TWO TECHNIQUES FOR THE ELIMINATION OF AWARENESS IN THE CONDITIONING OF MEANING EXPERIMENT

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ABSTRACT

Awareness in conditioning of meaning experiments was investigated. The experimental procedure employed closely paralleled that used by Staats and Staats (1957).

Conditioning trials were presented to 125 Subjects (Ss). For all Ss the conditioned stimuli (CSs) consisted of evaluatively neutral (as measured on four semantic differential evaluative scales) nonsense syllables. For about half (61) of the Ss the unconditioned stimuli were evaluatively loaded meaningful words. For the remainder (64) of the Ss the UCSs were evaluatively loaded nonsense syllables. One CS was consistently paired with six different positive evaluative UCSs and a second CS was paired with six negative evaluative UCSs. Normative evaluative ratings of CSs and UCSs were obtained prior to the actual experiment. Non-critical filler pairings were included to disguise the purpose of the experiment. In both groups pairings were presented either one, three or five times.

All Ss rated the CSs on four evaluative scales of the semantic differential, recalled the pairings and completed a demand and contingency awareness questionnaire. In addition, a control group of 22 Ss which did not receive conditioning trials rated the CSs.

It was hypothesized that the conditioning of meaning phenomenon (as reflected in the ratings of critical CSs) would occur and that this phenomenon would be independent upon the inclusion of "aware" Ss. There were two methods for determining awareness. Any S who indicated on the questionnaire that he was aware either of the CS-UCS contingency and/or of the purpose of the experiment were considered aware. Eleven Ss, all in the meaningful UCS group indicated such awareness. All Ss in the nonsense syllable UCS group were considered unaware because of the surface meaninglessness of the UCSs in that group. The conditioning phenomenon was shown to exist and was not dependent on the inclusion of the eleven aware Ss. However, the nonsense syllable UCS group did not in general, exhibit the phenomenon.

It was also hypothesized that the strength of the conditioning effect would be a function of the number of CS-UCS

pairings (one, three or five). This hypothesis found strong support and for the meaningful UCS group was not dependent upon the inclusion of the aware Ss.

Results are discussed in terms of the conditioning and awareness literature, demand characteristics, and the "mere-exposure" hypothesis of Zajonc.

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Chapter 1

In 1957 Staats and Staats reported a study which concluded that evaluative meaning was classically conditioned to previously neutral nonsense syllables. As a result of this study and numerous other studies based on it (e.g., Staats, Staats and Biggs 1958, Staats and Staats 1959) a controversy stemming from the Staats' interpretation has developed. The Staats' interpretation was founded on the assumption that the conditioning in their experiment took place without the Subjects' (Ss') awareness of the consistent pairings of one nonsense syllable with words that were positively evaluative (sweet, kind, etc.) and the pairing of a second nonsense syllable with negative evaluative words (cruel, sick, etc.). Opponents of the classical conditioning hypothesis have since conducted studies which they feel indicate that a conditioning of meaning without awareness of these contingencies is not possible (e.g., Cohen 1964, Page 1969).

The present study was conducted for the purpose of further clarifying the issues of awareness and the conditioning meaning. It attempts to replicate the Staats' results and to eliminate the possibility of awareness of the conditioned stimulus (CS) - unconditioned stimulus (UCS) contingencies.

The Staats' Experimental Procedure

In the technique employed by Staats and Staats (1957) six UCS word lists containing 18 words each were used. Two of the lists loaded highly on the evaluative factor of the Semantic Differential (Osgood and Suci, 1955). One of the lists consisted of negative evaluative words and the other of positive evaluative words. The other four lists contained words which were relatively neutral on the evaluative dimension. Each of these lists was paired with a different CS nonsense syllable. The former two lists served as the experimental variable. The latter four served to conceal the purpose of the experiment from Ss.

The nonsense syllables were projected on a screen and were followed by the auditory presentation of the associated UCS word. The syllables were presented in random order, though each syllable never appeared more than twice in succession. No UCS word was paired more than once with its associated nonsense syllable. In this way no systematic association was formed between a CS and a UCS. Each nonsense syllable was projected 18 times with a different word following it each time, i.e., there were 18 conditioning trials.

Prior to the presentation of the conditioning trials Ss were given two practice tasks. One of these tasks required the learning of nonsense syllables, the other the learning of

meaningful words. They were then instructed that the purpose of the experimental phase was to investigate the effects of learning nonsense syllables and meaningful words simultaneously. The instructions were used in order to keep Ss from becoming aware of the true purpose of the study.

After the conditioning phase of the study and prior to a recall test of syllables and words (used solely for consistency with the deceptive instructions) Ss rated the six nonsense syllable CSs on the pleasant-unpleasant scale of the Semantic Differential. Ss were told that the rationale for the rating was that the way one feels about a syllable may effect the learning of the syllable. On the post pairing rating test the syllable paired with the negative evaluative words was rated as significantly more unpleasant than neutral and the syllable paired with the positive evaluative words was rated as significantly more pleasant than neutral. Following the experiment Ss were asked to write down anything they thought about the nature and purpose of the experiment. Nine of the 86 Ss wrote that they were aware of a relationship between certain syllables and words. These Ss were dropped from the analysis. (The issue of awareness will be discussed in a following section).

Basic Studies in Conditioning of Meaning

In subsequent studies Staats and Staats, their

colleagues and other investigators have elaborated upon the original research findings. All of these studies, including the original one, are based upon the assumption that meaning is a response and that as a response it should be affected by any of the variables that effect responses in general.

Staats and Staats (1958) performed a variation of their original study which involved substituting national names and male first names for nonsense syllables as the CS. For one group "Dutch" was paired with positive UCS words and "Swedish" with negative words. In a second group the procedure was reversed. For other Ss the same procedure employed male first names. Again all Ss that indicated in the post-experimental interview that they were aware of a systematic name-word list contingency were dropped from the analysis. As in the original study the results showed that CSs paired with negative evaluative words were rated significantly lower than neutral and all CS words paired with positively evaluative words were rated significantly higher than neutral. The conclusion drawn on the basis of the data is that attitudes have been classically conditioned without S's awareness.

Staats, Staats and Biggs (1958) used the same paradigm in two other related studies. In one of these studies, colour names (red and yellow) were used as CSs. It was known from normative data that the colour names had slightly negative

evaluative meanings as measured by the pleasant-unpleasant scale of the Semantic Differential. In the second study the obviously negative words "awful" and "unfair" were used. Results showed that when these words were paired with positively evaluative UCS words they were rated significantly more positive than when paired with negative evaluative words. The nine Ss (out of the total of 72) who verbalized awareness of the CS-UCS contingencies were dropped from the analysis.

In another study, Staats and Staats (1959) tested the hypothesis that "if meaning is indeed a response...the intensity of conditioned meaning should increase as the number of conditioning trials are increased" (p. 211). In this study nine groups of Ss receiving 0, 2, 4, 6, 8, 10, 12, 14, 16 and 18 conditioning trials were used. Scale values of the critical CS nonsense syllables, as rated for pleasantness, were plotted against the number of conditioning trials. In support of the hypothesis, the results indicated a positive relationship between number of conditioning trials and the rated affect of the nonsense syllables.

In another study, Staats, Staats and Heard (1959) conditioned evaluative meaning to the words carpet and rock. The post-conditioning ratings were performed not on these words but on their synonyms - rug and stone. Results showed that the synonyms were rated in a negative or positive

direction depending on whether the original words were paired with negative or positive UCS words. The authors concluded from these results that evaluative meaning that has been conditioned to one word will generalize to words of similar meaning.

Staats, Staats and Heard (1960) demonstrated that meaning exhibits still another characteristic of responses in general. UCS word lists were used that contained varying numbers of words loading on the evaluative factor of the Semantic Differential. Varying percentages (they used 0%, 50%, and 100%) of a fixed ratio schedule of reinforcement were employed. The authors found that conditioning of meaning to CVCs was stronger under conditions of continuous reinforcement than under partial reinforcement so that "the intensity of the acquired attitude is a function of the percentage of reinforcement." (p. 349).

Another approach to the affect conditioning phenomena is reported by Blanford and Sampson (1964). In this study the usual nouns and adjectives used as UCSs in the preceding experiments were dropped and famous and infamous names of historical figures were used instead. It was found that CVCs paired with famous names were rated significantly more positively than CVCs paired with infamous names. Aside from the change of the kind of UCS used, the methodology was identical to that used in the original Staats and Staats experiment.

In yet another approach to investigating the affect conditioning phenomenon, Early (1968) has published a study that illustrates the possibility for attitude conditioning to affect social behaviours as well as ratings of the pleasant-unpleasant scales. Using fourth and fifth grade children as Ss, names of "isolate" children in the class were paired with positively evaluative UCSs. It was found by observation of a free-play situation that these isolates were subsequently approached by the Ss more frequently than were control isolates whose names did not appear as CSs in the conditioning procedure.

Various other studies have been reported in the literature which employ the Staats and Staats paradigm and have successfully replicated the original results while further exploring other characteristics of meaning as a response.

Awareness in Conditioning of Meaning Studies

Since the inception of both verbal operant conditioning (Greenspoon, 1955) and the classical conditioning of meaning studies, the psychological literature has been replete with reviews and studies challenging the conclusion that researchers in the learning field frequently adopt - that learning, operant or classical, takes place without S's awareness of the reinforcement contingency.

In the field of verbal operant conditioning numerous reviews (e.g., Eriksen, 1960; Dulany, 1961; Levin, 1961;

Lanyon, 1967) have cited evidence and arguments that this type of conditioning requires awareness of the reinforcement contingency in order for learning to occur. More recently, studies have appeared which challenge the conclusion that the classical conditioning of meaning can occur without the S's awareness of the reinforcement contingency. As an instance of the latter, Cohen (1964) replicated the Staats' procedure in all essential details with special attention "directed to the determination of awareness or unawareness" (p. 373). Using a post-experimental questionnaire, 52 of 97 Ss verbalized awareness of the CS-UCS contingency. Ratings of the CS nonsense syllables were analyzed separately for aware and unaware Ss. In addition, a control group which received no conditioning trials, evaluated the syllables. This provided a baseline against which the experimental group could be compared. The results of the study indicated that only aware Ss evinced a conditioning effect. Unaware Ss did not rate the syllables significantly different from the control group. In his discussion Cohen states that "...within the framework of a classical conditioning model, this study provides no support for learning without awareness." (p. 377).

Hare (1964, 1965), using a technique similar to that of Cohen, has also concluded that only Ss who were aware of the CS-UCS contingency were effectively conditioned. Hare prefers

a cognitive explanation of his results, that is, Hare believes that Ss form the concept of goodness or badness that relate all the words of the UCS list and this concept is then related to the nonsense syllable that is always paired to the list. The Ss rate the syllables in the expected direction because they are aware of the relationship between the syllable and the concept.

