

## MEANING ESTABLISHED BY CLASSICAL CONDITIONING<sup>1</sup>

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In recent times a number of psychologists, such as Cofer and Foley (2), Mowrer (6), and Osgood (8), to mention a few, have come to view meaning as a response—an implicit response, with cue functions which may mediate other responses. Osgood (8) does not consider the meaning response elicited by the sign of an object to be the same response which the object elicits. Only a fraction of the total response made to an object can come to be elicited by the sign. Osgood calls this component of the total response “detachable.” It can be “attached” to another stimulus, the sign, through conditioning, whereas the other components of the total response can only be elicited by the object itself. A number of studies (1, 10, 12) lend themselves readily to the interpretation of meaning as an implicit, mediating response.

If meaning is to be considered a response, however, the same expectations should apply to meaning as to other responses. It would be expected, consequently, that meaning could be classically conditioned, i.e., the meaning response elicited by a

word would be conditioned to any contiguously presented stimulus.

It follows from the above that if a nonsense syllable was presented and immediately followed by a meaningful word, it would be expected that the meaning response elicited by the word would be conditioned to the nonsense syllable. Experimentally this might be difficult to demonstrate since one conditioning trial might not establish a sufficiently strong association between the nonsense syllable and meaning response to be measurable. It would be expected that multiple paired presentations would be necessary in order to establish a conditioned meaning response strong enough to be measured. However, if the same word was paired many times with the nonsense syllable, the fact that the nonsense syllable would come to elicit the same meaning could be accounted for on the basis of a direct association between the nonsense syllable and the word itself. The direct association of syllable and word could be eliminated, however, even with multiple syllable-word pairings. This would be possible by pairing the syllable on each trial with a different word, all of the words having, however, an identical or similar meaning component. These words would not have to be synonyms, if the following rationale is correct. If the total meaning response to a word is composed of response components which are “detachable,” i.e., could be separately conditioned, it would be possible to use words with largely different meaning, but having a common component. For example,

<sup>1</sup>The authors for some time have been mutually interested in language behavior. This article, the first study in a research project on language jointly planned by the authors, is based on the theoretical-experimental method developed by the second author. They are presently conducting further studies in this research project. The experimental data in the present study obtained by the first author forms a portion of the results in the dissertation submitted by her in partial fulfillment of the requirements for the Ph.D. degree at the University of California at Los Angeles in 1957. The first author wishes to thank Professor John P. Seward for critical suggestions made on the dissertation.

the words PRETTY, SWEET, and HEALTHY have in common a positive evaluative meaning, and yet are quite different in meaning otherwise.

Thus on each conditioning trial the nonsense syllable could be paired with a different word and yet the same component of the meaning response would be evoked and associated to the syllable. If the nonsense syllable was never paired with the same word, a stable association between the syllable and the word would not be made. The association would be between nonsense syllable and meaning response. This process is schematized in more detail in Fig. 1 in the discussion section and will be dealt with further then.

In this study nonsense syllables were used as conditioned stimuli. The unconditioned stimuli were different words with a certain similarity in meaning. The hypothesis was that this similar component of meaning would be conditioned to the nonsense syllable with which the words were paired.

In order to test this hypothesis, it was necessary to use a method of measuring meaning. Osgood (7) has developed an instrument called the semantic differential, and Osgood and Suci (9) report that a large portion of the total variance in Ss' judgment of meaning can be accounted for in terms of three factors of meaning—evaluative, potency, and activity. Words that were heavily loaded with these three factors provided the three meaning responses to be conditioned in the three subexperiments included in the present study. The semantic differential provided the technique for measuring the meaning which was to be conditioned to the nonsense syllables.

## METHOD

### *Subjects*

The Ss were 86 students in elementary psychology at Arizona State College. They participated in the study to fulfill a course requirement. For 32 Ss the UCS's were words with high loading on the evaluative factor (Exp. I); 24 Ss had activity words as UCS's (Exp. II); and 30 Ss were conditioned with words with a high loading on the potency factor (Exp. III).

### *Procedure*

*Experiment I.*—The Ss were run in groups. There were two groups with one-half of the Ss in each group. Two types of stimuli were used: nonsense syllables which were presented visually by slide projection on a screen, and words which were presented orally by *E*, with Ss required to repeat the word aloud immediately after *E* had pronounced it.

The Ss were first seated in a room so they could all see the screen and not see each other's papers. They were told that they were to be Ss in an experiment concerned with studying two different types of learning—to see the effectiveness of each. One learning task was to concern nonsense syllables, and the other words.

