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ABSTRACT

In understanding comprehension as the active processing of reading material, and in assuming that certain key content is stored in the memory, then mnemonic cues could be one important means of recalling this stored information. Since associative words apparently have high mnemonic cue value, they have been the subject of numerous investigations. The author's experiment varied associative level and measured retention by content words, sequences, total words in sequence, average length of sequence, and idea units. The results indicated that the low-associative passages, not the high-associative ones, had consistently higher retention. Since this conflicted with numerous studies by Rosenberg, attempts were made to account for them by examining other research studies related to (1) the effects of associative strengths in child verbal learning, (2) the role of associative connections in processing discourse, and (3) different retention measures and their relation to a two-component memory analysis of discourse processing. Although the principle of associative wording as the key to retention of connected discourse was generally supported, further research was recommended on associative density, size of the associative unit, and associative saliency. A bibliography is included. (DH)

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RESEARCH ON WORD ASSOCIATION IN CONNECTED DISCOURSE

Fred Shima[1]

Comprehension has been previously defined (Mosberg & Shima, 1969) as the extraction and recall of new information from a language stimulus. The terms "extraction" and "recall" indicate that comprehension is a concept involving active processing of reading material. During discourse processing it is believed that the original material is transformed into kernel semantic content which is then stored in memory. In retrieving material from the memory store, cue words are first generated, followed by single words and sequences of words prompted by the cue items. Identifying words which might act as mnemonic cues for the rest of the passage would then be one step in controlling for processing of connected discourse.

Consequently, the content variable of associative words is chosen for investigation because recent research has suggested its mnemonic cue properties. Rosenberg has shown in numerous studies (e.g., 1966;

[1]I thank Lou Mosberg for his comments and suggestions.

1968 a, b) that highly associative words embedded in connected discourse are remembered better than low-associative ones, and that the rest of the passage (the context) surrounding the associative units is remembered better when high-associative units are embedded. This statistically significant high-associative facilitation was found in recognition, cued recall, and free recall tests. Retention in the recall tests was measured by number of words recalled.

Despite Rosenberg's consistent results, his choice of single words as dependent variables can be questioned. If connected discourse is more than a word salad, then the measure of its retention should cover more than single words. If one investigates connected discourse, which is a sequence of grammatically and semantically related words, it seems sensible to go beyond the traditional measures of simple rote learning and to assess retention in more relevant terms, such as sequences of words or main ideas.

With this in mind, an experiment was carried out (Shima, 1969) which varied associative level and which measured retention by content words, sequences, total words in sequence, average length of sequences, and idea units. Given Rosenberg's reliable results, a statistically significant effect or at least a tendency for high-associative facilitation was expected across the five retention indices.

However, neither a significant high-associative effect nor a high-associative tendency, was found. The low-associative passages consistently indicated higher retention, even in the content word score which had shown high-associative facilitation in Rosenberg's work.

In attempting to account for the conflicting results, two considerations were the age of subjects tested and the associative units inserted in the test passage. First, Shima studied fifth-graders, whereas Rosenberg studied college students. Second, Shima used S-R associative units, whereas Rosenberg used S-R,R,R units. These two considerations are related to the broader questions of examining conditions under which associative facilitation might vary, and deriving the associative processes in retention of connect discourse. These questions are treated according to: (1) the effects of associative strength in child verbal learning experiments, (2) the role of associative connections in processing discourse, (3) different retention measures and their relation to a two-component memory analysis of discourse processing, and (4) research implications.

ASSOCIATION STRENGTH IN CHILD VERBAL LEARNING

The question of interest here is whether there is any basis, aside from the Rosenberg results, for expecting that associative facilitation

in retention of discourse would occur with young children--that children's natural language habits as assessed by word association norms would affect their verbal learning.