Demand Characteristics in Conditioning of Meaning Studies

A different approach to the awareness problem in conditioning of meaning studies is taken by several investigators and involves studying the 'demand characteristics' of an experiment (Orne, 1962). This approach is based upon the assumption "...that S not only reacts to the experimental variable being manipulated but also reacts to the various cues of the experiment that reveal its 'real' purpose. These cues were designated as 'demand characteristics'" (Rozelle, 1968 p. 894).

The first published study to directly investigate the demand characteristic variable in conditioning of meaning experiments was reported by Insko and Oakes (1966). These investigators used a post-experimental questionnaire designed to discover those Ss who were either contingency aware and/or demand aware. They found that although contingency awareness was directly related to the strength of the conditioned

evaluative response, awareness of the demand characteristics did not add an effect beyond simple contingency awareness.

Rozelle (1968) performed a study that was an approximate replication of the Staats, Staats and Heard (1959) experiment previously reported. He failed to replicate the conditioning of meaning effect. In his discussion Rozelle states that due to his use of more elaborate and involved instructions than those used by Staats, Staats and Heard it is possible that the demand characteristics of his experiment were more ambiguous than those of the latter study. This would have prevented the Ss in Rozelle's study from "forming hypotheses that were accurate enough to allow the detection of the actual syllable-word relationships. Thus, the level of awareness or accuracy of S in attempting to discover the syllable-word relationships in the experiment was reduced. The result was a sample of 'unaware' Ss who showed no conditioning effect." (p. 894).

In a more recent study concerning the demand awareness variable in conditioning of meaning experiments Page (1969) contests the conclusions of the Staats and Staats (1957), Cohen (1964) and Insko and Oakes (1966) studies. Care was taken in Page's experiment to vary the learning difficulty of CS-UCS pairings by using 2, 4, and 10 filler CS-UCS lists. The post-experimental questionnaire included measures of both

contingency and demand awareness. Extra syllables were included in the semantic differential rating booklets in order to further disguise the nature of the task.

Page assumed that awareness is an all or none dichotomy, "a subject either knows it or he doesn't" (p. 181). A general analysis of the data indicated a strong conditioning effect - a replication of the original Staats and Staats results. It was also found that the more difficult the task (number of filler CS-UCS lists) the less likely were Ss to become aware of the real nature of the study. Awareness of contingency pairings (indicated by correct responses to questions such as "What syllable was always paired with words of pleasant meaning?") was a good predictor of strength of conditioning. However, contrary to the results of Insko and Oakes, awareness of the demand characteristics (indicated by positive responses to questions like "Did you think that the experimenter might have expected that you would rate certain of the nonsense syllables in any certain way?") was the best predictor of strength of conditioning. In addition "...eighteen subjects were contingency aware who weren't demand aware, and these subjects did not show high conditioning" (p. 183).

The overall analysis showed that Ss who were unaware of the demand characteristics rated the experimental syllables in the expected direction and significantly different from the

control syllable.

Page concludes that "It appears that the Staats' (1958) classical conditioning of evaluative affect or attitude interpretation of the data is incorrect ... the present study supports the idea that the so-called conditioned attitudes are entirely artifact of demand characteristics" (p. 185).

In a reply published simultaneously with Page's study Staats (1969) attempted to answer the many difficulties posed by the former author. Staats' argument contests not the results of the Page study, but his interpretation of the results. This argument has four main thrusts. The first point is that although some Ss do not evidence a conditioning effect this is most probably due to lack of attention on the part of these Ss rather than a general inability to classically condition a meaning response. Ss who attend to the stimuli will condition well and Ss who do not attend will not condition. This would explain the bimodal conditioning curves usually resulting in conditioning of meaning experiments. Page preferred explaining this bi-modality in terms of the demand-awareness explanation. That is, Ss who are demand-aware and cooperate with the demand characteristics of the experiment rate the syllables in the expected direction. Ss who are not demand-aware rate the syllables neutrally, as do those Ss who are demand-aware and uncooperative. Staats also employed the

preceding interpretation in order to reinterpret Page's results which showed that the greater the number of filler CS-UCS pairings the less likely are both awareness and conditioning. Staats states that the lengthening of the lists increases the boring and repetitive nature of the task and not its difficulty. This would, of course, result in more inattention and thereby in a lack of conditioning.

Secondly, Staats challenges the demand characteristic procedure itself. Staats suggests that the questionnaire used by Insko and Oakes and by Page, itself "demands" that the S become aware of the purpose of the experiment. The questionnaire shapes his verbal reports with items that "program" him to the response desired by E. The questionnaire may elicit awareness responses that weren't made during the conditioning trials. This may occur even though the question asks the S when the awareness occured.

Next Staats questions the implicit assumption in Page's study of the causative direction of awareness in the conditioning procedure. That is, although Page believes that awareness of contingency pairings and of demand characteristics precede and cause the desired evaluative response it is possible that the direction of causation is in the opposite direction. Staats describes an S in one of his studies who reported that during the conditioning procedure she saw a CS word and

immediately had the realization that she didn't like the word. Almost simultaneously a negative UCS word was presented. It was only then, she reported, that she realized why she did not like the CS word. What Staats is suggesting in this example is that Ss may be conditioned to awareness and yet respond to contingency and demand awareness questions in a way that would corroborate the awareness interpretation.

Finally, Staats cites various conditioning of meaning studies which by their design would, in his opinion, preclude an awareness interpretation. These include those experiments in which involuntary autonomic responses such as the Galvanic Skin Response (G.S.R.) have been conditioned to words which were originally paired with an aversive stimulus (e.g., Staats, Staats and Crawford, 1962). The G.S.R., being an involuntary response, is not subject, Staats says, to a demand awareness interpretation.

Staats also cites a study by Pecjak and Smith (in press) in which a complex combination of colours and shapes were used as conditioned stimuli. These were paired component by component with either negative, neutral, or positive UCS word lists. The two components, colour and shape then were combined for the Semantic Differential rating test. It was found that the test stimuli that contained a colour paired with a negative list and a shape paired with a negative list

were rated lowest followed by the negative-neutral, neutral-neutral, positive-neutral, and positive-positive combinations. Staats says that the very complex nature of the task makes awareness of the contingency pairings and the demand characteristics virtually impossible.

Purpose of the Present Study

The awareness controversy in conditioning of meaning studies is still to be resolved. With the purpose of attempting to clarify some of the still many to be answered questions within this controversy the present study was devised. This study focuses on three phenomena. First, the conditioning of meaning effect itself was investigated. Secondly, an attempt was made to replicate the phenomenon reported by Staats and Staats (1959) which indicated that the strength of conditioned meaning is a function of the number of CS-UCS pairings presented. The third phenomenon investigated was that of the effect of awareness (demand or contingency) on conditioning.

For the purpose of investigating the effects of awareness, two procedures were employed. One was the use of a short post-experimental questionnaire designed to measure both contingency and demand awareness. This procedure is similar to that used by many of the previously reviewed studies.

The second procedure used for studying the awareness

variable has not been reported in the literature. This procedure involved the use of two types of CS-UCS conditioning lists. One list was of the usual type, that is, nonsense syllable CSs were paired with words of either positive or negative evaluative meaning. A second group of Ss did not receive this treatment. Instead, the UCSs for this group were made up of nonsense syllables which were found by use of a normative group to contain a negative or a positive evaluative component. For this group one CS nonsense syllable was paired with negative evaluative nonsense syllables and another syllable was paired with positive evaluative nonsense syllables. It was felt that the use of nonsense syllables as UCSs would eliminate the possibility of Ss becoming aware of both the purpose of the experiment and the pairing contingency associated with each CS.

Hypotheses

1. The CS paired with the positive evaluative UCSs and the CS paired with the negative evaluative UCSs will be rated in the positive and negative directions respectively, on Semantic Differential evaluative scales, when compared to the rating of a control syllable (one not presented as a CS). This result is predicted for all Ss, including those unaware of either the contingency pairings or of the real purpose of the study.

A. The conditioning effect will occur for groups receiving neutral nonsense syllable-meaningful word pairings.

B. The conditioning effect will occur for groups receiving neutral nonsense syllables-evaluative nonsense syllable pairings.

2. The second hypothesis is that the conditioning effect will increase as the number of CS-UCS presentation is increased. This is hypothesized for all Ss, including only those Ss that are unaware.

A. The trials effect will occur in the meaningful word UCS group.

B. The trials effect will occur in the evaluative nonsense syllable group.

Chapter 2

METHOD

Subjects

The subjects in this experiment were male students from the introductory psychology classes at the University of Manitoba. The students were given the option of writing a paper or participating in departmental experiments. Grade credit was given for participation in the experiment. One hundred students participated in Phase I and 132 participated in Phase II of the experiment.

Apparatus

Stimuli were projected on a projection screen by a Kodak Carousel 800 projector. The 35 mm negative slides (stimuli) were each presented for three seconds with one second intervals between slides. The projection time was controlled by two Hunter Timers. Evaluative responses to the stimuli were recorded in a Semantic Differential booklet. Each syllable to be rated appeared at the top of each page. Four seven point bi-polar evaluative scales (pleasant-unpleasant, cruel-kind, beautiful-ugly, and dirty-clean) appeared below the syllable. (Appendix A contains a typical page from the

booklet). Ss recorded the recalled CS-UCS pairings on a sheet headed "recall of pairings." An awareness questionnaire (see Appendix B) was also used.

Procedure: Phase I

Prior to the experimental phase of the study, nonsense syllables selected from Montague and Keiss (1968) and nouns and adjectives selected from Staats and Staats (1957) were rated by 100 Ss on the four evaluative scales mentioned previously. Groups of 25 Ss rated approximately 20 CVSs and five meaningful words each. The results of the ratings in this phase of the study were used to select the CS-UCS pairings for the experimental phase. Four groups of syllables and words were selected depending on the purpose they were to serve in the experiment.

Group 1 was composed of meaningful words that were judged to have either strong positive or strong negative evaluative meaning (1 = strong negative and 7 = strong positive). These words composed the high positive and high negative evaluative word lists respectively. The former list contained the words friend, happy, healthy, rich, sweet and win and the latter contained disgusting, fear, insane, sick, stupid and worthless (see Appendix C).

Group II was composed of syllables that were rated as either strongly positive or strongly negative. These syllables

composed the positive and negative evaluative CVC lists respectively. The positive list was made up of CEN, JOH, MOY, WUM, YOS, AND ZAN. The negative list of CAK, GAC, GOC, GOK, WAP, AND YUH. (see Appendix D).

Group III was used to obtain CS and control stimuli. Only syllables that were rated near the neutral point (four) were selected for this purpose. This set contained BIW, DAP, KEJ, KOM, NID, QEP, REJ AND VEM. (see Appendix E).

Group IV consisted of twelve syllables which were used as UCSs in two non-critical CS-UCS pairings. Each of these lists was nonsystematic with respect to the evaluative component. One list was composed of BIS, FIC, SIY, TIZ, VOY AND YAT. The second list was made up of DAS, LIB, NEB, QUT, JEG, AND TIY. (see Appendix F).

