
VUP EVERY POJ BRICK GIC WEARY
POJ GROUP QEH NUMBER POJ THREAD
### APPENDIX 5

**Extinction List**

<table>
<thead>
<tr>
<th>POJ</th>
<th>GIC</th>
<th>QEH</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUTTON</td>
<td>VUP</td>
<td>SQUARE</td>
</tr>
<tr>
<td>PLASTER</td>
<td>GIC</td>
<td>ROUND</td>
</tr>
<tr>
<td>BRUSH</td>
<td>QEH</td>
<td>ARCHED</td>
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<tr>
<td>CARRIAGE</td>
<td>POJ</td>
<td>IRON</td>
</tr>
<tr>
<td>OBVIOUS</td>
<td>QEH</td>
<td>INTERMITTENT</td>
</tr>
<tr>
<td>CARPET</td>
<td>GIC</td>
<td>BULB</td>
</tr>
<tr>
<td>BUS</td>
<td>QEH</td>
<td>WHEEL</td>
</tr>
<tr>
<td>SAUCER</td>
<td>POJ</td>
<td>STICK</td>
</tr>
<tr>
<td>CUBE</td>
<td>QEH</td>
<td>TRUNK</td>
</tr>
<tr>
<td>GROUND</td>
<td>GIC</td>
<td>TRUNK</td>
</tr>
<tr>
<td>BASE</td>
<td>QEH</td>
<td>ENTER</td>
</tr>
<tr>
<td>PIPE</td>
<td>POJ</td>
<td>BELT</td>
</tr>
<tr>
<td>WORD</td>
<td>QEH</td>
<td>ARGON</td>
</tr>
<tr>
<td>SHIRT</td>
<td>POJ</td>
<td>WALL</td>
</tr>
<tr>
<td>PACK</td>
<td>GIC</td>
<td>FRAME</td>
</tr>
<tr>
<td>FLOOR</td>
<td>POJ</td>
<td>STORE</td>
</tr>
<tr>
<td>FOOT</td>
<td>QEH</td>
<td>SAND</td>
</tr>
<tr>
<td>TRIANGLE</td>
<td>VUP</td>
<td>SAND</td>
</tr>
</tbody>
</table>

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APPENDIX 6

Initial Instructions

This experiment is going to study two different types of learning--to see the effectiveness of each. One type of learning will concern words which will be presented auditorily, and the other will concern so-called nonsense syllables which will be presented visually. After the simultaneous presentation, you will be tested separately upon each type of learning task.

The learning tasks will be presented in the following way. A nonsense syllable will be flashed on the wall in front of you for five seconds. Shortly after it is exposed, I will pronounce a word out loud. You are to immediately pronounce the word aloud once after me, while you continue to look at the nonsense syllable on the wall. As long as the nonsense syllable is on the wall, continue to look at it, and, at the same time, keep pronouncing the word to yourself.

The words and syllables are to be learned in the two different ways. The syllables on the wall will be repeated, and you are to learn them by just looking at them--not pronouncing them. On the other hand, I will present many different words to you, and they are to be learned only by hearing them and pronouncing them. Do not
make sentences out of the different words or try to associate them in any way. Learn the syllables only by looking at them, and learn the words by hearing and pronouncing them.

Be sure to continue to look at the nonsense syllable as long as it is on the wall, even when you are saying the word aloud once after me, and while you repeat the word to yourself.

Do you have any questions?
APPENDIX 7

Example of Syllable Rating-Recognition Sheet

XXX

pleasant: __:__:__:__:__:__:unpleasant

Was this syllable presented during the experiment?

Yes No
APPENDIX 8

Syllable Orders for Rating-Recognition Booklet

<table>
<thead>
<tr>
<th>Order Number</th>
<th>Position Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1  DAX  POJ  XOR  GIC  VUP  QEH</td>
</tr>
<tr>
<td>2</td>
<td>2  QEH  GIC  VUP  POJ  XOR  DAX</td>
</tr>
<tr>
<td>3</td>
<td>3  GIC  QEH  POJ  XOR  DAX  VUP</td>
</tr>
<tr>
<td>4</td>
<td>4  POJ  VUP  DAX  QEH  GIC  XOR</td>
</tr>
<tr>
<td>5</td>
<td>5  XOR  DAX  GIC  VUP  QEH  POJ</td>
</tr>
<tr>
<td>6</td>
<td>6  VUP  XOR  QEH  DAX  POJ  GIC</td>
</tr>
</tbody>
</table>
APPENDIX 9

Instructions for Rating-Recognition Test

First we want to find out how many of the syllables that were presented on the wall you can remember. At the same time we also need to find out how you feel about those syllables, because this may affect how you learn them. People in general find that they feel differently regarding such syllables. That is, they feel that the syllables have different meanings along certain lines. For example, they find that some syllables give them more an impression of pleasantness, while others give them the impression of unpleasantness. This could affect the way they learn them; that is, the way a person feels about the syllables could have a very important effect on the way they are later learned. One way to control for this possibility is to get your ratings of the syllables as one of the pieces of information that we gather.