Several paired-associated studies have demonstrated that children do indeed make use of pre-established associative connections in verbal learning. Casteneda, Fahel and Odom (1961) obtained word association norms for adjectives from fourth-, fifth-, and sixth-graders. On the basis of these norms, they then constructed a list of 6 high and 6 low-associative adjective pairs, and presented the two lists to a group of fifth- and sixth-graders. The mean high association list value was 34%, and the mean low-associative list value was 1%. Each group learned the list to a criterion of one perfect list recitation. The high-associative group took 3.4 trials and the low-associative group 11.0 trials. McCullers (1961) replicated this study with fourth- and fifth-graders. A statistically significant high-associative facilitation was again obtained, and no reliable grade level difference was noted. In a further study, McCullers (1965) again found a reliable high-associative effect using fourth-, fifth-, and sixth-graders, and no significant difference by sex or grade level. It should be noted that in the McCullers studies, associative strength was a singular and potent factor since it did not interact with other experimental variables (interpair interval in list presentation, grade level, and sex).

Wicklund, Palermo, and Jenkins (1964) tested fourth-graders on lists where differences in associative strength between high and low-associative pairs were varied. They reported high-associative facilitation in terms of fewer errors across trials when intermediate differences in associative strength were compared as well as when extremes in associative strength were examined.

Also, Shapiro (1965) tested fifth-graders and Carroll and Penney (1966) tested sixth-graders, and both studies found high-associative facilitation in list learning.

Whereas the Casteneda et al., and McCullers experiments gave the high and low-association lists to different groups, the Wicklund et al., Shapiro, and Carroll and Penney studies presented a mixed list of high and low-associative word pairs to the same group of subjects. Thus, association strength remained a significant factor across between- and within-group comparisons of associative level.

Associative clustering provides additional evidence of associative effects in learning. Typically several high-association word pairs are presented in a list but the stimulus and response terms are randomly mixed in series. For example, two pairs like Woman-Man and Carpet-Rug could be presented in a list order like Rug-Man-Carpet-Woman. Subjects later tend to recall the list words in associated word pairs.

Wicklund, Palermo, and Jenkins (1965) tested fourth-graders and found that more words were recalled in associative clusters than would be expected by chance. They also reported that associative clustering increased as associative strength of word pairs increased.

A more complex verbal learning task which reflects associative effects is mediated transfer. Mediated transfer involves the role of implicit associative processes in relating past to present learning. A standard three-stage paradigm for mediated transfer is the chaining model: A-B,B-C,A-C. Based on association norms, the A word evokes the B word but not the C word, and the B word evokes the C word. For example, suppose Stem evokes Flower but not Smell, but Flower evokes Smell. Given those words, a subject undergoing the A-C,B-C,A-C paradigm would first learn Stem-Flower, then Flower-Smell, and finally Stem-Smell. The A-C learning (Stem-Smell) is supposedly easier because A (Stem) implicitly evokes B (Flower), which in turn evokes C (Smell), i.e., A-(B)-C. A standard control condition for the chaining paradigm is insertion of an unrelated word in the second stage. A-B, D-C,A-C.

Several studies have demonstrated that children are capable of verbal mediation with the A-B,B-C,A-C paradigm. Both Wismer and Lipsitt (1964) and Palermo & Jenkins (1964) tested fifth-graders while Nikkel and Palermo tested sixth-graders. All three studies found evidence of significant facilitation in the A-C test stage. Furthermore, Palermo and Jenkins reported that their results replicated Jarrett and Scheibe's (1962) results for adult learning in the chaining paradigm.

Associative facilitation in pair-associates learning, associative clustering, and mediation transfer paradigms with fourth-, fifth-, and sixth-grade children suggests that there is no striking developmental difference in the power of the associative variable. In a broad sense, child associative processes, at least at the fourth- through sixth-grade levels, should parallel associative processes in adults. Therefore, in the light of both Rosenberg's reliable associative facilitation in connected discourse with adults, and the substantial body of child verbal learning research, one would predict an associative facilitation in connected discourse with children.

