THE ROLE OF AWARENESS IN VERBAL LEARNING

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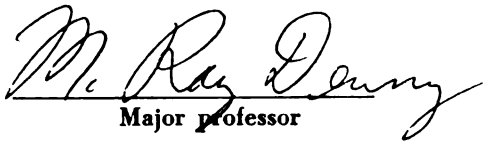

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ABSTRACT

THE ROLE OF AWARENESS IN VERBAL LEARNING

by Rosaria A. Bulgarella

The present study investigated the problem of verbal learning and awareness. Previous studies have indicated that learning frequently does not take place without awareness. However, these studies are illustrative of a specific area of learning in which the elicitors are weak and awareness is necessary for specification of the response.

Two experiments using strong elicitors (reinforcers) were carried out. The first was a classical learning situation in which Ss were classified as aware or unaware on the basis of a post-conditioning interview. The scores of the Aware and Unaware Ss on a recall test were compared. No significant differences were found between these two groups. However, both the Aware and Unaware Ss differed significantly from the Control Group indicating that learning took place without awareness.

The second experiment was an operant learning situation in which the Ss were able to relieve the monotony of a task by giving a particular response. The Ss were then given a rest interval containing a recorded joke. The extent of the Ss' awareness was determined by a specific, lengthy postconditioning interview. The

data from the Aware Ss' were eliminated from the analysis. The findings indicated that learning did occur without awareness since one group did show a significant rise in the correct responses and differed significantly from the Control Group.

These results were predicted and interpreted in the framework of elicitation theory.

THE ROLE OF AWARENESS IN VERBAL LEARNING

By

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INTRODUCTION

The presumed role of awareness in verbal learning has changed considerably throughout the last thirty years of experimentation. The results of the studies first supported the S-R positions of Thorndike and Hull in which the response is considered to be mechanically (automatically) strengthened simply because it occurs in association with a reinforcer which has satisfying (or drive-reducing) properties. However, with the development of more sensitive techniques for the assessment of awareness, the later findings of most experiments on verbal learning indicated that the response is not automatically strengthened. It was generally found that only aware Ss showed an increment in performance, and this caused many investigators to abandon the S-R positions of Thorndike and Hull. Since there appeared to be no better S-R alternative, the cognitive learning theory approach was adopted as the one best suited to predict and explain these findings. The investigators who follow the cognitive learning approach suggest that awareness is a necessary condition for learning and that unaware Ss do not learn.

In the present study, an alternative S-R mechanistic approach, elicitation theory as espoused by Denny and Adelman (1955), is used to predict and interpret the results obtained. In the framework of elicitation theory, awareness is necessary only in a <u>particular</u> area of learning. Learning occurs automatically in situations as specified by the theory in a subsequent section.

Historical Aspects

One of the first experiments examining the problem of the relationship between awareness and verbal learning was that devised by Thorndike and Rock (1934). Learning without awareness was of some importance in Thorndike's theory, particularly in the realm of learning emotions, attitudes, conduct, and other similar forms of social behavior. Consequently, an experiment on verbal learning, in addition to one on motor learning, was carried out. In these studies, learning without awareness was assumed to have occurred when the rewarded responses gradually increased whereas learning with awareness was assumed when these responses increased suddenly from a moderate percentage to a high one.

In the verbal experiment, E read a series of words, one at a time, to the S who was instructed to respond by saying the first word or words which came to his mind. If the S gave a sequential response to the word, E called it "right." However, if the S gave a response indicating word-meaning or interpretive connections, it was called "wrong." Thorndike and Rock found that there was a gradual rise in the number of sequential associations given by S. Since there was gradual, rather than rapid, improvement, they concluded that this was evidence for learning without awareness.

Irwin, Kauffman, Prior, and Weaver (1934) questioned Thorndike and Rock's assumption that a gradual increase in the percentage of correct responses indicated that learning took place without the S being aware of such learning. They replicated the experiment by Thorndike and Rock, except that, as a control, some of the Ss were given the reason for Es announcements of "right" or "wrong." It was found that these control Ss who were told of the correct principle, and thus were aware, also showed a gradual increase in the number of sequential associations. Consequently, it was concluded that Thorndike and Rock had not given any evidence of learning without awareness.

Hostman and Jarrett (1952) also used the same procedure as Thorndike and Rock. However, they used an additional criterion of awareness, that of asking the S to state the principle which he thought was correct. The Ss were divided into an informed group and an uninformed group. The first group was informed of the correct principle in the beginning of the experiment, whereas the latter was not. At the end of each block of twenty words, the uninformed Ss were asked if they could state the correct principle. An increase in the number of sequential associations occurred in both groups, and the majority of uninformed Ss were able to verbalize the principle correctly. The Ss who could verbalize showed gradual but significant improvement even before verbalization. However, the Ss who were not able to verbalize the correct principle did not show a significant amount of learning. Consequently, this experiment did not present convincing evidence of learning without awareness.

Philbrick and Postman (1955) investigated the role of awareness when the correct principle was quite simple and easily applicable, rather than complex as in the previous studies. It was expected that, since the principle was more simple, learning without awareness would be more likely to occur and, with verbalization, a rapid improvement would take place. The Ss were presented with a series of stimulus words to each of which they were to respond by giving a number. The number was called correct if it was equal to the number of letters in the word minus one. The expectation that this situation would enhance learning without awareness was fulfilled in that the group which could not verbalize the correct principle did show a significant amount of learning, although performance was consistently poorer than that of the Ss who eventually were successful.

A study (DiVesta and Blake, 1959) utilized the same procedure as Philbrick and Postman. It was found that, regardless of whether Ss are set for or are discouraged from looking for a principle, learning takes place. However, a set to look for a principle facilitated both awareness and learning.

Greenspoon (1955) determined the effectiveness of two stimuli, other than "right" and "wrong" as in the above studies. Either "mm-hmm" or "huh-uh" was given by E after the plural nouns for some Ss or after any word not a plural noun for other Ss. The S's task was to continue saying words until E told him to stop. Four groups, one for each condition, were used. Only data from Ss who were determined to be unaware by a brief, general interview were used. It was found that

the contingent stimulus, "huh-uh," had a different effect on the two groups which received it. The group which received the stimulus after non-plural responses increased their non-plural responses, whereas the group which received "huh-uh" for plural responses decreased their plural responses. The contingent stimulus, "mmm-hmm," on the other hand, had the effect of increasing both the plural and non-plural responses.

A study similar to the one above was carried out by Sidowski (1954). The task was the same as Greenspoon's in that the Ss were asked to say words one at a time, but the reinforcing stimulus was a light blink rather than a verbal stimulus by E. The results indicated that the light was an effective reinforcer. It was found that the unaware Ss did increase the number of plural words when these were followed by the flash of light.

Dulany (1961), also using Greenspoon's procedure, found that although the Ss may not have been aware of the correct contingency between the response and the reinforcer, they may have held a correlated hypothesis. This led them to increase their responses in such a way that it appeared they had the correct hypothesis. Some Ss showed learning because they held a correlated hypothesis (saying words in a series, e.g., diamonds, rubies, and pearls), rather than the correct hypothesis (saying plural words). Dulany concluded that unaware Ss who showed learning may have had correlated hypotheses of which they were very much aware.

Verplank (1955) attempted to condition the content of conversation

by reinforcement. The verbal behavior chosen for reinforcement was the statements of opinion, and the reinforcer consisted of agreement with, or the paraphrasing of, the opinion. The experiment was carried out by a number of Es who, during an unstructured half-hour conversation with an unsuspecting S, first determined the S's operant level. E then followed the S's opinions by paraphrasing or agreement. It was found that statements of opinion did increase with agreement or paraphrasing. Extinction was more difficult since some Ss became angry or left to "study" or gave some other such excuse. It was assumed that, since the Ss did not indicate that the conversation was an unusual one, they were unaware that they had been taking part in an experiment.

Cohen, Kalish, Thurston, and Cohen (1954) used a method commonly known as the Taffel procedure which consisted of giving Ss 80 stimulus cards with a verb and the pronouns, "I, we, you, he, she, they," on each. The Ss were asked to make up sentences using one of the pronouns and the verb. If the S used either pronoun of the first person, I or we, the E said "good" in a flat unemotional voice. It was found that an increment occurred in the pronouns followed by the E saying "good." Questioning of the Ss did not reveal awareness of the relationship between their responses and the E's behavior. Taffel (1955), using the same method, obtained similar results.

Levin (1961) has examined the problem of whether learning without awareness is an artifact of insensitive interviewing. His method was similar to Taffel's sentence construction task. To test for awareness, both a brief, general interview (BI), such as in the previous studies,

and an extended, specific interview (EI), developed by Levin, were used. Using the BI questions alone, only three out of the 60 Ss were classified as being aware. Using the additional EI questions, 16 more Ss were classified as being aware.

When only the BI was used to detect awareness, there was evidence for learning without awareness. However, when the EI was used in addition to the BI, the Ss who were found to be unaware did not, as a group, exhibit learning. It is interesting to note that when the Ss were aware of being reinforced for only one of the two pronouns, the Ss showed learning for that pronoun alone.

Levin's results threw serious doubts upon those studies which reported conditioning without awareness when only a brief, general interview was used. Following Levin's study, experiments on awareness and verbal learning (Spielberger, Levin, and Shepard, 1962; Spielberger and DeNike, 1962; Spielberger, Berger, and Howard, 1963; DeNike and Spielberger, 1963; DeNike, 1964; and Paul, Eriksen, and Humphreys, 1962) utilized the extended interview to assess awareness. When Ss were determined to be unaware by the EI, no significant learning occurred.

The experiment by Spielberger, Levin, and Shepard (1962) examined, in addition to awareness, the attitude of the Ss toward the reinforcer. Since the unaware Ss did not exhibit learning, only the aware Ss were used for the analysis of attitude upon learning. The Ss were asked to choose among three alternatives on an increasing scale indicating how much they wanted the E to say "good." The task was similar to that of

Taffel (1955). The results indicated that the Ss who desired the reinforcer very much showed greater learning than those who wanted it only somewhat or did not care one way or another about it.

Spielberger and DeNike (1962) replicated Greenspoon's (1955) study with a few refinements. Spielberger and DeNike matched their Ss more carefully as to operant rate than did Greenspoon. Using only data from unaware Ss, they did not find a significant difference between these experimental Ss and the control group. They concluded that Greenspoon's positive results were artifacts of an insensitive, brief postconditioning interview and unequally matched operant rates for the experimental and control groups.

In another study, utilizing Taffel's sentence construction task, Spielberger, Berger, and Howard (1963) also found no learning by unaware Ss. They examined, in addition, such variables as need for social approval (as measured by the Marlowe-Crowne Social Desirability Scale) and desire to receive the reinforcer. Again, a relationship was found between desire to receive the reinforcer, "good," and amount of learning for the aware Ss; data from unaware Ss were not used for this analysis since they showed no improvement. No relationship was observed between need for social approval and learning or desire to receive the reinforcer.

The experiments by DeNike and Spielberger (1963) and DeNike (1964) add to the impressive list of studies which showed no evidence for learning without awareness. The first of these experiments considered, among other variables, the role of mediat-

ing cognitive states (awareness) as measured by a rather detailed interview. The Ss were divided into three groups on the basis of whether they held the correct hypothesis, other hypotheses which could have augmented Ss giving the response in question, or no hypotheses which affected the giving of the response. Only the Ss having the correct hypothesis showed a significant increase in performance.

