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ABSTRACT

In three experiments undergraduates were presented with eight adjective-noun phrases within a paired-associate list context in the orders adjective-noun and noun-adjective and instructed that either word would be given as a cue for recall. The same phrases were presented within a prose context where recall was tested by the cloze procedure. In the first experiment adjectives were better cues, while in the second experiment nouns were. There was no cueing effect in the third experiment. The pattern of retrieval asymmetry shown for the adjective-noun order in the paired-associate context for experiments 1 and 2 corresponded to that occurring within prose. Experiment 4 suggested that the reversal in cueing effect between experiments 1 and 2 may be a result of imagery levels of adjectives and nouns. Alternative reasons for superior adjective cueing within prose were discussed. (Author/LL)

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RECALL OF ADJECTIVE-NOUN PHRASES WITHIN LIST AND PROSE CONTEXTS

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A number of studies have shown that the recall of lists of adjective-noun (A-N) phrases is generally superior when cued by the noun rather than the adjective component (cf. Paivio, 1963; Kusyzyn & Paivio, 1966, Lockhart, 1969). These data support the conceptual "peg" hypothesis (cf. Paivio, 1971) "according to which the stimulus term functions as a "peg" to which its associate is hooked during learning trials and from which it can be retrieved on recall trials. The more concrete the stimulus, the more "solid" it is a conceptual peg and the better the recall [p. 248]."

Two of the above studies (Paivio, 1963; Kusyzyn & Paivio, 1966) also indicated that the superiority of nouns as cues to the recall of adjective components was facilitated when the list was learned in N-A order. The possibility of this effect being a result of differing imagery values of adjectives and nouns was, left unresolved. Lockhart's (1969) subsequent study showed that A-N or N-A order-during learning did not affect recall of the A-N phrases. However, he did find that recall of A-N phrases was superior when cued by a noun. The superior cue function of nouns was shown to be a function of the relative abstractness of adjectives and consistent with the conceptual "peg" hypothesis rather than the notion that form class per se (nounness) is responsible for the observed retrieval asymmetry.

Yuille, Paivio and Lambert (1969) found that manipulation of the imagery value of adjectival or noun components in A-N phrases has a greater effect upon recall when the component occupies the stimulus posi-

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tion during learning. Noun imagery was also found to be more potent than adjectival imagery in this regard. They also showed that while N-A phrases are generally easier to recall than A-N phrases this trend can be reversed when adjective imagery is high and noun imagery is low within the A-N phrase. Although this study, and those cited earlier, support the conceptual "peg" hypothesis in terms of the differential imagery levels of adjectives and nouns, the fact that Yuille et al. found that N-A order was superior to A-N order even when nouns were as abstract as the adjectives suggests that the property of "nounness" per se may be involved in retrieval asymmetry.

The purpose of the present study is to investigate the recall of A-N phrases when cued by either component, within paired-associate (PA) list and prose contexts. The specific aim is to determine whether the relationships between cue function, word order, and recall of A-N phrases found within a list context can be replicated within a prose content.

Experiment I

Method

Material and Design - A passage of prose was adapted from Herman Hesse's novel "Beneath the Wheel"[1]. The following A-N phrases contained in the passage were the object of interest: heavy cover, strong wind, large cups, warm coats, white fields, busy station, single houses, first trip.

These adjectives and nouns were matched for frequency (Thorndike-Lorge, 1944) all being high frequency words (G>100). Within the constraints of the prose context the nouns selected were as concrete as possible to facilitate the type of retrieval asymmetry reported by Lockhart (1969). Because of

the extreme difficulty of simultaneously controlling frequency and concreteness within a prose passage the decision was made to opt for frequency because of the more extensive norms available. The same A-N phrases were also used within the PA list context.

Within the passage context there were two recall versions used for both the experimental and control groups. In both versions the S had to recall four adjectives and four nouns. The words to be recalled were counter-balanced across Ss so that for each A-N phrase the missing component was cued by the other component for an equal number of Ss. The nature of the context necessitated word order remaining the same during learning and recall.

