Affect and acquisition: List learning of nouns as a function of like-dislike ratings

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Five list-learning experiments demonstrated that Ss' idiosyncratic like-dislike (L-D) ratings of high-frequency nouns were related to recall. Recalled (R) nouns received significantly more positive ratings than nonrecalled (NR) ones, and there emerged a reliable interaction effect between the time of rating (before or after study-recall) and the ratings for the R and NR words. Also, during early learning trials, the order of learning across trials and the L-D rating of the nouns, were directly related. The L-D ratings were shown not to be correlated with the stimulus characteristics of imagery, concreteness, and meaningfulness. These findings were related to memory, attention, and learning models, which characterize the learner as an active information processor concerned with one aspect of the *pertinence* of stimulus input.

How a S "feels" about the material he is asked to learn will affect his efficiency in learning. This was one hypothesis tested in a series of experiments designed to explore the relationships between affect and acquisition in a verbal learning situation. Also investigated was the possibility that the learning process itself may change the rated value of the material learned. Some studies have shown that what is correctly recalled from memory storage may be affected by emotional factors related to the learning experience (e.g., Weiner, 1966), with little emphasis on differentiation of storage and retrieval mechanisms. In most cases, acquisition and retention have not been separated for study (Rapaport, 1947). In the experiments reported here, the acquisition phase of the process was identified as the change in behavior from Trial n to Trial $n+1$, as measured in a free-recall (FR) situation with a constant retention interval (Melton, 1963).

In this area of investigation, the measurement of affect has often been unclear (Rapaport, 1947). Emotionality of the learners vs affect of the material to be learned (as perceived by the learner) have seldom been clearly differentiated. General attitudinal effects, over various periods of time, have confounded specific effects dealing with the source of affect and the processing component involved (Fitzgerald & Ausubel, 1963; Levine & Murphy, 1943). In short, the distinction between the emotionality of the learner and the perceived affect of the material to be learned has seldom been made. Some early investigations, furthermore, left the designation of the "pleasantness" of various learning materials entirely up

to the judgment of E rather than S (e.g., Tolman, 1917).

Early studies, however inadequate, generally suggest that the acquisition process is affected by emotional components. Recent work in the study of the dimensions on which words are encoded (Wickens, 1970) has neglected the affect dimension, although its role in information processing seems critical (Zajonc, 1970). Zajonc has shown that experience ("mere exposure") with stimulus materials changes the like-dislike (L-D) ratings of the materials by the learner. This change in affect as a result of familiarity has not been clearly related to the learning process. The experiments reported here were performed to begin to find the place of affect in a learning information-processing scheme.

EXPERIMENT 1

Design

The first investigation was a group experiment in which Ss were required to study in a free-learning (stimuli to be learned were presented simultaneously to S) situation and to free-recall 30 nouns. The nouns were rated on the L-D scale by independent groups either before (PRE) or after (POST) the study-recall sequence. The resulting design was a 2 by 2 factorial, with a between factor of time of rating (PRE-POST) and the within factor of recallability (recalled, R; nonrecalled, NR) and with rating score as the dependent measure.

Subjects

Sixty-four male and female students in an introductory psychology course at Oakland University participated. There were 30 Ss in the PRE group and 34 in the POST group, with an equal number of males and females per condition.

Procedure

Two group sessions were conducted, one for each of the PRE and POST conditions. When all the Ss were assembled in a classroom, E distributed stapled packets of mimeographed information which included rating instructions, rating scales, study instructions, the list of words to be learned, and a page for recording recalled words. Each aspect of the procedure was kept separate from the subsequent steps so that the PRE group, while rating, did not know that the learn-recall step was to follow nor did the POST group, during study-recall, know that the rating task would occur.

The rating scale provided for each word consisted of a solid horizontal line, 10 cm long, with a zero at the left end (and the words "dislike very much") and a 10 at the right end (and the words "like very much"). The numeral 5 indicated the center of the line, and the word to be rated was to the left of the zero. For the rating task, S was told to (1) consider each word individually, (2) consider each word in its noun form (as a person, place, or thing), (3) think of each noun and what it represented ("to you") in terms of how much the noun was liked or disliked, and finally (4) draw a vertical line on the scale at that point which represented how much he liked or disliked that word and/or what it suggested to him. S was given 3 min to rate the words. The rating score was determined by measuring, in centimeters, the distance from the left end of the scale to the intersection of the vertical line drawn by S and the scale line. Two randomly determined orders of the list were used.

