

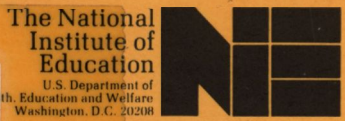
**T  
E  
C  
H  
N  
I  
C  
A  
L** | **R  
E  
P  
O  
R  
T  
S**

Technical Report No. 204  
MULTIPLE CODE ACTIVATION IN WORD RECOGNITION:  
EVIDENCE FROM RHYME MONITORING  
Suzanne D. Nolan and Michael K. Tanenhaus  
Wayne State University  
Mark S. Seidenberg  
McGill University  
May 1981

# Center for the Study of Reading

UNIVERSITY OF ILLINOIS  
AT URBANA-CHAMPAIGN  
51 Gerty Drive  
Champaign, Illinois 61820

BOLT BERANEK AND NEWMAN INC.  
50 Moulton Street  
Cambridge, Massachusetts 02138



372.414  
N789m



3 2842 1803 5052 9

CENTER FOR THE STUDY OF READING

Technical Report No. 204

MULTIPLE CODE ACTIVATION IN WORD RECOGNITION:  
EVIDENCE FROM RHYME MONITORING

Suzanne D. Nolan and Michael K. Tanenhaus  
Wayne State University

Mark S. Seidenberg  
McGill University

May 1981

University of Illinois  
at Urbana-Champaign  
51 Gerty Drive  
Champaign, Illinois 61820

Bolt Beranek and Newman Inc.  
50 Moulton Street  
Cambridge, Massachusetts 02238

A preliminary version of this paper was presented at the 52nd Annual Meeting of the Midwestern Psychological Association held in St. Louis in May 1980. This research was supported in part by Wayne State University Research Development and Faculty Research Awards to Michael K. Tanenhaus, and in part by the National Institute of Education under Contract No. HEW-NIE-C-400-76-0116 to the Center for the Study of Reading, University of Illinois.

College Library Center  
NATIONAL COLLEGE OF EDUCATION  
Evanston, IL 60201

EDITORIAL BOARD

Peter Johnston, Chairperson

Roberta Ferrara

Jim Mosenthal

Scott Fertig

Ann Myers

Nicholas Hastings

Andee Rubin

Asghar Iran-Nejad

William Tirre

Jill LaZansky

Paul Wilson

Peter Winograd

Michael Nivens, Editorial Assistant

## Abstract

Seidenberg and Tanenhaus (1979) reported that orthographically similar rhymes were detected more rapidly than dissimilar rhymes in a rhyme monitoring task with auditory stimulus presentation. The present experiments investigated the hypothesis that these results were due to a rhyme production-frequency bias in favor of similar rhymes that was present in their materials. In three experiments, subjects monitored short word lists for the word that rhymed with a cue presented prior to each list. All stimuli were presented auditorily. Cue-target rhyme production frequency was equated for orthographically similar and dissimilar rhymes. Similar rhymes were detected more rapidly in all three experiments, indicating that orthographic information was accessed in auditory word recognition. The results suggest that multiple codes are automatically accessed in word recognition. This entails a re-interpretation of phonological "recoding" in visual word recognition.

Multiple Code Activation in Word Recognition:  
Evidence from Rhyme Monitoring

The role of sound-based codes in visual word recognition has been studied extensively by cognitive psychologists and reading researchers. There are a number of reasons for interest in this topic. In languages such as English, words are specified in both phonological and orthographic codes, although the phonological code is in some sense primary. The child's initial language experience is through spoken language and in learning to read the child is taught to map printed words onto existing phonological forms. Even mature readers often have the phenomenological experience of hearing words as they read. These intuitions are supported by numerous studies demonstrating that subjects make sound-based confusions to visually presented words and letters in recognition and recall tasks (Conrad, 1972).

The classic explanation for phonological effects in visual word recognition is that the phonological code becomes available during a recoding stage impelled by limitations in working memory (Atkinson & Shiffrin, 1968). This explanation was partially based on the belief that working memory utilizes an acoustic and/or articulatory code.

A second explanation is provided by phonological-mediation models of visual word recognition. According to these models, visually presented words are translated into a phonological code. The phonological

code is then used to search the mental lexicon for the entry for the word (Meyer, Schvaneveldt, & Ruddy, 1974). However, phonological mediation models have proved extremely controversial with many researchers arguing that the lexicon can be directly accessed through a visual code, without phonological mediation (Baron, 1974; Massaro, 1975).

