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ABSTRACT

The mediating role of learning in the relationship between repeated exposure and affect was explored and supported in three experiments involving a total of 229 undergraduate participants. It was found that both learning and affect measures behaved in essentially the same way as a function of exposure duration (experiments I and III), serial position (experiments I and II), rating delay (experiment I) and stimulus properties (experiment I). These results suggest learning may be intrinsically rewarding, and clarify one of the mechanisms involved in the relationship between exposure frequence and effect, extending Berlyne's (1970) two factor theory of "mere exposure" effects. (Author)

THE EFFECTS OF "MERE EXPOSURE" ON LEARNING AND AFFECT

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Of the various theories of the effects of repeated exposure on affect, perhaps the most promising is the two factor theory proposed by Berlyne (1970). The essence of this theory is that the operation of one psychological factor accounts for enhancement of affect with repeated exposure, while the operation of another factor accounts for decrement in affect with repeated exposure. Because the theory can account for increasing, decreasing and inverted U-shaped functions, it seems *a priori* better than the popular single factor theories which only predict increasing (classical conditioning and response competition hypotheses) or inverted U-shaped functions (the various arousal theories) and which, incidentally, have received equivocal experimental support. Clearly, however, the two-factor theory will not have much predictive utility until those variables influencing the operation of each factor are specified.

Perhaps the most likely candidate for Berlyne's "positive habituation" factor--the factor responsible for enhancement of affect--is learning. Links between learning and affect have been shown by Munsinger and Kessen (1966), Matlin (1971) and James Crandall (personal communication); the remarkable resemblance between the well known learning curve and the typical result of Zajonc-type "mere exposure" experiments when plotted on nonlog paper is unlikely to be a coincidence. Nevertheless, the role of learning in the familiarity-affect relationship seems to have been overlooked by most previous investigators. Harrison and Crandall (1972a & b) have examined some of the parameters influencing the satiation factor. The present paper reports three experiments concerning the learning factor in the relationship between familiarity and affect.

Experiment I

The first experiment investigates the effect of exposure frequency and serial position on learning and affect, as well as examining the effect of rating delay on these two variables. Some delay between exposure and rating has previously been shown to be a necessary condition for repeated exposure to enhance affect (Stang,1973).

Method

Subjects

Subjects (Ss) were 46 male and female students drawn from the introductory psychology subject pool at Syracuse University.

Stimuli

Stimuli were 16 of the Turkish adjectives used by Solomon & Postman (1952), Johnson,Thomson,&Frincke(1960), Zajonc(1968) and others.

Procedure

After being told they were participating in a study of verbal learning, pairs of Ss viewed the Turkish words on DEC VB10C display screen linked to a PDP-10 computer, and rated them for pleasantness on a 7-point scale. The 16 Turkish words were systematically counterbalanced against four exposure frequencies (1,4,16 or 64 consecutive one second exposures) and four rating delays (1,4,16 or 64 seconds between last exposure and rating). Following this first set of affective ratings, Ss completed a first recall measure in which they were requested to list as many of the words as they could. A second recall measure was then administered, this one requiring Ss to complete the spelling of each of the Turkish words, given the first five letters. Finally, about five minutes after completing the first affect measure, Ss were given a second 7-point pleasantness scale. Two weeks later, Ss returned and completed a third measure of recall (this one identical to the second measure) and a third measure of affect.

Results

The first type of analysis to be described examines the effects of the manipulation of exposure duration and interval between exposure and first affect rating on the dependent variables of recall and affect. Data from each measure were analyzed by sorting the ratings obtained into the appropriate cells of a 16 x 16 matrix, with the rows representing the 16 Turkish words and the columns representing the 16 combinations of the four levels of each of the two independent variables. All values within a given cell of the matrix were pooled.

A separate 4 x 4 repeated measures anova was performed for each of the six measures, treating the words as "subjects" in the analysis. Rating delay (1,4,16 or 64 seconds) was expected to have an effect only on the first affect measure, but was included as a variable in all six analyses. These analyses indicated that neither exposure duration nor rating delay nor the interaction of these two variables had any effect approaching significance on any of the three affect measures. Anovas for each of the three recall measures indicated that neither exposure duration nor rating delay had significant main effects, but the interaction of these two factors was significant. This interaction appeared to be the result of words at the ends of the series being recalled with a higher probability than words occurring in the middle. Although a serial position effect had not been anticipated, the design of the experiment made it possible to statistically examine such an effect. This is described below.