Within the PA learning context there were sixteen learning lists. Eight lists followed the order A-N. The remaining eight lists followed the order N-A. To control for serial position the two groups of lists were based upon a normalized 8 x 8 latin square so that each word pair occurred in each list position once for either the A-N or N-A order. Each adjective or noun component of the A-N pairs occurred as a stimulus or response term four times within the sixteen lists. The same lists were used for recall except that the response term was omitted and each S was randomly assigned to a list order other than that presented during learning. Each learning and recall list was used twice.

Experimental Ss read the passage then answered the questions. Control Ss only answered the questions in order to obtain measures of the probability of guessing the missing words. The guessing data was

used to correct the scores of the experimental group.

Procedure. — Subjects were presented with a booklet which instructed them to "read this passage at your normal rate of reading in preparation for some questions (on the passage) which appear on the next page". On turning to page two, Ss read these instructions: "This is the same passage as the one you have just read except that some words have been omitted. Write the missing words in the blanks. Do not turn back to the passage." Recall was thus measured by the "cloze" procedure (Taylor, 1953). All blanks were of equal length to avoid providing additional cues for recall by the equation of word length with length of blank. Recall was unpaced.

Within the PA list context Ss were presented with each word pair for 3 sec. on a video screen by means of an IBM 1500 computer. All Ss spent about 30 min. on a demonstration program to familarize them with the response keyboard prior to the experiment. An unpaced test of recall followed immediately after the learning trials.

Subjects. — Ninety six students from undergraduate courses in Educational Psychology at the University of Alberta volunteered for the experiment. Subjects were randomly assigned to either one of the two passage conditions or the PA learning group.

Results and Discussion

The mean percent recall scores for the several conditions are shown in Table 1. The corrected recall scores within the prose context were obtained by subtracting the mean guessing score from the raw score for each type of word (adjective or noun).

Insert Table 1 about here

Analysis of the PA list data indicated that although the interaction of list order and cue only approached significance, $F(1,30) = 2.18$; $p < .15$, it precluded the possibility of a main-effect due to either factor.

The A-N list order recall data within the PA context were combined with the prose context data for the next analysis . There was a significant main effect for context with list recall being greater than prose recall, $F(1,46) = 20.58$; $p < .001$. It seems probable that there was a higher degree of learning involved in the more restricted context where the learning task was specified in contrast to the prose context where the learning set was incidental and the content much larger. There was a significant main effect due to recall cue, $F(1,48) = 9.57$; $p < .01$, with adjectives emerging as superior cues to nouns in both list and prose contexts. This result indicates that in this experiment the superiority of a particular cue form (adjective) is sustained across contexts.

Comparisons of recall scores for adjective or noun cueing under either A-N or N-A list orders were not significant. However, the trends in the data suggest that the superior cue function of adjectives for the A-N list order may be predictive of the superior cue function of adjectives within the prose context. The reversal of cue effect obtained for nouns when the N-A list order is used is consistent with findings which have shown the N-A list order facilitates noun cueing (Paivio, 1963, Kusyzyn & Paivio, 1966). Adjective cued recall was significantly greater than noun cued recall within the prose context, (Tukey) $q\ (2,30) = .54$, $p < .05$ The size of this difference accounted for most of the main effect for cueing obtained in the cue x context analysis of variance.

The majority of literature concerned with recall of A-N phrases within PA lists (cf. Paivio, 1971) has emphasized the general superiority of nouns as cues to recall relative to adjectives. The finding of Yuille, Paivio and Lambert (1969) that adjectives can be superior recall cues to nouns when the adjectives have high imagery values and the nouns have low imagery values points to the possible implication of differential imagery levels in the above results. This question, which is also relevant to Exp. II and Exp. III, is the object of Exp. IV.

Because of the somewhat unusual (adjectives being superior cues to nouns) Exp. II was conducted as a replication of Exp. I using different materials.