For the learning-recall phase, S was instructed to study, so that he could subsequently recall, the list of nouns. Two minutes were allowed for study of the list. Two random orders (different from the rating orders) were presented and equally distributed among Ss and between the PRE and POST conditions. S was instructed that when the time for studying was up he would be told, and that he should then turn the page in his packet and in 1 min write down, in the order of recall, all the words he could remember. The list studied consisted of words randomly selected from all five- or six-letter AA nouns from the compilation by Thorndike & Lorge (1944).

Results

A mean L-D rating on both R and NR words for each S was obtained. A one-between-factor (PRE, POST), one-within-factor (R, NR) analysis of variance was computed on the overall means of these like-dislike ratings

(Myers, 1966). The mean ratings for the R-PRE, R-POST, NR-PRE, NR-POST conditions were, respectively, 7.1, 6.8, 6.6, 6.2. The statistical analysis indicated a significant main effect for the R,NR factor, $F(1,62) = 34.58$, $p < .001$, with R words receiving a higher (more liked) rating than NR words. No significant PRE,POST or interaction effects were revealed.

EXPERIMENTS 2 AND 3

Design

The results of the first experiment suggested that words rated more positively were more likely to be recalled correctly in a free-learning free-recall situation. Since the POST rating was not significantly different from the PRE rating, it would seem that the like-dislike rating affects learnability-recallability, rather than the other way around. However, the design in Experiment 1, and especially the free-learning procedure, makes it unclear whether more-liked words are studied more or differently and are, therefore, more-learned and recalled. This second experiment attempted to make this differentiation by structuring the learning situation more so—specifically, by controlling the presentation time of the individual words in the list. With this modification, the design of this second experiment was a 2 by 2 factorial with the PRE-POST,N-NR factors.

Subjects

The Ss were 51 male and female students enrolled in an introductory psychology course at Oakland University. The PRE and POST groups comprised 29 and 22 Ss, respectively.

Procedure

Basically, the procedure was the same as that in Experiment 1, except that in Experiment 2, stimuli were individually presented to the Ss, in a group situation for either the PRE or the POST condition, via 35-mm slides and slide projector. Two random orders of the 30 stimuli were presented successively to each group on a screen in the front of the group. The presentation time per noun was 1 sec, with a .5-sec interstimulus interval. Following the presentation, Ss wrote down those stimuli they could recall.

The PRE or POST L-D rating procedure was the same as that in Experiment 1. Ss were given 3 min to rate all of the nouns. The nouns were the same as those used in Experiment 1.

Results

The same statistical analysis used in Experiment 1 was performed on these data. The mean rating for the R-PRE, R-POST, NR-PRE, NR-POST conditions were, respectively, 6.9, 7.1, 6.4, 6.2. The statistical analysis

revealed a significant mean difference for the R-NR factor with $F(1,49) = 59.00$, $p < .001$. As in Experiment 1, recalled words (R) were rated significantly more positively than were nonrecalled (NR) ones. The analysis also revealed a significant interaction between time of rating (PRE,POST) and R,NR dimensions, with $F(1,49) = 5.27$, $p < .05$. This interaction suggested that the ratings of R,NR words were affected by the learning-recall process. The POST ratings seem to be most affected by whether or not the noun is recalled, with POST-R words being rated more positively than PRE-R and POST-NR words being rated less positively than PRE-NR ones.

The reliability of the findings in Experiment 2 was checked in a replication (Experiment 3). A third 2 by 2 factorial design experiment was performed with PRE,POST and R,NR factors and a dependent measure of like-dislike rating. Forty male and female students in an educational psychology course at Oakland University were the Ss in this experiment. There were an equal number of males and females in the experiment and an equal number of PRE and POST conditions. The procedure was the same as that in Experiment 2. The results confirmed the findings of Experiment 2. A mixed-design analysis of variance was performed on the mean like-dislike ratings for the R-NR words for the PRE and POST conditions. A highly significant main effect was observed for the R,NR factor with $F(1,38) = 62.36$, $p < .001$, and, in confirmation of the interaction finding from Experiment 2, a significant PRE,POST by R,NR effect was observed, $F(1,38) = 5.29$, $p < .05$. The mean like-dislike ratings for the R-PRE, R-POST, NR-PRE, N-POST conditions, respectively, were 7.1, 7.3, 6.5, 6.2.

EXPERIMENT 4

Design

This experiment was performed to investigate further the relationship of L-D ratings with the acquisition process when the latter was extended over a number of training-testing trials. The factors of time of rating (PRE,POST) and trials for recalled (R) words were studied in a 2 by 2 mixed-factorial design, with the like-dislike rating as the dependent measure.

