

The effects of intertrial activity and locus of control orientation on verbal operant conditioning¹

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Forty-eight male undergraduates participated in an experiment designed to investigate the effects of intertrial activity and locus of control orientation (internal or external) on verbal operant conditioning (VOC). It was hypothesized that intertrial activity which required Ss to verbalize continuously during the intertrial interval would interfere with VOC, as well as reduce the frequency of postexperimentally assessed awareness among Ss. Both of these hypotheses were confirmed. In addition, it was hypothesized that intertrial activity would produce greater decrements in the performance of internals than externals. Exactly the opposite pattern of findings was obtained.

Spielberger (1962) has suggested that awareness (i.e., the ability of Ss to verbalize the contingency between their responses and reinforcement) is necessary for the occurrence of verbal operant conditioning (VOC). On the other hand, Krasner (1962) and Verplanck (1962) have held that there is no necessary relationship between awareness and VOC. Several recent experiments (Dixon & Oakes, 1965; Oakes, 1967; Thaver & Oakes, 1967) have attempted to resolve this controversy by examining the effects of intertrial activity on performance in VOC. The authors of these experiments have suggested that activity interpolated between trials in VOC interferes with Ss' hypothesizing behavior (i.e., attempts to verbalize the response-reinforcement contingency). Thus, if such behavior is necessary for conditioning, it would be expected that intertrial activity would interfere with VOC, while if such behavior is not necessary for conditioning, it would be expected that intertrial activity would have no effect upon VOC. The results of these experiments have generally supported the latter view. However, all these studies employed as intertrial activity a task (color naming) which may have failed to occupy Ss, and therefore prevent hypothesizing behavior, throughout the entire intertrial interval. The present experiment was designed to investigate the effect on VOC of a type of intertrial activity (number reading) which forced Ss to verbalize continuously during this interval. It was hypothesized that this type of activity would interfere with VOC, as well as reduce the frequency of occurrence of postexperimentally assessed awareness among Ss.

Rotter (1966) has developed a personality scale (the I-E scale) designed to measure differences in the extent to which individuals attribute control of their outcomes to their own behavior or to external agencies such as luck or fate. It was reasoned that individuals who attribute control of their outcomes to their own behavior (internals) would have stronger tendencies to engage in hypothesizing behavior than individuals who attribute control of their outcomes to chance or fate (externals). Thus, it was predicted that more internals than externals would become "aware" during VOC, and that intertrial activity, which presumably prevents the occurrence of hypothesizing behavior, would produce larger decrements in the performance of internals than externals.

METHOD

Approximately 2 weeks before the start of the experiment, 441 undergraduate students enrolled in sections of elementary psychology at the University of South Carolina completed the I-E scale (Rotter, 1966). Forty-eight males drawn from the upper and lower 10% of the distribution of scores participated in the experiment. The mean scale scores for the internal and external groups were 2.42 and 15.83, respectively.

The apparatus consisted of two decks of 150 3 x 5-in. index cards, a 15-W signal light, an Endura stopwatch, and a 28 x 48-in. Masonite screen. The cards of the first deck contained a verb in the past tense and the pronouns, I, we, you, he, she, they, all typed in capital letters. The verb was placed in the middle of the card, with the pronouns appearing above this word. The order of the pronouns was varied randomly from card to card. The cards of the second deck contained lists of five numbers. These numbers varied randomly in length from 4 to 17 digits. The signal light was controlled by E and was used to indicate to Ss when they should respond on each trial. The screen was used to hide the E from the view of Ss during the experiment.

Four groups of 12 Ss each were employed. There were two levels of activity (presence or absence of intertrial activity) and two levels of locus of control orientation (internal, external).

Subjects were seen individually by the E. When they entered the experimental room they were seated at a table which contained one or two decks of index cards, placed face down, and the signal light. In the no-activity (NA) groups, the Ss saw only one deck of cards on the table. They were instructed to

turn over the top card immediately after the signal light came on, and to construct a sentence using the word in the middle of the card (the verb) and beginning with one of the words above the word in the middle (the pronouns). Then they were to place the card face down on the table and wait for the signal light to come on again. When it came on, they were to pick up the next card in the deck, and again construct a sentence. Ss were told to continue in this manner until instructed to stop by E. In the intertrial activity (IA) groups, the Ss saw two decks of cards on the table. The first (labeled Deck One) contained the verbs and pronouns, while the second (labeled Deck Two) contained the lists of numbers. The Ss were instructed to turn over the top card in Deck One when the signal light came on, and to construct a sentence as described above. Then they were to place the card face down, immediately pick up the top card in Deck Two, and read the numbers shown on this card out loud until the signal light came on again. When it came on, they were to place the card face down, pick up the next card in Deck One, and again construct a sentence. Ss were told to continue in this manner until instructed to stop by E.