Stimuli had been exposed in such a way that each exposure frequency occurred once in each of four blocks of trials. By ignoring the initial variable of rating delay (1,4,16 or 64 seconds), it was possible to examine the independent effects of exposure duration and serial position. In order to directly compare learning and affect scores, scores on each of the six measures were standardized (mean = 50, standard deviation = 10). All six measures were then included in a single anova by considering each measure as one of six possible combinations of two variables: type of measure (learning or affect) and rating delay (either obtained immediately after exposure, approximately 5-10 minutes after exposure, or two weeks after exposure). Again treating words as "subjects", a 4 x 4 x 2 x 3 repeated measures anova was then performed, with the within "subjects" variables being exposure duration, serial position, type of measure and rating delay. Results are summarized in Table 1.

Insert Table 1 about here.

As it had appeared from an examination of the means, there was a significant ($F=7.413$, $df=3/45$, $p < .01$) main effect due to serial position, items being learned and liked better when they occurred at the ends of the list than when they occurred in the middle. The main effect of serial position may be inferred from Figure 1.

Insert Figure 1 about here.

Further, as originally hypothesized, there was a significant ($F=2.847$, $df=3/45$, $p < .05$) main effect due to exposure duration. This effect was apparently swamped by serial position in the earlier anovas reported. This main effect may be inferred from Figure 2.

Insert Figure 2 about here.

Because scores on each measure had been standardized, no main effect could be expected for type of measure (recall vs. affect) or rating delay between exposure and measure (no delay, 5-10 minutes, or two weeks) and none was found. The interaction of serial position and exposure duration was not significant ($F=.962$).

The interaction of serial position and type of measure was significant ($F=4.284, df=3/45, p < .01$) (see Figure 1) and seems to be the result of a less pronounced bowing in the affect curve than in the recall curve. If the two factor theory is correct, serial position determines learning which in turn determines affect. Thus the two factor theory accounts for the observation that the relationship between serial position and learning is stronger than the relationship between serial position and affect.

Further, the interaction between serial position and rating delay was significant ($F=2.430, df=9/60, p < .05$). This interaction is presented in Figure 3 and reveals that

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Insert Figure 3 about here.

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the serial position effect on learning and affect dissipates over time, being strongest when learning and affect are measured immediately, and weakest when they are measured with a two week delay.

One remaining interaction approaches significance ($F=2.071, df=9/60, p < .08$) and is rather remarkable. This is the interaction of exposure duration and rating delay. Exposure duration evidently had no main effect on learning and affect when ratings were made immdeiately, but after 5-10 minutes, the predicted effect occurred and remained strong after two weeks (see Figure 2). This finding may shed light on an analysis of the literature (Stang,1973) indicating that repeated exposure does not enhance immediate affective ratings, but does enhance delayed ratings. Apparently when ratings are made immediately , all stimuli are equally well remembered and consequently affective ratings are not affected by exposure duration. However, after a short delay, recall does covary with exposure duration, and consequently exposure duration covaries with affective ratings.

Two other interactions which are not significant are of interest: the lack of a triple interaction of serial position with type of measure and delay and the lack of a triple interaction of exposure duration, type of measure and delay. Lack of interaction here indirectly indicates that all of the measures are positively correlated and behave in essentially the same way when affected by serial position and exposure duration. This covariation of the six measures is discussed below.

Since it would be difficult to think about all of the correlations between the six measures simultaneously, a canonical correlation was computed to facilitate generalizations regarding the extent and nature of the interrelationships between the three recall measures and three affect measures. As may be seen from Table 2, a single canonical correlation

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Insert Table 2 about here.

(R_c) was significant (R_c=.7768,df=5,p $<$.05). Examination of the correlations between the six measures and their respective canonical factors for this first root suggests a straightforward relationship between the two sets of measures, with all correlation positively and substantially with their canonical factors. Further, the third affect and third recall measure, as evidenced by the weights in the present analysis, are most closely related to these factors. The redundancy of the measures which is displayed in the first canonical factors is $R_d$affect = .3014; $R_d$recall=.3749. The magnitude and similarity of these values suggests that the recall and affect factors simultaneously possess discriminant validity and are useful mutual predictors, with affect being a slightly better predictor of recall than vice versa.