The Ss wrote their names on several sheets of blank paper and the first task began. The nonsense syllables were VAF, XAD, VEC, YIM, and GAH. The syllables were presented in random order, with exposures of 5 sec. The intervals between exposures were less than 1 sec. The Ss were instructed to relax between syllables, and not to think of anything. Each syllable was presented four times. At the conclusion, Ss were instructed to write down all of the syllables they could recall.

The Ss then had 33 words presented to them which they were to learn. Each word was presented orally by *E* one time with approximately 2-sec. intervals between words. After the word was presented by *E*, Ss were instructed to immediately repeat the word aloud and then to continue to pronounce the word to themselves until the next word was given. The words were of no special type. Examples are: AT, BRIEF, UNDER, and BY. After each word was presented once, Ss were instructed to write down all of the words they could recall. Then they were presented with 12 pairs of words. One of each pair was one that had just been presented. Their task was to recognize which of the two it was and write it down. An example was "BRIEF or BRIEFCASE."

These two tasks were presented to train Ss in the procedure and to orient them properly for

TABLE 1  
 SYLLABLE (CS)-WORD (UCS) PAIRS FOR GROUP 1, EXP. I

YOF-beauty	XEH-worthless	XEH-sick	WUH-note
LAJ-with	XEH-sour	LAJ-ship	WUH-stick
XEH-thief	QUG-the	LAJ-room	YOF-success
LAJ-car	XEH-enemy	XEH-stupid	QUG-sock
YOF-win	QUG-box	LAJ-deck	QUG-six
WUH-pen	QUG-clay	LAJ-mop	LAJ-the
GIW-key	LAJ-this	GIW-glass	GIW-side
QUG-chair	XEH-cruel	WUH-into	LAJ-light
LAJ-paper	QUG-sand	XEH-failure	LAJ-three
LAJ-cord	XEH-dirty	GIW-shoe	QUG-saucer
YOF-gift	YOF-sacred	XEH-disgusting	YOF-money
XEH-bitter	YOF-friend	YOF-happy	GIW-quilt
GIW-book	LAJ-leaf	YOF-pretty	LAJ-it
LAJ-letter	XEH-evil	WUH-glove	GIW-truck
YOF-sweet	WUH-string	XEH-agony	LAJ-ground
LAJ-in	QUG-and	GIW-cart	WUH-water
YOF-honest	QUG-dot	QUG-wheel	GIW-garage
GIW-radio	WUH-line	WUH-on	XEH-poison
XEH-ugly	WUH-train	WUH-sofa	QUG-twelve
WUH-four	YOF-valuable	QUG-dresser	GIW-ink
GIW-cup	LAJ-table	WUH-trunk	GIW-store
XEH-sad	WUH-can	XEH-fear	QUG-number
WUH-five	GIW-word	WUH-those	GIW-hat
YOF-smart	GIW-pencil	XEH-insane	GIW-eleven
QUG-up	YOF-steak	QUG-fork	WUH-shirt
WUH-pot	QUG-sock	QUG-eight	YOF-vacation
YOF-rich	GIW-of	YOF-healthy	YOF-love

the next phase of the experiment where the hypothesis was tested.

The Ss were then told that the primary purpose of the experiment was to study "how both of these types of learning take place together—the effect that one has upon the other, and so on." Six new syllables were used: YOF, LAJ, XEH, WUH, GIW, and QUG. The syllables were presented in the same way. Approximately 1 sec. after the syllable appeared on the screen *E* pronounced a word aloud. The intervals between presentations of syllables were again less than 1 sec. The Ss were told they could learn the syllables by just looking at them, but that they should simultaneously concentrate on pronouncing the words aloud and to themselves since there would be many words, presented only once.

The nonsense syllables were presented in random order, though never more than twice in succession, so that no systematic associations were formed between them. Each nonsense syllable was presented 18 times, and each time it was paired with a different word, i.e., there were 18 conditioning trials. A nonsense syllable was never paired with a word more than once, so that stable associations were not formed between a nonsense syllable and any word. Thus, 108 different words were used. Two of

the syllables were always paired with words which had high loadings on evaluative meaning. Most of the relevant meaningful words were taken from Osgood and Suci (9). When appropriate words with high loadings could not be found in this way, a thesaurus supplied them. The other four syllables were paired with words which had no systematic meaning.

Table 1 illustrates the method. It contains the syllable-word pairs presented to Group 1 in Exp. I. For Group 1, XEH was paired with different words which had a negative evaluative meaning, and YOF was paired with words with a positive evaluative meaning. For Group 2, XEH was paired with the positive meaning words, and YOF with the negative meaning words, word order remaining constant.