Experiment II

Method

Materials. — Another prose passage adapted from the same source as the passage for Exp. I was used. The following eight A-N phrases were studied: cold drink, young man, full dinner, hot meat, wide chairs, clean glasses, thin sticks, whole branch. These phrases were also matched for frequency (Thorndike-Lorge count > 100).

Procedure, Design and Subjects. - The procedure and design were the same as those used in Exp. I except that there were forty-four Ss in the control prose condition. Once again, the Ss were volunteers from undergraduate educational psychology courses.

Results

Table 2 shows the mean percent recall scores for the various conditions. Recall data within the prose context was corrected for guessing as it was in Exp. I.

Insert Table 2 about here

There was a significant main effect due to cueing within the list context, $F(1,32) = 6.36$; $p < .05$. Nouns were better cues than adjectives regardless of list order. This result is characteristic of PA experiments with lists of A-N phrases (cf. Paivio, 1971).

The context x cue analysis using only A-N list order data also showed a significant main effect due to cueing, $F(1,46) = 4.43$; $p < .01$. In both contexts nouns were superior to adjectives as recall cues.

There was a trend for adjectives to be recalled more than nouns for both list orders although it was not significant. The N-A order produced the stronger trend towards superior noun cueing. Once again the facilitation of noun cueing by the N-A list order seems apparent. However, these data are not inconsistent with the notion that recall results within list context for the A-N order in both Exp. I and Exp. II are predictive of which type of cue is the most effective in a prose context.

There was a significant context effect, $F(1,58) = 6.48$; $p < .05$, with recall being greater in the list context as in Exp. I. As in Exp. I there was no interaction of list order and cue.

Noun cued recall was greater than adjective cued recall within the prose context, although not significantly. The uniform superiority of noun cueing within both contexts suggests that whatever characterisitc of the two word form classes is involved is more heavily weighted towards nouns. The most obvious place to look is the imagery levels of the adjectives and nouns involved in this study especially in view of the fact that the cue effect is reversed from Exp. I to Exp. II.

Although the results of Exp. I and Exp. II are contrary in terms of superiority of cue function there appears to be a systematic relationship between cue function within the list context for the A-N order and cue function within the prose context.

In order to examine the validity of this hypothesis a second replication was conducted using different materials.

Experiment III

Materials. — A prose passage was adapted from "The River War" by W.S. Churchill[2]. The following A-N phrases were used: right bank, small stream, most months, long piece, native homes, old city, few places, wide streets. All words were high frequency (Thorndike-Lorge, 1944) as in the first two experiments.

Procedure, Design and Subjects.— The procedure and design were the same as Exp. I except that forty Ss were used in the experimental prose condition and twenty-eight Ss in the control prose condition. Subjects from the same source as Exp. I volunteered for this experiment.

Results and Discussion

Table 3 shows the mean percent recall scores for the conditions used. Recall scores within the prose context were corrected in the same manner as for Exp. I.

Insert Table 3 about here

The analysis of list x context data revealed no significant effects or interaction. There was a trend towards superior adjective cueing for the A-N list order. This superiority for adjective cueing disappeared when the N-A order was used, supporting the previous finding that this order facilitates noun cueing (cf. Paivio, 1971).

The context x cue analysis produced a significant context effect, $F(1,54) = 12,84$; $p < .001$, with recall being greater in the list context. There was no cueing effect. The interaction of cue and context approached significance, $F(1,54) = 3.86$; $p < .06$. Unlike Exp. II the cueing effect within the prose context was not repeated for both list orders. The non significant results suggest that perhaps the imagery levels of the two form classes were lower in this experiment than in the first two.

In order to help interpret the results of the first three experiments a comparison of the imagery values of the adjectives and nouns used and their relation to recall was the object of Exp. IV.

Experiment IV

Materials.— the forty eight words used in the first three experiments were used.

Procedure.— the words were presented in ten random orders in booklet form to be rated for imagery using the identical procedure to that used by Paivio, Yuille and Madigan (1968).