Experiments II and III

Two other experiments, reported in more detail elsewhere (Stang,1973), provide conceptual replications of experiment I. Experiment II used different stimuli, a different testing situation, a different mode of presenting the list, and different measures of learning and affect. Ss (115 undergraduates) were given , en masse, a list of trigrams printed on a sheet of paper to study. Across stimulus pages, stimuli were counterbalanced with serial position. One half were then tested for recall while the other half made affective ratings. Items were recalled best and liked most when they occurred at the beginning of the list, and least when they occurred at the end (see Figure 4). This devia-

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Insert Figure 4 about here.

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from the typical serial position effect may have resulted from greater attention to early items than to later ones, but the link between learning and affect was again confirmed.

Experiment III provided 68 undergraduate Ss with a stimulus page of haphazardly scattered Turkish words in the frequencies of 0,1,2,4,8 or 16 occurrences. Ss studied the page for five minutes, then tried to recall the words, and finally made affective ratings. Both affect and recall measures described the typical learning curve as a function of exposure frequency.

Summary and Discussion

The results of the three experiments are summarized as follows: 1) Given a delay between exposure and rating, both recall and affect measures take the form of the typical learning curve as a function of repeated exposures (experiments I and III). With no delay between exposure and rating, however, repeated exposure has no effect on either recall or affect measures (experiment I). 2) With exposure frequency held constant, identical serial position effects are observed in both recall and affect measures (experiments I and II), the nature of the effect dependent on how the list is presented. The effect is slightly stronger on recall than affect, and stronger with immediate than with delayed ratings (experiment I).

Evidence at present seems to support the theoretical statements made below.

1. Learning accompanies repeated exposure to a stimulus.

2. Learning is intrinsically rewarding. That is, learning about a given object generally increases the positive affect or decreases the negative affect felt toward that object.

3. Consequently, organisms will seek to expose themselves to objects they can learn about, in order to obtain this positive reinforcement. These unlearned objects are usually called "novel stimuli", and this intrinsically motivated self-exposure is referred to as "exploration". This position explains why familiar objects are liked, while novel objects are explored, a metaphysical difficulty experienced by those who assume that approach invariably signals liking.

4. There is another factor which also determines exploration of novel objects, and that is satiation or boredom. When an organism has learned to recognize an object, and the learning curve reaches a plateau, satiation (an aversive state) begins to build and motivates the organism to expose itself to other less well learned stimuli.

5. Under ideal circumstances, an organism would not explore an object long enough for satiation to build.

The typical result of such voluntary self-exposure would show affect toward an object following the same shape as the typical learning curve. However, under constrained conditions, repeated exposure would cause affect to finally deviate downward from the asymptote of the learning curve, taking the form of an inverted U. Since satiation dissipates more rapidly than forgetting occurs, the effects of rating delay and exposure paradigm differendes are thus explained.

6. Simple stimuli are learned faster and therefore satiate more quickly than complex stimuli. Hence under constrained, prolonged exposure, simple stimuli are more likely to show inverted U-shaped curves than are complex stimuli.

7. Learning about a stimulus entails relating that stimulus to previous learning. "Latency to first free association", the measure most commonly used in response competition studies, is therefore an indirect measure of learning. Rather than showing a decrease in "response competition" with repeated exposure, these studies may be interpreted as having offered indirect evidence for increases in learning with repeated exposure.

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Footnotes

1. This paper is based on part of a doctoral dissertation written at Syracuse University. The author is very deeply indebted to his advisor, Edward J. O'Connell. Requests for reprints should be sent to David J. Stang, Psychology Department, Syracuse University, Syracuse, New York, 13210.