Another group of meaningful words was selected from Staats and Staats (1957). These words were not rated by Ss in this study. They were used as UCSs in non-critical CS-UCS pairings. Both lists were non-systematic in terms of evaluative meaning. One set contained the words enemy, gift, poison, smart, thief and valuable. The other set contained agony, evil, failure, honest, money and sacred.

Procedure: Phase II

There were six experimental groups and one control group. Half of the experimental groups received critical CS-UCS

pairings with meaningful evaluative words used as UCSs. In these three groups one CVC was paired with high evaluative words and another CVC was paired with low evaluative words. These groups also received two filler CS-UCS pairings consisting of CVCs paired with CVCs that were non-systematic with respect to the evaluative component. In the other experimental groups this arrangement was reversed. Critical pairings were between CVCs and high and low evaluative CVCs. The filler pairings for these groups consisted of CVCs with non-systematic meaningful words. Both of the preceding experimental conditions were varied as to the number of presentations of the lists. The lists were presented either one, three, or five times.

Within each of these experimental conditions for some Ss, KEJ was paired with the high evaluative list and VEM with the low evaluative list. This procedure was reversed for the remainder of the Ss. DAP and KOM were paired with the non-systematic filler lists in all conditions.

Each CS was paired only once with each UCS. The order of presentation of the pairings was randomized for each group of Ss tested, with the restriction that no two pairings of the same type appeared more than twice in succession. For repeated trials the order of the list was the same throughout the repetition.

The method of presentation was in the form of the

anticipation technique. That is, CS_1 appeared followed by CS_1-UCS_1, CS_2, CS_2-UCS_2, etc. Using this method 48 slides were needed for the 24 pairings. Each slide appeared on the projection screen for a period of three seconds. The interval between slide presentations was one second.

Ss were run in groups of from three to eight depending on the number that signed up for a particular session. After all Ss were seated in the experimental room E read the following instructions:

> This is an experiment in verbal learning. You will be shown a syllable followed by this same syllable paired either with another syllable or with a meaningful word. This procedure will be repeated a number of times. After the presentation of slides you will be asked to recall as many of the pairings as you can remember. Are there any questions?

After answering any questions E began the presentation of the slides. Following the presentation(s) E said:

> Before the recall test I would like you to fill out these booklets (shows Semantic Differential booklet) which asks you to rate different syllables on four different scales. Please read the instructions that I will give you carefully. If there are any questions about these instructions ask me. Remember, you should fill out every page of your booklet and there should be four Xs on each page - one for each scale.

The Experimenter then handed out the Semantic Differential booklets and instructions (the instructions are reproduced in Appendix G). Each booklet contained the four CS CVCs used in the conditioning trials and the four control CVCs (BIW, NID, QEP, AND REJ). The order of the conditioning

and control CVCs was randomized but they always appeared on pages three through ten in the booklet. Proceeding this block of eight syllables were two CVCs to be rated which were selected at random from otherwise unused Phase I data. These served to familiarize Ss with the task. Following the block of the eight CVCs were six more syllables selected in the same manner as the first two. It was felt that these might help disguise the purpose of the experiment.

When all Ss had finished rating the syllables E instructed them as follows:

> Now I want you to recall as many of the pairings as you can. Please do this on the sheet I am now handing out (hands out sheet). You will have a set amount of time for this task. I will tell you when your time is up. Remember - write down as many of the pairings as you can remember.

After three minutes E said:

> STOP. Your time is up. I am now handing out a questionnaire (hands out awareness questionnaire) which asks some questions about this experiment. Please put your name at the top of the sheet and answer the questions according to the instructions.

After the Ss had finished filling out the awareness questionnaire E invited them to self-address a provided envelope for the purpose of receiving summaries of the nature and results of the experiment. Ss were then dismissed.

Control Ss received no CS-UCS pairings and were required only to rate the same syllables as the experimental groups. Semantic Differential instructions and booklets were identical

to those used in the experimental conditions.

Chapter 3

RESULTS

This chapter presents the analyses of the conditioning, recall, and questionnaire data for all of the groups involved in the experiment. There were 132 Ss in the experimental groups and 22 Ss in the control group. Seven of the 132 experimental Ss failed to rate each syllable in the Semantic Differential booklet; these Ss were not included in the analyses. There was, then, data for 125 Ss from the experimental groups.

Control Syllable

Eight of the syllables rated in Phase I were selected for use in Phase II. Four of these syllables (DAP, KEJ, KOM, and VEM) were used as the CSs. DAP and KOM were always paired with the filler neutral evaluative UCS lists. KEJ and VEM were always paired with the critical evaluative UCS lists. The remaining four syllables (BIW, REJ, NID and QEP) were used as potential controls. These syllables were rated along with the CS syllable by both the experimental and control groups. For the purpose of selecting an appropriate control the ratings for the two critical CSs and the four potential control

syllables were analyzed for the 22 control Ss. This group rated KEJ 3.45 (s.d. = 1.60) on the pleasant-unpleasant scale and 3.68 (s.d. = 1.41) on the four evaluative scales. The comparable ratings for VEM were 3.18 (s.d. = 1.74) and 3.56 (s.d. = 1.60). The potential control syllable that was rated most similar to these syllables was QEP. Mean ratings for QEP were 3.55 (s.d. = 1.30) on the pleasant-unpleasant scale and 3.78 (s.d. = 1.20) on the four scales combined. QEP, then, was selected as the control syllable. The experimental groups' ratings of the critical CS syllable were compared to their ratings of QEP in the analyses of the conditioning data.

It should again be noted that in each of the experimental groups some Ss received KEJ-positive list pairings and VEM-negative list pairings. For the remainder of the Ss this procedure was reversed. For the purpose of analysis KEJ and VEM were analyzed as a single syllable, i.e., Ss receiving KEJ-high and those receiving VEM-high pairings were analyzed as a single group. Those receiving KEJ-low and VEM-low pairings were similarly treated.

Conditioning Data for All (including aware) Ss

There were 61 Ss in the groups receiving CVC-meaningful word pairings. Of these 61, 19 were in the one trial condition, 20 were in the three trial condition and 22 were in the five trial condition. Sixty-four Ss were in the groups receiving

CVC-CVC pairings. These were divided as follows: 21 in the one trial condition, 22 in the three trial condition and 21 in the five trial group. Two analyses of variance were performed on the data. One included the data for the pleasant-unpleasant scale alone and the other included the data from all four of the evaluative scales combined.

The design for the pleasant-unpleasant analysis was a 3 x 2 x 2 x 2 mixed factorial design as described by Winer (1962). The number of trials on the CS-UCS list presentation and the type of UCS pairing (meaningful word or CVC) were the two independent factors. The repeated factors were the rating of the control and the experimental syllable (conditioning) and the evaluative direction of the list paired with each experimental nonsense syllable. The design for the data from the four evaluative scales combined was the same as the pleasant-unpleasant design with the addition of a repeated factor-scales (pleasant-unpleasant, cruel-kind, beautiful-ugly, clean-dirty).[1]

The summaries of these analyses are presented in Tables 1 and 2. No major differences are to be found between the two analyses. The results relevant to the hypotheses of

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[1]These scales were treated as repeated measures for the purpose of gaining pilot data on the scales. The interpretations of the analysis are based on the mean value of the total of the four scales.

the study was the four way interaction between trials, type of CS-UCS pairing, syllable rated (control and experimental) and direction of the evaluative UCS list with which the syllable was paired. In both analyses this interaction was significant. For the pleasant-unpleasant analysis $F = 3.745$ (df 3, 161), $p<.05$. For the four scale analyses $F = 4.771$ (df 3, 161), $p<.01$. The four way interaction was clarified as follows: The mean conditioning score for the meaningful UCS and the CVC UCS groups are presented in Table 3. Figures one through four present this data in graphic form. Post boc mean comparisons were performed on the data. The Newman-Keuls test of ordered means was performed to test the difference between all means in each group. The Dunnett test for comparison of means with a control was performed for comparison of the one, three, and five trial groups with the control group and to compare the ratings of the CS syllables with the control syllable for each group. Linear trend analyses were also performed. The results of these analyses appear in tables 4 through 7. These data showed that there was a conditioning effect for CVCs paired either with positive or negative meaningful words. CVCs paired with evaluative CVCs did not show a conditioning effect except in the case of the CVC-positive evaluative CVC pairing in the five trial condition. In general, the trials effect showed significant linear trends

in the meaningful word groups and weaker (but significant in the positive CVC pairing) trends in the CVC groups. Generally, there was a significant difference in strength of conditioning between trials in the meaningful word groups. In the CVC groups this effect is generally absent.

Results of the Data of Unaware Ss

All of the preceding analyses were repeated after the elimination of those Ss who were judged to be aware of either the CS-UCS contingencies or the purpose of the experiment. Any S who indicated on the questionnaire that KEJ (VEM) was consistently paired with bad, unpleasant, etc. words or syllables and that VEM (KEJ) was consistently paired with good, pleasant, etc. words or syllables met the criterion of contingency awareness. Eleven Ss were judged to be contingency aware. Of these 11, all were in the meaningful UCS groups. One was in the one trial group, three were in the three trial group and seven were in the five trial group. Only seven of the eleven aware Ss responded to the question which was designed to determine when awareness was gained. Five of these seven estimated that the awareness had been gained after the first presentation of the CS-UCS lists. The remaining two Ss did not estimate the time of awareness. No S indicated that he was aware of the purpose of the experiment, i.e., no

S verbalized awareness of a relationship between the conditioning trials and the Semantic Differential ratings.

The analyses of variance summaries for the unaware Ss are presented in Tables 8 and 9. The number of unaware Ss in the meaningful UCS groups was 50: Eighteen in the one trial condition, 17 in the three trial condition and 15 in the five trial condition. Table 10 presents the mean conditioning scores for the unaware Ss in the meaningful UCS groups. Figures 5 and 6 present these results graphically. The post hoc mean comparison tests and linear trend analyses for these groups appear in Tables 11 and 12. These analyses resulted in essentially, and in all important respects, the same results as those performed on the meaningful pairings groups, with data from all Ss.

Recall of Critical CS-UCS Pairings

Because the number of aware Ss was so small, no formal analysis comparing recall of critical CS-UCS pairings between aware Ss and unaware Ss was performed. The mean number of critical pairings correctly recalled for both aware and unaware Ss are listed in Table 13.