Subjects in all groups constructed 120 sentences. During the first 20 trials E remained silent. On Trials 21-120, E said "good" whenever S began a sentence with the pronouns "I" or "we." The intertrial interval was 10 sec. At the end of the 120 acquisition trials, Ss filled out a post-experimental questionnaire (Spielberger, 1962) designed to assess awareness of the response-reinforcement contingency. Ss' responses to the questionnaire were rated for awareness independently by two judges who agreed in all cases.

RESULTS

The dependent measure employed in the present experiment was the number of correct ("I" or "we") responses made by Ss.

Figure 1 presents the mean number of correct responses made by Ss in the four groups in each of six blocks of 20 trials. Inspection of this figure indicates that the NA groups tended to perform at a higher level than the IA groups, and that only the NA groups showed any consistent improvements in performance over trials. An analysis of variance performed on the data for the first block of trials indicated that there were no significant differences between the groups. Thus, any subsequent differences in the performance of the groups cannot be attributed to differences in this block of trials. A Type III analysis of

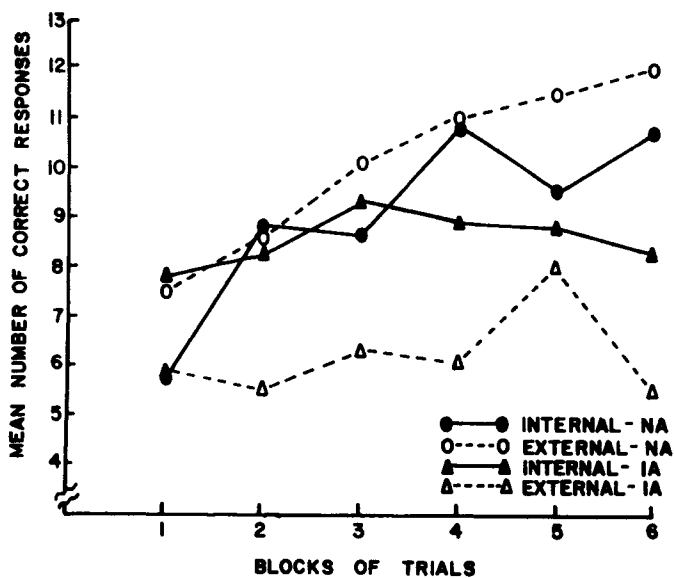


Fig. 1. Mean number of correct responses made by Ss in four groups as a function of blocks of 20 trials.

variance (Lindquist, 1953) performed on the data represented in Fig. 1 indicated that the effects of activity ($F = 5.82$, $df = 1,44$, $p < .05$) and trials ($F = 5.40$, $df = 5,220$, $p < .01$) were both significant. Thus, Ss in the IA groups made fewer correct responses than Ss in the NA groups, and the number of correct responses made by Ss increased over trials. In addition, the interaction between these two factors (Activity by Trials) was also significant ($F = 3.26$, $df = 5,220$, $p < .01$). Thus, as suggested by Fig. 1, only Ss in the NA groups showed consistent improvements in performance over trials. The effect of locus of control orientation (LC) was not significant ($F < 1$). However, the interaction between this factor and that of activity (LC by Activity) approached significance ($F = 3.60$, $df = 1,44$, $p < .10$). In order to examine this interaction more closely, the mean number of correct responses collapsed over trials) made by Ss in the four groups were compared by application of the critical difference technique (Lindquist, 1953). The means for the external-NA, external-IA, internal-NA, and internal-IA groups were 60.66, 36.83, 54.42, and 51.58, respectively. The results of these comparisons indicated that intertrial activity produced a significant decrement in the performance of externals ($p < .05$), but had no appreciable effect upon the performance of internals. Thus, the pattern of results obtained was directly opposed to the hypothesis that intertrial activity would produce greater decrements in the performance of internals than externals.