TABLE 1

Analysis of Variance: Experiment I

Source	df	MS	F
Between (words)	15	1290.4	
Within	1520	86.4	
Serial position (A)	3	1191.667	7.413*
error (A)	45	160.756	
Exposure duration (B)	3	517.667	2.847*
error (B)	45	181.822	
Type of measure (C)	1	2.000	.005
error (C)	15	432.200	
Delay (D)	2	4.000	.042
error (D)	30	94.733	
A x B	9	141.667	.962
error A x B	135	147.289	
A x C	3	592.667	4.284*
error A x c	45	138.356	
A x D	9	159.000	2.430*
error A x D	60	65.433	
B xC	3	23.000	.277
error B X C	45	83.156	
B x D	9	141.000	2.071**
error B x D	60	68.089	
C x D	2	4.000	.052
error C x D	30	76.533	
A x B x C	9	56.667	.587
error A x B x C	135	96.548	
A x B x D	18	56.778	1.045
error A x B x D	270	54.356	

TABLE 1 concluded

Source	df	MS	F
A x C x D	6	75.333	1.820
error A x C x D	90	41.400	
B x C x D	6	83.000	1.759
error BxCxD	90	47.178	
A x B x C x D	18	45.772	.925
error AxBxCxD	270	49.452	

*$p < .05$

**$p < .08$

TABLE 2

Canonical Correlation: Experiment I

Relationships between the canonical variates

canonical root	R_c	df	p	$R_d$affect	$R_d$recall
1	.7768	5	.0416	.3014	.3749
2	.4950	3	.3192	.0086	.0509
3	.2280	1	.5805	.0242	.0089

Relationships between the individual measures and their respective canonical variates for the first root

measure	correlation with first canonical variate	weights
affect #1	.6309	-.0099
affect #2	.5903	-.5192
affect #3	.8671	.8546
recall #1	.7300	.4866
recall #2	.7152	.3250
recall #3	.9052	-.8109