In fact, children might indicate stronger associative facilitation. Wicklund, Palermo, and Jenkins (1964) reported that Jenkins tested college subjects and found no learning differences between strongly and weakly associated pairs. For example, pairs with an average strength of 0.2% were learned as fast as 69% pairs, and both were learned faster than 0% control pairs. Yet Wicklund et al., tested fourth-graders and found significant learning differences between high- and low-strength pairs (54% vs 17%).

Nonetheless, suppose that future experiments still indicate no high-associative facilitation and instead show low-associative facilitation as did Sh (1969). How could such results be explained? Mosberg (personal communication) has suggested an Age x Novelty interaction. For adults, using expected, common, non-novel responses to stimuli words increases the cueing properties and thereby facilitates passage retention. But for children, using unexpected, uncommon, novel responses to stimuli words increases cueing and facilitates retention.

An alternative explanation is possible, keeping in mind that the low-associative facilitation was not a statistically significant effect. Children may process discourse without any strategy; they may not attend to potential memory cues in discourse, such as associative units. Therefore, neither significant high- nor low-associative facilitation will occur unless the associative units are made salient for children. If the associative units are made conspicuous, by instructions or special marking, it is assumed that high-associative cueing will result as with adults. Whether a developmental difference in associative effects for connected discourse does indeed exist, or whether certain passage variations can result in high-associative facilitation with children, is a question which can be answered only by future research.

ASSOCIATION CONNECTIONS IN PROCESSING DISCOURSE

First, reconsider the child verbal learning results discussed in the preceding section. The reliable high-associative facilitation suggests that high-association words in a word list are processed more easily.

Second, it has been shown that what is processed are not simple words but sequences of words. This organizational process of word-chunking occurs in the learning of word lists (Tulving, 1962; Bousfield, Puff & Cowan, 1964) as well as in discourse (Tulving & Patkau, 1962; McNulty, 1966).

Given that high-associative words are processed more easily than low-associative words, and that the unit of processing is a word sequence in discourse, the task is to determine how one affects the other--how word association affects the unit of processing. For example, when two associative words straddle two units, i.e., when the stimulus word is at the end of one unit and the response word is at the beginning of the next unit, is the unit boundary weakened by the associated words or is the associative tie weakened by the unit boundary?

Little work on specifying the unit of processing in discourse is available. Whether the unit is the sentence or the phrase is not clear. At the sentence level Johnson (1965) found evidence for processing by

phrase units. He gave a paired-associates task with digits as the stimuli and declarative sentences as the responses. Word-by-word transitional errors in sentence recall were examined. A transitional error was a wrong response preceded by a correct one. Results indicated that between-phrase transitional errors were greater than the within-phrase errors. For example, with the sentence "the fish / from the lake / are cooking," more transitional errors occurred between "lake" and "are" than between "are" and "cooking." Fodor and Bever (1965) found similar results with click localization in sentences. Clicks were presented at different points in sentences, and subjects reported where the clicks occurred. Correct click placements were higher at syntactic boundaries. Incorrect placements tended to be displaced toward the syntactic boundaries.

Johnson (1966) later investigated the effects of between and within-phrase associative connections on phrase unit processing. Before sentence learning, subjects underwent adjective-noun and noun-verb association learning. These associative units were then inserted into the sentence to be learned. The adjective-noun association represented a within-phrase unit, whereas the noun-verb was a between-phrase unit. If associative strength was the critical factor, then transitional errors between adjective-noun and between noun-verb should be the same in sentence learning. If phrase unit processing was the critical factor, then the transitional error between noun-verb should be greater than between adjective-noun. Greater transitional errors were found between noun-verb, thus supporting the idea of phrase processing.

Rosenberg (1968c), however, replicated the Johnson study using natural language associates instead of laboratory-established associations. He presented high-associative sentences where the adjective-noun, noun-verb, and verb-adverb were strongly associated, and low-associative sentences where the same combinations were weakly associated. The high-associative sentences showed higher recall, and the transitional errors between the noun and verb at the phrase boundary were higher than between other words only in the low-associative sentences. Therefore, given natural word association habits instead of laboratory-acquired associations, high-associative sentences are processed in units larger than the phrase. At the sentence level, strong associative connections are suggested to evoke larger units of processing, thereby resulting in greater recall of high-associative sentences.