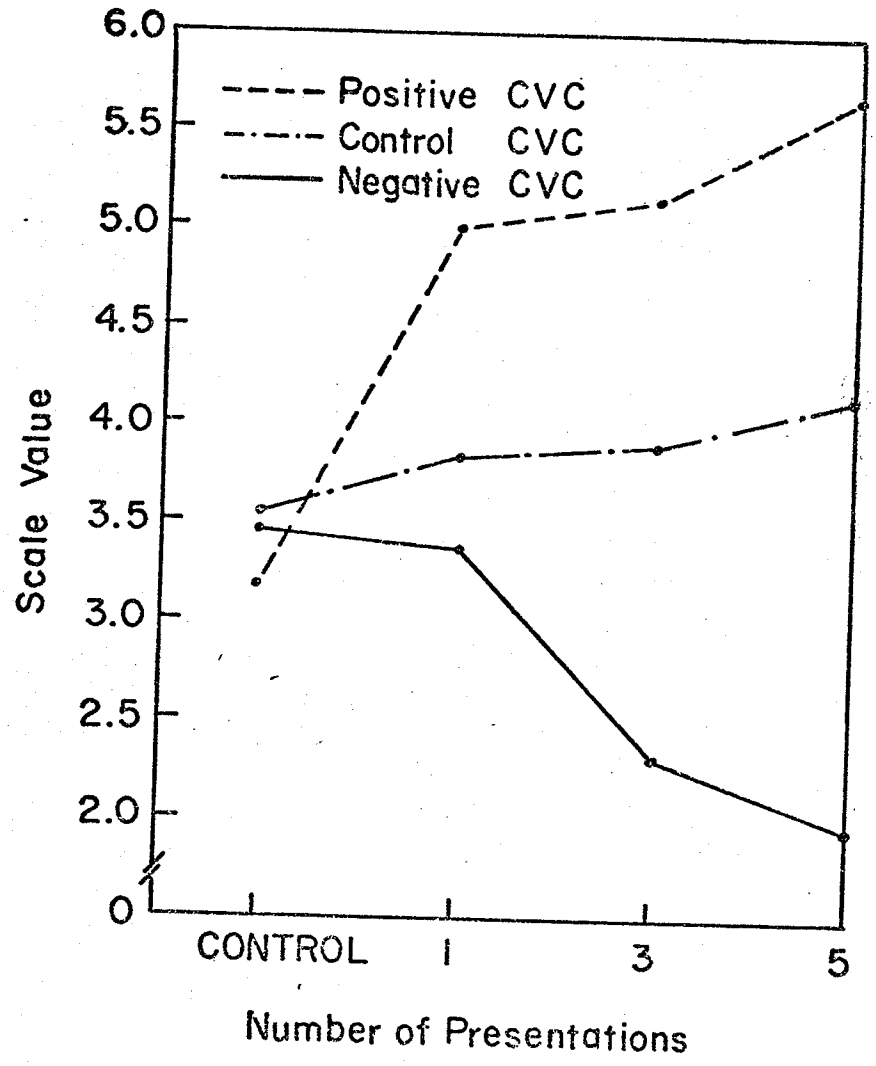

Figure 1. Conditioning scores for CVC - meaningful word groups (all subjects pleasant-unpleasant scale).

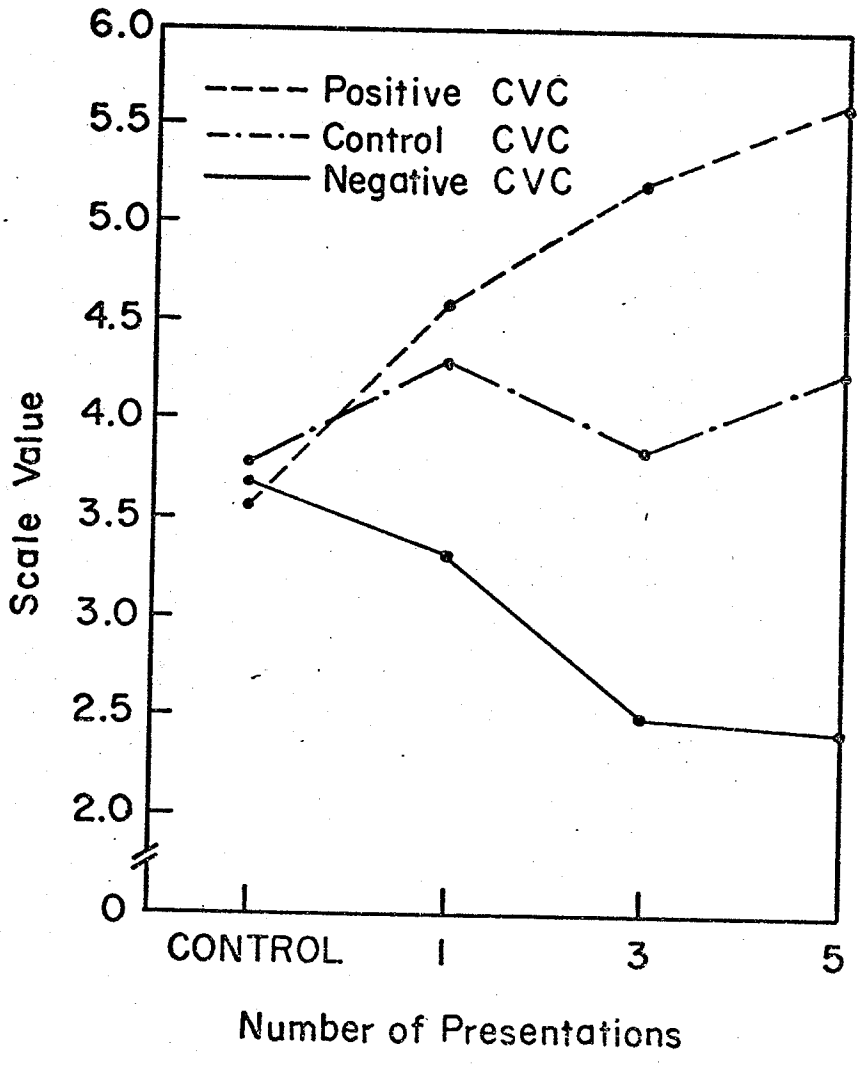

Figure 2 Conditioning scores for CVC - meaningful word groups (all subjects, all scales)

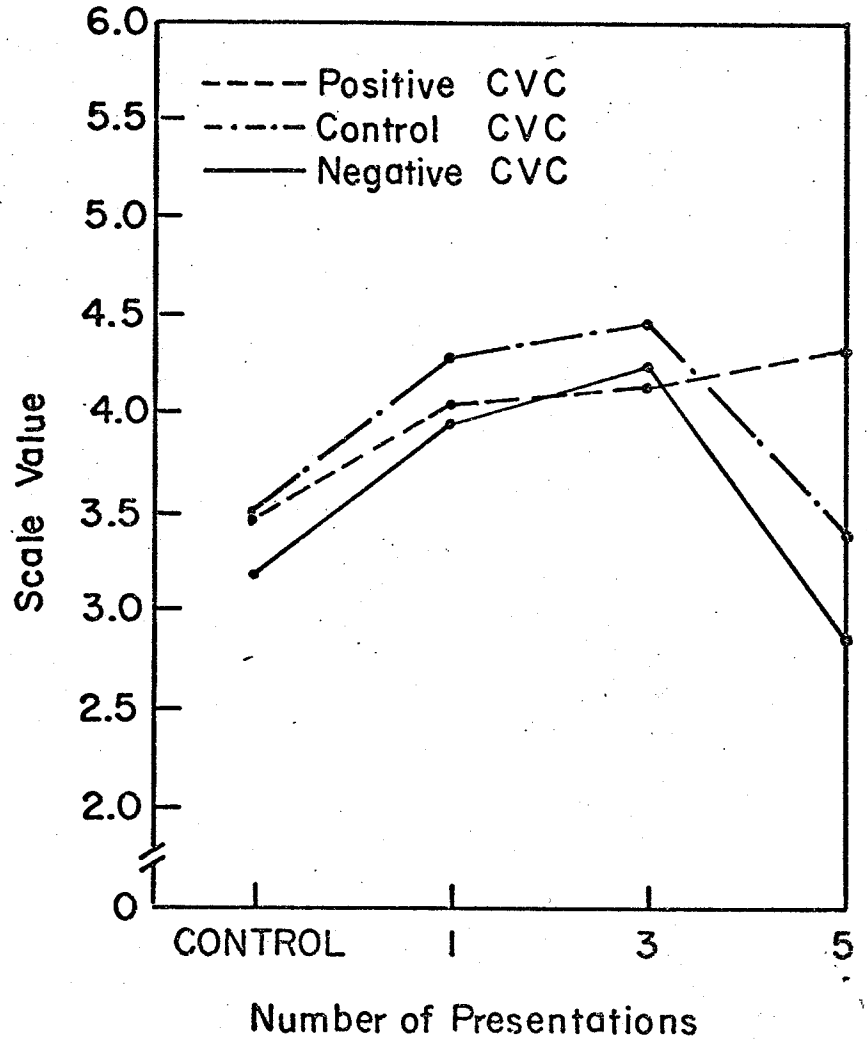

Figure 3. Conditioning scores for CVC-CVC groups (pleasant-unpleasant scale)

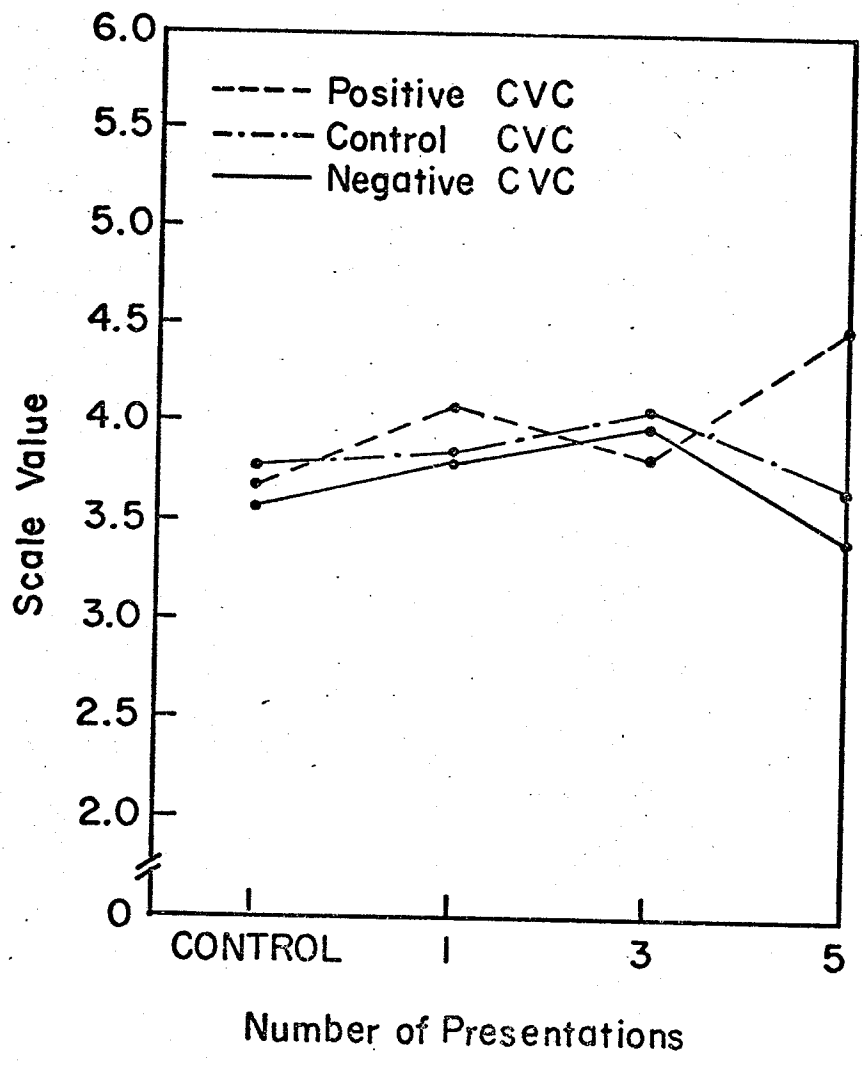

Figure 4. Conditioning scores for CVC-CVC groups (all four scales)