An alternative explanation for phonological effects in visual word recognition is suggested by recent models of the lexicon in which the phonological and orthographic codes for words are closely integrated. This assumption is embedded in Morton's (1969) logogen model and in the Collins and Loftus (1975) spreading activation model. In the logogen model each lexical item has a corresponding unit in memory which contains a representation of its semantic, phonological, and orthographic codes. In the spreading activation model, orthographic and phonological information are represented in a single lexical network. Both models imply that when a word is recognized, all of its codes become available. Thus both models can account for a sound-based code becoming available in visual word recognition.

The integrated representation of the sensory codes in these models has another implication. Just as the phonological code is accessed in visual word recognition, so should the orthographic code be accessed in auditory word recognition. Evidence supporting this somewhat counter-intuitive prediction is provided by a recent study by Seidenberg and

Tanenhaus (1979). In this study, subjects monitored a short list of spoken words for a word that rhymed with a cue word presented prior to each list. Rhyme monitoring latencies were approximately 50 msec faster when the cue and rhyming word were orthographically similar (e.g., pie-tie) than when they were orthographically dissimilar (e.g., rye-tie). Since subjects could in principle make rhyming decisions solely on the basis of phonological information, these results provide evidence that the orthographic code is accessed during auditory word recognition.

Since this study provides the most convincing evidence in the literature for the orthographic code being accessed during auditory word recognition, it is important to consider alternative explanations for the results. Recent research, reviewed by Cutler and Norris (1979) has indicated that the following dimensions influence response latencies in monitoring studies: word frequency (Foss & Blank, 1980); phonemic similarity (Newman & Dell, 1978); and syllable length (Mehler, Segui, & Carey, 1978). Seidenberg and Tanenhaus matched orthographically similar and dissimilar rhymes along all three of these dimensions. Furthermore, in two of their experiments the same target word was presented with both orthographically similar and dissimilar cue words. There is, however, one potentially serious confound that was not considered. It seems likely that subjects may have tried to predict the rhyme word on at least some proportion of the trials (see Tanenhaus &

Seidenberg, in press, for evidence that predictability influences rhyme monitoring in sentences). If there was a production-frequency bias in favor of orthographically similar rhymes, this would have resulted in subjects generating more predictions that were orthographically similar than dissimilar to the cue word. Monitor latencies would be facilitated on trials in which the subject correctly predicted the target word. Thus a production frequency bias in favor of orthographically similar rhymes would result in faster monitor latencies to similar rhymes than to dissimilar rhymes.

The issue is perhaps analogous to the production frequency confound in the classic study by Collins and Quillian (1969). They argued for a hierarchical model of semantic memory in which properties of a concept are stored only at the highest possible node in the semantic structure. For example, the property "can fly" would be stored with the concept "bird" and not the concept "robin," since "bird" is a superordinate of "robin." Collins and Quillian found that reaction times to verify the proposition "birds can fly" were faster than verification times to the proposition "robins can fly," apparently confirming the cognitive economy assumption. Subsequent work by Conrad (1972), however, demonstrated that Collins and Quillian had confounded production frequency and hierarchical level. Conrad found that reaction times in verification tasks are inversely related to the frequency with which the subject assigns a property



to a particular category. When production frequency was controlled, Conrad was unable to find evidence supporting this version of the cognitive economy assumption.

Rhyme production frequency norms collected from eighty Wayne State University undergraduates increase the plausibility of a production-frequency bias explanation for orthographic effects in rhyme monitoring. The stimuli used to collect the norms were taken from 48 word triples such as those (e.g., pie, rye, tie) used by Seidenberg and Tanenhaus. Each triple contained two cue words and a target word. Two lists of words were formed by assigning the cue words from each triple to different lists. Subjects received booklets containing a column of words followed by five blanks. Their task was to try to generate five rhymes for each word, preserving the order in which the rhymes came to mind. Production frequencies for rhyme associates were determined by collapsing across the five positions to compute the total number of times a word was given as a rhyme associate to the cue word. Overall 55% of the five rhyme associates generated most frequently for each cue word were orthographically similar to the cue word. An orthographic bias was particularly evident for the first rhyme associate, with 65% of the first rhyme associates being orthographically similar.<sup>1</sup>

A production frequency bias was verified in the Seidenberg and Tanenhaus study by using the norms to compute the production frequency for each cue-target pair. Production frequency was defined as the

percentage of subjects generating the target as a rhyme associate of the cue. Orthographically similar cue-target pairs were found to be more predictable than dissimilar cue-target pairs. Mean production frequencies were 37.5% for the orthographically similar pairs and 18% for the dissimilar pairs.