DeNike (1964) attempted to determine whether the point at which awareness occurs and the point at which performance gains take place are the same. In addition to a detailed postconditioning interview, the Ss were interrupted during the task (after each trial block of 25 words) and were asked to write down their thoughts about the experiment. These notes by the Ss were later used to determine when awareness first took place. The results indicated that performance increments and awareness occurred on the same trial block.

Paul, Eriksen, and Humphreys (1962) devised a completely novel method of studying learning and awareness. Though this experiment does not deal with verbal behavior, it is of interest because of the use of a strong elicitor. The Ss were required to sit through an experimental session in a chamber maintained at 105° F. They were deliberately misled as to the purpose of the study and were given a pseudo task. During this time, a puff of cool air contingent about particular physical movements, e.g., face or mouth movements, was given whenever S gave the appropriate response. Only the aware Ss showed an increase in response although almost all of the Ss

indicated they wanted very much to receive the cool air.

However, the picture for learning without awareness is not as bleak as may appear from the above account. There have been isolated cases in which learning appears to have occurred without awareness, and these suggest that this matter should not be considered settled. These positive results seem to be found using strong aversive stimuli as the elicitors (Eriksen and Kuethe, 1955; Turner and Solomon, 1962), and using responses over which the S has no apparent control (Hefferline, Keenan, and Harford, 1959; Hefferline and Keenan, 1963; Barrett, 1962).

Eriksen and Kuethe (1955) used shock as the elicitor. A list of words was presented to the Ss several times, and they were instructed to give the first association (word) which came to mind for each of the words. The Ss were misled as to the purpose of the study and were shocked immediately after their first response to certain words. Each time they repeated the same association for which they were shocked the first time, they were shocked again. Awareness was assessed by an intensive postconditioning interview. Both the high and the low awareness groups showed a decline in the repetition of shocked associations as compared to the nonshocked responses. There were no significant differences in the amount and rate of learning between the two groups.

However, the high awareness group differed significantly from the low awareness group in amount of time taken to give associations to the critical and noncritical words. For the high awareness group,

following the first shocked trial, reaction time increased for the critical words, whereas for the low awareness group, there was no difference in reaction time for the critical and noncritical words. The increase in reaction time for the aware group corresponded with their report of deliberate suppression of the shocked responses while trying to think of new responses. The authors concluded that this difference in reaction time was an independent check upon the validity of classifying the Ss into the respective groups.

Turner and Solomon (1962) carried out a rather complex study (eight experimental groups) of avoidance learning in which both the type of instruction and the amount of reflexiveness of the escape responses (respondents versus operants) was varied. The Ss were either given minimal instructions that a tone and shock would be presented or adequate instructions which also included the knowledge that they would do something to terminate or avoid the shock. The Ss were interviewed at the end of the first session and at the beginning and end of the other sessions. Considering the adequately instructed Ss, all groups learned to avoid and escape shock and were able to verbalize the correct avoidance response. In the minimally instructed operant groups, one group did not even show the escape response and was unable to verbalize whereas another group, similar to the shuttle box situation, was able to verbalize and learned to avoid the shock. However, in the minimally instructed respondent groups, the Ss were unable to verbalize either the correct escape or avoidance response and yet showed consistent escape from shock.

The remaining studies have in common the fact that the Ss did not appear to be in a position to deliberately control the responses. The series by Hefferline et al. used a covert response which was so small that the Ss were unaware that they did anything. In Hefferline, Keenan, and Hartford's study (1959), Ss could either escape or avoid an aversively loud noise superimposed on music by giving a small, invisible thumb-twitch. These minute responses were able to be seen by E through electromyographic amplification. Ss who were unaware that they could avoid or escape showed increases in the thumb-twitch from operant level. Some of the Ss who were instructed that they could avoid the aversive noise by a tiny twitch of their thumb were unable to deliberately produce such a small twitch as the unaware Ss.

The second study, (Hefferline and Keenan, 1963), also used the small thumb-twitch as the response to be learned. S was seated in a reclining chair and told that E was measuring ability to relax. After some time, for the establishment of operant rate, numbers appeared on a box before the S, indicating the number of nickels S earned. Each time S gave a thumb-twitch of a particular amplitude, the number on the box would advance one. During the conditioning period, all Ss increased the number of thumb-twitches over operant level. When questioned at the end of the session, no S was able to tell how he earned the money. All Ss reported intense annoyance during the extinction period, indicating that earning money is a strong elicitor.

Other evidence comes from studies such as Barrett's (1962) in

the area of medicine. A patient suffering from neuromuscular tics participated in an experiment designed to help reduce the tics. Music, which was pleasing to the S, was interrupted whenever a tic occurred. Barrett found that these tic-produced interruptions were effective in reducing the tics. Deliberate attempts by the S to reduce tics were not as effective as the interruptions of music.

Another interesting study (Lindsley, Hobika, and Etsten, 1961), in the medical field, examined what occurred to a previously conditioned avoidance response when the S was anesthetized for surgery. Ss who had learned an avoidance response to a loud tone prior to surgery, were found to give the response while recovering from anesthesia even though they could not answer questions or give motor responses to verbal commands.

This last group of studies presents some difficulty for those who hold that awareness is a necessary condition for learning. The findings of these studies indicate that learning without awareness is possible, particularly under circumstances in which the elicitors are strong. The present study examines the role of awareness in verbal learning as conceived within the elicitation framework.

Elicitation Theory

Elicitation theory (Denny and Adelman, 1955; Denny and Adelman, 1956) is presented here as an alternative S-R mechanistic position which suggests the hypotheses of the present study. It is a contiguity theory which states as an acquisition hypothesis that "the stimulus complex S

which closely precedes in time any response elicited by any stimulus (Se) acquires the property to elicit this response" (Denny and Adelman, 1955, p. 290). Unlike the drive reduction theory of Hull or Thorndike, the reinforcer serves as a form of bribery for the elicitation of the response to be learned rather than as a drive reducer. In other words, the response is strengthened merely because it is produced rather than because it is associated with a satisfier or reward. Learning occurs when a response is consistently elicited during a series of trials or period of time in a particular situation. Examples of consistent (strong) elicitors are the UCS in a classical conditioning paradigm and food, water, or shock in operant learning situations.

If the elicitor is a strong, consistent one and naturally elicits the response, the stimulus-response situation is automatically strengthened. In this case, the stimulus itself provides the appropriate response, and the S need not be aware in order to make the correct response. Awareness may occur particularly when the S is responding at a high level, but it is not a necessary condition for learning. In studies of animal learning, where awareness defined as verbalization cannot take place, the elicitors are necessarily quite strong, such as food which consistently elicits approach responses or shock which elicits escape responses.

On the other hand, the stimuli, such as "mmm-hmm" and "good," used in verbal learning studies are not strong, consistent elicitors. They do not produce, or elicit, any particular response consistently. For this reason, the positive results obtained in the early experiments

were unexpected. Elicitation theory predicated the opposite results from the drive reductionists who maintained that these stimuli could automatically strengthen responses since they were satisfying (showing approval) to the S. Elicitation purports that since these stimuli do not directly produce the response, the S must become aware before learning can take place (i.e., the S himself must provide the response in accordance with some hypothesis he holds). These weak elicitors are first used by S as feedback that he has made a particular response. In other words these stimuli function as knowledge of results that the S has made an appropriate response. The E's saying "mmm-hmm" or "right" merely specifies the response that S should be making according to his hypothesis as to what the experiment is about. Consequently, in the area of learning with weak elicitors in which the stimulus situation does not provide the correct response, awareness is necessary for learning. Awareness is defined here, similar to previous studies, as the ability to verbalize (i.e., give the correct hypothesis) about the experiment.

In the present study, the stimuli used are presumed to be strong elicitors for most Ss. It is divided into two experiments. The first of these is a classical conditioning paradigm in which, of course, the elicitor is a strong and consistent one. The second experiment is an instrumental learning situation also using a strong elicitor. The major hypotheses to be tested are: 1) Verbal learning takes place in a classical conditioning paradigm without awareness. 2) Verbal learning without awareness occurs in an instrumental learning situation if the elicitor is strong.

EXPERIMENT ONE

Method

Subjects

The Ss were 246 students enrolled in the introductory course in psychology at Michigan State University. Three experimental groups consisted of 82, 51, and 61 Ss respectively, and a control group consisted of 52 Ss. The data were obtained in five classroom situations prior to termination of the teaching hour. They were collected in two sessions, a conditioning session and a recall session, with a 24 hour intersession interval. Consequently, the Ss worked individually but as part of a group.

Materials Used

The conditioning procedure was a multiple-choice task in which a phrase, consisting of an adjective and a noun, and five alternative verbs were given (see Appendix A and B). The S completed the phrase by choosing one of the five verbs. The nouns were names of occupational groups and functioned as CSs even though they followed the adjectives which served as the UCSs. Each of these nouns was repeated three times with a different adjective each time, and since there were 24 nouns, or occupational groups, the task consisted of 72 phrases to be completed. The adjectives, accompanying each noun, were such that one verb (the UCR) was more likely to be chosen from the alternatives given. For example, the awkward barber, the careless barber, and the unskilled barber were placed throughout the task. These all had in common, among the

alternatives, the verb "nicks." The other alternatives, though plausible, did not fit the UCS as well as "nicks" (UCR). Therefore, most Ss chose "nicks." The UCS quite consistently elicited the expected UCR.[1]

Two different forms of the conditioning task were used. Form A (see Appendix A) had the 24 nouns randomly placed three times throughout the task. For Form B (see Appendix B), the 24 nouns were divided into two groups of 12 nouns, or 36 items, constituting the first half and the second half respectively, of Form B. These were divided so that the number of incorrect responses was equal for each half (i.e., equal conditionability for the two halves). The eliciting value (number correct) for each noun was determined by a pilot study.

The control task (see Appendix C) consisted of 72 items, each being composed of two verbs, one of which the S was to circle as the preferred. This task included the 24 verbs from the conditioning task, each repeated three times as in the conditioning task. Thus, the control Ss saw the critical verbs, or response items, as often as the experimental Ss, though they did not see them paired with the adjective and occupation (control for familiarity or recency of exposure).

The postconditioning interview (see Appendix D) consisted of four

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1 The adequacy of the conditioning task was determined by pilot studies. The adjectives, nouns, and verbs were adjusted until a vast majority of the Ss chose the verb to be conditioned to the occupation. In a pilot study of 76 Ss, the appropriate verbs were selected 21 to 72 times out of a possible 72. The median score was 66. Only 15 Ss scored below 60 and, of these, only four scored below 52.

questions which allowed E to determine objectively whether S actually knew that he was in a learning situation. Another question asked the S to explain his choice in order to determine whether S was merely guessing.

The recall test (see Appendix E) consisted of 50 occupations, 24 of which were the same as in the conditioning task. The S's task was to add a verb to these nouns.

A postrecall interview (see Appendix F) consisting of two questions was also given to some of the Ss after the recall test. This was used to determine whether the Ss realized at that point that they had been in a learning situation on the previous day.

