Recall of paired-associates as a function of their associability¹

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The recall of paired CVCs varied as a joint function of the association value (AV) of items constituting the pairs and the associability (AS) of the pairs, where the AS of a pair was defined as the probability of forming a natural language mediator (NLM) between its members. AS value variation within AV levels produced reliable differences in recall. A significant AS by AV interaction indicates that the magnitude of the effect of AS on recall is considerably greater when pairs are composed of high AV items.

A natural language mediator (NLM) for paired associates is any association of any type or complexity that S brings to bear on his verbal learning task. These associative devices have been shown to facilitate both acquisition and retention (Adams, 1967; Kiess & Montague, 1965; Montague, Adams, & Kiess, 1966; Montague & Wearing, 1967). However, the presence or absence of NLMs is usually detected by means of a questionnaire administered during the course of the experiment. This procedure may prompt Ss to use NLMs, or to infer that such devices are the object of investigation and to behave accordingly. It is also possible that the form and/or content of NLMs may change over trials. Therefore, some independent measure of the likelihood of NLMs being formed is necessary.

Montague & Kiess (1966) have scaled pairs of CVCs for the probability of forming an NLM in the following manner. Large groups of Ss were shown CVC pairs for 15 sec. During this time, the Ss wrote down any NLM they had for the pair. The proportion of Ss reporting an NLM for each pair defined the associability scale value (AS). In validating this scale, Montague and Kiess found that variations in AS value were associated with reliable differences in learning rate, and that association value (AV; Archer, 1960) was highly correlated with AS. However, Wearing & Montague (1967) found that AS was related to acquisition even when the meaningfulness of the individual items did not vary.

The purpose of the present study was to examine the effect of AS on retention by partially replicating the experiment of Montague et al (1966) using AS as an independent measure of NLM formation. These authors used 96 pairs of either high or low meaningfulness, which were presented only once to the S for a period of 15 or 30 sec. During presentation the S had to write down his NLM, if any. After 24 h, S was given a retention test, being allowed 23 sec to recall each item. They found that the reported use of NLMs was strongly associated with a high level of retention.

Both members of each item in the present study were either of high or relatively low AV. Within each AV level there were two levels of AS. If AS is a reliable index of NLM formation, and since NLM formation is associated with high levels of recall, AS should be significantly related to retention independently of AV. Such effects would demonstrate the usefulness of the AS measure for predicting results not accountable for by assessment of individual item meaningfulness, i.e., AV.

Method

Forty-eight paid female volunteers, undergraduates at the University of Illinois, served as Ss.

Sixty pairs of CVCs comprised the list. Thirty of the pairs contained items with a mean AV of 42 (item range 38-47), the other 30 items with a mean AV of 99 (range 97-100). In each of the two AV levels there were two levels of AS, 15 pairs per level. Within low AV, the AS means were .365 (range .283-.433) and .626 (range .517-.775), and within high AV, .781 (range .608-.858) and .959 (range .950-.992). The 60 pairs were randomly assigned to four blocks of 15 with the restriction that no AS level occurred more than four times per block. Sixteen different lists were constructed by varying the order of the blocks such that each block followed each other exactly four times across lists. One novel sequence of blocks was used in the retention tests for all Ss.

Procedure

Subjects were run in groups of 10 to 16 on the University of Illinois' PLATO System (Bitzer, Lyman, & Easley, 1966). Each S sat at a booth with a CRT on which instructions and stimuli were projected, and with a typewriter-like keyset for responding. Ss were instructed that 60 pairs of CVCs would be presented once each for 15 sec, that they were to learn as many as possible during the one trial, and that they would be tested for recall 24 h later. A 5 cent bonus per correct response was offered as an incentive to learn.

To familiarize them with computer controlled PA learning, Ss were given practice with nine letter-pairs to a criterion of one perfect list recall by the dropout correction method (Battig, 1965). Then the experimental list was presented, and recall tested 24 h later at the same exposure duration. To reduce variability in the data due to differences in typing skill, Ss were required to type with their preferred hand, hunt and peck fashion.

Results

Because AS and AV are correlated (Montague &

Kiess, 1966), it was not possible to cross the levels of the two factors. For this reason, AS levels were nested within AV levels, planned comparisons providing specific tests of AS with the effects of AV controlled. From lowest AS level to highest the mean number of correct recalls per S per 15 pairs at that level were: .94, 1.77, 3.79, and 7.48. The overall subjects by treatments analysis of variance yielded $F=119.74$ ($df=3/141$, $p<.0005$). Within low AV, AS level produced a significant difference in level of recall ($F=4.93$, $df=3/47$, $p<.005$), as did the comparison of AS level within high AV ($F=96.71$, $df=3/47$, $p<.005$). A test of the interaction of AS and AV was provided by an orthogonal comparison of the differences between the AS level means for high and low AV (i.e., 7.48-3.79 and 1.77-.94). The difference was significantly larger at high AV than at low ($F=29.0$, $df=3/47$, $p<.0005$).

Discussion

The results provide evidence for the proposition that AS is a reliable index of NLM formation, and show that an independently obtained estimate of the probability that an NLM will be formed between a pair of items may be used to predict retention of that pair. Not only was AS value shown to be related to the level of recall but, more importantly, recall varies as AS value was varied between pairs composed of items of the same AV level.

The significant interaction between AS and AV indicates that their relationship is not a simple one. Since Montague et al (1966) found a similar interaction between NLMs used in learning and AV, and since it has appeared in other, as yet unpublished data from our laboratory, the result seems to have general significance. The effect of AS value is dependent upon the level of AV in that at low AV levels the effect on retention of differences in AS is much less than at high AV levels.

Associability is a joint function of two items, whereas AV is a property of a single item. The interaction result implies that at high AV some factor enters the learning (and retention) process that is not present at low AV levels and, furthermore, the implication is that this factor depends

not on the individual items, but on the item pairs. This factor, which must derive from past language experience, may be some aspect of the transition probability between words. The high AV trigrams are actual words and, therefore, certain combinations are very familiar. Other combinations, of course, are quite unfamiliar. However, the point is that the range in familiarity is large. At low AV levels, on the other hand, the trigrams are usually not words, and so all combinations of low AV trigrams have low transition probabilities; hence, this variable exerts less differential effect on learning and retention. Thus, it is suggested that the interaction between AV and AS may be due to the possibility that transition probabilities between CVCs have only a small range and so play virtually no part at low AV levels, but a large range, and thus quite a significant role, at high AV levels.

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Notes

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