Given the well-known relationship between production frequency and reaction time, it seemed likely from these norms that orthographic effects in rhyme monitoring might simply be due to a production frequency bias in favor of orthographically similar rhymes. Experiment 1 was conducted to investigate this possibility.

### Experiment 1

#### Method

Subjects. Twenty-two Wayne State University students participated as unpaid subjects.

Stimulus Materials. Stimuli for all trials were taken from monosyllabic rhyme triples such as boat-vote-goat. Each triple contained a cue word and two rhyming target words, one orthographically similar and the other orthographically dissimilar to the cue word. Predictable rhymes (e.g., down-town), unusual spellings, uncommon words, homophones, homographs, and homonyms were avoided. Within test triples, production frequency was controlled, as nearly as possible, by using the rhyme production frequency norms previously described. Within a test triple, the

orthographically similar target and the orthographically dissimilar target had been generated with equal frequency as a rhyme associate to the cue word. For example, the targets words goat and vote were both generated equally often as rhyme associates of the cue word boat. For these stimuli, mean production frequencies for the orthographically similar and dissimilar targets were 8.00 and 8.75, respectively. The mean Kučera and Francis (1967) word frequencies for orthographically similar and dissimilar targets and cue words were 44, 44, and 42, respectively.

In order to make sure that orthographically similar and dissimilar cue-target rhymes did not differ in phonemic similarity, the mean number of phonemes shared by cues and targets and the mean number of differing phonemes were calculated. For example, boat and goat share two phonemes, |o| and |t|, and differ by two phonemes, |g| and |b|. Orthographically similar cue-target pairs shared 2.0 phonemes and differed by 2.4 phonemes, while dissimilar pairs shared 2.0 phonemes and differed by 2.1 phonemes.

Monitor lists of three semantically unrelated monosyllabic words were constructed. Each list contained a target that rhymed with the cue. All words in a target list were similar in length, frequency and number of syllables. The two nontargets in each list were neither orthographically nor phonologically similar to the target words. Each word including cues and targets was presented only once during the experiment.

On test trials, the target word occurred in the second position of the monitor list. Only the second position was used because data from the second position are the most stable. Monitor times to first position targets are affected by shifts in attention and monitor times for third position targets are unusually short due to expectancy effects.

Distractor trials used to vary the position of the targets were constructed in a similar manner to test trials and were divided equally between similar and dissimilar orthography conditions. The cue-target pairs used in distractor trials were different from the cue-target pairs used in test trials.

Procedure. On each trial, subjects heard a single word in isolation (the cue), followed two seconds later by an auditorily presented list of three semantically unrelated monosyllabic words. The subject's task was to detect the single word in the list that rhymed with the cue.

Two versions of the stimuli were recorded with each target word appearing once in each version. For each triple, the orthographically similar target appeared in one version, and the orthographically dissimilar target in the other. Each subject heard only one version and, therefore, either the boat-goat or boat-vote combination but not both. Each version contained a total of 24 test trials, 12 orthographically similar and 12 orthographically dissimilar cue-target pairs. Each version contained 48 distractor trials. On test trials, the target word was the second in the three-word list. On the distractor trials, the target appeared equally often at each of the other two positions.

The stimuli were recorded in a quasi-random order with the first six trials being fillers, and the only other constraint being that no more than two trials from either orthography condition occurred successively. The distribution of items from these conditions was counterbalanced by halves. The stimuli were recorded on the left channel of a stereo tape. A 500 Hz timing tone was placed on the right channel so as to coincide with the beginning of each target rhyme. The tone, which was not heard by the subjects, was input to a voice operated relay that started a Gebrands digital timer. The timer stopped when the subject pressed a telegraph key.

#### Results and Discussion

Of the 528 possible monitor latencies, 12 were errors, which were randomly distributed.

Mean latencies for each subject were computed by collapsing across the twelve targets in the orthographically similar and dissimilar conditions. Mean latencies for each item were computed by collapsing across the scores of the subjects who received each target word in orthographically similar and dissimilar conditions.