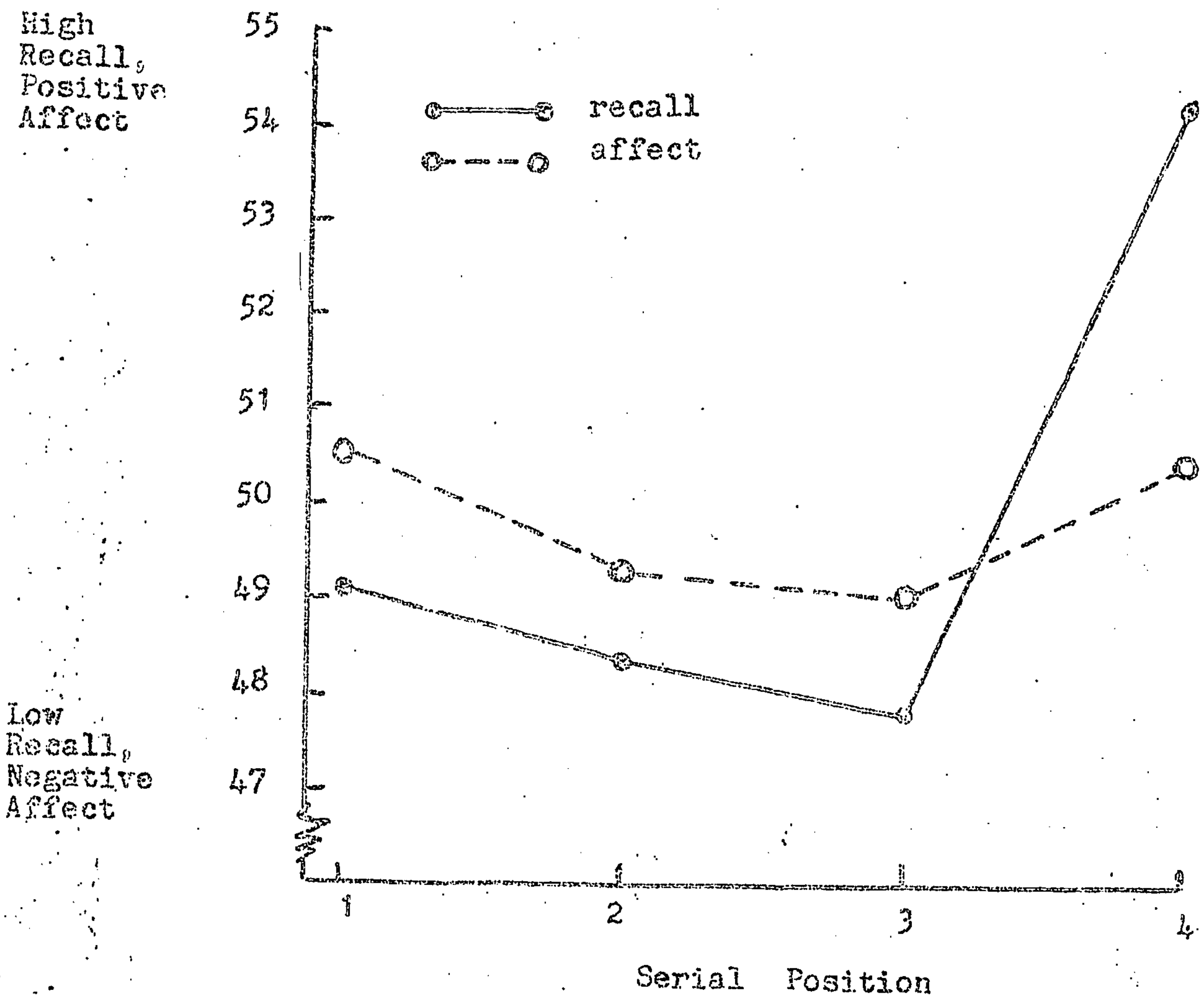

Figure 1. Interaction of serial position and type of measure in experiment I.

