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ABSTRACT

The extent to which semantic differential ratings of trigrams remain consistent over a four-week retention period following pairing with positive or negative attitudinal words was determined. The trigrams initially served as stimulus items in a paired associate list consisting of both positive and negative evaluative response terms; and rating and recall periods were presented to five independent groups at the end of zero, one, two, three, and four-week retention intervals. The mean ratings for syllables paired with positive words and the syllables paired with negative words tended to converge across the four-week retention period. However, when the ratings were adjusted for the number of associates recalled, either statistically or experimentally, no evidence of systematic change in the ratings across time was obtained. These results were interpreted as supporting a classical conditioning interpretation of attitude formation as opposed to a word association interpretation. (Author)

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Technical Report Number 6

April 1970

PRINCIPAL INVESTIGATOR:
ARTHUR W. STAATS

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The extent to which semantic differential ratings of trigrams remain consistent over a four week retention period following pairing with positive or negative attitudinal words was determined. The trigrams initially served as stimulus items in a paired associate list consisting of both positive and negative evaluative response terms, and rating and recall periods were presented to five independent groups at the end of zero, one, two, three, and four week retention intervals. The mean ratings for syllables paired with positive words and the syllables paired with negative words tended to converge across the four-week retention period. However, when the ratings were adjusted for the number of associates recalled, either statistically or experimentally, no evidence of systematic change in the ratings across time was obtained. These results were interpreted as supporting a classical conditioning interpretation of attitude formation as opposed to a word association interpretation.

LONG-TERM RETENTION OF CONDITIONED ATTITUDES[1]

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Following the suggestions of Doob (1947), Osgood and Tannenbaum (1955), Staats (Staats, 1963, 1964, 1967, 1968, Staats and Staats, 1958) has developed a theory of attitudes based upon the conception of an attitude as an implicit, mediating response. (See also Rhine, 1958.) In Staats' formulation an attitude is defined in terms of an evaluative, or emotional, response which comes to be elicited by a stimulus through either first-order or higher-order classical conditioning. On the basis of this analysis, Staats and associates have demonstrated that a number of variables known to affect the formation of conditioned responses have similar effects on the formation of attitudes as well. Making use of his classical conditioning of word meaning procedure (Staats and Staats, 1957), such variables as number of conditioning trials (Staats and Staats, 1959), ratio of reinforcement (Staats, Staats, and Heard, 1960), and the use of synonyms in the test phase (Staats, Staats, and Heard, 1959) have been manipulated and found to influence the formation and function of attitudes as would be expected on the basis of the principles of classical conditioning.

The present study is directed toward further extending the application of basic conditioning principles to the area of attitude by investigating the durability of experimentally established attitudinal responses across time. Specifically, if classical conditioning is the basic process operating in the establishment of attitudes, then the strength of the attitudinal response should remain relatively constant across time to the extent that extinction and counter-conditioning are controlled for.

A study by Yavuz and Bousfield (1959) suggested that such conditioned responses do indeed persist across time in the absence of further conditioning experience with the attitudinal stimulus (the CS for the emotional response). These investigators demonstrated that when evaluative (attitude) words were paired with Turkish words in a paired-associate learning task, the nonsense words were rated on a GOOD-BAD semantic differential scale in the same direction as the meaningful words with which they had been paired. The conditioning effect was measured one week after the learning had taken place. For example, if a positive evaluative (i.e., GOOD) word had been learned as the associate to a particular Turkish word, the probability was that subjects would rate the Turkish word toward the GOOD pole of the semantic differential during a recall period one week later. While the effect was much stronger when subjects could recall the experimentally established associates to the Turkish words, the effect occurred even when they could not. Thus, some factor other than recall of the associates must have been responsible for ratings of the Turkish words in those instances when subjects could not recall those associates.

The present experiment may be regarded as a systematic replication of the above experiment. It is designed to determine the extent to which ratings of trigrams remain consistent over a four week retention period following their involvement as CSs in a classical conditioning of attitude procedure. The procedure involved presentation of the trigram items in a paired associate list consisting of both positive and negative evaluative response terms. The design utilized independent groups, with rating and recall periods occurring at the end of each week.