Analyses were performed on both the subject and item latencies for reasons given in Clark (1973). The mean monitor latency was 527 for similar rhymes and 580 for dissimilar rhymes. The effect of orthography was significant by subjects,  $F(1,20) = 42.18$ ,  $M_{se} = 740.48$ ,  $p < .001$ ,

and by items,  $F(1,23) = 7.02$ ,  $M_{se} = 4675.55$ ,  $p < .05$ . The  $\min F'$  was also significant,  $\min F'(1,30) = 6.02$ ,  $p < .025$ . There was no significant effect of version ( $F < 1$ ) by subjects nor a significant orthography x version interaction ( $F < 1$ ).

The results indicate that with production frequency controlled, orthographically similar rhymes are detected faster than orthographically dissimilar rhymes. However, in order to obtain precise matching in production frequency, it was necessary to use different target words in the similar and dissimilar conditions. As a consequence, it is possible to attribute the results of Experiment 1 to differences between the orthographically similar and dissimilar target words. In Experiment 2, the same target word was preceded by either an orthographically similar or dissimilar rhyme.

## Experiment 2

### Method

Subjects. Twenty-two Wayne State University students served as unpaid subjects.

Materials, design, and procedure. The design, task and procedure were largely the same as those in Experiment 1. Monosyllabic rhyme triples (e.g., boat, vote, goat) were constructed as before; however, one cue word was also orthographically similar to the target (boat) while the other was not (vote). Test triples were constructed such that the target

word bore the same production frequency to both the orthographically similar and dissimilar cues. For example, the target word goat was generated as a rhyme associate of boat as often as it was to vote. For test trials, mean production frequencies for orthographically similar and dissimilar cue-target pairs were 6.58 and 6.08, respectively. The mean Kučera and Francis (1967) word frequencies for orthographically similar and dissimilar cue words and targets were 31, 28, 23, respectively. Similar cue-target pairs shared 2.1 phonemes and differed by 2.4 phonemes. Dissimilar cue-target pairs shared 2.0 phonemes and differed by 2.4 phonemes.

Two versions of the stimuli were recorded with each target word appearing once in each version. Target words that were preceded by orthographically similar cues in one version were preceded by orthographically dissimilar cues in the other version. Each subject heard only one version.

### Results

Of the 528 possible monitor latencies, 7 were errors and 2 were lost due to mechanical failures. Ten scores over 1,000 msec were entered in the analyses as 1,000 msec.

As in Experiment 1, rhyme monitor latencies were faster to orthographically similar rhymes than to dissimilar rhymes. The mean monitor latency was 492 for similar rhymes and 542 for dissimilar rhymes. The 50 msec effect was comparable to the 53 msec effect found in Experiment 1.

Both analyses revealed a significant effect of orthography,  $F(1,20) = 39.99$ ,  $M_{se} = 703.22$ ,  $p < .0001$  in the subject analyses, and  $F(1,23) = 6.37$ ,  $M_{se} = 5156.06$ ,  $p < .01$  in the item analyses. The  $\min F'$  was also significant,  $\min F'(1,30) = 5.49$ ,  $p < .025$ .

By-subject analyses revealed no significant effect of version ( $F < 1$ ) and a marginally-significant orthography x version interaction  $F(1,20) = 3.69$ ,  $M_{se} = 703.22$ ,  $.05 < p < .10$ .

The results of the preceding experiments clearly demonstrate that when rhyme production frequency for orthographically similar and dissimilar rhymes is equated, similar rhymes are still detected more rapidly than dissimilar rhymes. These results, in conjunction with the experiments reported by Seidenberg and Tanenhaus (1979), provide strong support for the claim that word recognition leads to activation of both orthographic and phonological codes, regardless of presentation modality. This interpretation assumes that the orthographic effects in these experiments occurred as a consequence of lexical access.

The rhyme monitor task, however, does not logically require lexical access and there is no direct evidence that lexical access was occurring during these experiments. Furthermore, Davelaar, Coltheart, Besner, and Jonasson (1978) have questioned the utility of tasks other than lexical decision for investigating the lexicon on the grounds that these tasks do not require lexical access. Given these considerations, it seemed important to determine whether or not lexical access was occurring during rhyme monitoring. Experiment 3 was designed for this purpose.