Rosenberg's findings, therefore, suggest that to obtain the associative facilitation over phrase units, which is assumed to be one of the units of discourse processing, there should be strong associative ties across the entire sequence. To measure the associative ties, an extensive body of word association norms is required. Norms should be obtained on verbs and adjectives as well as on nouns, since a sentence contains more than nouns alone. In addition, sequential

associative norms should be collected. For example, given a particular noun, associate a verb to it; given the noun-verb, associate an adverb or noun to it, and so on. Rosenberg (1967) has collected a set of modified sequential associations where sentences were used ("The actor _____the_____") to obtain verb and noun (object) norms.

Obtaining either comprehensive single word or sequential word association norms is a staggering task. One might control associative connections in several sentences, then string the sentences for a paragraph. But unless the same words or the same sequences of words are used again and again, there is no way of controlling for associative connections in new paragraphs which include new words and new sequences of words. Consequently, if an associative influence on units of discourse processing depends on word-to-word associative connections across the entire sequence of discourse, then evaluating the influence involves too much expense for too little scop

A more sensible associative approach focuses on generalized associative facilitation in retention of the whole passage. In other words, whether associative facilitation occurs when associative density in the passage is less then 100%. Unlike the word-to-word technique, a smaller set of word association norms is required and associated words drawn from those norms can be used repeatedly in constructing new passages. Some important considerations bearing on this question are: (1) the number of associated words per passage; whether the associative density should be 10%, 20%, or 30% of the total passage, (2) the size of associative units used: whether S-R, or S-R,R, or S-R,R,R, and (3) placement of the associated words, whether intra- or inter-sentence, whether within or between phrases, or whether close or far apart.

Perhaps the most critical variable is associative density because its effects would provide some basis for deciding whether the associative approach should be continued or dropped. If the associative density required to achieve facilitated recall is high, perhaps over 20% of the passage, then one is getting close to unwieldy word-to-word constraints.

Associative density refers only to the associated words manipulated by the experimenter. It does not include other sources of associative connections, such as connections between several R words, between R and context words, and between context words. These non-S-R associative connections are not assessed because child word associative norms are unavailable for all those words. Even the R-R-R connections in Rosenberg's S-R,R,R units cannot all be evaluated by adult norms. Consequently, three alternatives remain: (1) construct associative passages only using words on which associative norms are available, (2) collect child norms on more words for greater control of R and context word connections, or (3) assess the associative connections for the R and context words as much as possible with available norms, and assume the associative density constant for the remainder of the passage.

Although offering high-associative control, the first alternative restricts the vocabulary and thereby the general subject matter of passages. The second alternative is a sound idea, not only for providing greater associative control in passages but for compiling larger units of associated words--multi-word associative networks--which is useful in investigating the important variable of size of associative units. (The saliency and consequently the facilitating effects of associated words might depend on their size. Given a 120-word passage and 24 associated words for a 20% density, should the 24 words be comprised of 12 S-R pairs, eight S-R,R,R triads, six associative quartets, or one 24-word network?) One problem with the second alternative is feasibility. Much work would be required, not only in data collection and tabulation, but in selection of stimuli words.

The third alternative involves limited associative control in passages. Yet such a procedure corresponds most directly to the field situation. All the associative connections in reading material across different subject areas cannot be measured unless a very large set of word association norms is compiled. Since only partial control for associative connections is ever likely, it seems appropriate to discover if associative facilitation can occur with limited associative constraint.

Therefore, it is suggested to proceed with the third alternative of limited associative control. If the size of associative unit proves an important variable, i.e., if children show associative facilitation with S-R,R,R, units but not with S-R units, then the second alternative of collecting additional norms and assessing associative connections among a set of words is the next step.