Subjects.— two hundred and eight subjects from a large undergraduate course in Educational Psychology at the University of Alberta were used.

Results

Table 4 shows the mean percent recall scores for context and list order for each of the A-N phrases used in the first three experiments and the imagery values of the words used. The recall scores within the prose context were corrected for guessing as before.

Noun imagery was significantly greater than adjective imagery in all the previous experiments. For Expts. I, II and III respectively: $\bar{X}n = 5.1$ $\bar{X}a = 4.8$, $t(1663) = 4.8$, $p < .001$; $\bar{X}n = 5.6$, $\bar{X}a = 5.1$, $t(1663) = 9.6$, $p < .001$; $\bar{X}n = 4.8$, $\bar{X}a = 4.3$, $t(1663) = 8.7$, $p < .001$.

Insert Table 4 about here

Also, all the pair-wise comparisons between the mean imagery levels for the adjectives used in the first three experiments were significant ($p < .001$) using the Scheffe method. The paired-wise comparisons of the mean noun imagery levels for the same experiments were also significant ($p < .001$) using the Scheffe technique.

Discussion

In the first three experiments mean noun imagery levels were significantly greater than mean adjective imagery levels, however, the difference was smallest for Exp. I in which adjectives proved to be the superior cue. In Exps. I and II the imagery levels of both adjectives and nouns were moderately high in relation to the nouns of Paivio, Yuille and Madigan (1968). It was in these two experiments that a significant cue effect appeared.

In Exp. II where noun imagery was greater than adjective imagery and at a higher level than in either of the other two experiments, noun cues were superior within both list orders and the prose context. If noun cueing was superior to adjective cueing for the A-N list order then it is not surprising to find the same result for the N-A list order in the light of studies showing facilitation of noun cueing by this order.

In Exp. I the imagery level of the adjectives was apparently high enough and close enough to that of the nouns to result in a trend towards superior adjective cueing for the A-N list order. However, this trend

was predictably reversed for the N-A order which facilitates noun cueing.

In Exp. III the imagery levels were lowest and the superiority of noun imagery quite substantial. This may be why noun cueing, although greater than adjective cueing, was not significantly so in either context or across both lists and prose. The imagery data while not conclusive seems to suggest that part of the reason for particular patterns of retrieval assymmetry for A-N phrases within prose and list contexts is a function of the magnitude of imagery levels and their differences for the components of these phrases. When imagery levels for adjective and noun components are high and minimally different the probability of superior adjectival cueing within prose may increase.

GENERAL DISCUSSION

The results of these experiments suggest that what happens within a PA list context for the A-N list order tends to happen in a prose context for the recall of A-N phrases. It seems likely, however, that there are additional factors operating within a prose context which may facilitate adjective cueing apart from imagery. These will be discussed later.

Although the results within a list context were statistically significant only for Exp. II they did correspond to the pattern of results shown within a prose context in regard to the A-N word order producing significant effects over the two contexts for Exps. I and II.

In Exp. I within the list context for the A-N order, nouns were recalled more than adjectives while in the prose context the same pattern of retrieval asymmetry occurred producing a significant cue effect for adjectives. In Exp. II superior recall of adjectives within the A-N list context corresponded to the same pattern within the prose context. It appears, as might be expected, that the pattern of retrieval asymmetry found for the A-N list order rather than the N-A list order within a PA

context corresponds to the pattern of retrieval asymmetry for the same A-N phrases within a prose context.

The correspondence between the A-N list order recall and retrieval asymmetry within the prose context was not present in Exp. III. This may have been related to the lack of a significant cueing effect for either adjectives or nouns over both contexts.

The failure to find a significant word order or cue effect within the list contexts for Exps. I and III offers support for Lockhart's (1969) failure to find such effects, however, the pattern of results, namely the facilitation of noun cueing by the N-A list order in Exps. I and II, offer support for the word order effect reported in earlier work (Paivio, 1963; Kusyzyn & Paivio, 1966).