### Experiment 3

The logic for this experiment is derived from research on context effects in word recognition. A number of studies have demonstrated that a word is encoded more rapidly when it is preceded by a semantically and/or associatively related word. Most of these studies have used the lexical decision task (e.g., Meyer & Schvaneveldt, 1971; Fischler, 1977), although similar effects have been demonstrated with word naming and color naming (Warren, 1972). Studies by Meyer, Schvaneveldt, and Ruddy (1974) and Becker and Killion (1977) suggest that these semantic context effects occur at the sensory level (but cf. Stanovich & West, 1979). That is, encoding a word facilitates the sensory analysis of semantically related words. These results can be accounted for within the framework of both the logogen and spreading activation models. If lexical access occurs during rhyme monitoring, then it should be possible to demonstrate similar semantic facilitation effects. In the present study, the target word that rhymed with the cue word was preceded either by a semantically unrelated word as in Experiments 1 and 2, or by a semantically related word. If lexical access is taking place during rhyme monitoring, monitor times to target words preceded by semantically related word should be faster than monitor times preceded by an unrelated word.

#### Method

Subjects. Twenty-two Wayne State University students served as unpaid subjects.

Materials and procedure. Stimuli for all trials were taken from monosyllabic rhyme pairs. The test pairs were divided equally between similar and dissimilar orthography conditions. Within test pairs, production frequency was controlled, as nearly as possible, by using the rhyme production frequency norms described in the introduction. For critical trials, mean production frequencies for orthographically similar and dissimilar cue-target pairs were 7.5 and 9.8, respectively. Word frequency within these trials was controlled as nearly as possible by using the Kučera and Francis (1967) norms. For test trials, mean frequencies for orthographically similar and dissimilar target words were 31 and 28, respectively. Similar cues and targets shared 2.0 phonemes and differed by 2.4 phonemes. Dissimilar cues and targets shared 2.0 phonemes and differed by 2.5 phonemes. Filler trials used to vary the position of the targets were constructed in a similar manner and were divided equally between similar and dissimilar orthography trials.

In the previous experiments, the cue word was followed by a list of three semantically unrelated monosyllabic words. A semantic manipulation was introduced by changing one of the words in this list so that it was semantically related to the target word. On these trials, the first word in the list and the target word, which was always the second word in the list, were semantically related (e.g., CUE - kite; TARGET LIST - chew, bite, told). On semantically unrelated test trials, all three words in the target list were semantically unrelated (e.g., CUE - kite; TARGET LIST

- vest, bite, told). Test trials were divided equally between semantically related and semantically unrelated conditions.

Two versions of the stimuli were recorded with each target word appearing in both versions. Since orthography was nested within semantic relatedness, target words were preceded by the same cue word in each version. The semantic relatedness of the target word to the preceding word in the list varied between versions. Target words that were preceded by a semantically related word in one version were preceded by a semantically unrelated word in the other version. Each subject heard only one version and therefore either the kite-chew-bite or the kite-vest-bite combination. Each version contained a total of 20 critical trials, 10 in which the first word in the list was semantically related to the target word and 10 in which the three words in the list were unrelated. Within the 10 related trials, 5 of the trials contained orthographically similar cue-target pairs and 5 contained orthographically dissimilar cue-target pairs. Each version contained 60 distractor trials divided equally between relatedness conditions. Within each relatedness condition, distractor trials were divided equally between similar and dissimilar orthography conditions.

The filler trials were constructed so that the target appeared equally often in the first position and last position. On related trials the position of the related word, relative to the target word, was varied so that relatedness could not be used to predict the position of the

target word. Related trials were divided equally among the following: (a) second and third words related, target in third position, (b) first and second words related, target in third position, and (c) first and third words related, target in first position. This meant that, in two-thirds of the unrelated filler trials, the target word occurred in the first position and, in one-third of the unrelated filler trials, the target word appeared in the third position. This confounding was introduced in order to ensure that the probability that the target followed a related word equalled the probability that the target followed an unrelated word. Within each type of related distractor trial, similar cue-target pairs and dissimilar cue-target pairs occurred equally often. In summary, distractor trials were divided equally between relatedness conditions. Within each relatedness condition, the cue-target pairs were orthographically similar on half the distractor trials and dissimilar on the remaining half of the distractor trials. In the related condition, third word targets were twice as frequent as first word targets. In the unrelated condition, first word targets were twice as frequent as third word targets. Overall, first and third word targets occurred equally often. The procedure was identical to that used in the previous experiments. Subjects heard the cue followed by the target list, and pressed a reaction time key when they detected the rhyme.