In addition to determining the shape of the retention function for conditioned attitudes, however, an attempt was made to obtain evidence concerning two competing interpretations of the results of the Yavuz and Bousfield experiment. Bousfield (1961) explained the fact that a significant rating effect was still

obtained when subjects could not recall the experimentally established associate by postulating the presence of distant associates to the originally established response items. He suggested that during the initial learning associations were formed not only between the Turkish word and the meaningful word supplied by the experimenter, but between the nonsense word and a group of implicit verbal responses elicited by the response word as well. During the recall period one week later, even though the first associate established to the Turkish word had been lost, he conjectured that the associates to this associate still had some strength and were mediating the appropriate rating on the semantic differential scale.

Recently Staats (1969) has offered an alternative explanation for this phenomenon, based upon his theory of attitudes, discussed earlier. Staats has suggested that during the initial learning of the paired associate list not only is a specific associate to the stimulus word being formed, but, in addition, an evaluative attitudinal response elicited by the meaningful word is being classically conditioned to the stimulus word. Such a classically conditioned response component, rather than distant associate, would mediate the Turkish word ratings when subjects cannot recall the experimentally-established associates.

While not specified in the Yavuz and Bousfield study, Bousfield's (1961) word association position would seem to suggest that the mean semantic differential scores to Turkish words paired with positive and negative words should systematically converge as a function of time. That is, loss should occur for both the original response items and the more distant associates to these items (although presumably at different rates), since the more distant associates should be no more immune to the effects of interference and unlearning than any other learned associate. The Staats position, on the other hand, would indicate that once the experimentally established associate was lost as a major mediating event, the classically conditioned attitudinal response would still remain. That is, to the extent that nonsense words were dissimilar enough from everyday

speech that extinction and/or counter-conditioning would not occur, the classically conditioned mediator should remain relatively constant over time.

An attempt is made in the present experiment to provide evidence concerning the two interpretations of the Yavuz and Bousfield study discussed above by statistically removing the effects of recalling the response item by means of an analysis of covariance and by plotting the rating function of those trigrams for which the experimentally-established associate is not recalled.

METHOD

Subjects

Subjects for this experiment consisted of 150 undergraduates enrolled in various basic psychology courses at the University of Hawaii. Each subject volunteered for one of 10 groups, and the treatment condition assigned to each group was randomly determined. Subjects were not told at this time that some of them would be asked to participate in a second session.

Materials

Two paired associate lists were constructed, consisting of 10 CVC trigram-meaningful word pairs, five of the response items being positive evaluative words and five being negative evaluative words. The ten trigrams utilized were selected from a group of 200 with association values between 13 and 20 (Archer, 1960). These trigrams had been rated on a PLEASANT-UNPLEASANT semantic differential (SD) scale the previous semester by an independent group of 100 subjects. The trigrams were selected such that no consonant occurred more than once in an initial or terminal position, and the vowels e, i, o, u, and y were each represented twice. The ten trigrams were divided into two sets of five each, each vowel occurring once in each set. The mean SD ratings for the trigrams were 3.99 for Set 1 and 3.98 for Set 2, with no trigram deviating from 4.00 by more than .05.

The mean association values for the two sets of trigrams were 16.40 and 15.40 respectively.

The ten response items were selected from a group of words rated by 89 graduate and undergraduate students at the University of Hawaii during the summer of 1968. The five positive evaluative words had a mean SD rating of 1.61 on a PLEASANT-UNPLEASANT scale and a mean frequency of 68.00 on the I, scale of the Thorndike-Lorge (1944) list. The negative words had a mean SD rating of 6.42 and a mean frequency of 63.60.

The first paired associate list was established by pairing each trigram in Set 1 with a positive evaluative word and each trigram in Set 2 with a negative evaluative word. The second list was constructed by reversing the evaluative dimension paired with each set of trigrams. The specific trigram-word pairings were made with the restriction that neither an initial nor a terminal consonant for a trigram would be the same as the first or last consonant of the word with which it was paired. The specific trigrams and words comprising the two lists are presented in Table 1.