When the conditioning phase was completed, Ss were told that *E* first wished to find out how many syllables they remembered. At the same time, they were told, it would be necessary to find out how they felt about the syllables since that might have affected how the syllables were learned. Each S was given a small booklet in which there were six pages. On each page was printed one of the nonsense syllables and a semantic differential scale. The scale was the 7-point scale which Osgood and Suci describe (9), with the continuum from

pleasant to unpleasant. An example is as follows:

QUG

pleasant :—:~

In the booklet, QUG was on the first page and the other syllables on the following pages: XEH, LAJ, WUH, YOF, and GIW, in that order. The Ss were told how to mark the scale and to indicate at the bottom of the page whether or not the syllable was one that had been presented.

The Ss were then tested on the words. Finally they were asked to write down anything they had thought about the experiment, especially the purpose of it, and so on, or anything they had thought of during the experiment. It was explained that this might have affected the way they had learned the task.

*Experiment II.*—The procedure was exactly repeated for these Ss except that the words used to condition meaning to XEH and YOF had high loadings on the activity factor. The “active” words used are as follows: fast, ferocious, tense, energetic, hot, brisk, agitate, speed, eager, sharp, quick, haste, fidgets, excited, young, hustle, frisky, spry. The “passive” words used are as follows: slumber, cool, listless, drowsy, loafing, dull, lazy, calm, old, slow, relaxed, sleep, resting, peaceful, inert, sluggish, lag, lifeless. Since all other conditions were identical to Exp. I, it is not necessary to completely list the syllable-word pairs.

The Ss were again divided equally into a Group 1 and a Group 2. For Group 1, YOF was paired with passive meaning words and XEH with active meaning words. This was reversed for Group 2. The semantic differential booklet was also the same except the syllables were judged on an active-passive dimension.

*Experiment III.*—The procedure was again the same, except that words with high loadings on potency meaning were used. The words used are listed as follows with “strong” words first and “weak” words second: powerful, athletic, sturdy, masculine, robust, healthy, heavy, rugged, brave, active, hard, loud, deep, sharp, rich, wide, thick, large; crippled, feeble, soft, frail, narrow, poor, dull, thin, cowardly, feminine, lame, fragile, delicate, sick, quiet, passive, small, shallow. The syllables were later judged on a strong-weak dimension. Group 1 had YOF paired with strong words, XEH paired with weak words; Group 2 had this reversed.

### Design

The data for the three experiments were treated in the same manner. Three variables

were involved in the design: conditioned meaning (pleasant and unpleasant, active and passive, or strong and weak, depending upon the experiment); syllables (XEH and YOF); and Groups (1 and 2). The scores on the semantic differential given to each of the two conditioned syllables were analyzed in a  $2 \times 2$  latin square as described by Lindquist (5, p. 278) for his Type II design.

### RESULTS

All Ss were questioned about the purpose of the experiments. Of the 86 Ss, 9 indicated awareness of a relationship between certain words and syllables. For these Ss it could be suggested that any meaning which the syllables had acquired was due to this awareness. For this reason, the data were analyzed without the scores of the “aware” Ss. In order to maintain a counterbalanced design when these Ss were excluded, it was necessary to randomly eliminate three additional Ss from the data. The resulting Ns were as follows: 30 in Exp. I, 20 in Exp. II, and 24 in Exp. III.

Table 2 presents the means and SD's of the meaning scores for Exp. I, II, and III. The table itself is a representation of the  $2 \times 2$  design

TABLE 2  
MEANS AND SD'S OF CONDITIONED  
MEANING SCORES

Exp.	Group	Syllables			
		XEH		YOF	
		Mean	SD	Mean	SD
I	1	4.80	1.80	2.40	1.50
	2	3.13	1.46	4.73	1.77
II	1	4.90	1.70	3.30	2.33
	2	3.00	1.79	5.00	2.00
III	1	4.42	2.14	6.33	.94
	2	4.58	2.25	3.92	2.32

Note.—The pleasant pole scored 1, unpleasant 7; passive 1, active 7; weak 1, strong 7.