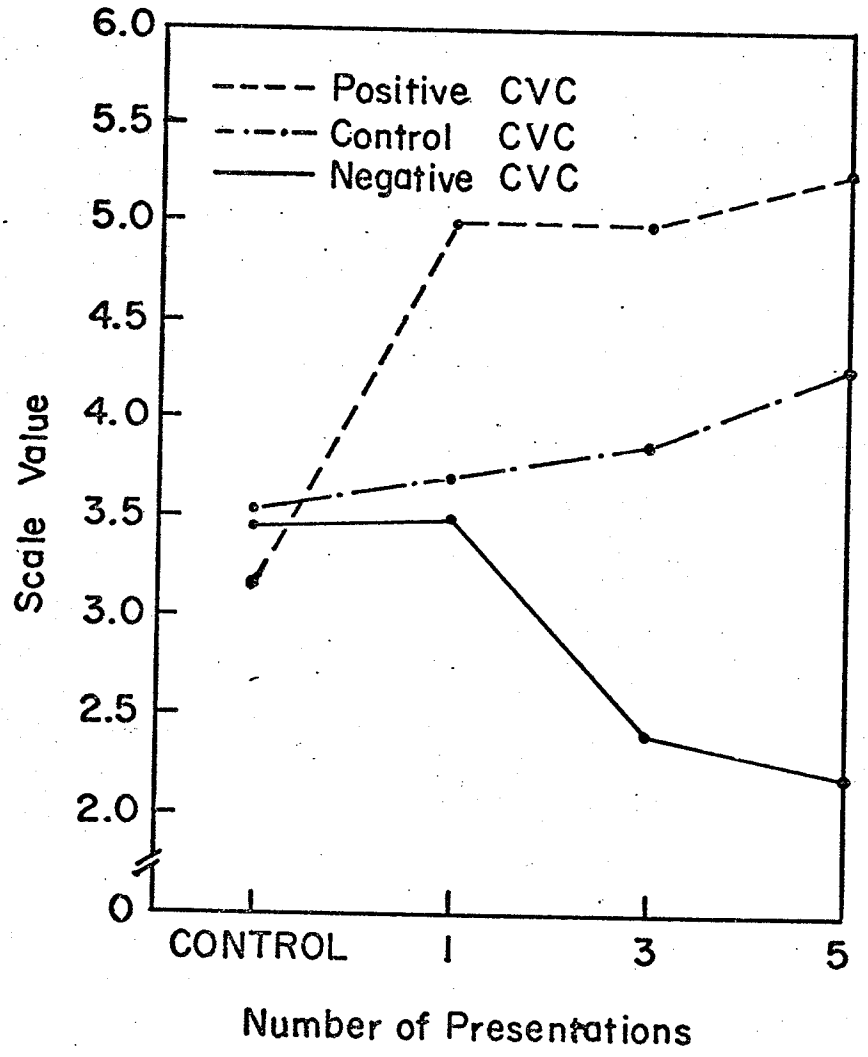

Figure 5. Conditioning scores for CVC – meaningful word groups (Unaware subjects, pleasant-unpleasant scale).

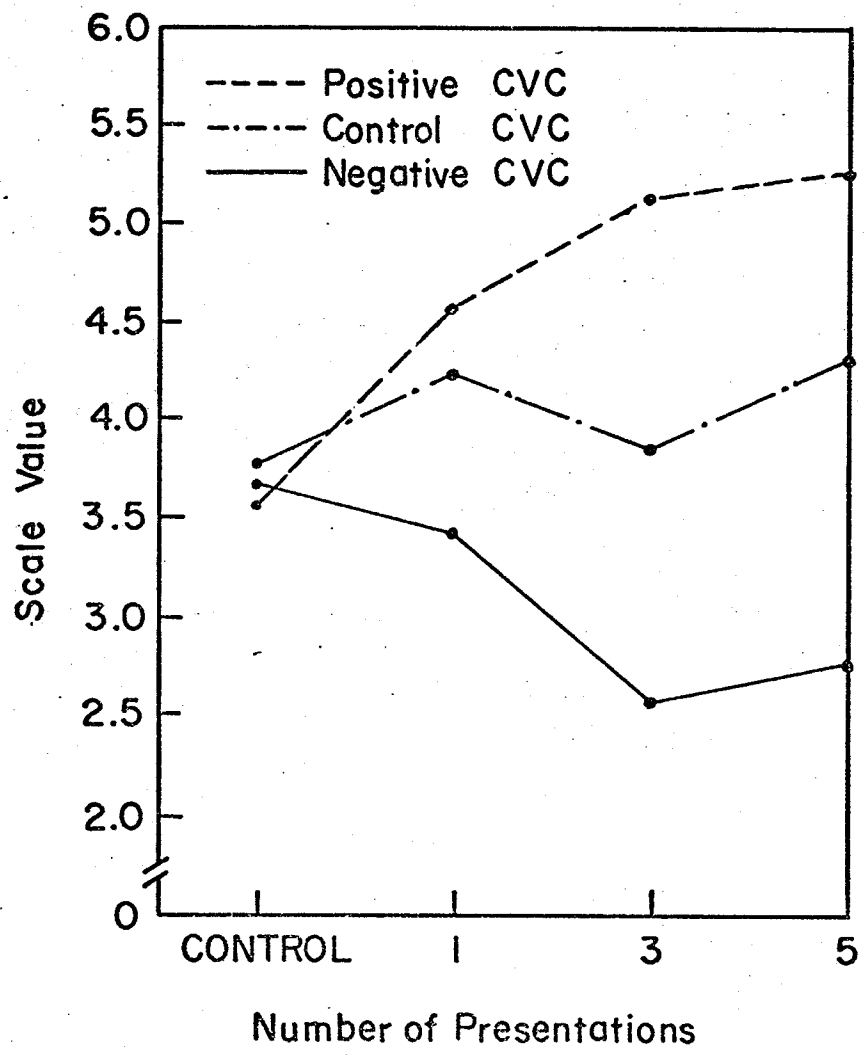

Figure 6. Conditioning scores for CVC - meaningful word groups (unaware subjects, all four scales)

Table 1

Summary of Analysis of Variance For All Subjects; Meaningful And CVC Pairings, Pleasant-Unpleasant Scale

SOURCE OF VARIATION	DF	SS	MS	F
LEV	3	48.6751	16.2250	5.221**
PAR	1	0.4011	0.4011	0.129
LEV PAR	3	18.4602	6.1534	1.980
ERROR 1	161	500.3210	3.1076	
CVC	1	1.5311	1.5311	0.540
LEV CVC	3	2.4006	0.8002	0.282
PAR CVC	1	0.0001	0.0001	0.000
LEV PAR CVC	3	9.0793	3.0264	1.068
ERROR 2	161	456.2932	2.8341	
AFF	1	65.6870	65.6870	43.276***
LEV AFF	3	41.8017	13.9339	9.180**
PAR AFF	1	22.9507	22.9507	15.120***
LEV PAR AFF	3	17.0543	5.6848	3.745*
ERROR 3	161	244.3748	1.5179	
CVC AFF	1	65.6870	65.6870	43.276***
LEV CVC AFF	3	41.8017	13.9339	9.180**
PAR CVC AFF	1	22.9508	22.9508	15.121***
LEV PAR CVC AFF	3	17.0535	5.6845	3.745*
ERROR 4	161	244.3747	1.5179	
ERROR DUE TO APPROXIMATION		0.5369		
TOTAL	675	1821.4363		

* = p<.05
** = p<.01
*** = p<.001
LEV = number of trials; 1, 3, or 5
PAR = type of pairing; CVC-word or CVC-CVC
CVC = control CVC or experimental CVC
AFF = polarity of pairing for CVC-word or CVC-CVC pairing; positive or negative

Table 2

Summary of Analysis of Variance for all Subjects; Meaningful And CVC Pairings, All Scales

SOURCE OF VARIATION	DF	SS	MS	F
LEV	3	38.6494	12.8831	1.929
PAR	1	7.4735	7.4735	1.119
LEV PAR	3	23.2726	7.7575	1.162
ERROR 1	161	1075.0359	6.6772	
CVC	1	4.1921	4.1921	0.708
LEV CVC	3	3.9399	1.3133	0.222
PAR CVC	1	6.4222	6.4222	1.085
LEV PAR CVC	3	14.7786	4.9262	0.832
ERROR 2	161	953.0203	5.9194	
AFF	1	183.9539	183.9539	46.301***
LEV AFF	3	100.6652	33.5551	8.446***
PAR AFF	1	86.4337	86.4337	21.755***
LEV PAR AFF	3	56.8562	18.9521	4.770**
ERROR 3	161	639.5675	3.9730	
CVC AFF	1	183.9557	183.9557	46.301***
LEV CVC AFF	3	100.6618	33.5539	8.445***
PAR CVC AFF	1	86.4299	86.4299	21.754***
LEV PAR CVC AFF	3	56.8608	18.9536	4.771**
ERROR 4	161	639.6570	3.9730	
SCA	3	17.3338	5.7779	5.038**
LEV SCA	9	34.9548	3.8839	3.386**
PAR SCA	3	5.8980	1.8993	1.656
LEV PAR SCA	9	10.4899	1.1655	1.016
ERROR 5	483	553.9731	1.1469	
CVC SCA	3	4.2240	1.4080	1.393
LEV CVC SCA	9	9.5983	1.0665	1.055
PAR CVC SCA	3	2.7813	0.9271	0.917
LEV PAR CVC SCA	9	18.1040	2.0116	1.990
ERROR 6	483	488.1682	1.0107	

Table 2 (continued)

SOURCE OF VARIATION	DF	SS	MS	F
AFF SCA	3	4.4777	1.4926	3.999**
LEV AFF SCA	9	4.7314	0.5257	1.409
PAR AFF SCA	3	0.3178	0.1059	0.284
LEV PAR AFF SCA	9	5.7685	0.6409	1.717
ERROR 7	483	180.2689	0.3732	
CVC AFF SCA	3	4.4742	1.4914	3.996**
LEV CVC AFF SCA	9	4.7330	0.5259	1.409
PAR CVC AFF SCA	3	0.3181	0.1060	0.284
LEV PAR CVC AFF SCA	9	5.7673	0.6404	1.717
ERROR 8	483	180.2690	0.3732	
ERROR DUE TO APPROXIMATION		-4.9735		
TOTAL	2703	5793.4180		