Groups and Instructions

There were three main experimental groups, one given neutral instructions at the beginning of both the conditioning and the recall session (Neutral-Neutral Group), a second group which received instructions specifying the task at the beginning of the conditioning session and neutral instructions at the beginning of the recall session (Specific-Neutral Group), and a third group which received neutral instructions at the beginning of the conditioning session and instructions specifying the responses on the recall session (Neutral-Specific Group).

The neutral conditioning instructions given at the beginning of the first session were as follows: "Select one alternative which best fits the beginning phrase." Specific conditioning instructions used in

place of the neutral instructions at the beginning of the first session were as follows:

> You will note that in this task an occupation is given along with a descriptive adjective. This combination of an adjective and an occupation will strongly suggest one verb among the choices given as the best fitting one. It is your task to choose the best fitting one. Note also that the occupation is repeated and the same verb may be chosen.

The neutral instructions given at the beginning of the recall session were, "Complete the following by adding the first verb that comes to mind." The specific instructions were as follows:

> Yesterday you had to choose one verb from several which seemed to best fit the occupation. Today some of the same occupations are repeated. See if you can recall the verbs you chose yesterday. Complete the following occupations by adding the appropriate verbs.

The control group was merely given the following instructions on the first session: "Circle the letter in front of the alternative which you prefer." Instructions on the second session were the neutral ones given above for the recall session.

Procedure

The Ss participated in a classroom situation with the cooperation of the instructors who taught the classes. The Ss did not receive advance notice that an experiment was to take place. The E merely showed up during the class period and was given a segment of the normal class hour. The E then asked the Ss' cooperation and handed out the materials to the class.

First Session. The control group received the task and instructions as shown in Appendix C. The Ss in the Neutral-Neutral Group, which was made up of three small classes, received either Form A or Form B of the conditioning task with neutral instructions. The Specific-Neutral Group and the Neutral-Specific Group were run at the same time, since the class obtained was quite large and no other class meeting within a 24 hour interval was available. All instructions were written on the first page, so the tasks for the two groups were interlaced and handed out in such a way that part of the class received specific instructions and part received neutral instructions. The Ss in the Specific-Neutral Group received either Form A or Form B. The Ss in the Neutral-Specific Group received only Form A.

Along with one form of the conditioning task which included the instructions, all experimental Ss received an IBM five-choice answer sheet and the postconditioning interview sheet (Appendix D).

Second Session. All groups received the test for recall of verbs (Appendix E). Part of the Neutral-Neutral Group and all of the Specific-Neutral Group and Neutral-Specific Group received, in addition, the postrecall interview of two questions (Appendix F).

RESULTS

Conditioning Task

The data for the three experimental groups on the conditioning task (number of correct responses) are presented in Table 1, Appendix G. The mean scores for the Neutral-Neutral, the Neutral-Specific, and Specific-Neutral Groups were 62.0, 65.2, and 64.2 respectively. A *t*-test was used to test the differences between these experimental groups. The Neutral-Neutral and Specific-Neutral Groups did not differ significantly from each other ($t = 1.562$, $p > .05$), and the Neutral-Specific and Specific-Neutral Groups also did not differ ($t = .6329$, $p > .05$). The differences between the Neutral-Neutral and Neutral-Specific Groups, however, was significant at the .05 level ($t = 2.078$).

Table 1 also presents the data for the Aware and Unaware subgroups within the experimental groups. These subgroups within the Neutral-Neutral Group and Specific-Neutral Group did not differ significantly from each other ($t = .369$, and $t = 1.771$ respectively). The Aware and Unaware subgroups within the Neutral-Specific Group showed a significant difference ($t = 2.087$, $p < .05$).

Postconditioning Interview

Table 2 below presents a distribution of the experimental groups divided into Unaware and Aware Ss on the basis of the postconditioning interview.

Table 2. Distribution of Ss in the experimental groups on the basis of postconditioning interview.

Group	Aware	Unaware	Total
Neutral-Neutral	36	46	82
Neutral-Specific	24	27	51
Specific-Neutral	27	34	61
Total	87	107	194

The divisions were almost equal with slightly more of the Ss being categorized as unaware. The Ss were determined to be aware if they chose two of the correct multiple-choices or chose one correct alternative and gave a reasonable answer as to why they chose the alternative. If the S chose neither of the correct alternatives, the S was placed into the unaware category. In cases where it was difficult to determine whether the S was aware or not, the S was randomly placed into either of the categories. However, in most cases, the nature of the interview allowed a clear division.

A χ^2 test was used to determine whether there were approximately the same proportion of aware and unaware Ss in each of the experimental groups. The groups did not differ significantly in this respect ($\chi^2 = .1381$, $df = 2$, $p > .90$).

Recall Test

Table 3 in Appendix G presents the recall data for the Neutral-Neutral Group, divided into Aware and Unaware Ss, plus the data for the Control Group. The medians were 2.0 correct recalls for the Aware Ss, 1.5 for the Unaware Ss, and 0 for the Control Group. The Mann-Whitney U test was used to determine whether the differences between the groups were significant. As predicted, the difference between the Aware and Unaware Ss within the Neutral-Neutral Group was not significant ($z = 1.02$, $p = .3078$). The differences between the Control Group and the Aware and Unaware subgroups of the Neutral-Neutral Group were both highly significant ($z = 4.90$, $p < .00003$, and $z = 4.14$, $p < .00003$), indicating learning occurred without awareness.

Tables 4 and 5 of Appendix G present the recall data for the Neutral-Specific and the Specific-Neutral Groups again divided into Aware and Unaware subgroups. In the Neutral-Specific Group the medians were 19.5 for the Aware Ss and 18.0 for the Unaware Ss. In the Specific-Neutral Group, the medians were 7.0 for the Aware Ss and 4.0 for the Unaware Ss. Neither of these differences between the Aware and Unaware Ss was significant ($z = 1.443$, $p = .1498$, and $z = 1.043$, $p = .2984$).

Table 6, Appendix G, presents the recall data for the three intact experimental groups (i.e., irrespective of awareness). The median number of verbs recalled were 2, 19, and 5 respectively for the Neutral-Neutral Group, the Neutral-Specific Group, and the

Specific-Neutral Group. When the differences were tested by means of the U test, each of the distributions was found to be significantly different from the others (between Neutral-Neutral and Neutral-Specific, $z = 8.63$, $p < .00003$; between Neutral-Neutral and Specific-Neutral, $z = 4.19$, $p < .00003$; between Neutral-Specific and Specific-Neutral, $z = 7.07$, $p < .00003$).

Form B and Recall

As mentioned previously in the method section, Form B of the conditioning task was made up of two halves of equal conditionability.[1] The number of correct recalls for the nouns in the first half of Form B was compared to the number of correct recalls for the nouns in the second half. It was assumed that if awareness developed during the conditioning session, and thereby facilitated learning, there would be a greater number of correct recalls on the second half than on the first half.

Table 7, Appendix G, presents the number of correct recalls on the first half and second half of Form B for the Ss in the Neutral-Neutral and Specific-Neutral Groups. The t-test for matched groups showed no significant difference between Ss' performance on the first and second halves ($t = .453$, $p > .60$), indicating that Ss did not do better on the second half.

---

1 The nouns of equal conditionability on the conditioning task were also found to be of equal recallability on the recall test in that Ss who were given Form A showed no difference in recall to the nouns of the two halves of Form B. Of 40 Ss with Form A, 18 Ss did the same on those nouns from each half of B, 11 Ss did better on the second half, and 11 Ss did worse on the second half.

Postrecall Interview

A final division of the experimental groups into Unaware and Aware Ss was carried out on the basis of the postrecall interview (see Table 8 below). Only the data from initially Unaware Ss were

Table 8. Distribution of Ss in the experimental groups on the basis of the postrecall interview.

Group	Aware	Unaware	Total
Neutral-Neutral	24	23	47*
Neutral-Specific	29	18	47**
Specific-Neutral	40	21	61
Total	93	62	155

* A class of 35 Ss did not receive the postrecall interview and were not included above.

** Four Ss did not fill out the postrecall interview and were not included above.

recategorized. Consequently, the Aware subgroups consisted of two types of aware Ss: 1) those who knew that they were in a learning situation during the conditioning task in the first session and, 2) those who only realized, during the recall test in the second session, that they had been in a learning situation on the previous day.

Tables 9, 10, and 11 of Appendix G show the number of correct recalls for the Aware and Unaware Ss in each of the experimental groups. The medians for the Aware and Unaware Ss in the Neutral-Neutral Group were 3 and 1 correct responses respectively (Table 9).

The medians for the Aware and Unaware Ss in the Specific-Neutral Groups were 7 and 3 respectively (Table 10). The differences in recall between the Aware and Unaware Ss in the Neutral-Neutral Group and the Specific-Neutral Group were significant ($z = 3.15$, $p = .0016$, and $z = 2.14$, $p = .0324$). However, the difference in recall between the Aware and Unaware Ss for the Neutral-Specific Group (Table 11), the medians of which were 19 and 18 correct responses, was not significant ($z = .562$, $p = .5754$).

DISCUSSION

The most important finding of this study appears to be the lack of significant differences in recall scores between the Aware and Unaware Ss in all experimental groups. This finding strongly supports the major hypothesis that classical conditioning may take place without awareness. The crucial factor seems to be the use of strong elicitors. The negative results obtained by Spielberger, DeNike, Levin, and others who follow the cognitive learning theory approach seem representative of a particular area in which the elicitors are weak.

It appears that, when the response is naturally elicited, Ss learn even though they are not aware that they are in a learning situation. Many Unaware Ss, in this study, indicated that they believed their prejudices, or opinions of occupations, were being measured. Others believed that the conditioning task was some sort of personality test. Yet, these Ss who had no clear idea that they were in a learning situation appeared to learn as well as the Aware Ss.

Form B afforded a completely objective check as to whether awareness, independent of its estimation during the postconditioning interview, played a role in conditioning the response. If awareness is irrelevant in classical conditioning, no improvement in performance of Ss on the second half of Form B should have taken place. No significant improvement was found, indicating that awareness, objectively defined, did not facilitate learning.

The significant differences among the experimental groups on the recall test may be considered performance differences resulting from the sets induced by the different instructions given each group. However, as discussed above, the instructions did not differentially affect the performance of the Aware and Unaware subgroups within each of the experimental groups. This finding is consistent with the prediction that set, or awareness, should make a large difference in operant learning situations where the role of the weak elicitor must be interpreted as knowledge of results, but not in classical conditioning where the appropriate response is clearly defined.

The postrecall interview can best be considered a measure of whether the Ss were using an unlimited pool of responses, or associations, for the recall task (Unaware Ss) or whether they were using the pool supplied 24 hours earlier (Aware Ss). If the Ss were aware during recall that they were being tested for responses previously learned, they would have, most likely, given the learned response. On the other hand, for the Ss who were not aware that they were being tested, competing responses had more of an opportunity to interfere with learned responses. (For example, it would be much easier to give the competing response, "the barber cuts," rather than the learned response, "the barber nicks.")

The significant differences between the Aware and Unaware Ss in the Neutral-Neutral and Specific-Neutral Groups probably cannot be interpreted as the Aware Ss showing more learning as a result of

awareness, since the awareness assessed by the postrecall interview did not occur during the conditioning session.