The consistently higher recall of A-N phrases within a list rather than a prose context is probably a function of a higher degree of original learning facilitated by the intentional and much more circumscribed PA context.

The hypothesis proposed in Exp. IV that minimally discrepant and moderately high imagery levels for adjectives and nouns may produce superior adjective cueing within a prose context might appear to contradict evidence which has shown superior adjective cueing only when nouns were low and adjectives high on imagery (Yuille, Paivio & Lambert, 1969). However, this evidence was gathered with list data. The failure to obtain a significant effect for either cue in Exp. I within the list contexts is consistent with earlier results (Lockhart, 1969). Nevertheless the trend towards superior adjective cueing within the A-N list may have been facilitated within the prose context by other factors.

The results of Exp. I suggest that encoding and retrieval processes may differ between list and prose contexts. An obvious difference bet-

ween the two contexts is the greater number of possible cues to recall surrounding the word to be recalled within prose. If nouns are the most salient parts of speech and the most concrete and probably the most facilitative of verbal or imaginal encoding, as Paivio (1971) has suggested, it can be assumed that within either context they will be the "conceptual pegs" or locii of associative networks. Within the restricted PA context the subject is induced to concentrate upon the single association between noun and adjective whereas in a prose context there may be several modifiers as well as verbs forming a larger associative net something like the retrieval hierarchy of Bower, Clark, Lesgold and Winzenz (1969). Without specific direction there may be no reason, apart from contiguity, to expect the subject to concentrate upon the adjective-noun association. Prose is a more meaningful context than a PA list in which associations may be built around contextual meaning or thematic images (Pompi & Lachman, 1967) rather than just two words. If adjectives, which are contiguous to nouns share an associative network with other parts of speech which together focus upon that particular noun in a prose context, the ability of the noun to elicit any one of these associates may be weakened relative to that noun's cue power to elicit one adjective in a PA list. There is likely to be more associative interference within a prose context. The superior recall of nouns within such a context may be the result of multiple cues eliciting more salient parts of speech (noun) which form the nuclei of associative networks, rather than just the imagery function of adjectives.

The effect of contiguous word order may be another reason for what appears to be the superior cue function of adjectives. This effect has been called the initial reproductive tendency (cf. Meyer, 1939). The word transition probability of A-N phrases has to be greater than N-A phrases within a prose context due to the adjective-noun word order inherent in the English

language. Although Paivio and Kusyzyn (1966) found the N-A word order to facilitate noun cueing within PA learning the situation may be reversed within prose where the reader is strongly habituated to reading and segmenting phrases in the order adjective noun. The recall results of Exps. I and II for the A-N list order suggest this.

Closely related to the question of word order is the application of redintegrative theory to help explain the results of Exp. I. If A-N phrases are learned as wholes then it would be reasonable to expect the first part of the phrase to be a better cue to the recall of the remaining part than if this last part were the cue. This parallels Horowitz, White and Atwoods' (1968) finding that the beginning of words are better cues to recall of the whole than the word endings.

This series of studies suggests that what happens in a PA context for A-N list orders appears to happen in a prose context. Put somewhat differently, it could be argued that the failure to achieve a significant cue effect for nouns within an A-N ordered PA list increases the probability of finding an adjective cueing effect within a prose context for the same A-N phrases.

Results also suggest that imagery may be part of the reason for finding an adjective cueing effect in Exp. I. However, it seems likely that other factors may facilitate adjective cueing in prose. The presence of superior noun cueing within two of the three prose contexts where noun imagery was considerably greater than adjective imagery implies that imagery is a variable which is potent enough to overcome contextual factors which may otherwise facilitate adjective cueing.