RETENTION MEASURES AND A TWO-COMPONENT MEMORY ANALYSIS OF DISCOURSE PROCESSING

Mosberg and Shima (1969) pointed out that processing of discourse could be examined in terms of memory because measures of comprehension are typically taken after, rather than concurrently with, reading. Retention is measured instead of actual, ongoing processing of information. Since different response measures could present different views of memory, the various measures of retention should be considered. Although Mosberg and Shima specified verbatim and substance information processing and short and long-term memory, the distinctions between the two are not considered in this section. Instead, the retention measures of free recall and cued recall will be discussed as they relate to information in memory generally, and as they relate to two basic hypothetical stages of memory--storage and retrieval. Recognition is only covered briefly because recall measures are of primary interest in the proposed associative research.

In reading a passage, the information extracted from the passage is stored in memory. When the information is later remembered, the amount recalled depends on two factors: (1) whether the information is stored

in memory and, (2) whether the information is retrievable from storage. This distinction between availability (storage) and accessibility (retrieval) of information was probably first proposed by Tulving and Pearlstone (1966). A typical procedure presents organizational cue words (usually category names) during storage and/or during retrieval. For example, a learning list might include items such as Dog-Cat-Horse and Dress-Pants-Coat, with category cues like ANIMAL and CLOTHING given during learning and/or recall. Investigating the presentation of cues at retrieval is important, for then the memory capacity for information tapped by noncued free recall and by cued recall procedures may be compared.

Tulving and Pearlstone (1966) gave a single list presentation of words belonging to common categories, along with the category names. Recall was tested with or without category names. Cued recall resulted in higher recall, and the cued-noncued differences were greater as the list length increased from 12 to 48 words. Since Tulving and Pearlstone gave category cues at storage for both cued and noncued retrieval groups, the cued retrieval facilitation may depend on the presence of cues at storage.

To answer this question, Wood (1967) in Experiment 1 used a 2 x 2 factorial design to study the effects of presence or absence of cues in learning or recall. Cued learning resulted in higher recall than non-cued learning, as did cued recall compared to noncued recall. But Wood concluded that retrieval cueing was more important than storage cueing because (1) the noncued learning-cued recall group had reliably higher recall than the noncued learning-noncued recall group, and (2) the difference between the cued learning-noncued recall condition and the noncued learning-noncued recall condition was small. In Experiment 2, Wood found that retrieval cueing by category names was effective only if the list words had strong connections with the category names. Since the facilitation was not explained by better guessing of list items to category names in retrieval, perhaps implicit category cueing in storage with the strongly associated list items accounted for the facilitation.

Crouse (1968) in Experiment 1 replicated Wood's 2 x 2 factorial analysis of cueing in storage and retrieval. Similar main effects for storage and retrieval cueing were found. However, only the cued learning-cued recall group showed significantly greater recall than the other groups, so that retrieval cueing was not shown to be more important than storage cueing. Crouse's Experiment 2 presented either appropriate or inappropriate category cues for list words during learning. With appropriate storage cues, retrieval cueing resulted in higher recall than retrieval noncueing as found before. But with inappropriate storage cueing, no recall differences were found between retrieval cueing and noncueing. Crouse's two studies consequently suggested that both storage and retrieval cueing are critical factors in obtaining higher recall.

Storage and retrieval cueing was studied with cues weakly associated with list words by Tulving and Osler (1968). Instead of category names, words which were weak associates of the list words (less than 1% according to word association norms) were presented as cues. Two cues per list word were selected. In learning, subjects received either no cue, one cue, or both cues for each list word. In recall, subjects received either no cue, the same cue as before, the alternative cue, or both cues. The cued storage-cued retrieval group showed higher recall than the cued storage-noncued retrieval group, which indicated that weak associates of list words could act as facilitating retrieval cues. The most significant result was cueing symmetry: identical cueing conditions in learning and recall produced highest recall. Given no storage cues, retrieval was highest with no cue than with one or both cues. Given one storage cue, retrieval was highest with the same cue and both cues than with the alternative cue or no cue. Given two storage cues, retrieval was highest with both cues than with one cue or no cue. Thus, similarity of cueing conditions across storage and retrieval led to higher retention.