It appears that the Aware Ss who connected the recall test with the conditioning task suppressed competing responses whereas the Unaware Ss did not. Evidence for this view comes from the lack of a significant difference between the Aware and Unaware Ss in the Neutral-Specific Group who were told to give the same responses on the recall test as they did the day before. In this case, it did not matter whether the Ss were aware of the learning situation, since specifying the response on the recall test eliminated stronger competing responses. The general finding of the superiority of the Neutral-Specific Group on the recall test can be attributed to the suppression of these competing responses.

EXPERIMENT TWO

Method

Subjects

The Ss were 72 Ss enrolled in the introductory course in psychology at Michigan State University. They volunteered to serve for credit. They were each run individually during sessions of approximately one hour in duration. Four Ss were eliminated because of apparatus failure. There was a total of 17 Ss in each of three experimental groups and in the control group.

Apparatus and Stimuli

The experiment was carried out in a small room equipped with a desk and two chairs, one for E at the desk and one for S near one end of the desk facing the E. A screen prevented the S from seeing what the E was doing at the desk. A stopwatch was prominently displayed though not used as an accurate time piece. The major piece of equipment was a tape recorder (a Wollensak 1580). The tape contained 85 short jokes or one-line gags by some of the current popular comedians, as well as a few amateurs, each separated by five seconds of canned laughter (see Appendix H, for examples of jokes). The laughter facilitated the presentation of one joke at a time. The tape recorder was started and stopped by a foot pedal which was concealed from the S's view. However, when the foot pedal was operated, there was a distinct click.

Procedure

The S was seated near the desk by the tape recorder. A sheet of paper and a pencil were placed on the desk before the S. The E first engaged the S in casual conversation to establish rapport. When the S was comfortably seated, the following instructions were given:

> The purpose of this experiment is to measure the effect of disruptive stimuli on one's ability to judge time.
>
> Your task is to say or give a number from zero to 1000 every 3 seconds. However, you cannot repeat the same number consecutively, count, or consistently give multiples of any number, especially 10. (An example of each was given.)
>
> Before the experiment actually begins, we will have a practice session. I will nod my head every three seconds to pace you, until you are able to pace yourself. Continue to say numbers every three seconds until I say stop. Please remember: Do not count, do not repeat the same number, and do not give multiples of any number. Are there any questions? (Questions were generally answered by repeating the appropriate phrases.)

At this point, E displayed the stopwatch and pretended to pace S, making sure that he had understood the directions. If S appeared to be considerably off in his timing, E suggested that he speed up or slow down--whichever was the appropriate direction. However, E kept a record only of the numbers which S had given. The practice session included either two, three, or four blocks of 30 trials (i.e., a total of 60, 90, or 120 trials). This served the dual purpose of

determining the S's operant rate and increasing the S's boredom and fatigue with the task.[1] The Ss were randomly assigned to either of three groups having 60 trials (low boredom), 90 trials (medium boredom), or 120 trials (high boredom) of practice.

Immediately after the practice session, E continued with the following instructions:

> Now that you have had some practice, you will be given disruptive stimuli from the tape recorder to interrupt your giving of numbers and perception of time. These interruptions will be quite irregular. You are to do the same thing you did during the practice session, following the same rules. However, when the tape recorder turns on, stop giving numbers until it turns off. Continue your task immediately after each interruption until I say, "stop." Are there any questions? All right, begin.

These instructions began the experimental session in which the tape recorder was turned on and the S was allowed to listen to one joke each time he gave a number containing the digit, "7." This digit was chosen, since it is the only two-syllable digit (besides 0) and thus was more likely to be distinguishable from the others. The jokes varied in length, but most of them were about ten seconds long.

After the first block of 30 trials, the E asked the S to stop and read the following instructions:

> We are also very interested in your subjective reactions and thoughts as you participate in this experiment. So, any time you have any kind of thought about the experiment, please stop and write your thought down on the paper before you. Number each time you stop. Continue the task again after you record your thought or reaction until I say stop. Are there any questions?

---

1 This task was determined to be very dull and fatiguing in a pilot study, both from Ss verbal reports and from the Ss' reluctance to avoid an aversively loud stimulus even when they were able to do so. A few Ss increased the response which led to the aversive stimulus and reported they did so to break the monotony of the task.

The experiment continued until S gave a total of 360 numbers, including the operant rate, or until the S had received 85 jokes. This was the total number of jokes available and, consequently, the experiment was terminated out of necessity after the supply of jokes was exhausted.

The task was interrupted in three ways. The S interrupted the task by giving a number which included the digit, "7." The S also was able to interrupt the task by saying he had a thought to write down. Lastly, the E interrupted the task at the end of each block of 30 trials and asked the S to write his thoughts down. This last interruption took place if the S did not ask to stop during the last block of 30 trials.

After the task, the postconditioning interview (see Appendix I) was given to determine whether the S had become aware. The interview is a modified version of the one used by Paul, Eriksen, and Humphreys, (1962). If the S indicated he had become aware, E checked to make certain that S had written down the point at which he became aware. In the postconditioning interview, questions 1, 5, 7, 8, and 9 were used to assess awareness. After the interview, S was asked if he had prior knowledge about the experiment. (No S indicated he had.) E then asked S's cooperation in maintaining secrecy and gave a brief explanation of the purpose of the experiment.

The procedure for the control group was the same as the 90 trial practice (medium boredom) group. The instructions did not differ. The only difference was in the way in which the jokes were given.

The control group randomly received six to seven jokes for each block of 30 trials during the experimental session after operant rate was determined. The number of jokes given was based on the operant rates of the experimental groups.

RESULTS

The Assessment of Awareness

Of the 51 experimental Ss, 14 were determined to have become aware during the conditioning session. The breakdown of the number of Ss, who first expressed awareness in response to questions 1, 5, 7, 8, or 9 of the postconditioning interview interview (Appendix I), is shown in Table 12.

Table 12. Number of Aware Ss in each group according to which question first indicated awareness.

Group	Question				
	1	5	7	8	9
Low Boredom	2	1	1		
Medium Boredom	2	1			
High Boredom	2	5			

There was little difficulty in assessing awareness since most of these Ss gave unprompted evidence of awareness to questions 1 and 5. Two additional Ss gave the correct response (numbers containing the digit, "7,") to question 8. However, when asked to pick one digit out of the number, the Ss did not pick "7" and conceded it could have been some other digit. They were not certain as to which was the correct response. Therefore, these Ss were classified as unaware. Seven of the 14 Aware Ss were from the High Boredom Group.

An additional factor minimized the difficulty of determining which Ss were aware. With one exception, all Aware Ss showed a decrease in

giving the digit, "7," as evidenced by a sharp drop in the correct response in the block of trials after awareness.[1]

The performance for the Aware Ss are shown in Figure 1. Both the Medium and High Boredom Groups showed a downward trend as more Ss became aware. The Low Boredom Group showed an increase toward the end because one S gave nothing but "7s" after awareness (cooperative rather than contrary). The slight upward trend at the end of the Medium Boredom Group appears to support the Ss' verbalizations that they could not suppress the response even though they tried.

The data from these Aware Ss were eliminated from the main analysis.

The Operant Rates

The operant rate of each group was based on the two blocks of trials (60) of the pre-experimental practice session. In order that the operant rates could be compared with each block of the conditioning trials, the mean of the two blocks was used. The mean operant rates of the Control, Low Boredom, Medium Boredom, and High Boredom Groups were 7.06, 5.73, 6.68, and 6.65 numbers containing the digit, "7," respectively. An analysis of variance (Simple-Randomized Design, Lindquist, 1953) indicated no significant differences among the four groups in mean operant rate ($F = .7916$). The raw data are included in Table 13, Appendix J.

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† When questioned, Ss gave a variety of reasons for the decline, but most said they tried to avoid the response because they felt E was trying to get them to increase it. Five of the 14 Ss reported great difficulty avoiding the digit, "7." Even though they tried, some of the 7's slipped out anyway.

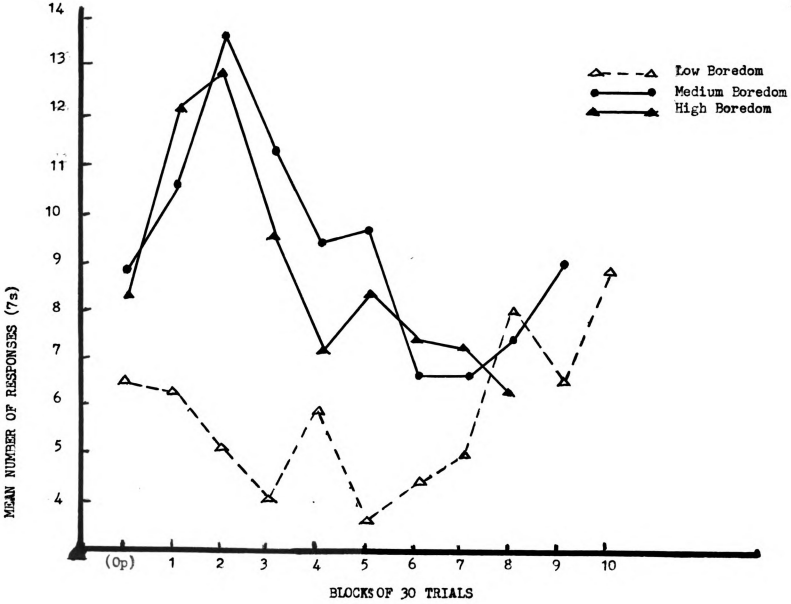
Low Boredom
Medium Boredom
High Boredom
MEAN NUMBER OF RESPONSES (7s)
14
13
12
11
10
9
8
7
6
5
4
(Op)
1
2
3
4
5
6
7
8
9
10
BLOCKS OF 30 TRIALS

Figure 1.

Performance of Unaware Ss

The performance curves of the three experimental groups and the control group are presented in Figure 2. Because of the dropping out of Ss who had exhausted the supply of jokes after the fifth rewarded block of trials, only the operant rates and the first five blocks are shown in Figure 2. These data were subjected to an analysis of variance (Type I Design, Lindquist, 1953). The results of this analysis are presented below in Table 14. The significant main effects

Table 14. Summary of Analysis of Variance of Operant Rate and First Five Blocks of Trials.

Line	Source	df	MS	Error Term	F
a.	Between Groups	3	151.293	(b)	4.163*
b.	Between Ss in Same Group	50	36.344		
c.	Between Trials	5	30.308	(e)	6.178**
d.	Interaction: Trials x Groups	15	7.833	(e)	1.601
e.	Pooled Ss x Trials	250	4.892		
	Total	323			

* Significant beyond .05 level of confidence
** Significant beyond .01 level of confidence

of Groups ($F = 4.163$, with 3 and 50, $p < .05$) and of Trials ($F = 6.178$, with 5 and 250 df, $p < .01$) indicate that the total number of "7s" given by each group differed significantly and that the number of such responses differed significantly across trials. The interaction effect, Groups x Trials, did not quite reach .05 significance level ($F = 1.601$, with 5 and 250 df, $p > .05$).

