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Effects of "Mere Exposure" on Learning and Affect

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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 1 and 3), serial position (Experiments 1 and 2), rating delay (Experiment 1) and stimulus properties (Experiment 1). These results suggest learning may be intrinsically rewarding and clarify one of the mechanisms involved in the relationship between exposure frequency and affect, extending Berlyne's two-factor theory of the effects of stimulus familiarity.

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) and Stang (1973a, 1973b). The theory posits that a learning and a satiation factor have additive, antagonistic roles in determining the effects of repeated exposure on affect. The theory suggests that repeated exposure is accompanied by learning about the stimulus, which in turn increases the pleasantness of the stimulus exposed; once the stimulus is learned, a boring unpleasant state of satiation is hypothesized to develop, causing a depression of affect ratings. Conditions of repeated exposure which favor the operation of the learning factor and minimize satiation (e.g., distributed exposure of complex, novel stimuli with delayed affect ratings) would be expected to produce a frequency-affect function resembling the learning curve, while conditions favoring the operation of first the learning and then the satiation factors would theoretically result in an inverted U-shaped function.

There have been several previous demonstrations of links between learning and affect. There are reports that recognized paralogs were rated as more pleasant than unrecognized ones (Matlin, 1971), that recalled paralogs were rated as more pleasant than unrecalled ones (Stang, 1973b), that first syllables were liked better when followed by recalled than by nonrecalled syllables (Crandall, Note 1), that preference for differing orders of approximation to English was correlated with recall (Munsinger & Kessen, 1966), and that rated goodness of trigram pairs was positively correlated with degree of paired associate learning (Rajecki & Hodes, Note 2). In spite of this evidence, the role of learning in the relationship between familiarity and affect has been largely ignored by previous investigators. The present article focuses on the mediating role of learning in the familiarity-affect relationship.

Experiment 1

The first experiment investigated the effects of exposure duration, serial position, and rating delay on learning and affect. From the two-factor theory, it might be expected that each of these variables might have effects on learning, and hence on affect.

Method

Subjects

Subjects 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 and Postman (1952), Johnson, Thomson, and Frincke (1960), Zajonc (1968), and others.

Procedure

After being told they were participating in a study of verbal learning, pairs of subjects viewed the

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Turkish words on a 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 durations (1, 4, 16, or 64 consecutive one-second exposures with effectively no interexposure interval) and four rating delays (1, 4, 16, or 64 seconds between last exposure and rating). Following this first set of affect ratings, subjects 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 subjects to complete the spelling of each of the Turkish words, given the first five of the seven letters in each word. Finally, about five minutes after completing the first affect measure, subjects were given a second 7-point pleasantness scale. Two weeks later, subjects returned and completed a third measure of recall and a third measure of affect, both identical to the second measures.

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 16×16 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 4×4 repeated measures analysis of variance was performed for each of the

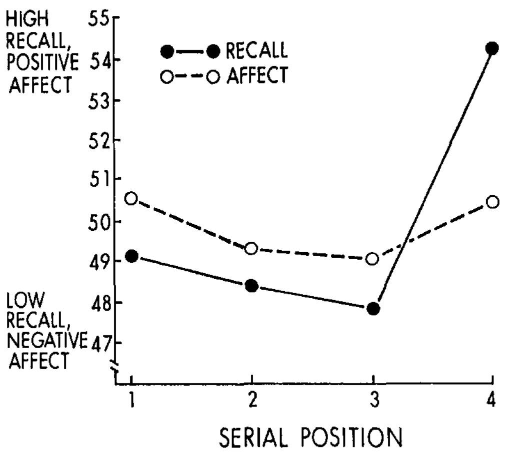

FIGURE 1. Interaction of serial position and type of measure in Experiment 1.

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. Analyses of variance 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 examine statistically 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 compare directly learning and affect scores, scores on each of the six measures were standardized, $M = 50$, $SD = 10$. All six measures were then included in a single analysis of variance 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 $4 \times 4 \times 2 \times 3$ repeated measures analysis of variance was then performed, with the within subjects variables being exposure duration, serial position, type of measure, and rating delay.