* = p<.05
** = p<.01
*** = p<.001
LEV = number of trials; 1, 3, or 5
PAR = type of pairing; CVC-word or CVC-CVC
CVC = control CVC or experimental CVC
AFF = polarity of pairing for CVC-word or CVC-CVC pairing; positive or negative
SCA = type of evaluative scale; pleasant-unpleasant, cruel-kind, beautiful-ugly, clean-dirty

Table 3

Mean Conditioning Scores For All Subjects

Meaningful Word Pairings, Pleasant-Unpleasant Scale

Syllable	Control	Trials 1	3	5
Positive	3.18	5.00	5.15	5.68
Negative	3.46	3.37	2.30	1.96
Control	3.55	3.84	3.90	4.14

Meaningful Word Pairings, All Scales

Syllable	Control	Trials 1	3	5
Positive	3.57	4.59	5.21	5.56
Negative	3.68	3.32	2.50	2.44
Control	3.78	4.30	3.84	4.24

CVC Pairings, Pleasant-Unpleasant Scale

Syllable	Control	Trials 1	3	5
Positive	3.46	4.05	4.14	4.62
Negative	3.18	3.95	4.23	2.86
Control	3.50	4.29	4.46	3.38

CVC Pairings, All Scales

Syllable	Control	Trials 1	3	5
Positive	3.68	4.08	3.83	4.50
Negative	3.57	3.80	3.99	3.42
Control	3.77	3.85	4.08	3.66

Table 4

Mean Comparison Tests and Trend Analyses for Meaningful Word Groups For All Subjects (Pleasant-Unpleasant Scale)

Neuman-Keuls Tests

Trials Compared

Syllable	Control,1	Control,3	Control,5	3,1	5,1	5,3
Positive CS	6.43**	6.96**	8.83**	.53	2.45	1.88
Negative CS	.318	4.10*	5.30**	3.78*	5.05**	1.20
Control	1.02	1.59	2.08	.21	1.06	.85

Dunnett Tests Between Levels

Trials Compared

Syllable	Control,1 (df=39)	Control,3 (df=40)	Control,5 (df=41)
Positive CS	6.43**	6.96**	8.83**
Negative CS	.318	4.10*	5.30**
Control	1.02	1.59	1.59

Dunnett Tests Within Levels (1,3,5, Control)

No. of Trials	df	Control-positive CS	Control-Negative CS
1	18	4.05***	1.66
3	19	4.42***	5.65***
5	21	5.44***	7.70***
Control	21	.98	.035

Linear Trend Analyses (df = 1, 161)

Positive CS	37.5**
Negative CS	23.32**
Control	1.45

* = p<.05
** = p<.01
*** = p<.005

Table 5

Mean Comparison Tests and Trend Analyses For Meaningful Word Groups For All Subjects (All Scales)

Neuman-Keuls Tests

Trials Compared

Syllable	Control,1	Control,3	Control,5	3,1	5,1	5,3
Positive CS	4.636**	7.558**	9.575**	2.743	4.59**	1.797
Negative CS	1.636	5.438**	5.849**	.796	4.00*	.276
Control	2.363	.276	2.170	2.035	.273	1.843

Dunnett Tests Between Levels of Trials

Trials Compared

Syllable	Control,1 (df=162)	Control,3 (df=166)	Control,5 (df=174)
Positive CS	4.636**	7.558**	9.575**
Negative CS	1.636	5.438**	5.849**
Control	2.363*	.276	2.170*

Dunnett Tests Within Levels (1,3,5, Control)

No. of Trials	df	Control-Positives	Control-Negatives
1	75	1.6	2.29*
3	79	6.0***	5.80***
5	87	6.0***	7.90***
Control	87	1.08	.044

Linear Trend Analyses (df = 1, 161)

Positive CS	52.82**
Negative CS	20.90**
Control	1.50

* = p<.05
** = p<.01
*** = p<.005

Table 6

Mean Comparison Tests and Trend Analyses For CVC Groups (Pleasant-Unpleasant Scale)

Neuman-Keuls Tests

	Trials Compared					
Syllable	Control,1	Control,3	Control,5	3,1	5,1	5,3
Positive CS	2.22	2.56	4.37*	2.90	2.15	1.81
Negative CS	2.90	3.96*	1.21	1.06	3.43*	1.40
Control	2.98	3.62*	.45	3.43*	3.43*	4.08*

Dunnett Tests Between Levels of Trials

	Trials Compared		
Syllable	Control,1 (df=41)	Control,3 (df=42)	Control,5 (df=41)
Positive CS	2.22*	2.56*	4.37**
Negative CS	2.90**	3.96**	1.21
Control	2.98**	3.62**	.45

Dunnett Tests Within Levels (1,3,5, Control)

No. of Trials	df	Control-Positive CS	Control-Negative CS
1	20	.90	1.20
3	21	1.19	.85
5	20	4.60	5.50
Control	21	.148	1.19

Linear Trend Analyses (df = 1, 161)

Positive CS	7.22*
Negative CS	.585
Control	.152

* = p<.05
** = p<.01
*** = p<.005

Table 7

Mean Comparison Tests and Trend Analyses
For CVC Groups (All Scales)

Neuman-Keuls Tests

	Trials Compared					
Syllable	Control,1	Control,3	Control,5	3,1	5,1	5,3
Positive CS	1.90	.71	3.83*	1.19	1.98	3.13
Negative CS	1.10	1.98	.70	.91	1.79	2.67
Control	1.38	1.48	.51	1.10	.90	1.97

Dunnett Tests Between Levels of Trials

	Trials Compared		
Syllable	Control,1 (df=171)	Control,3 (df=174)	Control,5 (df=171)
Positive CS	1.90	.71	3.83*
Negative CS	1.10	1.98	.70
Control	1.38	1.48	.51

Dunnett Tests Within Levels (1,3,5, Control)

No. of Trials	df	Control-Positive CS	Control-Negative CS
1	83	1.29	.23
3	87	1.16	.415
5	83	3.86***	1.15
Control	87	.50	.92

Linear Trend Analyses (df = 1, 161)

Positive CS	9.67**
Negative CS	3.35
Control	.110

* = p<.05
** = p<.01
*** = p<.001

Table 8

Summary of Analysis of Variance for Unaware Subjects in Meaningful Groups, All Subjects in CVC Groups, Pleasant-Unpleasant Scale

SOURCE OF VARIATION	DF	SS	MS	F
LEV	3	43.4439	14.4813	4.442**
PAR	1	0.4639	0.4639	0.142
LEV PAR	3	18.6856	6.2285	1.910
ERROR 1	150	489.0461	3.2603	0.543
CVC	1	1.5502	1.5502	0.543
LEV CVC	3	2.9649	0.9883	0.346
PAR CVC	1	0.0017	0.0017	0.001
LEV PAR CVC	3	14.2094	4.7365	1.659
ERROR 2	150	428.2966	2.8553	
AFF	1	49.1198	49.1198	31.906***
LEV AFF	3	29.9642	9.9881	6.488**
PAR AFF	1	14.3635	14.3635	9.330**
LEV PAR AFF	3	12.8121	4.2707	2.774*
ERROR 3	150	230.9289	1.5395	
CVC AFF	1	49.1198	49.1198	31.906***
LEV CVC AFF	3	29.9642	9.9881	6.488**
PAR CVC AFF	1	14.3635	14.3635	9.330**
LEV PAR CVC AFF	3	12.8123	4.2708	2.774
ERROR 4	150	230.9290	1.5395	
ERROR DUE TO APPROXIMATION		-25.6046		
TOTAL	631	1647.4365		

* = p<.05
** = p<.01
*** = p<.001
LEV = number of trials; 1,3, or 5
PAR = type of pairing; CVC-word or CVC-CVC
CVC = control CVC or experimental CVC
AFF = polarity of pairing for CVC-word or CVC-CVC pairing; positive or negative

Table 9

Summary of Analysis of Variance for Unaware Subjects in Meaningful Groups, All Subjects in CVC Groups, All Scales

SOURCE OF VARIATION	DF	SS	MS	F
LEV	3	37.2538	12.4179	1.775
PAR	1	8.2110	8.2110	1.174
LEV PAR	3	22.0249	7.3416	1.049
ERROR 1	150	1049.4121	6.9961	
CVC	1	3.9640	3.9640	0.656
LEV CVC	3	2.1055	0.7018	0.116
PAR CVC	1	6.0138	6.0138	0.995
LEV PAR CVC	3	13.1671	4.3890	0.726
ERROR 2	150	906.6433	6.0443	
AFF	1	132.8709	132.8709	34.149***
LEV AFF	3	67.5374	22.5125	5.786**
PAR AFF	1	54.3817	54.3817	13.976**
LEV PAR AFF	3	42.5389	14.1796	3.644*
ERROR 3	150	583.6433	3.8910	
CVC AFF	1	132.8729	132.8729	34.149***
LEV CVC AFF	3	67.5345	22.5115	5.786**
PAR CVC AFF	1	54.3793	54.3793	13.976**
LEV PAR CVC AFF	3	42.5396	14.1799	3.644*
ERROR 4	150	583.6411	3.8909	
SCA	3	17.1456	5.7152	4.798**
LEV SCA	9	29.6642	3.2960	2.767**
PAR SCA	3	6.2737	2.0912	1.755
LEV PAR SCA	9	11.0749	1.2305	1.033
ERROR 5	450	536.0701	1.1913	
CVC SCA	3	2.4995	0.8332	0.812
LEV CVC SCA	9	10.1565	1.1285	1.100
PAR CVC SCA	3	2.0912	0.6974	0.680
LEV PAR CVC SCA	9	20.6629	2.2959	2.238*
ERROR 6	450	461.5630	1.0257	

Table 9 (continued)

SOURCE OF VARIATION	DF	SS	MS	F
AFF SCA	3	4.6299	1.5433	3.989**
LEV AFF SCA	9	4.4389	0.4932	1.275
PAR AFF SCA	3	0.1076	0.0359	0.093
LEV PAR AFF SCA	9	6.0563	0.6729	1.739
ERROR 7	450	174.0973	0.3869	
CVC AFF SCA	3	4.6276	1.5425	3.987**
LEV CVC AFF SCA	9	4.4386	0.4932	1.275
PAR CVC AFF SCA	3	0.1066	0.0355	0.092
LEV PAR CVC AFF SCA	9	6.0580	0.6731	1.740
ERROR 8	450	174.0960	0.3869	
ERROR DUE TO APPROXIMATION		-91.1741		
TOTAL	2527	5195.4258		

* = p<.05
** = p<.01
*** = p<.001
LEV = number of trials; 1, 3, or 5
PAR = type of pairing; CVC-word or CVC-CVC
CVC = control CVC or experimental CVC
AFF = polarity of pairing for CVC-word or CVC-CVC pairing; positive or negative
SCA = type of evaluative scale; pleasant-unpleasant, cruel-kind, beautiful-ugly, clean-dirty