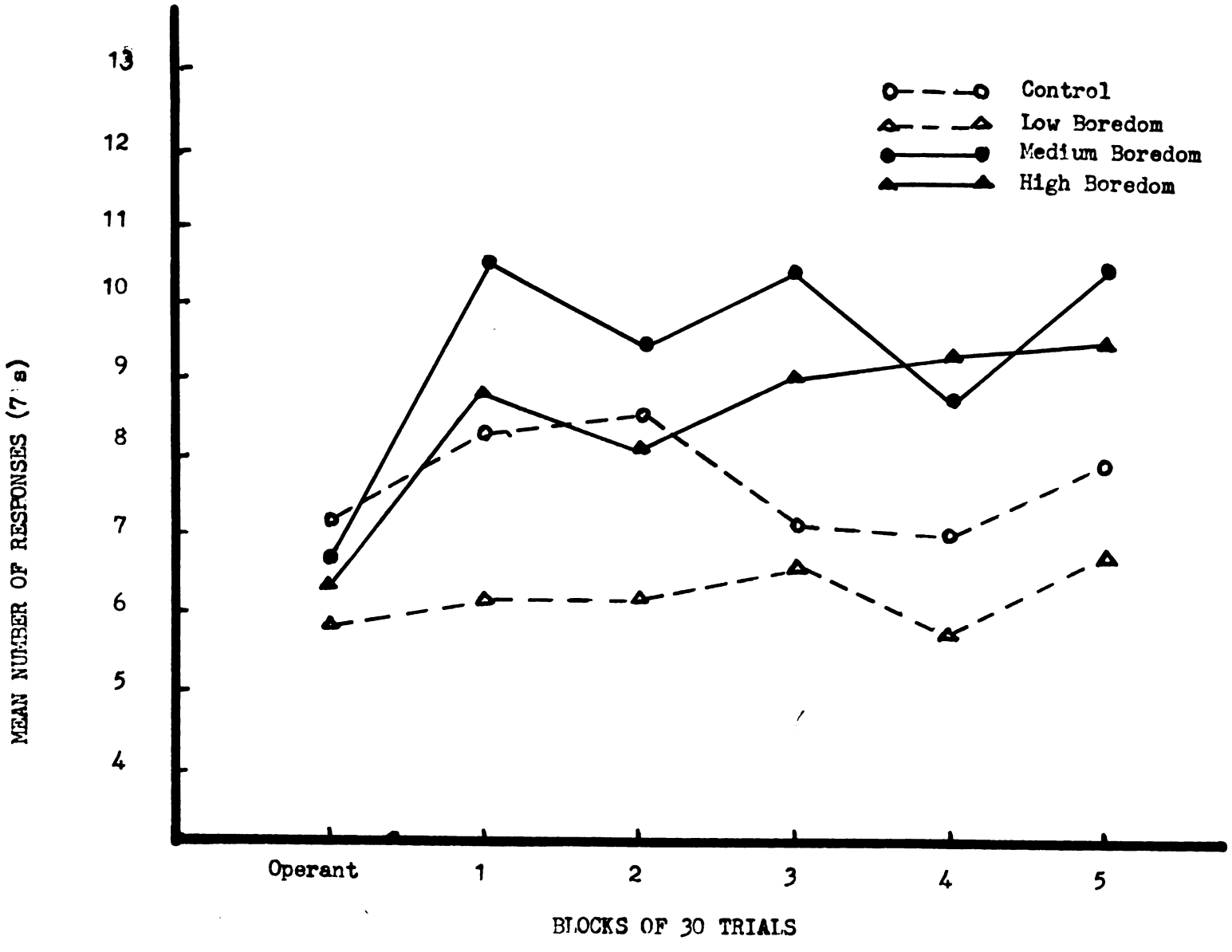
Control
Low Boredom
Medium Boredom
High Boredom
MEAN NUMBER OF RESPONSES (7 s)
13
12
11
10
9
8
7
6
5
4
Operant
1
2
3
4
5
BLOCKS OF 30 TRIALS

Figure 2.

The operant rate and only the first rewarded block of trials were also subjected to a separate analysis of variance which is summarized in Table 15.

Table 15. Summary of Analysis of Variance of Operant Rate and First Block of Trials.

Line	Source	df	MS	Error Term	F
a.	Between Groups	3	33.64	(b)	2.988*
b.	Between Ss in Same Groups	50	11.26		
c.	Between Trials	1	99.19	(e)	21.521**
d.	Interaction: Trials x Groups	3	15.14	(e)	3.284*
e.	Pooled Ss x Trials	50	4.61		
	Total	107			

* Significant beyond .05 level of confidence
** Significant beyond .01 level of confidence

Again both the main effects of Groups and Trials were significant ($F = 2.988$, with 3 and 50 df, $p < .05$, and $F = 21.521$, with 1 and 50 df, $p < .01$). However, here the interaction effect of Groups x Trials was found to be significant ($F = 3.284$, with 3 and 50 df, $p < .05$), indicating that some groups showed a significantly larger increase from operant rate to first block of trials than did other groups.

Individual comparisons were made between the number of "7s" given in the operant rate and the first block of trials for each group. The t-test for matched groups showed a significant difference between the operant rate and the first block of trials for the Medium Boredom Group only ($t = 5.929$,

$p < .01$). (For the Control, the Low Boredom, and High Boredom Groups, the respective results are $\underline{t} = 1.574$, $p > .10$; $\underline{t} = .1780$, $p > .80$; and $\underline{t} = 1.724$, $p > .10$.) A $\underline{t}$-test for independent groups was also computed between the Medium Boredom and the Control Group on the first block of trials. This difference was significant ($\underline{t} = 2.209$, $p < .05$), indicating the expected learning effect.

Since there was such a large disparity between operant rate of emitting "7" and the rate in the first block of 30 trials, this first block was broken down into five blocks of six trials each. The performance curves for all groups over these trials are shown in Figure 3. These data were subjected to an analysis of variance (Type I, Lindquist, 1953). The results of the analysis are summarized below in Table 16.

Table 16. Summary of an Analysis of Varience on the First 30 Conditioning Trials.

Line	Source	df	MS	Error Term	F
a.	Between Groups	3	8.857	(b)	4.335**
b.	Between Ss in Same Groups	50	2.043		
c.	Between Trials	4	.4700	(e)	.6564
d.	Interaction: Trials x Groups	12	.4375	(e)	.6110
e.	Pooled Ss x Trials	200	.716		
	Total	269			

** Significant beyond the .01 level of confidence

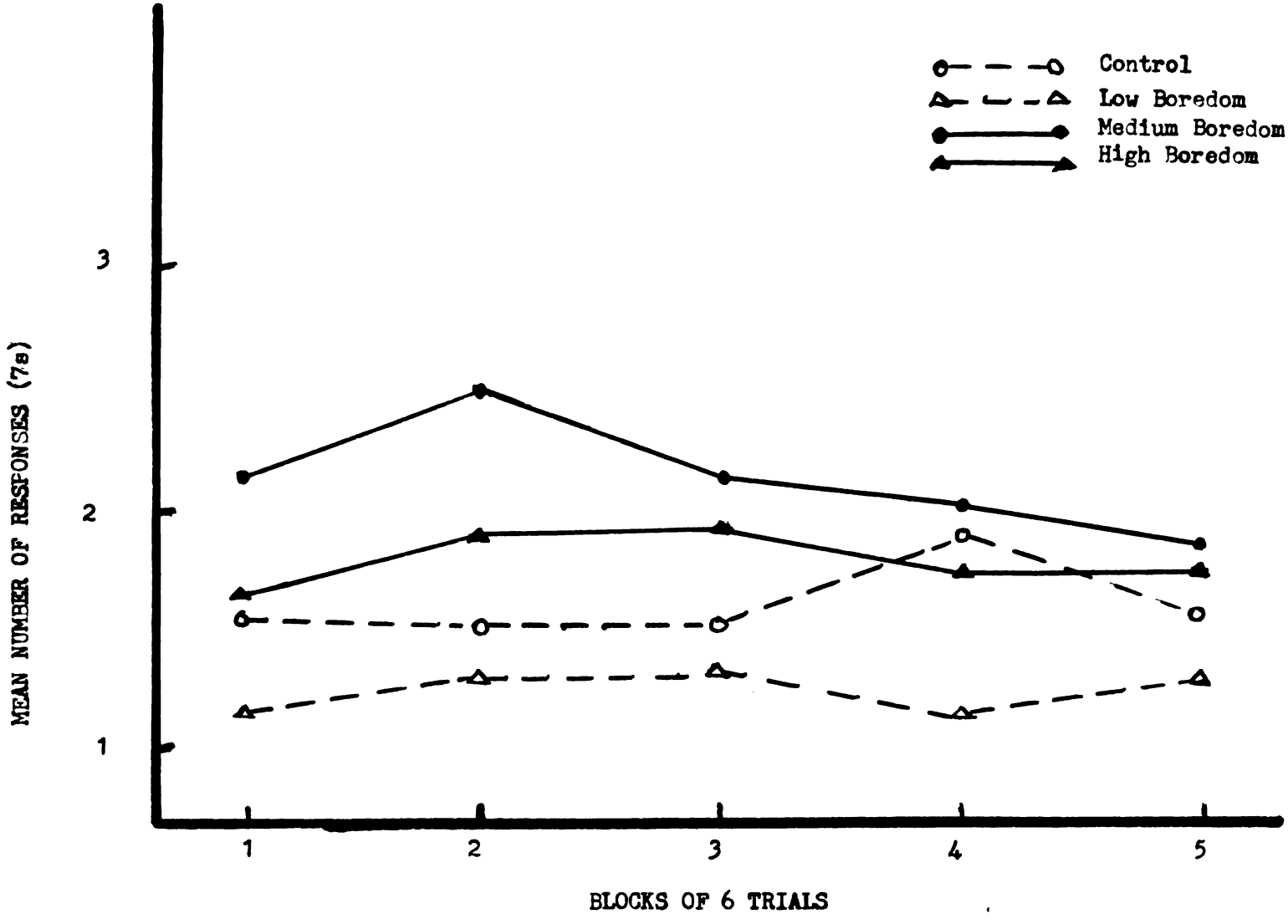
Control
Low Boredom
Medium Boredom
High Boredom
MEAN NUMBER OF RESPONSES (7s)
3
2
1
1
2
3
4
5
BLOCKS OF 6 TRIALS

Figure 3.

Only the main effect of Groups was significant ($F = 4.335$, with 3 and 50 df, $p < .01$). An examination of the curves shows a slight increase on the second block of six trials. However, the last few blocks show a decrease.

DISCUSSION

To evaluate the results properly, perhaps it would be best to examine the task in detail. The long practice session was used to augment the amount of boredom, or fatigue, with the task. (The greater the number of trials in the practice session, the greater the amount of boredom.) Therefore, there existed a partial eliciting state, within the organism, so that the organism tended to make a response which relieved his boredom, namely to approach the joke or rest interval, as concieved in elicitation theory. However, with each response that reduced boredom, as the background elicitor, the rest session and the joke lost their high eliciting power. In other words, the strength of the elicitor fluctuated with the building up and dissipation of boredom.

Presumably, for this reason, the Medium and High Boredom Groups showed a jump from the operant rate to the first block of trials. They began to respond initially at a high rate showing that the elicitor was quite strong at that point. However, with each response that was made, the elicitor lost its effectiveness. The lack of change in performance, after the initial jump, indicates that the boredom was only enough to maintain the response performance.