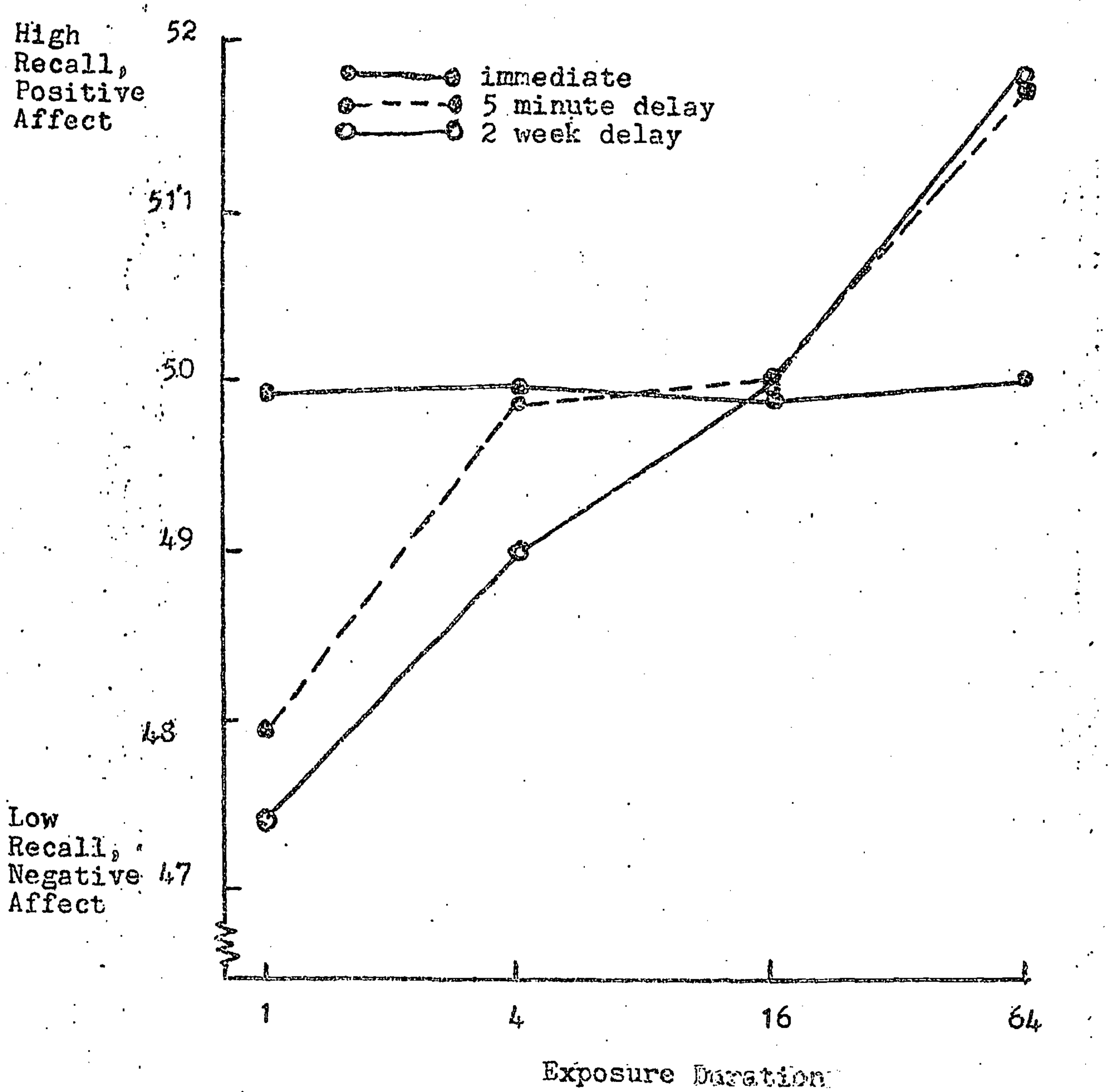

Figure 2. Interaction of exposure duration and rating delay in experiment I.

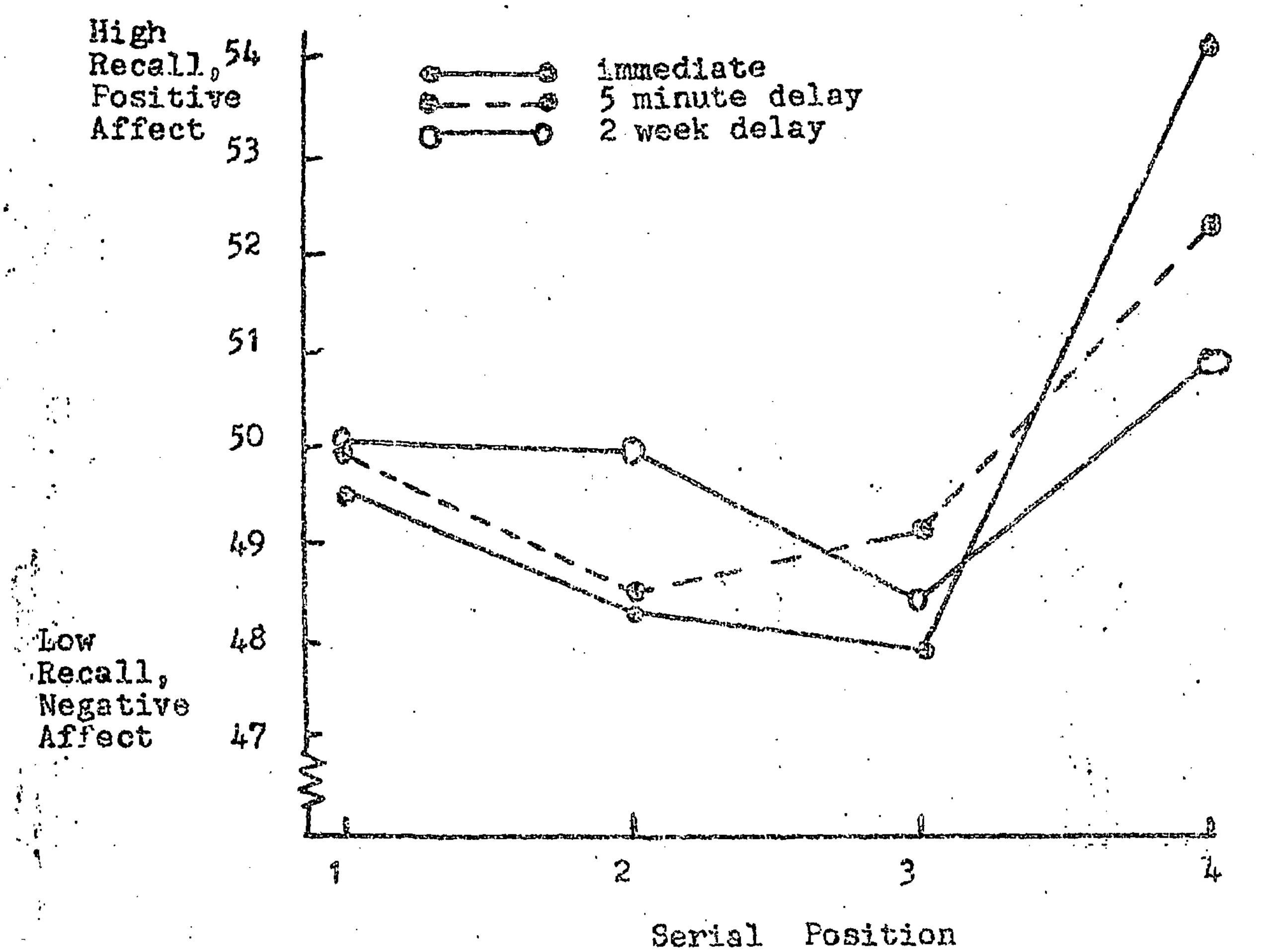

Figure 3. Interaction of serial position and rating delay in experiment I.