TABLE 3  
ANALYSIS OF VARIANCE OF CONDITIONING DATA

Source	Exp. I			Exp. II			Exp. III		
	df	MS	F	df	MS	F	df	MS	F
Between Ss									
Groups	1	1.66	.59	1	.10	.15	1	15.19	3.82
Error	28	2.82		18	3.54		22	3.98	
Within									
Cond. Meaning	1	60.00	20.62***	1	32.40	6.39**	1	20.02	4.24*
Syllables	1	2.40	.82	1	.40	.08	1	4.68	.99
Residual	28	2.91		18	5.07		22	4.72	
Total	59			39			47		

\*  $P < .06$ .  
 \*\*  $P < .01$ .  
 \*\*\*  $P < .001$ .

for each experiment. The pleasant extreme of the evaluative scale was scored 1, the unpleasant 7; the passive extreme was scored 1, active 7; for potency, weak was 1 and strong 7.

The analysis of the data for the three experiments is presented in Table 3. The results of the analysis indicate that the hypothesized conditioning effect occurred. In Exp. I the  $F$  for the conditioned evaluative meaning variable was significant at better than the .001 level. None of the other variables were significant.

In Exp. II the  $F$  for conditioned activity meaning was significant at better than the .05 level. None of the other variables were significant. In Exp. III the  $F$  for conditioned potency meaning was significant at better than the .06 level. The  $df$  in this case was only 1 and 22. None of the other variables were significant.

### DISCUSSION

It was possible to condition components of the total meaning responses of words to contiguously presented nonsense syllables. This conception is schematized in Fig. 1, and in so doing, the way the conditioning in this study was thought to have taken place is

shown more specifically. The nonsense syllable YOF, in this example, is presented prior to the word PRETTY. PRETTY elicits a meaning response. This is schematized in the figure as two component responses; an evaluative response  $r_{PV}$  (in this example, the words have a positive value), and the other distinctive responses that characterize the meaning of the word,  $R_P$ . The pairing of YOF and PRETTY results in associations between YOF and  $r_{PV}$ , and YOF and  $R_P$ . In the following presentations of YOF and the words SWEET and HEALTHY the association between YOF and  $r_{PV}$  is further strengthened. This is not the case with associations  $R_P$ ,  $R_S$ , and  $R_H$ , since they occur only once and are followed by other associations which are inhibitory. The direct associations indicated in the figure between the nonsense syllable and

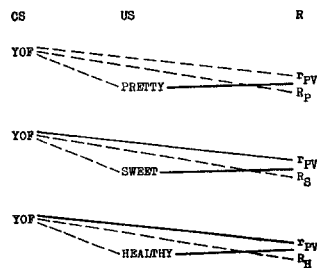


FIG. 1. The conditioning of positive evaluative meaning.

the individual words would also in this way be inhibited.

The results of this study have implications in several areas. (a) Using a conception of meaning as a mediating response, Mowrer (6) has suggested that a sentence is a conditioning device and that communication takes place when the meaning response which has been elicited by the predicate is conditioned to the subject of the sentence. The results of the present study substantiate Mowrer's approach by substantiating the basic theory that word meaning will indeed condition to contiguously presented stimuli. (b) Osgood (8) considers concept formation as learning a common mediating response for a group of stimuli. This study suggests that verbal concepts are signs that have been conditioned to the identical response components involved in the total response to each of several objects or signs. In Fig. 1, YOF is thus analogous to a concept; however, because of the design of the experiment, few Ss attained this concept on a verbal level. (c) A question has arisen in the context of a number of studies of verbal behavior (3, 4, 13, 14), to name a few, concerning the necessity of awareness in order for learning to occur. The present results indicate that the meaning of stimuli may be learned without awareness. (d) Razran (11) has recently suggested that no American laboratory has produced second-order conditioning and that second-order conditioning "needs cognition to be adequately affected" (11, p. 329). However, in the present study, words, which are conditioned stimuli themselves, served as unconditioned stimuli in conditioning meaning to the nonsense syllables—and without cognition. (e) The results also suggest that there are psychological processes underlying the meaning factors arrived at by Osgood and Suci (9).

#### SUMMARY

Three experiments were conducted to test the hypothesis that meaning responses elicited by a word can be conditioned to a contiguously

presented neutral stimulus, e.g., a nonsense syllable. The study assumed that total word meaning is composed of response components which can be separately conditioned. A nonsense syllable was visually presented 18 times, each time paired with the auditory presentation of a different word. While these words were different, they all had an identical meaning component. In Exp. I, one nonsense syllable was paired with positive evaluative meaning and another was paired with negative evaluative meaning; in Exp. II "active" meaning and "passive" meaning responses were conditioned; and in Exp. III, "strong" and "weak" meaning responses were conditioned. In each experiment there was significant evidence that meaning responses had been conditioned to the nonsense syllables.

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