Confounded with the above was the S's ability to interrupt the task whenever he had a "thought about the experiment." Some Ss appeared to take much longer than necessary to write their thoughts

down, and one S interrupted the conditioning task as much as 40 times. These self-regulated interruptions by the Ss also could have kept them from increasing their giving of the digit "7."

Yet, in spite of these factors, the Medium Boredom Group showed a significant increase in the response over the Control Group. The Low Boredom Group did not show any evidence of learning. The curve of the High Boredom Group showed an upward tendency from the operant rate, though this increase was not significant either. However, almost half of these Ss became aware, as might be expected if awareness follows learning, and their data were removed from the analysis. The curves for these Ss showed that they gave a high number of "7s" before awareness. As a whole, the results of this study support the hypothesis that operant learning will occur without awareness.

The experiment by Paul, Eriksen, and Humphreys (1962) seems to be the only study using a strong elicitor which presents negative results. However, the assessment of awareness was made at the end of the experiment only. No attempt was made to see whether Ss improved before awareness, as in this study, where it appears that the Aware Ss showed improvement before awareness. This indicates that awareness follows learning rather than learning follows awareness.

In addition, 7 out of 16 Ss classified as aware in the study by Paul, et al., were classified as such by their answer to question 8 only of the postconditioning interview (similar to question 8, Appendix I, in this study). Since this is a guess

question, it is possible that these Ss may not have been aware during the conditioning task but gave the correct answer because they had been responding at a high rate and were quite near the point of awareness. Therefore, it is not felt that the study by Paul, et al, presents a serious contradiction to the hypothesis and findings of this study.

GENERAL DISCUSSION

The findings of these two experiments strongly suggest that learning may occur without awareness, particularly with the use of strong, consistent elicitors. The negative findings of previous studies appear to result from the use of weak elicitors. These do not naturally provide the response to be learned and necessitate mediating states (awareness) so that the S himself provides the response in accordance with a hypothesis which he holds. Most of the laboratory studies of verbal learning involve only weak elicitors, and the cognitive learning theory approach is adequate for the interpretation of these studies.

However, the cognitive learning theory approach would be hard pressed to explain the findings of the present study. These results are consistent with elicitation theory which is a S-R contiguity position. Elicitation theory is offered as an alternative to the Hullian type S-R theory which fails to explain past negative results in verbal learning since it holds that the stimulus-response associations are automatically strengthened because of the satisfying effect of the reinforcer. Elicitation theory, on the other hand, emphasizes the mechanistic strengthening of the response only when the stimulus situation itself provides the response naturally. Consequently, elicitation theory appears more adequate in predicting and interpreting the role of awareness in verbal learning.

SUMMARY

A review of the literature on learning and awareness indicated that Unaware Ss typically do not learn. These negative results were found with weak elicitors.

The purpose of this study was to examine verbal learning and awareness when the elicitors are strong. It consisted of two experiments, one being a classical conditioning situation and the other, an operant learning situation with strong elicitors. The major hypotheses are as follows: 1) Awareness is not necessary for learning in classical conditioning. 2) Awareness is not necessary for learning in an operant learning situation if the elicitors are strong.

A unique conditioning task was devised for the classical conditioning situation. The Ss were classified as aware and unaware on the basis of a postconditioning interview. The scores of the Aware and Unaware Ss on a recall test were compared. No significant differences were found between these two groups. However, both the Aware and Unaware Ss differed significantly from the Control Group indicating that learning took place without awareness.

The operant learning situation was one in which the Ss could relieve the monotony of a task by giving a particular response. The Ss were given a rest interval containing a prerecorded joke. The task consisted of giving a number every 3 seconds, and the response to be elicited was the digit, "7." The extent of the Ss'

awareness was determined by a specific, lengthy postconditioning interview. The data of the Aware Ss were eliminated from the analysis. The findings indicated that learning did occur without awareness since one group showed a significant rise in the correct response and differed significantly from the Control Group.

Both of the hypotheses were supported. It was found that learning does occur without awareness in classical conditioning and in operant learning with strong elicitors.

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Appendices

Appendix A

Conditioning Task--Form A

1. The thirsty carpenter (1) shovels (2) drinks* (3) leaves (4) rescues (5) drills.

2. The careless barber (1) knows (2) eats (3) shaves (4) manipulates (5) nicks.

3. The unluckly pilot (1) steers (2) listens (3) assists (4) delivers (5) crashes.

4. The unthinking dentist (1) understands (2) hurts (3) operates (4) files (5) drills.

5. The hard-working laborer (1) sweats (2) sleeps (3) sings (4) hints (5) believes.

6. The absent-minded professor (1) hums (2) votes (3) writes (4) punishes (5) forgets.

7. The poor farmer (1) struggles (2) dances (3) gossips (4) jokes (5) prospers.

8. The clumsy typist (1) bathes (2) suffers (3) errs (4) underestimates (5) learns.

9. The patient fisherman (1) waits (2) rushes (3) collects (4) repairs (5) navigates.

10. The well-liked bartender (1) gripes (2) cooks (3) judges (4) listens (5) swears.

11. The cowardly soldier (1) listens (2) surrenders (3) doubts (4) rescues (5) defends.

12. The quiet librarian (1) gambles (2) whispers (3) staggers (4) snickers (5) blushes.

13. The untipped cabdriver (1) honks (2) waves (3) moves (4) grumbles (5) agrees.

14. The over-weight movie star (1) fights (2) seduces (3) diets (4) hates (5) annoys.

15. The miserly shopkeeper (1) saves (2) worries (3) loses (4) pulls (5) curses.

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* The underlined verbs are the correct responses (UCR).

16. The unhappy housewife (1) dusts (2) instructs (3) cooks (4) loves (5) nags.

17. The flattered secretary (1) Loafs (2) writes (3) fights (4) smiles (5) starves.

18. The cunning banker (1) embezzles (2) counts (3) laughs (4) travels (5) obeys.

19. The cocky athlete (1) helps (2) hires (3) hides (4) giggles (5) fights.

20. The tired maid (1) rests (2) shouts (3) entertains (4) flirts.

21. The cheating gambler (1) proposes (2) repairs (3) manages (4) wins (5) educates.

22. The gay waitress (1) orders (2) giggles (3) writes (4) smirks (5) discouraged.

23. The ill-humored teacher (1) jokes (2) constructs (3) trips (4) reads (5) scolds.

24. The bad-tempered umpire (1) trembles (2) yells (3) waves (4) loafs (5) smiles.

25. The stalled cabdriver (1) grins (3) resists (3) sympathizes (4) drives (5) grumbles.

26. The thrifty shopkeeper (1) buys (2) hinders (3) exercises (4) lies (5) saves.

27. The typical female movie star (1) peddles (2) diets (3) philophizes (4) dances (5) understands.

28. The hoarse librarian (1) whispers (2) questions (3) giggles (4) rages (5) errs.

29. The agreeable bartender (1) annoys (2) listens (3) criticizes (4) gossips (5) overcharges.

30. The calm fisherman (1) deceives (2) sinks (3) waits (4) wrestles (5) swims.

31. The confused pilot (1) guides (2) rests (3) dances (4) crashes (5) pushes.

32. The tipsy carpenter (1) trades (2) saves (3) drinks (4) digs (5) pounds.

33. The awkward barber (1) understands (2) nicks (3) succeeds (4) massages (5) steals.

34. The bad dentist (1) hurts (2) talks (3) hums (4) comforts (5) anesthetizes.

35. The preoccupied professor (1) criticizes (2) forgets (3) advances (4) chats (5) laughs.

36. The nervous typist (1) yields (2) errs (3) profits (4) hedges (5) practices.

37. The weary farmer (1) remembers (2) struggles (3) watches (4) whistles (5) grins.

38. The hot laborer (1) speaks (2) trusts (3) sweats (4) meddles (5) pushes.

39. The frightened soldier (1) blackmails (2) challenges (3) investigates (4) bargins (5) surrenders.

40. The frustrated housewife (1) scrubs (2) remembers (3) smiles (4) nags (5) washes.

41. The aggressive athlete (1) chuckles (2) specializes (3) sighs (4) fights (5) moves.

42. The happy secretary (1) smiles (2) telephones (3) argues (4) types (5) annoys.

43. The desperate banker (1) adds (2) embezzles (3) smiles (4) investigates (5) jokes.

44. The contested umpire (1) yells (2) pretends (3) stands (4) signals (5) snores.

45. The lucky gambler (1) walks (2) shaves (3) fails (4) errs (5) wins.

46. The strict teacher (1) scolds (2) prints (3) overlooks (4) soothes (5) swears.

47. The nervous waitress (1) waits (2) rescues (3) giggles (4) yells (5) socializes.

48. The exhausted maid (1) fumbles (2) rests (3) scorns (4) smokes (5) gossips.

49. The hushing librarian (1) guesses (2) assists (3) whispers (4) steals (5) goofs.

50. The sympathetic bartender (1) contradicts (2) gossips (3) reasons (4) drives (5) listens.

51. The hopeful fisherman (1) protects (2) waits (3) rests (4) drives (5) cooperates.

52. The hopeless soldier (1) surrenders (2) suspects (3) cares (4) smiles (5) courts.

53. The tough athlete (1) marries (2) cries (3) fights (4) dances (5) sympathizes.

54. The angry umpire (1) pitches (2) catches (3) yells (4) points (5) grins.

55. The experienced gambler (1) wins (2) forgets (3) falters (4) wheedles (5) watches.

56. The teen-age waitress (1) listens (2) snores (3) profits (4) giggles (5) snubs.

57. The lazy maid (1) shops (2) scrubs (3) rests (4) perspires (5) breathes.

58. The neurotic teacher (1) rescues (2) advises (3) diets (4) scolds (5) comforts.

59. The sleepy pilot (1) crashes (2) flirts (3) tries (4) waits (5) fibs.

60. The unkind dentist (1) examines (2) fills (3) smiles (4) hurts (5) wonders.

61. The inexperienced typist (1) rides (2) boasts (3) hurries (4) errs (5) resigns.

62. The shirtless laborer (1) protests (2) sweats (3) questions (4) fails (5) snacks.

63. The over-burdened farmer (1) sings (2) visits (3) struggles (4) charges (5) jumps.

64. The thoughtless professor (1) talks (2) searches (3) understands (4) forgets (5) explains.

65. The unscrupulous banker (1) runs (2) calculates (3) embezzles (4) waves (5) thinks.

66. The hostile housewife (1) sews (2) cherishes (3) nags (4) forgets (5) irons.

67. The friendly secretary (1) files (2) wonders (3) sits (4) dishonors (5) smiles.

68. The unskilled barber (1) nicks (2) hurts (3) smokes (4) runs (5) shampooes.

69. The greedy shopkeeper (1) toils (2) sells (3) saves (4) pays struggles.

70. The figure-conscious movie star (1) diets (2) promises (3) sings (4) cries (5) disagrees.

71. The typical New York cabdriver (1) grumbles (2) stops (3) approves (4) pushes (5) sobs.

Appendix B

Conditioning Task—Form B

1. The well-liked bartender (1) gripes (2) cooks (3) judges (4) listens* (5) aware.

2. The careless barber (1) knows (2) eats (3) shaves (4) manipulates (5) nicks.

3. The flattered secretary (1) loafs (2) writes (3) fights (4) smiles (5) starves.

4. The quiet librarian (1) gambles (2) whispers (3) staggers (4) snickers (5) blushes.

5. The absent-minded professor (1) hums (2) votes (3) writes (4) punishes (5) forgets.

6. The unthinking dentist (1) understands (2) hurts (3) operates (4) files (5) drills.

7. The unhappy housewife (1) dusts (2) instructs (3) cooks (4) loves (5) nags.

8. The tired maid (1) rests (2) shouts (3) entertains (4) dusts (5) flirts.

9. The over-weight movie star (1) fights (2) seduces (3) diets (4) hates (5) annoys.

10. The cowardly soldier (1) listens (2) surrenders (3) doubts (4) rescues (5) defends.

11. The unlucky pilot (1) steers (2) listens (3) assists (4) delievers (5) crashes.

12. The cunning banker (1) embezzles (2) counts (3) laughs (4) travels (5) obeys.

13. The agreeable bartender (1) annoys (2) listens (3) criticizes (4) gossips (5) overcharges.

14. The exhausted maid (1) fumbles (2) rests (3) scorns (4) smokes (5) gossips.

15. The awkward barber (1) understands (2) nicks (3) succeeds (4) massages (5) steals.

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* The underlined verbs are the correct responses (UCR).