As it had appeared from an examination of the means, there was a significant, $F(3, 45) = 7.413$, $p < .01$, 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 can be inferred from Figure 1.

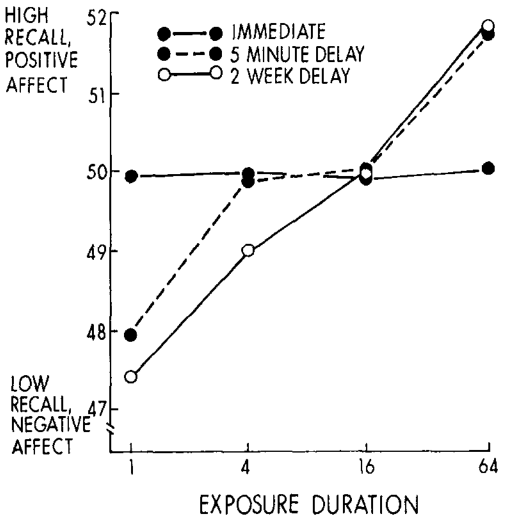

FIGURE 2. Interaction of exposure duration and rating delay in Experiment 1.

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

Because scores on each measure had been standardized, no main effect could be expected for type of measure (recall versus 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, $F(3,45) = 4.284$, $p < .01$, (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, and serial position determines learning which in turn determines affect, the theory accounts for this finding that the effect of serial position on learning is stronger than the effect of serial position on affect.

Further, the interaction between serial position and rating delay was significant, $F(9,60) = 2.430$, $p < .05$. This interaction is presented in Figure 3 and reveals that 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 approached significance, $F(9,60) = 2.071$, $p < .08$, 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 immediately, but after 5–10 minutes the predicted effect occurred and remained strong after two weeks (see Figure 2). It has been shown previously that exposure duration and recall covary only with some interval between exposure and rating (Hellyer, 1962) and that exposure duration and affect covary only with such an interval (Harrison & Crandall, 1972; Stang, 1974). The present simultaneous demonstration of both effects lends plausibility to the hypothesis that differential recall mediates the relationship between exposure frequency and affect.

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.

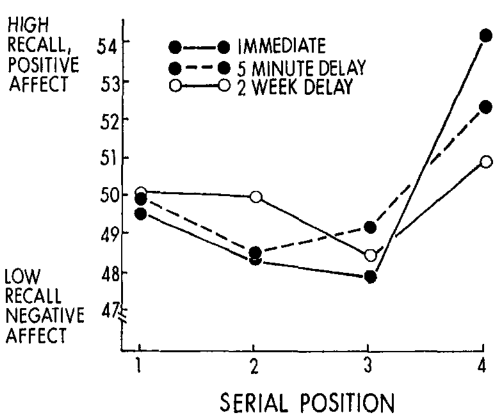

FIGURE 3. Interaction of serial position and rating delay in Experiment 1.

TABLE 1

RELATIONSHIPS BETWEEN THE CANONICAL VARIATES IN EXPERIMENT 1

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

Since it would be difficult to think about all of the correlations between the six measures simultaneously, a canonical correlation[1] was computed to facilitate generalizations regarding the extent and nature of the interrelationships between the three recall measures and the three affect measures. As can be seen from Tables 1 and 2, a single canonical correlation was significant, $R_c(5) = .78$, $p < .05$. 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 correlating positively and substantially with their canonical factors. Further, the third affect and third recall measures, 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 2 AND 3

Two other experiments provide conceptual replications of Experiment 1. Experiment 2 used different stimuli, a different testing situation, a different mode of presenting the list, and different measures of learning and affect. Subjects (115 undergraduates) were given, en masse, a list of trigrams printed on a sheet of paper to study. Across stimulus pages,

TABLE 2

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

stimuli were counterbalanced with serial position. One half were then tested for recall while the other half made good–bad ratings on 7-point scales. Items were recalled best and liked most when they occurred at the beginning of the list, while items were recalled and liked least when they occurred at the end (see Figure 4). This deviation 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 3 provided 68 undergraduate subjects with a stimulus page of haphazardly scattered Turkish words in the frequencies of 0, 1, 2, 4, 8, or 16 occurrences. Subjects studied the page for five minutes, then tried to recall the words, and finally made affect ratings. Both affect and recall measures described the typical learning curve as a function of exposure frequency.