The importance of storage cueing was also noted by Earhard (1969). A list of 22 non-associative, non-categorical words was presented, each word beginning with a different letter of the alphabet. Instructions to memorize the words in alphabetical order were given either before or after list presentation, i.e., before or after storage. The pre-presentation cueing consistently resulted in higher recall than post-presentation cueing in Earhard's three experiments. Organizational processes during the storage phase resulted in higher recall.

Although Tulving and Pearlstone (1966) and Wood's (1967) Experiment 1 found higher recall based on retrieval cueing, Wood's (1967) Experiment 2, Crouse (1968), Tulving and Osler (1968), and Earhard (1969) suggest that facilitated recall in cued retrieval depends on cued storage. List items should be tagged by category or associative cues during learning, if the tags are to facilitate recall latter. This conclusion has important implications for measuring retention of reading material. If one reads a text with no strong implicit organization or with no organizational cues provided--in effect, no cueing during the storage phase--then cueing in the retrieval stage would not increase retention. Cued recall scores would not be higher than noncued free recall scores with disorganized reading material.

Several studies have considered this question and support this contention. Allen (1969) presented a list of 72 words which were not strongly related associatively or categorically. Subjects first had a series of free recall tests, followed by cued recall tests. Retrieval cues were words randomly selected from the learning list. In Experiment 1, cued recall indicated no reliable increase after switching from free recall, compared to the control group given free recall throughout the test series. However, when the 72 list items were structured into pairs of related words in Experiment 2, cued recall showed improvement over free recall. Therefore, cued recall was reliably higher than free

recall only when list organization was present. Similar results were found by Freund and Underwood (1969). After presentation of a 40-item list, a free recall test was followed by a cued recall test. Retrieval cues again were words selected from the learning list. Also, instructions to recall the list in terms of serial order, interitem association, or alphabetical order were given. No significant increase in cued recall following free recall was found in any condition, and the overall mean increase was only .43 words.

There are, however, instances where the free recall-cued recall equality would occur with very high organization as well as with low organization. But this would be based on a ceiling effect; free recall is so high that little room is left for improvement. For example, Bower, Clark, Lesgold, and Winzenz (1969) presented a hierarchically-organized list of 112 words organized into major and minor subcategories. After only two trials, free recall was 100%.

However, disregarding very highly organized material where free recall is already near or at 100%, free recall-cued recall differences should increase from low to high organization. Therefore, the selection of free recall or cued recall as the response measure would make little difference with weakly organized passages, whereas cued recall would provide a more accurate measure of the memory capacity for discourse with strongly organized passages.

The previously noted studies varied organization by providing storage and retrieval cues in the form of category names and word associations. At the discourse level, it is believed that associatively related words in a passage may act as storage cues in reading. Associated words could act as pegs to which surrounding words are attached. Words preceding and following the associative cues may be linked to them. In retrieval, the associated words are recalled first, and they then prompt recall of contiguous context words. Associated words therefore should affect the sequences of words recalled. Despite Shima's (1969) failure to find reliable associative differences in number and length of word sequences, it is still believed that by increasing the associative density of a passage, by increasing the saliency of associative cues, high-associative facilitation would result in number and length of sequences. For instance, Rosenberg (1968c) found sentence processing in units greater than the phrase only when associative connections were strong across the entire sentence (i.e., with high-associative density) and not with only a pair of associated words in sentences.

Besides noncued free recall and cued recall, there are recognition retention measures. Unlike recall measures, recognition apparently involves no retrieval stage: the to-be-remembered material is presented during the test and does not have to be drawn from the memory store. Only a judgment of familiarity or recency is required. Since there is no active retrieval process and since the facilitating effects of

implicit organization cues in storage (such as category names or word associations) may require a retrieval stage, the level of organization in reading material may not influence recognition test scores. Highly-organized and weakly-organized passages might lead to similar recognition scores. In testing this hypothesis, Kintsch (1968) found that although highly-organized lists of word or nonsense syllables led to higher free recall, but recognition performance was only slightly affected.