Insert Table 1 about here

Each subject was furnished with two booklets during the course of the experiment. The immediate recall booklet consisted of 10 pages with a different trigram used in the paired associate learning task appearing on each page. The first 10 pages of the long-term retention booklet contained the trigrams used followed by a PLEASANT-UNPLEASANT SD scale, one trigram and scale to a page, a page of instructions, and ten more pages with the trigrams occurring alone.

Ten orders of the nonsense syllables were generated such that the same syllable did not occur in the same position in the orders more than once. Further, the restriction was made that no more than three syllable-word combinations representing the same meaning dimension could occur in sequence within an order.

Table 1

Trigrams and Corresponding Response Items
for Paired Associate Learning Task

Set	Trigram	Response Item List 1	Response Item List 2
	YOX	entertaining	irritable
	GIC	advunturous	hostile
1	VUP	enthusiastic	jealous
	QEH	dependable	stingy
	NYZ	considerate	liar
	POJ	irritable	enthusiastic
	CIW	liar	dependable
2	FUV	hostile	considerate
	XEB	stingy	adventurous
	ZYD	jealous	entert·ining

Four of these orders were randomly selected for the paired associate task, three for the immediate recall task, and the remaining three were used for the long-term recall task. All three orders for both the immediate recall booklets and the long-term recall booklets were equally represented in each independent group. In terms of the latter booklet, a different order was used for the rating of the syllables and the recall.

PROCEDURE

Two groups of 15 subjects each were run under each of the five recall conditions (0, 1, 2, 3, and 4 week retention intervals). Under each condition one group learned List 1 and the other group List 2 during the paired associate learning task. The instructions and procedures for both the paired associate learning task and the recall task were the same for all groups of subjects.

The instructions utilized for the paired associate task were modified from those used by Underwood and Keppel as reported by Runquist (1966). The paired associate lists were presented by means of a Carousel slide projector. Each slide (containing either the trigram alone or the trigram-word pair) was exposed for 2 seconds with no inter-trial interval except for 1 blank slide at the end of every fourth presentation of the list. Four different orders of the individual pairs were used to minimize the possibility of serial learning, and each group was presented with 16 presentations of the list. Immediately following the learning task subjects were presented with the immediate recall booklets and asked to write down the response item they remembered being associated with each syllable in the booklet. Subjects were given unlimited recall time for this task.