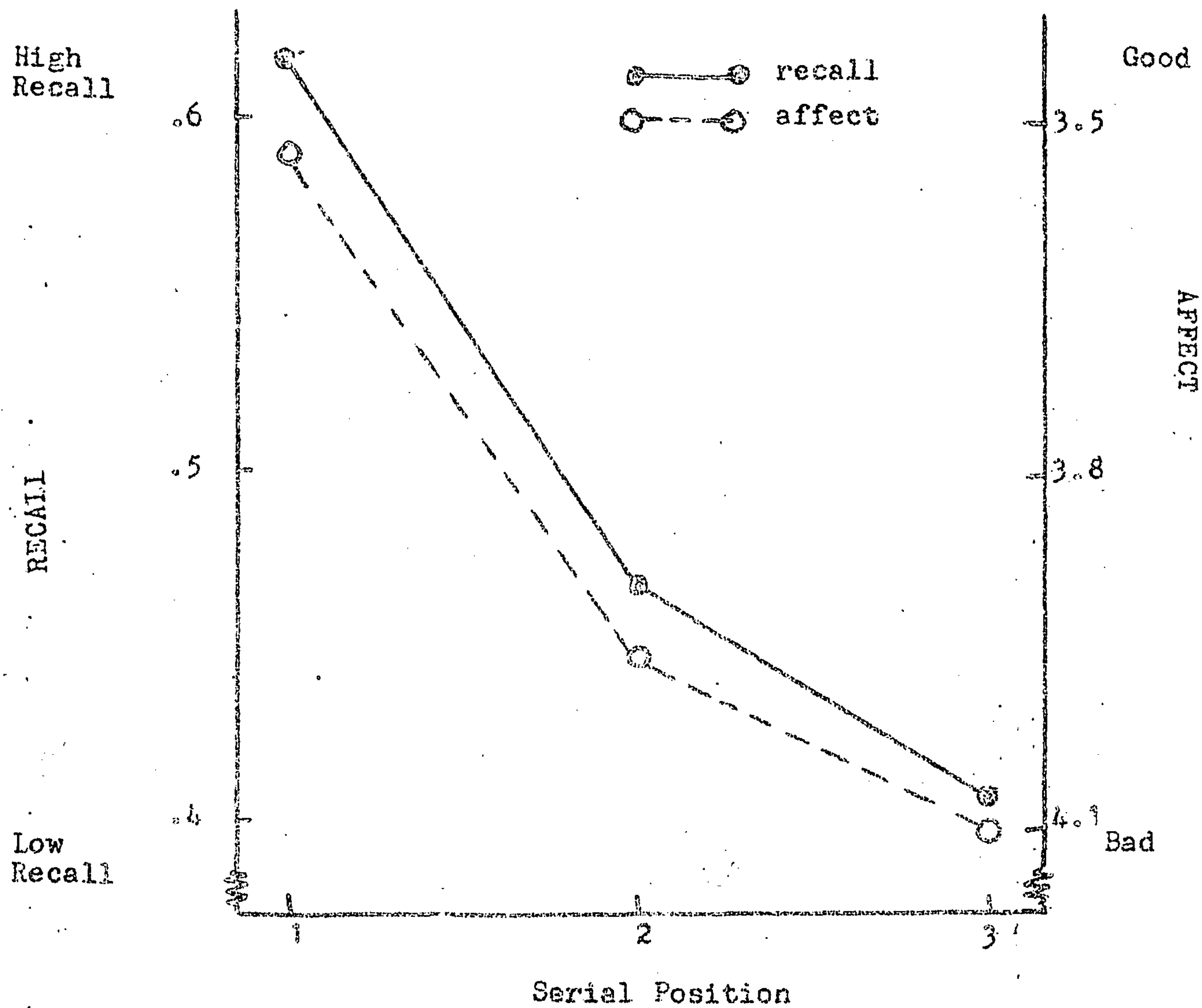

Figure 4. The effect of serial position on recall and affect in experiment II.