Table 10

Mean Conditioning Scores For Unaware Subjects in Meaningful Word Groups

Pleasant-Unpleasant Scale

Syllable	Control	Trials 1	3	5
Positive	3.18	5.00	5.00	5.27
Negative	3.46	3.50	2.41	2.20
Control	3.55	3.72	3.88	4.27

All Scales

Syllable	Control	Trials 1	3	5
Positive	3.68	4.08	3.83	4.50
Negative	3.57	3.80	3.99	3.42
Control	3.77	3.85	4.08	3.66

Table 11

Mean Comparison Tests and Trend Analyses For Meaningful Word Groups; Unaware Subjects, Pleasant-Unpleasant Scale

Neuman-Keuls Tests

Trials Compared

Syllable	Control,1	Control,3	Control,5	3,1	5,1	5,3
Positive CS	6.57**	6.50**	7.28**	.00	.89	.87
Negative CS	.14	3.75*	4.39**	3.68*	4.25*	.78
Control	.61	1.18	2.50	.54	1.80	1.46

Dunnett Tests Between Trials

Trials Compared

Syllable	Control,1 (df=38)	Control,3 (df=37)	Control,5 (df=35)
Positive CS	6.57**	6.50**	7.28**
Negative CS	.14	3.75*	4.39**
Control	.61	1.18	2.50*

Dunnett Tests Within Trials

No. of Trials	df	Control-Positive CS	Control-Negative CS
1	17	4.30***	.75
3	16	3.95***	5.00***
5	14	3.40***	7.10***
Control	21	1.28	.03

Linear Trend Analyses (df = 1, 150)

Positive CS	.88
Negative CS	34.80
Control	3.27

* = p<.05
** = p<.01
*** = p<.001

Table 12

Mean Comparison Tests and Trend Analyses For Meaningful Word Groups; Unaware Subjects, All Scales

Neuman-Keuls Tests

Trials Compared

Syllable	Control,1	Control,3	Control,5	3,1	5,1	5,3
Positive CS	4.55**	6.95**	7.37**	2.34	2.89	.53
Negative CS	1.09	4.89**	3.99*	3.62	2.77	.73
Control	2.14	.40	2.28	1.62	.21	1.75

Dunnett Tests Between Trials

Trials Compared

Syllable	Control,1 (df=158)	Control,3 (df=154)	Control,5 (df=146)
Positive CS	4.55**	6.95**	7.37**
Negative CS	1.09	4.89**	3.89**
Control	2.14*	.40	2.28*

Dunnett Tests Within Trials

No. of Trials	df	Control-Positive CS	Control-Negative CS
1	71	1.16	3.92***
3	67	5.39***	5.52***
5	59	4.09***	6.59***
Control	87	.91	.43

Linear Trend Analyses (df = 1, 150)

Positive CS	.58
Negative CS	51.87**
Control	8.97**

* = p<.05
** = p<.01
*** = p<.001

Table 13

Mean Critical CS-UCS Pairings Recalled

	Unaware			Aware		
	Trials	$\bar{X}$		Trials	$\bar{X}$	
Meaningful UCS Groups	1	1.5	(n=18)	1	2.0	(n=1)
	3	4.8	(n=17)	3	5.33	(n=3)
	5	5.6	(n=15)	5	7.29	(n=7)
CVC-UCS Groups	1	.333	(n=21)			
	3	1.23	(n=21)			
	5	3.95	(n=21)			

Chapter 4

DISCUSSION

This chapter presents a general discussion of the results of the study in relation to previous findings in the area of conditioning of meaning. Suggestions of possible future research in relation to the present study are also discussed.

General Results

Both of the main hypotheses presented in Chapter One found general support from the results of the study. Nonsense syllables paired with evaluative UCSs were rated on the Semantic Differential scales in the direction of the list with which it was paired. These results held even when those Ss who verbalized awareness of the contingency pairings were dropped from the analyses.

The hypothesis that the conditioning effect would increase as the number of CS-UCS pairings increased also found support. Ss receiving five list presentations exhibited a stronger conditioning than Ss receiving three or one presentations. The three trial group, in turn, showed a stronger effect than the one trial group. Again, dropping aware Ss

from the analysis did not alter these findings in any significant way.

It was further hypothesized that the preceding results would occur for both the meaningful UCS groups and the nonsense syllable UCS groups. Although the former groups responded in the expected direction, the results for the latter groups are less clear with respect to the hypotheses. No conditioning effect was evidenced by the groups receiving nonsense syllable UCS list in the one and three trial conditions. However, for the five trial condition, the syllable that was paired with the positive evaluative list was rated as significantly more positive than the control syllable. The syllable paired with the negative list was rated more negatively than the control but the results for this syllable did not reach significance. In general, the analysis of the single scale data (pleasant-unpleasant) showed effects which were consistent with the analysis of the four scale data.

Conditioning and Trials Effect for Meaningful Pairings

The conditioning of meaning effect with meaningful UCSs that has been reported in much of the literature reviewed in Chapter One (e.g., Staats and Staats, 1957) has been replicated in the present study. The effect reported by Staats and Staats (1959) that increasing the number of CS-UCS presentations results in an increasingly strong conditioning effect

was also replicated. This replication was achieved with several modifications of the experimental procedure used originally by the Staats' and then by other investigators (e.g., Cohen, 1964; Page, 1969).

In the conditioning of meaning studies previously reported in the literature the E has presented the CS visually followed by oral presentation of the UCS. In the present study both CS and UCS were presented visually. In addition, the present study employed the anticipation method of stimulus presentation. CS_1 was shown, followed by CS_1-UCS_1, CS_2, CS_2-UCS_2, etc. Previous studies in the area had all employed a CS_1-UCS_1, CS_2-UCS_2 arrangement.

One other difference in technique between the present study and those previously reported should be noted. Most of the previous studies continued to follow the original Staats and Staats (1957) procedure of using 18 conditioning trials. Hare (1964) used only eight trials but reported no conditioning effect when contingency aware Ss were not included in the analysis. In the present study there was a significant conditioning effect in the meaningful UCS group for unaware Ss when just six conditioning trials were employed.

Awareness of Contingency

The major variable investigated in this study was the effect of awareness on the conditioning of meaning. Is

awareness necessary for the conditioning of meaning to occur or is awareness merely a frequent by-product of meaning conditioning which is itself an unnecessary element in achieving the conditioning as Staats (1969) suggested?

Other studies had concentrated on one technique - the post-experimental questionnaire - to investigate the effects of awareness on meaning conditioning. This technique had been criticized by Staats (1969) who stated that the questionnaire itself might "shape-up" affirmative awareness responses. Taking this criticism into account, the present study employed two separate methods of studying the awareness variable. One of these methods was the questionnaire method itself. The other technique attempted to eliminate the possibility of contingency and demand awareness and was inherent in the conditioning procedure for Ss in the nonsense syllable UCS groups. For these groups the UCS list contained only nonsense syllables that were previously found to be positively or negatively evaluative on the Semantic Differential rating scales. None of the 64 Ss in these groups verbalized contingency awareness while 11 Ss of a total of 61 in the meaningful UCS groups verbalized contingency awareness.

Hare (1964) speculated that awareness of contingency pairings was caused by Ss perceiving the conditioning procedure as a problem-solving task. He stated that S "figures-out" the

purpose of the conditioning of meaning experiment by forming the concept of "goodness" or "badness" from the UCS lists. The S who is successful in forming the correct concept looks upon the Semantic Differential scales as a way of telling E that he has indeed solved the problem. This would result, Hare states, in extreme rating scores for such Ss. Hare reported that he found such extreme ratings for these Ss. In the present study a similar trend was observed. The mean rating for aware Ss of the CS paired with the negative UCS word list was lower than 2.0; for the CS paired with the positive word list it was greater than 6.0. This was true for analysis of both the pleasant-unpleasant scale alone and for the four evaluative scales combined.

As was previously reported, 11 of the 61 Ss (approximately 20% of the group) verbalized contingency awareness. In the studies reviewed, awareness varied from 5% (Blanford and Sampson, 1964) to 83% (Hare, 1964). What are some of the variables contributing to this large discrepancy? It seems that two of these variables may be the criterion measure of awareness and the number of Ss run in each session of the experiment.

An analysis of ten of the studies reported in Chapter One of the number of Ss in each session and percentage of Ss dropped from the analysis because of awareness was performed.

(All of the studies except for Hare (1965) included this information). The present study was also included in this analysis. In general it was found that the larger the group, the larger the reported awareness. On the extremes, Blanford and Sampson (1964) ran Ss in groups of from one to six and reported 5% awareness. Hare ran approximately 35 Ss in each group and reported 83% awareness. A rank-order correlation of these data for all the studies yielded a coefficient of .70. Although these data are not conclusive, they are interesting. The control of Ss' behaviour is probably much more difficult to monitor in large groups than in small groups. If one S becomes aware in a large group it would be easy for him to transmit his insight to the other. These problems can be sharply reduced when the E is in a position to observe all Ss and exert whatever authority Ss might perceive he has. In the present study the groups of from three to eight Ss were seated in a small room with partitions between them. Copying and talking were thereby eliminated.

The criterion of awareness is a second variable thought by the present author to influence the percentage of aware Ss reported. Hare (1964, 1965) used the number (he did not indicate what number) of correct CS-UCS pairings recalled. All of the other studies reviewed in Chapter One used some kind of post-experimental verbal or written questionnaire as

the awareness criterion. The difference between the Hare (1964) study and the study which reported the next highest percentage of awareness (Page, 1969) in terms of this percentage is striking. Hare reported 83% of his Ss became aware while Page reported 39.5% (demand and contingency awareness). The criterion of awareness must certainly be taken into account in discussing any difference in percentage of aware Ss between these two studies. It is probable that correct recall of a particular number of CS-UCS pairings is a necessary but not a sufficient condition for verbalizing awareness on the questionnaire. In the present study all 11 aware Ss (judged aware on the basis of the questionnaire data) correctly recalled at least two CS-UCS pairings. The mean was 6.8 correctly recalled pairings for the aware group. The mean correct recall for the unaware group (N = 48) was just 3.8.

Apparently, the type of questionnaire used is itself a variable affecting the report of the Ss' awareness. This factor will be discussed in the next section.

Demand Awareness

No S in the present study verbalized demand awareness. That is, no S wrote in the questionnaire that he felt that the purpose of the study was to see how the syllables would be rated after the CS-UCS presentation. Why are these results so seemingly inconsistent with those of Page (1969)? The number

of Ss that verbalized demand awareness in the Page study was 86 of a total of 281.