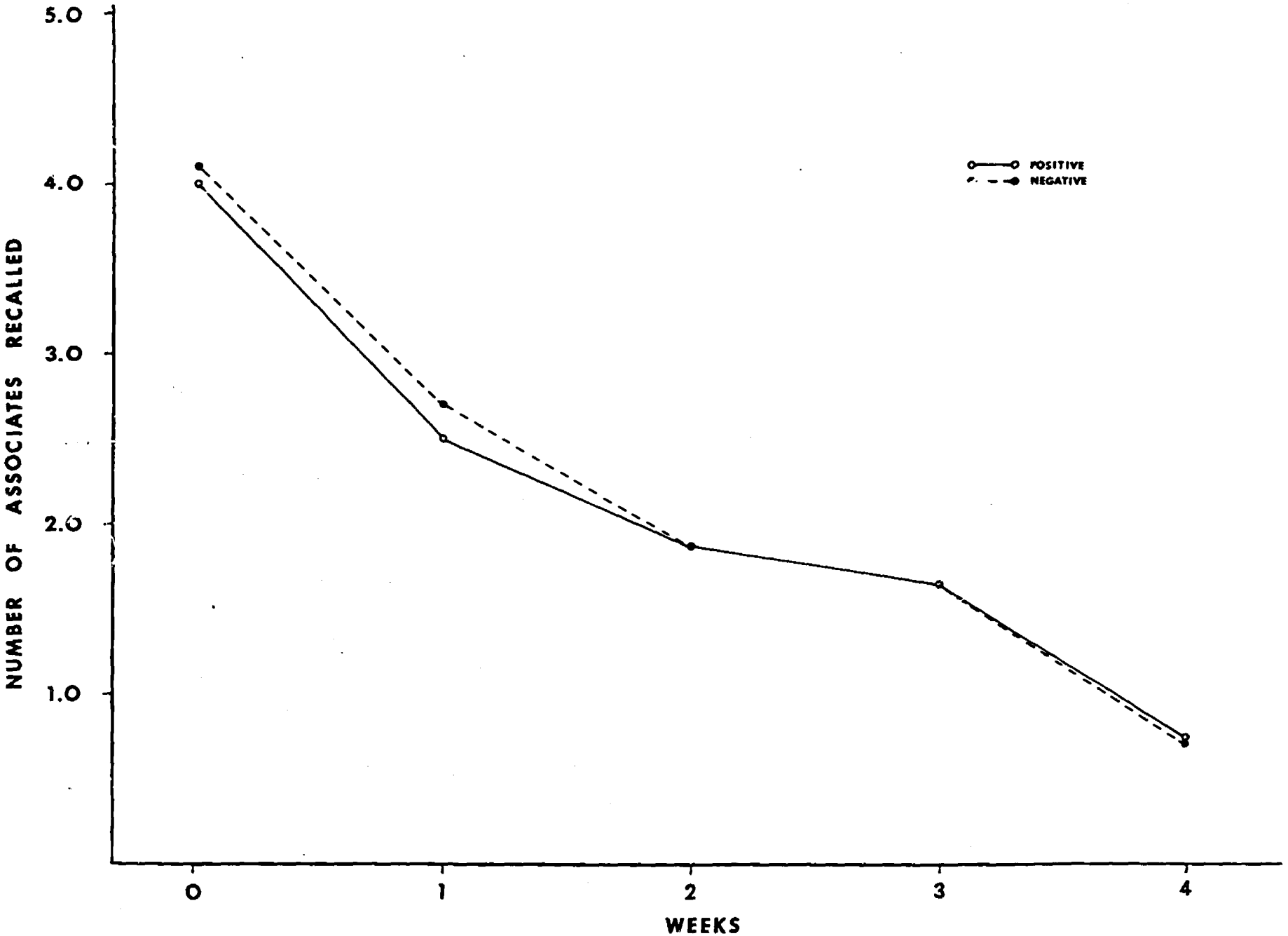
The long-term recall task was presented to the 0-week recall groups immediately upon completion of the above task. All other groups received the long-term recall task on the same day and time as the original learning, but the appropriate number of weeks later. Subjects in these groups were notified by

mail a few days prior to the recall session that their attendance was required for an experiment, and no mention was made of the relationship between the recall task and the paired associate learning task until the appropriate place in the instructions. During the recall session subjects were initially told that individuals found that nonsense syllables had different meanings along certain lines, and that the experimenter would like to assess some of these differences. Subjects were then instructed in the use of the semantic differential and were told that further instructions would be contained within the booklet itself. Immediately following the last scale in the booklet was a page of instructions reminding subjects that they had previously learned a group of nonsense syllable-word pairs. They were told, "A certain amount of time has now passed since you first learned them, and we want to determine how many pairs you can now remember." Again, no time limit was imposed for the completion of this task. An abbreviated form of the immediate recall instructions were then presented. After subjects had completed the recall task, they were asked to write their answers to two questions on the outside of their booklets: 1) "What do you think was the purpose of the experiment?", and 2) "Why did you rate the syllables the way you did?"

RESULTS

The mean number of experimentally-established associates recalled was a negative function of the length of time elapsing between original learning and recall. Subjects in the 0-week recall groups recalled a mean of 8.47 response items to the 10 trigrams on the recall task, while a mean of 1.47 response items were recalled by subjects in the 4-week recall groups. The mean number of positive and negative associates recalled as a function of weeks since initial learning is presented in Figure 1.

Insert Fig. 1 about here


5.0
4.0
3.0
2.0
1.0
NUMBER OF ASSOCIATES RECALLED
POSITIVE
NEGATIVE
0
1
2
3
4
WEEKS

Inspection of the graph suggests that the recall functions for both positive and negative items were highly similar. This conclusion was supported by the results of an analysis of variance on the recall scores, $F(4, 120) = 0.18$.