Subjects

Forty female undergraduate Ss were equally distributed between the PRE and POST conditions.

Procedure

The Ss were individually run in the experiment. E presented the words to be learned on a screen in front of S.

The words used were the same nouns used in the previous experiments. All 30 nouns were presented in a new random order on each training trial with a presentation time of 1 sec and with .5 sec between stimuli. S was instructed to study, with the intent to memorize, the nouns presented on the screen and then to write down all she could remember on the sheets of paper provided. Four training-testing trials ensued either before (PRE) or after (POST) which S rated each noun on the like-dislike scale.

Results

The mean L-D ratings for the words recalled for the first time per trial were calculated for each S. The means of these were statistically analyzed in a one-between one-within analysis of variance design (Myers, 1966). The means for the PRE condition over Trials 1-4 were, respectively, 6.8, 6.2, 6.1, 6.4, and for the POST condition over the same trials, the means were, respectively, 7.5, 7.1, 6.4, 7.1.

The analysis of variance revealed a significant effect due to time of rating (PRE,POST) with $F(1,38) = 4.84$, $p < .05$, indicating that the POST ratings were significantly higher (more positive) than the PRE ratings. The trials factor was also significant, $F(3,115) = 4.44$, $p < .01$, and the means suggest that the nouns that received the highest affect rating were learned on the first trial. A decrease in the ratings of the R words on Trials 2 and 3 was observed, but an increase occurred on Trial 4. No significant interaction effects were observed.

EXPERIMENT 5

Design

This final study was performed to investigate the relationship between the L-D dimension of stimuli that are to be learned and other S-rated characteristics. Imagery (I), abstractness-concreteness (C), and meaningfulness (m) (Paivio, Yuille, & Madigan, 1968) have been indicated as important stimulus characteristics related to the information processing system. A correlation study was conducted to investigate the relationship between like-dislike ratings and I, C, and m.

Subjects

The Ss were 60 (34 male, 35 female) students enrolled in an introductory psychology course at Oakland University.

Procedure

Thirty Thorndike-Lorge AA nouns (different from those 30 nouns used in the previous experiments, since only 12 of those were contained in the Paivio et al list) were selected randomly from the Paivio, Yuille, & Madigan (1968) ratings of 925 nouns. In the Paivio et al study, Ss were asked to rate nouns on a 7-point scale with

respect to their relationship to sense experience (concreteness) and their ability to arouse nonverbal images (imagery). In this same study, the *m* values of the nouns were estimated by the production method (Noble, 1952), where *S* was asked to produce as many associations as possible in 30 sec to the stimulus word. The like-dislike ratings on the 30 nouns were obtained in the present study in the same way as in the previous experiments. A group rating session was conducted, where all 69 *Ss* rated, on the 0-to-10 scales, all 30 nouns. The nouns were assorted randomly into six random orders, with similar proportions of the *Ss* rating the nouns in one of the six sequences. Packets were assembled containing rating instructions and rating scales containing the nouns. Three minutes were allowed for the rating of the 30 words.

Results

The mean *I* and *C* ratings per word were obtained from Paivio et al. The ranges of these means for the 30 *AA* nouns used in this study were, respectively, 2.50-6.77 and 2.25-7.00. The range for the mean number of words produced per noun for the *m* dimension was 4.60-8.32. The range of mean L-D ratings was 2.06-8.59. The distributions of the means for each of the four measures over the 30 nouns tended to be mildly negatively skewed. For this reason, the extent of correlation was tested by the Spearman rho procedure.

No significant correlations were obtained between the L-D ratings and the *I*, *C*, and *m* factors. The rhos obtained were .10 (*I*), .08 (*C*), and .11 (*m*), where rho necessary at $p = .05$ ($N = 30$) is .36. The lack of correlation suggests that the L-D ratings are reflecting some aspect of the stimulus materials that is not accounted for by these other measures.

DISCUSSION

Affect, as revealed by L-D ratings, appears to be an important aspect of the cognitive encoding-retrieval process. Recent concerns about stimulus characteristics (Wickens, 1970) and other factors in information processing (e.g., Neisser, 1967) have not integrated this dimension into their considerations. In the development of a theory of memory and attention, Norman (1968) has included the concept of *pertinence* of input, suggesting that various expectations of the processor and properties of stimulus input determine

the selectivity of information. One part of this pertinence dimension may be the affect rating of the to-be-processed material. Atkinson & Wickens (1969) have related the concept of pertinence and affective rating to the incentive value of various information. The studies reported in this paper seem to indicate that there is indeed an important and accessible interface between the cognitive and affective aspects of the information processing activity.