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TABLE 1

Mean Percent Recall for Context,
Cue and List Order

	Prose			PA List		
Present.	Cue		Mean	Cue		Mean
Order	A	N	Total	A	N	Total
A-N	42.7	25.0	33.8	62.5	54.5	58.5
N-A				60.7	68.7	64.7
Mean Total				61.6	61.6	61.6

TABLE 2

Mean Percent Recall for Context,
Cue and List Order

	Prose			PA List		
Present.	Cue		Mean	Cue		Mean
Order	A	N	Total	A	N	Total
A-N	44.7	53.9	49.3	56.2	68.7	62.5
N-A				59.3	75.0	67.1
Mean Total				57.7	71.8	64.8

TABLE 3

Mean Percent Recall for Context,
Cue and List Order

	Prose			PA List		
Present.	Cue		Mean	Cue		Mean
Order	A	N	Total	A	N	Total
A-N	37.4	41.2	39.3	65.6	51.5	58.5
N-A				60.9	62.5	61.7
Mean Total				63.2	57.0	60.1

TABLE 4

Mean Percent Recall for Context x List Orders and Imagery Values for A-N Phrases

ADJECTIVE	LIST A-N	LIST N-A	PROSE	IMAGERY	NOUN	LIST A-N	LIST N-A	PROSE	IMAGERY
heavy	50.0	62.5	31.2	5.00	cover	50.0	75.0	31.2	3.87
strong	62.5	75.0	12.5	5.35	wind	100.0	100.0	18.7	5.47
large	50.0	75.0	43.7	4.85	cups	75.0	37.5	68.7	5.39
warm	25.0	37.5	31.2	5.19	coats	62.5	75.0	68.7	5.31
white	50.0	75.0	43.7	5.25	fields	100.0	50.0	62.5	5.80
busy	87.5	62.5	6.2	4.66	station	25.0	62.5	50.0	4.40
single	12.5	87.5	12.5	4.54	houses	62.5	37.5	12.5	5.60
first	100.0	75.0	18.7	3.72	trip	25.0	50.0	31.2	4.99
cold	100.0	100.0	64.15	5.57	drink	37.5	25.0	61.8	5.43
young	62.5	87.5	100.00	5.38	man	100.0	87.5	47.2	6.05
full	50.0	37.5	30.1	4.82	dinner	25.0	50.0	36.3	5.84
hot	62.5	62.5	68.1	5.72	meat	25.0	25.0	69.3	6.29
wide	87.5	87.5	31.8	4.97	chairs	62.5	100.0	17.6	5.60
clean	87.5	75.0	28.4	5.10	glasses	50.0	62.5	25.0	5.66
thin	62.5	87.5	68.2	5.20	sticks	87.5	87.5	31.8	4.95
whole	37.5	62.5	40.9	3.95	branch	62.5	37.5	68.8	4.95
right	37.5	100.0	85.0	3.13	bank	100.0	75.0	66.5	5.49
small	37.5	50.0	33.6	4.58	stream	50.0	37.5	22.9	6.15
most	75.0	62.5	10.0	3.13	months	37.5	25.0	15.0	3.20
long	75.0	37.5	25.0	5.05	piece	12.5	50.0	-3.5	3.48
native	62.5	62.5	50.0	4.66	homes	100.0	100.0	18.0	5.52
old	50.0	50.0	58.0	5.89	city	75.0	75.0	65.0	5.65
few	50.0	75.0	30.8	3.52	places	50.0	25.0	45.8	3.91
wide	25.0	62.5	38.6	5.05	streets	100.0	100.0	70.0	5.52

Abstract

In three experiments Ss were presented with eight adjective-noun phrases within a paired-associate list context in the orders adjective-noun and noun-adjective and instructed that either word would be given as a cue for recall. The same phrases were presented within a prose context where recall was tested by the "cloze" procedure. In Exp. I adjectives were better cues while in Exp. II nouns were better cues. There was no cueing effect in Exp. III. The pattern of retrieval asymmetry shown for the adjective-noun order in the paired-associate context for Exps. I and II corresponded to that occuring within prose. Exp. IV suggested that the reversal in cueing effect between Exps. I and II may be a result of imagery levels of adjectives and nouns. Alternative reasons for superior adjective cueing within prose were discussed.

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