The major difference between the Page study and the present study in terms of the determination of awareness was the type of questionnaire used. Page used a quite lengthy and involved protocol which asked highly specific questions as to the nature of the experiment, its purpose and so on (e.g., "were you ever aware during the experiment that YOF... was always paired with words of unpleasant meaning or connotation and that WUH... was always paired with words of unpleasant meaning? And if so were you aware of any effect this might have had on you as you marked the rating scales? Explain." Page, 1969, p 181). It will be recalled that Staats (1969) criticized this type of protocol on the grounds that its format may lead to previously unaware Ss becoming aware of the purpose of the study and possibly indicating that they were aware during the experiment itself. The protocol employed in the present study (see Appendix B) was quite short and its purpose was probably not apparent. The questions asked were of a general nature and offerred few hints as to its purpose. Possibly for this reason unaware Ss were kept from becoming aware during completion of the questionnaire. All of the 11 aware Ss indicated that the awareness was achieved sometime during the presentation of the slides - usually about halfway

through the presentation. If this conclusion is accepted, then criticism of the long questionnaire might be investigated more closely. An analogous criticism of Levin's (1961) questionnaire used in a study on verbal operant conditioning has been made by Speilberger (1962) and is quite compelling.

The Nonsense Syllable UCS Groups

The operationalization of awareness (either demand or contingency) as the verbal report of this awareness presents many problems. Although Staats (1969) suggested that the long and detailed questionnaire shapes some Ss' responses to a previously unattained awareness it is possible, in turn, that the shorter questionnaires or verbal questions are not explicit enough to elicit a criterion awareness response from Ss who are in fact aware of the CS-UCS contingencies or the purpose of the experiment or both.

The nonsense syllable UCS lists were used in this study to eliminate the possibility of becoming aware of both the CS-UCS contingencies and the purpose of the study. The concept of "goodness" or "badness" probably could not be ascribed to apparently "meaningless" nonsense syllables even though these same syllables were previously found to contain an evaluative component. None of the 64 Ss in this condition verbalized anything resembling the nature of the contingency used. None of them verbalized awareness as to the purpose of the study.

The results of the conditioning of meaning for these groups are equivocal. They do not clearly support either the conditioning without awareness hypothesis or the conditioning only with awareness hypothesis. The groups receiving one and three presentations of the CS-UCS lists did not show any significant difference in rating the CS syllable compared to the control syllable. It will be recalled that the equivalent groups in the meaningful UCS condition exhibited differential ratings. A comparison of these conditions would tend to strongly support a conditioning only with awareness hypothesis if it is assumed that concept formation can occur only with blatently meaningful stimuli.

Care must be taken before acceptance of the preceding conclusion. The mean Phase I ratings of the meaningful words were much more extreme than the ratings of the syllables. (see Appendices C and D). For this reason it would be expected that the conditioning effect would be weaker for the nonsense syllable groups than for the meaningful word groups. This point is supported by the findings in the five presentation nonsense syllable group. For this group there were differences of ratings for CS syllables and control syllables. These differences occurred in the expected direction but were significant only for the syllable paired with the positive evaluative list. The syllable paired with the negative list

was trended in a negative direction but failed to reach significance. It might be explained, then, that even though the UCS lists were evaluatively weak for the nonsense syllable groups, many presentations of the list resulted in a small conditioning effect. This explanation finds support from the results of Staats and Staats (1959) and from the present study. Both of these experiments found that as exposure to CS - meaningful UCS pairings increased, the conditioning effect exhibits a concommitant increase.

The preceding interpretation is made with some reservations. An alternative explanation might be equally acceptable. This alternative finds a basis in the work of Zajonc (1968) and others who found that mere repeated exposure to a stimulus results in an enhancement of its evaluative meaning. Zajonc cites a study by Johnson, Thomson and Frinke (1960) which found that repeated exposure of a nonsense syllable resulted in an increasingly positive "good-bad" semantic differential rating.

The results of the ratings of the CS syllable paired with the positive UCS list are in agreement with the Johnson, Thomson and Frinke (1960) results. Further support for this interpretation would be had by comparing the control syllable ratings for groups receiving one, three and five presentations. The greater the number of presentations, the higher the

syllable is rated. This was also true in the case of the group receiving meaningful UCS lists. However, what of the relatively negative ratings given to the CS paired with the negative UCS syllable list? These findings are unexpected in terms of the "mere-exposure" hypothesis. Although these results were not significant, the trend fits in only with the conditioning without awareness hypothesis.

Conclusions

The conditioning of meaning effect reported by Staats and Staats (1957) and by others and the effect of increasing conditioning with increasing CS-UCS presentation has been replicated in the present study. However, the conditioning without awareness hypothesis was neither supported or unsupported. Using the criterion of verbal report, the results indicated that conditioning of meaning does occur without awareness. Using the technique of eliminating awareness by means of UCS lists composed of nonsense syllables, the conditioning without awareness hypothesis was given little if any support.

Future research in this area is needed that would enlarge upon the technique for eliminating awareness introduced in the present experiment. The use of UCS lists composed of nonsense syllables that are found to be more strongly evaluative than those used in the present study and increasing

the number of CS-UCS trials from the five used in this study would provide a stronger test of the conditioning without awareness hypothesis.

APPENDICES

APPENDIX A

Typical Page from Semantic Differential

Rating Booklet

CVC

PLEASANT :____:____:____:____:____:____:____: UNPLEASANT

CRUEL :____:____:____:____:____:____:____: KIND

BEAUTIFUL :____:____:____:____:____:____:____: UGLY

DIRTY :____:____:____:____:____:____:____: CLEAN

APPENDIX B

Awareness Questionnaire

1. What procedure (or procedures) did you use to learn the pairs?

2. In the past we have found that some people who participate in verbal learning experiments form ideas or hypotheses about how or what they should learn, etc., and these ideas are independent of the experiment's instructions. Did you form such ideas?

   Yes _____ No _____(Check one)

3. If you checked yes above, what was your hypothesis or hypotheses?

4. When did you develop the hypothesis? Check one of the following:

   _____ During the presentation of the slides. (If you check this one estimate when it was during the presentation of the slides that you formed your hypothesis.

   _____ After the presentation of the slides, but before the recall of the pairs.

   _____ During the recall of the pairs.

   _____ After the recall of the pairs.

   _____ While reading the questionnaire.

APPENDIX C

Mean Ratings and Standard Deviations of Negative and Positive UCS Word Lists for Phase I Subjects

Negative Word UCS List

Word	Total $\bar{X}$	s.d.	p-u $\bar{X}$	s.d.
Disgusting	2.00	1.30	1.56	0.77
Fear	2.47	1.42	1.76	0.93
Insane	2.48	1.49	2.08	1.53
Sick	2.50	1.27	1.52	0.87
Stupid	2.91	1.31	2.44	1.26
Worthless	3.04	1.51	2.60	1.66

Positive Word UCS List

Word	Total $\bar{X}$	s.d.	p-u $\bar{X}$	s.d.
Friend	6.15	1.05	6.60	0.76
Happy	6.28	1.06	6.80	0.50
Healthy	6.13	1.08	6.56	0.87
Rich	4.77	1.69	6.08	0.95
Sweet	6.11	1.11	6.60	0.50
Win	5.20	1.76	5.96	1.70

(1 = extreme positive, 7 = extreme negative

Total $\bar{X}$ = Mean rating for all four scales

p-u $\bar{X}$ = Mean rating for pleasant-unpleasant scale

APPENDIX D

Mean Ratings and Standard Deviations of Negative and Positive Nonsense Syllable UCS List for Phase I Subjects

Negative Nonsense Syllable UCS List

Syllable	Total $\bar{X}$	s.d.	p-u $\bar{X}$	s.d.
CAK	3.07	1.42	2.88	1.64
GAC	2.76	1.26	2.36	1.29
GOC	2.76	1.20	2.32	1.44
GOK	3.00	1.56	2.72	1.43
WAP	2.85	1.10	2.80	1.22
YUH	2.92	1.20	2.60	1.15

Positive Nonsense Syllable UCS List

Syllable	Total $\bar{X}$	s.d.	p-u $\bar{X}$	s.d.
CEN	4.76	1.20	5.28	1.21
JOH	4.72	1.09	4.78	1.17
MOY	4.56	1.57	4.40	1.71
WUM	4.77	1.38	4.60	1.66
YOS	4.55	1.40	4.92	1.38
ZAN	4.68	1.31	5.20	1.41

(1 = extreme positive, 7 = extreme negative)

Total $\bar{X}$ = Mean rating for all four scales

p-u $\bar{X}$ = mean rating for pleasant-unpleasant scale

APPENDIX E

Mean Ratings and Standard Deviations of CS and Control Nonsense Syllables For Phase I Subjects

Syllable	Total $\bar{X}$	s.d.	p-u $\bar{X}$	s.d.
BIW	3.83	1.36	3.40	1.44
DAP	4.00	1.29	4.07	1.32
KEJ	3.91	1.25	3.84	1.31
KOM	4.03	1.48	4.08	1.47
NID	4.10	1.37	3.92	1.66
QEP	3.91	1.26	3.84	1.65
REJ	4.07	1.66	4.00	1.96
VEM	3.84	1.70	3.92	1.91

(1 = extreme positive, 7 = extreme negative)

Total $\bar{X}$ = Mean rating for all four scales

p-u $\bar{X}$ = Mean rating for pleasant-unpleasant scale

APPENDIX F

Mean Ratings and Standard Deviations for Filler Nonsense Syllables (Used as CSs in non-critical CS-UCS Pairings) For Phase I Subjects

Filler List A

Syllable	Total $\bar{X}$	s.d.	p-u $\bar{X}$	s.d.
BIS	4.34	1.34	4.32	1.46
FIC	3.37	1.43	3.45	1.50
SIY	4.27	1.22	4.48	1.58
TIZ	4.26	1.19	4.28	1.21
VOY	4.51	1.28	4.36	1.41
YAT	3.51	1.16	3.48	1.22

Filler List B

Syllable	Total $\bar{X}$	s.d.	p-u $\bar{X}$	s.d.
DAS	4.22	1.17	4.32	1.31
LIB	4.28	1.28	4.36	1.34
NEB	3.88	1.39	3.68	1.03
QUT	3.23	1.05	3.20	0.91
SEG	3.53	1.19	3.48	1.29
TIY	4.38	1.22	4.40	1.35

(1 = extreme positive, 7 = extreme negative)

Total $\bar{X}$ = Mean Rating for all four scales

p-u $\bar{X}$ = Mean rating for pleasant-unpleasant scale

APPENDIX G

Semantic Differential Instructions

If you feel that the concept at the top of the scale is very closely related to one end of the scale, you should place your check-mark as follows:

STRONG :x:_:_:_:_:_:_: WEAK or STRONG :_:_:_:_:_:_:x: WEAK

If you feel that the concept is quite closely related to one or the other end of the scale (but not extremely), you should place your check-mark as follows:

STRONG :_:x:_:_:_:_:_: WEAK or STRONG :_:_:_:_:_:x:_: WEAK

If the concept seems only slightly related to one end as opposed to the other end (but is not really neutral), then you should check as follows:

STRONG :_:_:x:_:_:_:_: WEAK or STRONG :_:_:_:_:x:_:_: WEAK

The direction toward which you check depends upon which of the two ends of the scale seem most characteristic of the concept or person you are judging.

If you consider the concept to be neutral, on the scale, both sides of the scale equally describe the concept, then you should place your check-mark in the middle space:

STRONG :_:_:_:x:_:_:_: WEAK

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