The most interesting finding from the studies reported here seems to be the reliable interaction between the L-D ratings and the acquisition-recall process. A simple extrapolation of Zajonc's (1968) finding that L-D ratings increase positively as exposure increases is inadequate to explain the interactive effect. In the first place, Zajonc concludes that the increase in "liking" as a function of exposure does not apply to high-frequency (high familiarity) words. The words used in the present experiments were the most frequently occurring according to the Thorndike-Lorge count. Secondly, while Zajonc found that positive ratings increased with exposure, he had no comparable effect to the depressed ratings for *NR* words: observed here.

The "mere exposure" effect from Zajonc's work, furthermore, postulates the information processor as relatively passive. The affect and acquisition experiments are more in line with the notion that the information processor is much more active in selecting, changing, organizing, and retrieving stimuli that reach a sensory registration level (Kagan, 1967; Norman, 1968; Seligman, 1970). There seems to be at least a partially directed interaction of attitudinal and cognitive systems determining not only that what is "liked" is learned, but also that what is learned becomes "liked."

The interactive effects observed seem to have emerged partly as a result of the fact that the stimulus materials were within-*Ss* ratings. It is unclear whether a general L-D rating, as a distal-stimulus characteristic, could be applied across learners with the same results. The interactive effects may depend on the idiosyncratic nature of such affective responses. Future experiments will attempt to define a more general dimension in this attitudinal category. An approach relating the L-D rating and the evaluative factor in semantic

differential ratings would seem to hold some promise (Osgood, Suci, & Tannenbaum, 1957). The relationship of L-D ratings and other important factors such as imagery will also be investigated.

REFERENCES

- ATKINSON, R. C., & WICKENS, T. D. Human memory and the concept of reinforcement. Institute for Mathematical Studies in the Social Sciences, Stanford University Technical Report No. 145, Psychology Series, 1969.
- FITZGERALD, D., & AUSUBEL, D. P. Cognitive versus affective factors in the learning and retention of controversial material. *Journal of Educational Psychology*, 1963, 54, 74-84.
- KAGAN, J. On the need for relativism. *American Psychologist*, 1967, 22, 131-142.
- LEVINE, J. M., & MURPHY, G. The learning and forgetting of controversial material. *Journal of Abnormal & Social Psychology*, 1943, 38, 507-512.
- LOTT, A. J., LOTT, B. E., & WALSH, M. L. Learning of paired associates relevant to differentially liked persons. *Journal of Abnormal & Social Psychology*, 1970, 16, 274-283.
- MELTON, A. W. Implications of short term memory for a general theory of memory. *Journal of Verbal Learning & Verbal Behavior*, 1963, 2, 1-21.
- MYERS, J. L. *Principles of experimental design*. Boston: Allyn & Bacon, 1966.
- NEISSER, U. *Cognitive psychology*. New York: Appleton-Century-Crofts, 1967.
- NOBLE, C. E. Analysis of meaning. *Psychological Review*, 1952, 59, 421-430.
- NORMAN, D. A. Toward a theory of memory and attention. *Psychological Review*, 1968, 75, 522-536.
- OSGOOD, C. E., SUCI, G. J., & TANNENBAUM, P. H. *The measurement of meaning*. Urbana: University of Illinois Press, 1957.
- PAIVIO, A., YUILLE, J. C., & MADIGAN, S. A. Concreteness, imagery and meaningfulness: Values for 925 nouns. *Journal of Experimental Psychology*, Monograph Supplement, 1968, 76, 1-25.
- RAPAPORT, D. *Emotions and memory*. Baltimore: Williams & Wilkins, 1947.
- SELIGMAN, M. E. P. On the generality of the laws of learning. *Psychological Review*, 1970, 77, 406-419.
- THORNDIKE, E. L., & LORGE, I. *The teacher's word book of 30,000 words*. New York: Bureau of Publications, Teachers College, Columbia University, 1944.
- TOLMAN, E. D. Retroactive inhibition as affected by conditions of learning. *Psychological Monographs*, 1917, 25, Whole No. 107.
- WEINER, B. Motivation and memory. *Psychological Monographs*, 1966, 80, Whole No. 626.
- WICKENS, D. D. Encoding categories of words: An empirical approach to meaning. *Psychological Review*, 1970, 77, 1-15.
- ZAJONC, R. B. Attitudinal effects of mere exposure. *Journal of Personality & Social Psychology*, Monograph Supplement, 1968, 9, 1-27.