16. The desperate banker (1) adds (2) embezzles (3) smiles (4) investigates (5) jokes.

17. The happy secretary (1) smiles (2) telephones (3) argues (4) types (5) annoys.

18. The confused pilot (1) guides (2) rests (3) dances (4) crashes (5) pushes.

19. The frightened soldier (1) blackmails (2) challenges (3) investigates (4) bargins (5) surrenders.

20. The hoarse librarian (1) whispers (2) questions (3) giggles (4) rages (5) errs.

21. The typical female movie star (1) peddles (2) diets (3) philosophizes (4) returns (5) understands.

22. The frustrated housewife (1) scrubs (2) remembers (3) smiles (4) nags (5) washes.

23. The bad dentist (1) hurts (2) talks (3) hums (4) comforts (5) anesthetizes.

24. The preoccupied professor (1) criticizes (2) forgets (3) advances (4) chats (5) laughs.

25. The sympathetic bartender (1) contradicts (2) gossips (3) reasons (4) drives (5) listens.

26. The unscrupulous banker (1) runs (2) calculates (3) embezzles (4) waves (5) thinks.

27. The unskilled barber (1) nicks (2) hurts (3) smokes (4) runs (5) shampooes.

28. The sleepy pilot (1) crashes (2) flirts (3) tries (4) waits (5) fibs.

29. The friendly secretary (1) files (2) wonders (3) sits (4) dishonors (5) smiles.

30. The hopeless soldier (1) surrenders (2) suspects (3) cares (4) smiles (5) courts.

31. The figure-conscious movie star (1) diets (2) promises (3) sings (4) cries (5) disagrees.

32. The unkind dentist (1) examines (2) fills (3) smiles (4) hurts (5) wonders.

33. The lazy maid (1) shops (2) scrubs (3) rests (4) perspires (5) breathes.

34. The hushing librarian (1) guesses (2) assists (3) whispers (4) steals (5) goofs.

35. The hostile housewife (1) sews (2) cherishes (3) nags (4) forgets (5) irons.

36. The thoughtless professor (1) talks (2) searches (3) understands (4) forgets (5) explains.

37. The patient fisherman (1) waits (2) rushes (3) collects (4) repairs (5) navigates.

38. The hard-working laborer (1) sweats (2) sleeps (3) sings (4) hints (5) believes.

39. The untipped cabdriver (1) honks (2) waves (3) moves (4) grumbles (5) agrees.

40. The clumsy typist (1) bathes (2) suffers (3) errs (4) underestimates (5) learns.

41. The poor farmer (1) struggles (2) dances (3) gossips (4) jokes (5) prospers.

42. The bad-tempered umpire (1) trembles (2) yells (3) waves (4) loafs (5) smiles.

43. The ill-humored teacher (1) jokes (2) constructs (3) trips (4) reads (5) scolds.

44. The cheating gambler (1) proposes (2) repairs (3) manages (4) wins (5) educates.

45. The thirsty carpenter (1) shovels (2) drinks (3) leaves (4) rescues (5) drills.

46. The miserly shopkeeper (1) saves (2) worries (3) loses (4) pulls (5) curses.

47. The cocky athlete (1) helps (2) hires (3) hides (4) giggles (5) fights.

48. The gay waitress (1) orders (2) giggles (3) writes (4) smirks (5) discourages.

49. The calm fisherman (1) deceives (2) sinks (3) waits (4) wrestles (5) swims.

50. The lucky gambler (1) walks (2) shaves (3) fails (4) errs (5) wins.

51. The hot laborer (1) speaks (2) trusts (3) sweats (4) meddles (5) pushes.

52. The nervous waitress (1) waits (2) rescues (3) giggles (4) yells (5) socializes.

53. The stalled cabdriver (1) grins (2) resists (3) sympathizes (4) drives (5) grumbles.

54. The aggressive athlete (1) chuckles (2) specializes (3) sighs (4) fights (5) moves.

55. The thrifty shopkeeper (1) buys (2) hinders (3) exercises (4) lies (5) saves.

56. The nervous typist (1) yields (2) errs (3) profits (4) hedges (5) practices.

57. The tipsy carpenter (1) trades (2) saves (3) drinks (4) digs (5) pounds.

58. The strict teacher (1) scolds (2) prints (3) overlooks (4) soothes (5) swears.

59. The contested umpire (1) yells (2) pretends (3) stands (4) signals (5) snores.

60. The weary farmer (1) remembers (2) struggles (3) watches (4) whistles (5) grins.

61. The hopeful fisherman (1) protests (2) waits (3) rests (4) dives (5) cooperates.

62. The teen-age waitress (1) listens (2) snores (3) profits (4) giggles (5) snubs.

63. The shirtless laborer (1) protests (2) sweats (3) questions (4) fails (5) snacks.

64. The tough athlete (1) marries (2) cries (3) fights (4) dances (5) sympathizes.

65. The typical New York cabdriver (1) grumbles (2) stops (3) approves (4) pushes (5) sobs.

66. The greedy shopkeeper (1) toils (2) calls (3) saves (4) pays (5) struggles.

67. The dry carpenter (1) drinks (2) bears (3) fixes (4) crys (5) saws.

68. The angry umpire (1) pitches (2) catches (3) yells (4) points (5) grins.

69. The experienced gambler (1) wins (2) forgets (3) falters (4) wheedles (5) watches.

70. The inexperienced typist (1) rides (2) boasts (3) hurries (4) errs (5) resigns.

71. The neurotic behavior teacher (1) rescues (2) advises (3) diets (4) scolds (5) comforts.

72. The over-burdened farmer (1) sings (2) visits (3) struggles (4) charges (5) jumps.

Appendix C

Control Task

INSTRUCTIONS: circle the letter in front of the alternative which you prefer.

1. (a) shovels (b) drinks
2. (a) knows (b) nicks
3. (a) assists (b) crashes
4. (a) hurts (b) files
5. (a) sweats (b) sleeps
6. (a) writes (b) forgets
7. (a) struggles (b) prospers
8. (a) errs (b) learns
9. (a) waits (b) collects
10. (a) listens (b) swears
11. (a) surrenders (b) doubts
12. (a) whispers (b) blushes
13. (a) waves (b) grumbles
14. (a) diets (b) annoys
15. (a) saves (b) worries
16. (a) instructs (b) nags
17. (a) loafs (b) smiles
18. (a) embezzles (b) counts
19. (a) hires (b) fights
20. (a) rests (b) flirts
21. (a) repairs (b) wins
22. (a) orders (b) giggles
23. (a) reads (b) scolds
24. (a) trembles (b) yells
25. (a) drives (b) grumbles
26. (a) buys (b) saves
27. (a) diets (b) understands
28. (a) whispers (b) questions
29. (a) annoys (b) listens
30. (a) waits (b) swims
31. (a) guides (b) crashes
32. (a) drinks (b) pounds
33. (a) nicks (b) steals
34. (a) hurts (b) hums
35. (a) criticizes (b) forgets
36. (a) errs (b) practices
37. (a) struggles (b) whistles
38. (a) sweats (b) meddles
39. (a) bargins (b) surrenders
40. (a) scrubs (b) nags
41. (a) sighs (b) fights
42. (a) smiles (b) argues
43. (a) embezzles (b) jokes
44. (a) yells (b) pretends
45. (a) fails (b) wins
46. (a) scolds (b) overlooks
47. (a) rescues (b) giggles
48. (a) rests (b) smokes
49. (a) guesses (b) whispers
50. (a) contradicts (b) listens

51. (a) waits (b) cooperates

52. (a) surrenders (b) cares

53. (a) marries (b) fights

54. (a) yells (b) points

55. (a) wins (b) wheedles

56. (a) giggles (b) snubs

57. (a) rests (b) breathes

58. (a) advises (b) scolds

59. (a) crashes (b) fibs

60. (a) examines (b) hurts

61. (a) errs (b) resigns

62. (a) protests (b) sweats

63. (a) struggles (b) jumps

64. (a) searches (b) forges

65. (a) runs (b) embezzles

66. (a) cherishes (b) nags

67. (a) dishonors (b) smiles

68. (a) nicks (b) runs

69. (a) toils (b) saves

70. (a) diets (b) promises

71. (a) grumbles (b) approves

72. (a) drinks (b) fixes

Appendix D

Postconditioning Interview

1. The reason for this experiment is (circle one of the following):

   a. To find what students' reactions are to certain occupations

   b. To see whether students are consistent in their responses to certain occupations over a short period of time

   c.* To teach students a particular response to a certain occupation

   d. To compare the favorableness or unfavorableness of one occupation to the others

   e. None of the above

2. Explains why you chose the alternative you did in question 1, if possible (use other side too if necessary):

3. This task involves (circle one of the following):

   a. Judgment

   b. Interests

   c. Prejudice

   d.* Learning

   e. Personality

4. Indicate your second choice to question 1 (on this sheet):

---

* This response was used to assess awareness

Appendix E

Recall Test

1.	The politican _____	26.	The storeclerk _____
2.	The teacher scolds*	27.	The Librarian whispers
3.	The psychologist _____	28.	The engineer _____
4.	The barber nicks	29.	The professor forgets
5.	The banker embezzles	30.	The maid rests
6.	The statistician _____	31.	The machanic _____
7.	The baker _____	32.	The painter _____
8.	The advertiser _____	33.	The sociologist _____
9.	The pilot crashes	34.	The waitress giggles
10.	The farmer struggles	35.	The singer _____
11.	The plumber _____	36.	The fisherman waits
12.	The typist errs	37.	The designer _____
13.	The accountant _____	38.	The housewife nags
14.	The cook _____	39.	The gardener _____
15.	The athlete fights	40.	The proofreader _____
16.	The policeman _____	41.	The cabdriver grumbles
17.	The bartender listens	42.	The fireman _____
18.	The nurse _____	43.	The carpenter drinks
19.	The soldier surrenders	44.	The milkman _____
20.	The movie star diets	45.	The post _____
21.	The musician _____	46.	The shopkeeper saves
22.	The dentist hurts	47.	The secretary smiles
23.	The truckdriver _____	48.	The gambler wins
24.	The laborer sweats	49.	The electrician _____
25.	The lawyer _____	50.	The umpire yells

* The correct verbs (CR) are written in.