In order to determine whether locus of control orientation and intertrial activity influenced the frequency of postexperi-

mentally assessed awareness, the number of aware and unaware Ss in the appropriate groups was compared by means of chi square. Twelve Ss in the internal groups and 11 Ss in the external groups were aware ($\chi^2 = 0.00$, $p > .05$), while 17 Ss in the NA groups and 6 Ss in the IA groups were aware ($\chi^2 = 8.35$, $p < .01$). Thus, the frequency of awareness was significantly reduced by intertrial activity, but was not related to locus of control orientation.

DISCUSSION

The hypotheses that intertrial activity which requires Ss to verbalize continuously during the intertrial interval would interfere with VOC as well as reduce the frequency of postexperimentally assessed awareness among Ss were both confirmed. These findings appear to be consistent with Spielberger's (1962) view that awareness (and presumably the hypothesizing behavior which leads to awareness) is necessary for VOC. However, the results of the present study may be interpreted as providing direct support for this position only if it is assumed that intertrial activity interfered with VOC by blocking Ss' hypothesizing behavior. Although it may indeed be the case that intertrial activity interfered with VOC in this manner, there are two other ways in which it could have produced the same effect. First, intertrial activity may have interfered with VOC by distracting Ss, thus preventing them from directing their attention to the relevant cues (e.g., E's saying "good") during training. Second, it is possible that Ss in the IA groups interpreted their inability to finish reading all the numbers on the number cards during the 10-sec intertrial interval as "failure" in this phase of the experiment. Previous experi-

ments (see, e.g., Lazarus, Deese, & Osler, 1952) have indicated that such failure experiences may interfere with performance on a wide variety of tasks. In view of these alternative interpretations of the detrimental effects of intertrial activity, the results of the present experiment cannot be accepted as providing direct support for the view that awareness is necessary for VOC.

The hypothesis that intertrial activity would produce greater decrements in the performance of internals than externals was not confirmed. In fact, a trend toward the exact opposite pattern of results was obtained. One possible explanation for this finding may lie in the relative strengths of the tendencies of internals and externals to engage in hypothesizing behavior. If, as suggested above, internals have stronger tendencies to engage in such behavior than externals, it would be expected that they would be more likely than externals to make use of any opportunities for engaging in such activities which existed during the intertrial interval. Although the present study attempted to eliminate such opportunities for Ss in the IA groups, it became apparent during the course of the experiment that at least one opportunity of this type had not been eliminated. This occurred in the interval which elapsed between completion of Ss' sentences, and their first verbalization on the number-reading task. During this period, Ss were reaching for and turning over the number cards. Thus, they were not verbalizing and could have been engaging in attempts to formulate the contingency between their responses and E's saying "good." Because of their presumed stronger tendency to engage in such behavior, internals may have made greater use of this interval than externals for engaging in hypothesizing behavior. Future research may investigate this possibility by employing procedures which permit E-controlled presentation of the number cards.

REFERENCES

- DIXON, P. W., & OAKES, W. F. Effect of intertrial activity on the relationship between awareness and verbal operant conditioning. *Journal of Experimental Psychology*, 1965, 69, 152-157.
- KRASNER, L. Reported awareness in verbal conditioning as a function of experimental conditions and subjects' personality. Paper read at Western Psychological Association, San Francisco, April, 1962.
- LAZARUS, R. S., DEESE, J., & OSLER, S. The effects of psychological stress upon performance. *Psychological Bulletin*, 1952, 49, 293-317.
- LINDQUIST, E. F. *Design and analysis of experiments in psychology and education*. Boston: Houghton Mifflin, 1953.
- OAKES, W. F. Verbal operant conditioning, intertrial activity, awareness, and the extended interview. *Journal of Personality & Social Psychology*, 1967, 6, 198-202.
- ROTTER, J. B. Generalized expectancies for internal versus external control of reinforce-

ment. Psychological Monographs, 1966, 80, (Whole No. 609).

SPIELBERGER, C. D. The role of awareness in verbal conditioning. In C. W. Eriksen (Ed.), *Behavior and awareness*. Durham: Duke University Press, 1962, Pp. 73-101.

THAYER, F., & OAKES, W. F. Generalization and awareness in verbal operant conditioning. *Journal of Personality & Social Psychology*, 1967, 6, 391-399.

VERPLANCK, W. S. Unaware of where's

awareness: Some verbal operants—notates, moments, and notants. In C. W. Eriksen (Ed.), *Behavior and awareness*. Durham: Duke University Press, 1962. Pp. 130-158.