Of course, it can be proposed that recognition does involve an active retrieval stage, although a different retrieval process than in recall. In deciding which test items were originally given, the memory store is searched and a match is attempted between the stored material and each test item. The searching and matching activity suggest an active retrieval process.

It should be noted that the studies reviewed in this section involve simple word lists and not connected discourse. There is no evidence that organizational cueing at the passage level actually affects free recall, cued recall, and recognition performance in the manner discussed here. Similarly, there is no evidence that a two-component memory analysis (storage and retrieval) is appropriate for conceptualizing connected discourse retention. Whether organizational cueing and a memory analysis are indeed fruitful approaches to studying connected discourse is another question which should be answered by future research.

RESEARCH IMPLICATIONS

The foregoing review suggests a need to shed more light on effects of associative density and size of the associative unit upon retention of connected discourse. Another factor apparently in need of additional study is associative saliency, which bears upon the alternative hypotheses formulated by Mosberg and by Shima to account for the effects of low-association pairs encountered in the Shima (1969) study. (According to Mosberg, marking procedure will heighten the novelty of low-association units and marked low-association units should, in consequence, facilitate retention to a greater degree than unmarked low-association units. According to Shima, marking procedure will heighten associative cues as mnemonic devices and, hence, should facilitate retention of high-association units to a greater degree than would unmarked high-association units.)

Should it turn out that associative facilitation of the retention of connected discourse depends on a moderately high level of associative density and larger-than-S-R units, then the relevant research of the future would substitute larger sets of associates for the S-R pair unit that has customarily been used in the past. The introduction of such sets suggests a fresh approach to studying the process of connected discourse. By way of illustration, assume that the four words in Rosenberg's high-associative S-R,R,R units typically share semantic

features--e.g., Man-Woman-Boy-Girl are all human-category words; Table-Chair-Desk-Cloth are furniture-category words. Since high-associative sets tend to share common associative features--Animate, Human for the first set, Inanimate, Man-Made for the second--a shift from an associative to a nonassociative-semantic approach might be warranted.

Such a shift would necessitate changing the basis for selecting related words to be embedded in passages. That is, whereas the associative approach entails using child norms for S-R associations, a semantic approach would be based on a semantic rating system.

An unpublished paper by Marsh and Sheff (1968) explored the assumption that common semantic features underlie word associations--McNeill's "minimal contrast" hypothesis (1966). They found that the communality of semantic features (as determined by adult raters) for stimulus and response words in child norms showed a striking increase from Grade 1 to Grade 3, but little change from Grade 3 to Grade 5. The rise in communality of semantic features of S-R pairs from Grade 1 to Grade 3 was accompanied by increasing paradigmatic responses relative to syntagmatic responses. Paradigmatic responses are defined on shared semantic features in the weak sense of shared grammatical form class. The semantic approach favors construction of coherent passages, a goal difficult to achieve when norm-generated S-R pairs are used.

In sum, the literature does not rule out the possibility that associative norm-based interword associations will prove a key to understanding the retention of connected discourse, but further work on associative density, size of the associative unit, and perhaps associative saliency must be done before the question can be settled definitively. Given that retention of connected discourse can appreciably be predicted on the basis of norm-generated associative values, it should prove difficult to use such information to control for level of difficulty of material. Moreover, if it turns out that the S-R unit alone will not serve as an appreciable basis for predicting retention, evaluation of associative strength will depend on going beyond norms. Either multiword associative values will have to be generated using the data contained in S-R norms (with or without empirical follow-up) or some other basis will have to be found for expressing the relatedness of the multiword set--e.g., a semantic features analysis. An understanding of retention as a function of a semantic approach to relatedness might well turn out to be more exploitable by designers of instruction than the classical associative approach.

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