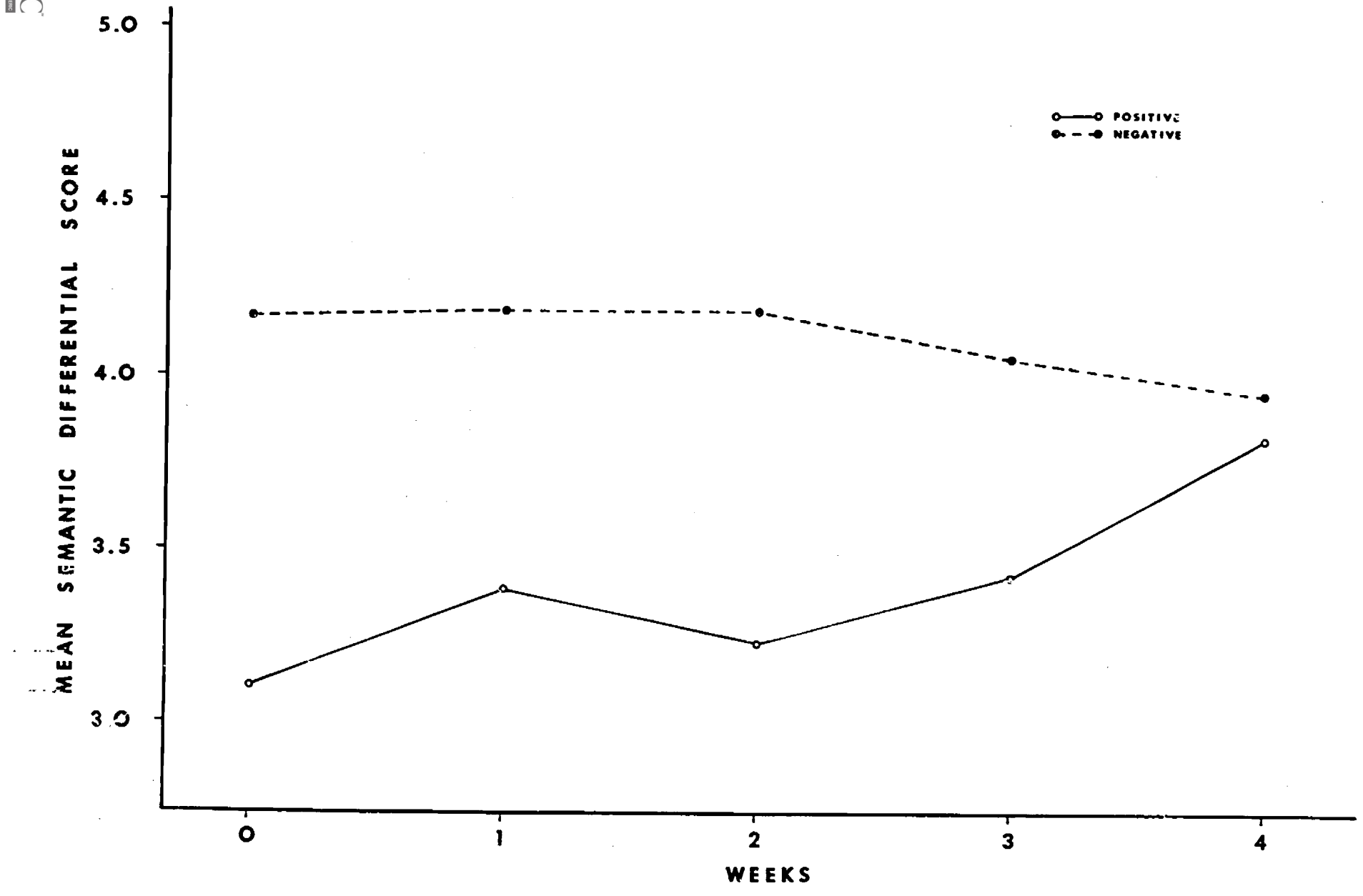
The mean semantic differential scores across weeks for trigrams paired with positive and with negative words are depicted in Figure 2. As anticipated, the mean ratings for the trigrams paired with positive words and the trigrams paired with negative words tended to converge across the four week retention period as recall of the associates decreased.