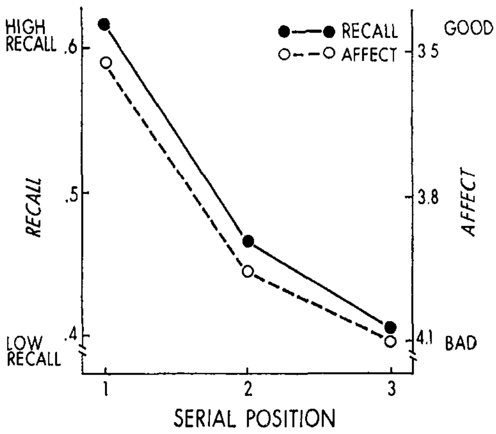

FIGURE 4. The effect of serial position on recall and affect in Experiment 2.

[1] Discussions of the canonical correlation can be found in Cooley and Lohnes (1971), Stewart and Love (1968), Van de Geer (1971), and Veldman (1967).

GENERAL DISCUSSION

The three experiments reported here support the hypothesized mediating role of learning in the relationship between exposure frequency and affect, since both learning and affect measures behaved in essentially the same way as a function of exposure duration or frequency (Experiments 1 and 3), serial position (Experiments 1 and 2), rating delay (Experiment 1), and stimulus properties (cf. the canonical correlation of Experiment 1). The results of the present experiments, therefore, can be viewed as evidence that learning is intrinsically rewarding.

With little difficulty, the two-factor theory can be extended to explain exploratory behavior (see Stang, 1973a, 1973b). First, since novel stimuli are less well learned than familiar stimuli, more learning about them is possible, and learning about them is consequently more reinforcing than learning about other relatively familiar stimuli. The learning factor would thus be expected to cause the organism to *approach* novel stimuli. Second, when an organism has learned to recognize an object, satiation begins to build and motivates the organism to expose itself to other less well learned stimuli. Thus the satiation factor induces the organism to *avoid* familiar stimuli. The two-factor theory thus provides a point of convergence for those theorists (and their data) who explain exploration in terms of approach tendencies (e.g., Dember, 1961) and those who explain exploration in terms of avoidance tendencies (e.g., Glanzer, 1958).

Several important questions await answers. First, there is some previous evidence that stimulus affect plays a role in learning and memory, and one might speculate that subjects in these experiments learned what they liked, rather than vice versa. This seems an unlikely explanation of the similar effects of serial position, exposure duration, and rating delay on recall and affect, since counterbalanced designs were used, but may account for some portion of the covariation represented by the canonical correlation. Logical rather than experimental analysis may be required to disentangle the causal direction between these two intervening variables.

A second and perhaps more promising direction for research may lie in determining the relative merits of the response competition hypothesis (e.g., Harrison, 1968; Matlin, 1971) and the two-factor theory. Further research may show that the various measures of response competition are merely unusual measures of learning, merging the data if not the rhetoric of these two theoretical positions.

Other research might be profitably directed at the satiation factor. The physiological process underlying satiation in the present theory may ultimately prove to be the same as the process underlying Hull's notion of reactive inhibition (Hull, 1943), Glanzer's notion of stimulus satiation (e.g., Glanzer, 1958), and Lambert and Jakobovits's notion of semantic satiation (Jakobovits & Lambert, 1964; Lambert & Jakobovits, 1960).

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