Appendix F

Postrecall Interview

INSTRUCTIONS: Answer each question as fully as possible.

1. What do you think the experiment was about?

2. During the task, did you get the idea that you were supposed to choose the verbs in any particular way? If yes, in which way or ways?

Appendix G

Tables of Data From Experimental Group

Table 1. Frequency Distribution of Scores (Number Correct) on the Conditioning Task for the Experimental Groups.

Score	Neutral-Neutral Group		Neutral-Specific Group		Specific-Neutral Group	
	Aware	Unaware	Aware	Unaware	Aware	Unaware
72	1	3	3	1	1	1
71	3	0	2	0	3	0
70	3	0	2	4	4	6
69	2	2	4	5	3	4
68	5	5	3	0	1	4
67	2	3	3	3	4	2
66	1	4	2	3	1	0
65	1	1	0	1	1	1
64	3	4	1	1	4	4
63	1	5	1	1	0	0
62	2	2	0	2	0	2
61	2	3	1	1	2	0
60	0	1	0	1	2	3
59	0	4	1	1	0	1
58	0	0	1	0	0	0
57	1	1	0	0	0	1
56	3	0	0	0	0	0
55	1	1	0	1	0	0
54	0	1	0	0	0	1
53	2	0	0	0	0	1
52	0	0	0	0	1	0
51	0	1	0	1	0	0
50	0	1	0	0	0	0
49	1	0	0	0	0	0
48	0	1	0	0	0	0
47	1	1	0	0	0	0
43	0	1	0	0	0	0
39	0	0	0	0	0	1
37	1	0	0	0	0	0
34	0	0	0	0	0	1
32	0	0	0	0	0	1
25	0	1	0	0	0	0
12	0	0	0	1	0	0
Total	36	46	24	27	27	34
Mean	62.7	61.5	67.3	63.3	66.3	62.6
GROUP Total	82		51		61	
Mean	62.0		65.2		64.2	

Table 3. Frequency Distribution of Scores (Number Correct) on the Recall Test for the Neutral-Neutral and Control Groups.

Score	Neutral-Neutral Group		Control Group
	Aware	Unaware	
24	0	0	0
23	0	0	0
22	0	0	0
21	0	0	0
20	1	0	0
19	0	0	0
18	0	0	0
17	0	0	0
16	0	0	0
15	0	0	0
14	0	1	0
13	0	0	0
12	1	1	0
11	1	0	0
10	0	0	0
9	1	1	0
8	0	2	0
7	1	2	0
6	2	1	0
5	2	2	0
4	0	0	0
3	6	4	0
2	7	9	2
1	7	10	10
0	7	13	40
Total	36	46	52
Median	2	1.5	0

Table 4. Frequency Distribution of Scores (Number Correct) on the Recall Test for Aware and Unaware Ss in the Neutral-Specific Group.

Score	Aware	Unaware
24	2	1
23	2	2
22	3	2
21	2	1
20	3	5
19	3	2
18	4	3
17	1	1
16	2	2
15	0	1
14	0	2
13	1	1
12	0	1
11	0	0
10	0	1
9	1	0
8	0	0
7	0	0
6	0	1
5	0	0
4	0	0
3	0	0
2	0	1
1	0	0
0	0	0
Total	24	27
Median	19.5	18

Table 5. Frequency Distribution of Scores (Number Correct) on the Recall Test for Aware and Unaware Ss in the Specific-Neutral Group.

Score	Aware	Unaware
24	0	1
23	0	0
22	1	0
21	0	2
20	1	0
19	1	0
18	0	0
17	0	1
16	0	1
15	0	0
14	0	2
13	5	0
12	1	0
11	1	1
10	2	0
9	0	0
8	0	2
7	2	0
6	1	2
5	3	3
4	1	3
3	1	4
2	2	4
1	1	5
0	4	3
Total	27	34
Median	7	4

Table 6. Frequency Distribution of Scores (Number Correct) on the Recall Test for the Experimental Groups.

Score	Neutral-Neutral Group	Neutral-Specific Group	Specific-Neutral Group
24	0	3	1
23	0	4	0
22	0	5	1
21	0	3	2
20	1	8	1
19	0	5	1
18	0	7	0
17	0	2	1
16	0	4	1
15	0	1	0
14	1	2	2
13	0	2	5
12	2	1	1
11	1	0	2
10	0	1	2
9	2	1	0
8	2	0	2
7	3	0	2
6	3	1	3
5	4	0	6
4	0	0	4
3	10	0	5
2	16	1	6
1	17	0	6
0	20	0	7
Total	82	51	61
Median	2	19	5

Table 7. Number of Correct Recalls to the two halves of Form B by Ss in the Neutral-Neutral and Specific-Neutral Groups.

Subject	First Half	Second Half	Sign
1	0	0	
2	1	1	
3	0	1	+1
4	1	0	-1
5	3	6	+3
6	0	2	+2
7	1	1	
8	0	0	
9	0	0	
10	0	1	+1
11	1	0	-1
12	0	1	+1
13	1	1	
14	1	5	+4
15	0	0	
16	0	1	+1
17	1	1	
18	2	1	-1
19	0	0	
20	0	0	
21	1	2	+1
22	0	2	+2
23	0	1	+1
24	1	1	
25	9	5	-4
26	0	1	+1
27	2	3	+1
28	0	2	+2
29	8	6	-2
30	11	10	-1
31	2	1	-1
32	0	0	
33	2	1	-1
34	1	1	
35	2	4	+2
36	12	9	-3
37	0	1	+1
38	3	2	-1
39	4	2	-2
40	0	1	+1
41	0	0	
42	2	1	-1
43	6	5	-1

(Table 7 continued)

Subject	First Half	Second Half	Sign
44	0	1	+1
45	0	0	
46	1	2	+1
47	7	4	-3
48	0	1	+1
49	0	1	+1
50	1	1	
51	5	2	-3
52	1	2	+1
53	0	1	+1
54	0	1	+1
55	0	0	
56	7	5	-2
57	1	2	+1
58	1	1	
59	2	3	+1
60	0	0	
61	4	2	-2
62	1	4	+3
63	5	1	-4
64	5	6	+1
65	0	0	
66	5	7	+2
67	0	1	+1
68	5	5	
69	2	2	
70	3	2	-1
Mean	1.9	2.0	

Table 9. Frequency Distribution of Scores (Number Correct) on the Recall Test for Aware and Unaware Ss in the Neutral-Neutral Group based on the Postrecall Interview.

Score	Aware	Unaware
24	0	0
23	0	0
22	0	0
21	0	0
20	0	0
19	0	0
18	0	0
17	0	0
16	0	0
15	0	0
14	1	0
13	0	0
12	0	1
11	1	0
10	0	0
9	1	1
8	0	0
7	2	1
6	2	0
5	1	0
4	0	0
3	6	0
2	4	5
1	4	5
0	3	9
Total	24	23
Median	3	1

Table 10. Frequency Distribution of Scores (Number Correct) on the Recall Test for Aware and Unaware Ss in the Specific-Neutral Group based on the Postrecall Interview.

Score	Aware	Unaware
24	1	0
23	0	0
22	1	0
21	1	1
20	1	0
19	1	0
18	0	0
17	1	0
16	1	0
15	0	0
14	1	1
13	5	0
12	1	0
11	2	0
10	2	0
9	0	0
8	1	1
7	2	0
6	1	2
5	4	2
4	1	3
3	3	2
2	3	3
1	2	4
0	5	2
Total	40	21
Median	7	3

Table 11. Frequency Distribution of Scores (Number Correct) on the Recall Test for Aware and Unaware Ss in the Neutral-Specific Group based on the Postrecall Interview.

Score	Aware	Unaware
24	2	1
23	2	1
22	3	2
21	2	1
20	5	3
19	3	0
18	4	3
17	1	1
16	3	1
15	0	1
14	0	2
13	1	1
12	1	0
11	0	0
10	0	1
9	1	0
8	0	0
7	0	0
6	1	0
5	0	0
4	0	0
3	0	0
2	0	0
1	0	0
0	0	0
Total	29	18
Median	19	18

Appendix H

Examples of Jokes in Experiment Two

Rossi: "What qualifications do you need to be a spy?"
Allen: "You've got to be a liar, a sneak, a thief, a cheat--"
Rossi: "How did you train for this?"
Allen: "I was a used car salesman."

Rossi: "Are you married?"
Allen: "Yeah, my wife's a princess."
Rossi: "A princess?"
Allen: "She's built like a phone."

Rossi: "What would a spy do if he were attacked by a killer?"
Allen: "Some spies run, and some spies scream."
Rossi: "And what are you?"
Allen: "I'm a screaming runner."

Rossi: "Who's the world's greatest spy?"
Allen: "Herbie Margolis."
Rossi: "Herbie Margolis! I never heard of him."
Allen: "You see!"

A telephone rings
First voice: "hello"
Second voice: "What's the easiest way to catch a squirrel?"
First voice: "Climb a tree and act like a nut."

A telephone rings
First voice: "hello"
Second voice: "Do you like flying?"
First voice: "No, it hurts my arms."

Appendix I

Postconditioning Interview of Experiment Two

1. Would you tell me, in your own words, exactly what we are studying?

2. For any reason, did you look forward to the recorder turning on?

   Relatively how much?

3. Were you able to concentrate on giving numbers the entire period?

4. How well do you believe you did?

5. Do you feel you had any control over when the recorder was turned on? How? When?

6. Would you mind telling me specifically what you thought about when you were giving the numbers?

7. Did anything you said during the experiment have any influence upon when the recorder was turned on? What?

8. If I were to tell you that your saying a certain number determined when the recorder was turned on, which number would you guess it would be?

9. Did you feel the recorder was turned on after number 7? If yes, when did you notice this?

10. Would you describe the feelings you had about the following things on a five point scale from none at all to very much.

    a. Boredom with giving numbers

    b. Eagerness to hear recording

    c. Disappointment when recorder turned off

Appendix J

Operant Rate for the Control and Experimental Groups

Table 13. Operant Rates for the Control Group and Unaware Ss in the Experimental Groups.

	Control	Low Boredom	Medium Boredom	High Boredom
	4.5	9.5	6.0	8.0
	10.0	4.5	4.5	8.0
	9.5	7.5	7.0	8.0
	9.0	8.0	5.0	7.5
	10.5	4.5	7.0	5.0
	9.0	2.5	4.5	4.0
	8.0	2.5	8.0	4.5
	11.0	5.5	7.5	7.0
	5.0	6.5	4.0	6.5
	5.0	4.5	5.0	8.0
	4.5	3.5	10.5	
	8.0	4.0	5.0	
	5.5	7.0	8.5	
	7.0		11.0	
	3.5			
	9.0			
	1.0			
Total	120.0	74.5	93.5	66.5
N =	17	13	14	10
Mean =	7.06	5.73	6.68	6.65