Insert Fig. 2 about here

For purposes of statistical analysis, a mean SD difference score was obtained for each subject by subtracting the mean SD rating of the five trigrams paired with positive evaluative words from the mean SD rating of the five trigrams paired with negative evaluative words. The over-all conditioning effect was tested by means of a one-tailed matched t-test on these difference scores, using the error term from the anlysis of variance as the best estimate of between-subject variance. The over-all mean difference was +.712 SD units, with $t_D (120) = 6.39$ ($p < .001$).

Despite the apparent convergence of SD ratings in Figure 2, an analysis of variance on the difference scores indicated that the Weeks effect did not quite obtain significance at the .05 level. However, a trend analysis on the difference scores across weeks demonstrated a significant downward linear trend, $F(1, 120) = 6.62$, $p < .05$. The quadratic component of the trend analysis was non-significant, $F(1, 120) = 1.09$.

To evaluate the effect of the Weeks variable on the mean rating scores in the absence of the effect of the Weeks variable on the number of associates recalled, an analysis of covariance was conducted on the SD ratings, using the number


5.0
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MEAN SEMANTIC DIFFERENTIAL SCORE
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WEEKS

of associates recalled as the covariate. The F-ratio for the Weeks variable in this analysis was reduced to a value of less than 1, $F(1, 119) = 0.69$, and a trend analysis on the adjusted SD difference scores across weeks demonstrated no significant systematic change in these scores, with $F(1, 119) = 0.03$ for the linear component and $F(1, 119) = 2.09$ for the quadratic component (the latter F-ratio is reflecting a general inverted-U shape of the adjusted means across weeks).

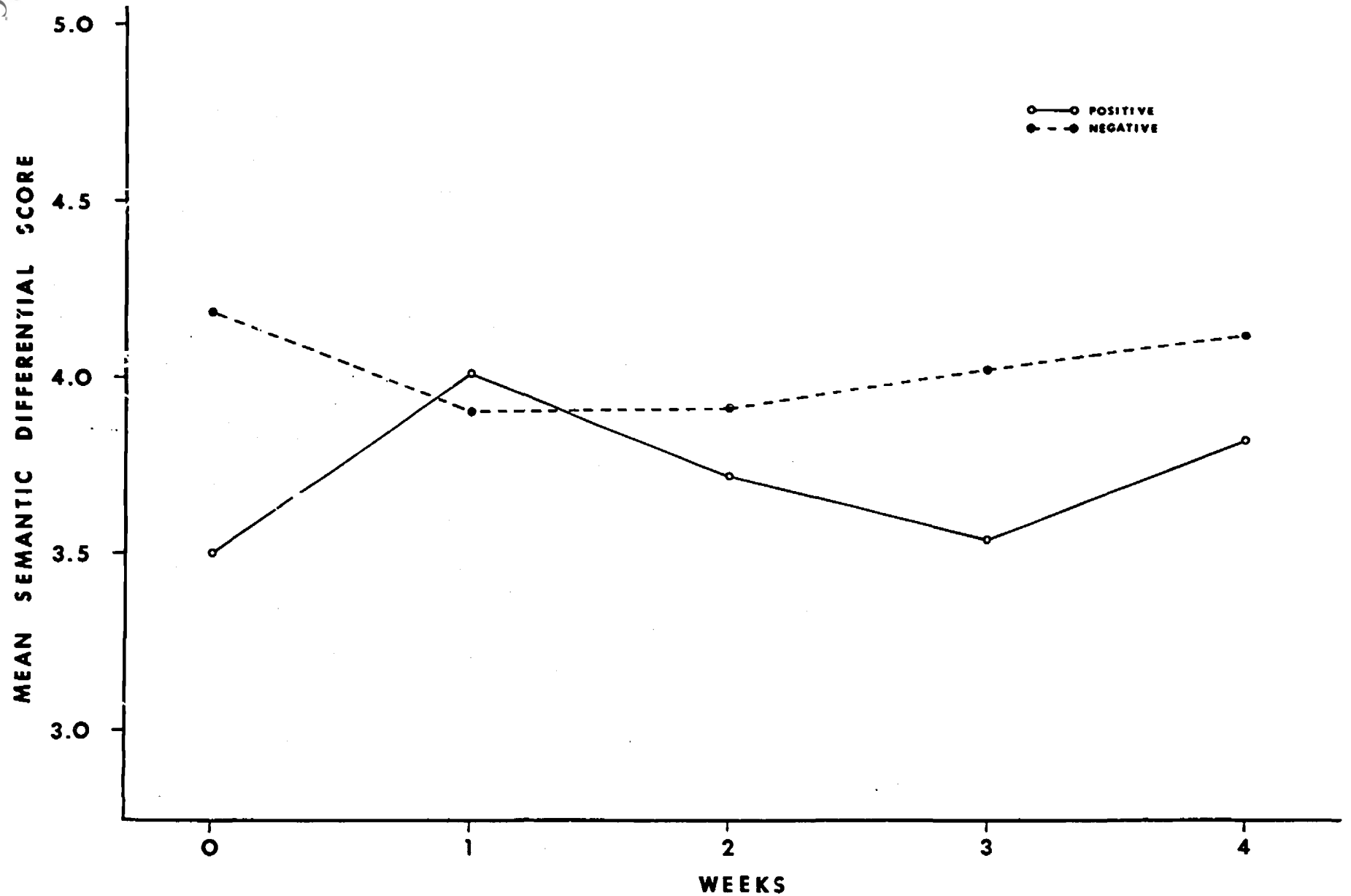
Although the above analysis indicated that there was no systematic effect of weeks upon the mean SD difference scores following linear adjustment for the number of associates recalled, the possibility arises that no conditioning effect exists at all when subjects cannot recall the particular associate with which a nonsense syllable has been paired. To determine if this was the case, data were evaluated only for those subjects who 1) did not recall at least one positive and one negative associate, and 2) were not aware of the use of two classes of words, i.e., did not verbalize that positive and negative words were used in the experiment in answer to the questions asked at the end of the recall period.