NOTE

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regarding the powerful influence of adjectives having strong connotative implications which was made by Cofer (1962) in the course of his studies of context effects in associative processes. It was predicted that vivid adjectives would be superior to dull adjectives in both immediate and delayed recall and that MVM containing vivid adjectives would show better recall than the same MVM having dull adjectives substituted for vivid adjectives. It was further hypothesized that nouns modified by vivid adjectives would be superior in recall to the same nouns modified by dull or colorless adjectives.

MATERIALS

The manipulated stimulus words consisted of 17 vivid and 17 dull adjectives selected from a pool of 68 adjectives for which ratings on a seven-point scale of the dimension "vivid-colorless" had been obtained from 30 male and female college Ss, and for which meaningfulness (*m*) data had been obtained from 50 male college Ss by the production method (Noble, 1952). The adjectives were selected in pairs of one vivid and one dull member, each appropriate for inclusion in the meaningful material to be presented to the Ss. Pair equivalence in *m* and in frequency of occurrence (Thorndike & Lorge, 1944) was closely approximated; the few discrepancies occurring were those which would work counter to the hypotheses concerning V. The meaningful material, into which either the vivid or the dull adjectives were inserted into 17 "slots" for presentation, consisted of a 112-word narrative concerning a professor and his students; it was designed to be interesting to Ss, but neither vivid nor dull in itself without the inclusion of the modifying adjectives. The experimental adjectives were the only adjectives occurring throughout the narrative.

PROCEDURE

The narrative in either its vivid or dull form was introduced to a total of four groups of Ss (two groups for each of the two conditions) as a brief memory task. Ss were asked to attend carefully during the oral presentation and immediately thereafter to write as much as they remembered as exactly as possible. After this free recall of the narrative, Ss were given approximately 30 min of interpolated activity consisting primarily of personality inventories. Following this interpolated activity, and having received no prior expectation of further requests for recall of the narrative, Ss were given mimeographed copies of the story in which the experimental adjectives had been replaced by blanks. Ss were asked to fill in as many of these blanks as possible; they were told that the exact words in their correct positions were preferred, "but if you can't remember exactly, guess." Ss were given up

Vividness of adjectives and the recall of meaningful verbal material

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Either vivid or dull adjectives (roughly equal in T-L frequency and m) were inserted into a narrative in 17 appropriate and identical slots. In immediate written recall after oral presentation 36 Ss hearing the vivid narrative showed greater productivity ($p < .01$) and greater recall of nouns ($p < .05$) than did 40 Ss who heard the dull narrative. Recall of the vivid and dull adjectives themselves showed no differences in immediate or delayed assisted recall. It is proposed that vividness of adjectives may involve an alerting or energizing function.

Vividness (V) as a variable in associative processes has a long history. Thomas Brown (1778-1820) proposed V as a secondary law of association, asserting that "... the parts of a train (of association) appear to be more closely and firmly associated, as the original feelings have been more lively [1854, Vol. 1, p. 372]." Despite its conceptual age, however, V has been explored in relatively few experimental studies. Early experimental work operationally defined V in terms of stimulus isolation which was achieved by such external manipulations as, e.g., printing particular trigrams or numerals in a color contrasting to that of others (Calkins, 1894; Van Buskirk, 1932) or stressing certain orally presented meaningful material by inflection, gesture, or verbal

emphasis (Jersild, 1929). So defined in terms of stimulus isolation, V has consistently shown a positive influence on retention.

In the course of recent studies, the variable of V has undergone a shift in its operational definition which suggests that V is conceived of as an "inherent" characteristic of verbal material rather than an externally imposed attribute. In the more recent work V has been defined by judges' ratings, usually under instructions which imply some similarity between V and imagery. Haagen (1949) defined adjective pairs of maximum V as "being highly colored and forceful, often emotionally toned"; adjective pairs of minimal V were described as "dull, lifeless, and lacking in intensity of feeling ... they bring to mind no graphic imagery." The reliability of such ratings was shown to be high. Tulving, McNulty, & Ozier (1965) found high V nouns superior to low V nouns in free recall; the potentially confounding effects of abstractness/concreteness, however, were uncontrolled. No recent studies were found which investigated V as a factor in other than rote learning tasks.

The present study was designed as an initial exploration of the V inherent in certain words as a factor in the immediate and delayed recall of meaningful verbal material (MVM). Adjectives were chosen as the experimental material; in addition to lessening the possible confounding effects of V with the abstract-concrete dimension, their selection was based upon a speculation