I am going to give you a booklet in just a moment. (TAKE OUT SEMANTIC DIFFERENTIAL CHART) You will find a syllable printed on the center of each page, and a scale going from pleasant to unpleasant. (POINT TO APPROPRIATE PLACES)
Now, first look at the syllable and then mark on the scale how it strikes you. If it strikes you as very pleasant, put an X here; quite pleasant, put an X here; slightly pleasant, an X here. If it is inbetween, put an X here. If it strikes you as slightly unpleasant, put an X here; quite unpleasant, an X here; very unpleasant, an X here. (PUT SCALE AWAY)

After you finish that, indicate at the bottom of the page whether the syllable was one of those just presented on the wall. If it was one presented on the wall, circle the yes; if it was not one just presented, circle no. Remember, however, to put down how you feel about the syllable first. (HAND BOOKLET TO SUBJECT)
APPENDIX 10

Word Recognition Task

<table>
<thead>
<tr>
<th>FLOWER</th>
<th>PROGRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISH</td>
<td>STINGY</td>
</tr>
<tr>
<td>SMOOTH</td>
<td>SOFT</td>
</tr>
<tr>
<td>ROUGH</td>
<td>PIANO</td>
</tr>
<tr>
<td>BLEAK</td>
<td>ABRUPT</td>
</tr>
<tr>
<td>DISTANT</td>
<td>BOOK</td>
</tr>
<tr>
<td>ROCK</td>
<td>IRRITABLE</td>
</tr>
<tr>
<td>TASTY</td>
<td>RIVER</td>
</tr>
<tr>
<td>WAGON</td>
<td>LAMP</td>
</tr>
<tr>
<td>SOUR</td>
<td>BABY</td>
</tr>
<tr>
<td>NUMBER</td>
<td>CAN</td>
</tr>
<tr>
<td>STALE</td>
<td>PAIN</td>
</tr>
</tbody>
</table>
APPENDIX II

Initial Awareness Probe

On the other side of that paper I'd like you to write down any information that you can give me that would help me get a better understanding of your performance--that is, anything you can tell me; for example, any thoughts or ideas that may have occurred to you during the experiment--anything that could give me a more complete picture of what was going on in your particular case when you were learning the different materials.
APPENDIX 12

Second Awareness Probe

Before you go, I'd like to ask you a couple of questions. I was just glancing over the results of your performance; and, for one thing, I noticed that the same thing happened that I had mentioned in the instructions. That is, people generally give different syllables different ratings, and I noticed that you did the same thing—you didn't give all the syllables the same rating. Can you tell me, in your particular case, how did you judge or decide how to rate each of the syllables?
APPENDIX 13

Cover Task 1: Syllable Recognition Test

<table>
<thead>
<tr>
<th>LAJ</th>
<th>POJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOB</td>
<td>YOX</td>
</tr>
<tr>
<td>NAJ</td>
<td>PYM</td>
</tr>
<tr>
<td>XAV</td>
<td>VUP</td>
</tr>
</tbody>
</table>
APPENDIX 14

Cover Task 2: Word Recognition Test

<table>
<thead>
<tr>
<th>Block</th>
<th>House</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Hard</td>
</tr>
<tr>
<td>Book</td>
<td>Paper</td>
</tr>
<tr>
<td>Inferior</td>
<td>Complete</td>
</tr>
<tr>
<td>Right</td>
<td>Sorry</td>
</tr>
<tr>
<td>Bread</td>
<td>Slow</td>
</tr>
<tr>
<td>Stingy</td>
<td>Wet</td>
</tr>
<tr>
<td>Stone</td>
<td>Late</td>
</tr>
</tbody>
</table>
APPENDIX 15

Initial Second Session Instructions for Q-EXT Subjects in Experiment I.

A while ago you were in an experiment in which you learned two different types of materials under two different types of stimulus presentations. This was the study in which you learned nonsense syllables by just looking at them, and words by hearing and pronouncing them. In order to get a more complete picture of these learning processes, it was necessary to ask you to come in for an additional assessment. (Followed by instructions in Appendix 9.)
APPENDIX 16

Initial Second Session Instructions for 5-EXT and 15-EXT Subjects in Experiment II.

A while ago you were in an experiment in which you learned two different types of materials under two different types of stimulus presentations. This was the study in which you learned nonsense syllables by just looking at them, and words by hearing and pronouncing them. In order to get a more complete picture of these learning processes, it was necessary to ask you to come in for an additional assessment.

To get a more reliable measure of these learning techniques, we want you to complete some additional trials in which you learn nonsense syllables and words. Again, after the simultaneous presentation, you will be tested separately upon each type of learning task.

(Followed by instructions in Appendix 6.)
APPENDIX 17

Proportion of Subjects Excluded from Data Analyses that were Excluded on the Basis of Responses to the Second Awareness Probe.

<table>
<thead>
<tr>
<th>EXPERIMENTAL CONDITION</th>
<th>Conditioning Only</th>
<th>Extinction 5 Trials</th>
<th>Extinction 15 Trials</th>
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</thead>
<tbody>
<tr>
<td>EXPERIMENT I</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>List 1</td>
<td>1/9</td>
<td>1/4</td>
<td>0/2</td>
</tr>
<tr>
<td>List 2</td>
<td>0/1</td>
<td>2/4</td>
<td>2/4</td>
</tr>
<tr>
<td>EXPERIMENT II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>List 1</td>
<td>0/0</td>
<td>1/1</td>
<td>3/3</td>
</tr>
<tr>
<td>List 2</td>
<td>0/1</td>
<td>0/1</td>
<td>1/1</td>
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</table>
APPENDIX 18
Mean Conditioning Score and Number of Aware Subjects in Each Experimental Group.

<table>
<thead>
<tr>
<th>EXPERIMENTAL CONDITION</th>
<th>Conditioning Only</th>
<th>Extinction 5 Trials</th>
<th>Extinction 15 Trials</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>M 3.56</td>
<td>2.20</td>
<td>3.50</td>
</tr>
<tr>
<td></td>
<td>n 9</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>List 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M 6.00</td>
<td>5.00</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td>n 1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>List 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M -</td>
<td>1.00</td>
<td>-0.67</td>
</tr>
<tr>
<td></td>
<td>n -</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>List 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M 3.00</td>
<td>2.00</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>n 1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>List 2</td>
<td></td>
<td></td>
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(a)

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