Of the 150 subjects run in the experiment, 77 met this dual requirement. For each of these subjects the mean rating of trigrams for which the associate was not recalled was computed separately for trigrams paired with positive and with negative words. The over-all means of these mean scores across subjects were 3.72 for syllables paired with positive words (positive syllables) and 4.01 for syllables paired with negative words (negative syllables). A graph of this data across recall weeks is presented in Figure 3, but it must be interpreted with caution, since the means become systematically more stable across weeks, i.e.,

Insert Fig. 3 about here

the means computed for each subject are based upon more and more cases and the over-all Weeks means are based upon more and more subjects.

In order to test for the over-all conditioning effect, a difference score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MEAN SEMANTIC DIFFERENTIAL SCORE
POSITIVE
NEGATIVE
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4
WEEKS

was computed for each subject described above by subtracting the mean rating on the positive syllables for which the associate was not recalled from the mean rating on the negative syllables. Of the 77 difference scores obtained, 50 were positive and 27 were negative. A one-tailed sign test yielded a z of 2.53 ($p < .01$).

DISCUSSION

The results of this study indicate that the strength of conditioned attitudes is an orderly function of the length of time elapsing since the original conditioning. One of the correlates of this function is ability to recall the experimentally established word associates; the fewer positive and negative associates subjects could recall, the less were the differences in ratings of positively and negatively paired trigrams. When recall was statistically equated across weeks, the relationship between passage of time and the rating effect disappeared. However, the differential rating effect for positively versus negatively paired trigrams was present even when subjects judged unaware could not recall the associates. This suggests, as did the Yavuz and Bousfield (1959) study, that some variable in addition to the experimentally established associate accounts for the rating effect.

While part of the study involved statistical rather than experimental manipulation, the results also suggest, contrary to Bousfield's interpretation, that the additional factor does not involve the mediation of distant associates to the originally established response term. Since it seems reasonable to assume that associative strength for such hypothetical associates would follow some type of forgetting function, and if these associates were, in fact, mediating the rating of the trigrams, it would also be reasonable to expect that the rating effect would diminish with time. No evidence of such systematic loss was obtained when the ratings were adjusted for the number of associates recalled, either statistically or experimentally. Thus, a word association interpretation of this data

would have to suggest that the associative strength established during the pairings persisted at the same level beyond four weeks, an interpretation at variance with the literature on paired associate learning.

While the present results do not support a distant associate interpretation of the obtained effect, they are not incompatible with a classical conditioning interpretation. It would be expected that forgetting of associates would occur; however, if classical conditioning of attitudes is actually involved, it would not be expected that extinction of counter-conditioning would occur to any great extent. Either process would involve the presentation of the trigrams in the absence of the meaningful words used in the study, which is an unlikely event except to the extent that generalization would occur between the trigrams and meaningful words used by the subjects between experimental sessions.

It should be pointed out that whether an implicit verbal response helps mediate the rating of the CS word in a conditioning of meaning paradigm is not at issue here. Several sources of evidence suggest this is the case. Thus, Yavuz and Bousfield found that the ratings of the Turkish words when subjects could recall the experimentally established associates were 1.66 and 6.16 for the words paired with positive and negative response items respectively, while the ratings were 3.28 and 4.54 respectively when the associates were not recalled. A similar finding occurred in the present study. The means of the individual subject means for the 1-week recall groups, most comparable to the Yavuz and Bousfield situation, indicated that the positive and negative trigrams had mean ratings of 3.18 and 4.65 when the associate was recalled and mean ratings of 3.69 and 3.64 when it was not.[2] Further, Pollio (1963) demonstrated that Staats' conditioning of meaning procedure (Staats and Staats, 1957), designed to experimentally control the formation of direct associates by pairing each syllable once with a number of words sharing a common semantic component, was ineffective in this respect, in that subjects could typically recall about 50% of the words

paired with each syllable.

In fact, it is possible that the existence of implicit direct associates following the conditioning of meaning (or attitudes) procedure is one of the major variables accounting for the failure to demonstrate some of the phenomena predicted by the classical conditioning model, e.g., extinction of conditioned attitudes (Insko and Oakes, 1966; Miller, Gimpl, and McCrimmon, 1969; Miller and Clark, 1969; Miller and Baraness, 1969). If the trigram tends to elicit one or more of the meaningful response items paired with it during the conditioning phase, then "extinction" trials conducted immediately afterward should have no weakening effect upon the conditioned attitudinal response--if anything, repetition of the syllable may have a strengthening effect, in that the trigram is being further paired with the meaningful word, this time elicited implicitly. It is suggested that a more meaningful test of the extinction hypothesis would involve the presentation of extinction trials after a sufficient period of time had elapsed so that direct associates were no longer occurring.

FOOTNOTES

[1]The technical assistance of Samuel I. Shapiro in constructing the paired-associate learning task is gratefully acknowledged. The authors also would like to thank Marilyn R. Goldberg, Charleen A. Higa, and Gary D. Montgomery for their assistance in collecting the data.

[2]It is suggested that the greater differences obtained between nonsense words paired with positive and negative response items when subjects could recall the meaningful associate in the Yavuz and Bousfield study as compared to the present study is probably due to instructional differences. The response items in the earlier experiment were presented to subjects as the English translations (or meanings) of the Turkish words. These instructions probably increased the use of the response item as a mediator one week later when subjects were asked to rate the meaning of the Turkish words on the semantic differential.

FIGURE CAPTIONS

Fig. 1. Mean number of positive and negative associates recalled as a function of weeks since initial learning.

Fig. 2. Mean SD ratings for trigrams paired with positive and negative words as a function of weeks since initial learning.

Fig. 3. Mean SD ratings across weeks for trigrams paired with positive and negative words when the experimentally established associate was not recalled.

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13. ABSTRACT

The extent to which semantic differential ratings of trigrams remain consistent over a four week retention period following pairing with positive or negative attitudinal words was determined. The trigrams initially served as stimulus items in a paired associate list consisting of both positive and negative evaluative response terms, and rating and recall periods were presented to five independent groups at the end of zero, one, two, three, and four week retention intervals. The mean ratings for syllables paired with positive words and the syllables paired with negative words tended to converge across the four-week retention period. However, when the ratings were adjusted for the number of associates recalled, either statistically or experimentally, no evidence of systematic change in the ratings across time was obtained. These results were interpreted as supporting a classical conditioning interpretation of attitude formation as opposed to a word association interpretation.

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