#### Results and Discussion

Of the 440 possible monitor latencies, four were errors. Three scores over 1,000 msec were entered into the analyses as 1,000 msec.

Mean latencies for each subject were computed by collapsing across the five targets in each of the orthography x relatedness conditions. Mean latencies for each item were computed by collapsing across the subjects that received each target word in the related and unrelated conditions. Overall mean latencies for each condition are presented in Table 1.

-----  
Insert Table 1 about here.  
-----

When a related word was included in the monitor list, rhymes were detected 69 msec faster than rhymes embedded in a list of unrelated words. Analyses were performed on both subject and item latencies. Both analyses revealed a significant effect of relatedness,  $F(1,20) = 27.22$ ,  $M_{se} = 3817.53$ ,  $p < .001$  in the subject analysis, and  $F(1,18) = 12.89$ ,  $M_{se} = 4381.00$ ,  $p < .005$  in the item analysis. The  $\min F'$  was also significant,  $\min F'(1,33) = 8.75$ ,  $p < .01$ . There were no significant version effects or version interactions.

Although the word frequency of the target words was closely controlled, the word frequency of the first word in the monitor list across relatedness conditions was not carefully controlled. In the related condition, the mean word frequency of this first word was 66, whereas the mean frequency of this first word was 34 in the unrelated condition. In monitor tasks, the word frequency of the word preceding the target word is inversely related to monitor latencies (Cutler & Norris, 1979; Foss & Blank, 1980). In order to determine whether the faster reaction times observed in the

related condition were due to this difference in word frequencies, an analysis of covariance was performed on the item latencies, using word frequency of the word preceding the target as a covariate. The analysis of covariance revealed a significant effect of relatedness,  $F(1,17) = 9.71$ ,  $M_{se} = 4638.98$ ,  $p < .01$ . While the effect of relatedness is somewhat reduced by removal of the confounding effect of the word frequency difference, it is still robust. Thus rhyme monitoring was facilitated when the target word was preceded by a semantically related word. This result indicates that word meanings are accessed during rhyme monitoring.

As in Experiments 2 and 3, rhyme monitor latencies were faster to orthographically similar rhymes than to dissimilar rhymes. This difference, which averaged 37 msec, was significant in the subject analysis  $F(1,20) = 12.32$ ,  $M_{se} = 2461.83$ ,  $p < .005$ , but only a trend in the item analysis,  $F(1,18) = 3.63$ ,  $M_{se} = 5037.74$ ,  $.05 < p < .10$ , and in the analysis of covariance,  $F(1,17) = 2.48$ ,  $M_{se} = 4844.70$ ,  $.10 < p < .15$ .

The weakness of the orthography effect compared to Experiments 1 and 2 may be due to two factors. A relatively small number of items was used in this experiment and similar and dissimilar targets were not as well matched as in the previous experiments. Finally, the orthography x relatedness interaction was not significant ( $F < 1$ ).

### Discussion

The most important result from Experiment 3 is that rhyme monitoring is facilitated when the target word is preceded by a semantically related

word. This result indicates that listeners access the meanings of target words during rhyme monitoring. There would seem to be at least two explanations for the semantic facilitation effect observed.

One explanation is that the semantically related word facilitated the encoding of the target word. On this view, the mechanism for the semantic facilitation obtained in this experiment is the same as the mechanism responsible for semantic facilitation effects in lexical decision experiments. These effects are usually attributed to spreading activation which occurs as an automatic consequence of word recognition (Collins & Loftus, 1975).

An alternative possibility is that the semantically related word enabled the subject to predict the target word more accurately. This explanation is similar to the production frequency explanation for orthographic effects in rhyme monitoring tested in Experiments 1 and 2.

This explanation, however, seems unlikely given that the stimulus materials were designed to minimize subject strategies. In addition, there probably was not enough time between words for the subject to use the related word to generate a prediction. Research by Neely (1977) and Stanovich and West (1979) has demonstrated that expectancy effects in word recognition require 500 msec or so to develop. In the present study, there was less than a 250 msec interval between target words.

The absence of an interaction between relatedness and the orthography effect is potentially important. Meyer et al. (1974) and Becker

and Killion (1977) have suggested that the semantic facilitation effects observed in lexical decision experiments obtain because the prime word facilitates the sensory analysis of the target word. This conclusion derives from the fact that semantic priming interacts with visual degradation and/or brightness of the target word, variables which are assumed to influence the sensory analysis of a word. In contrast, semantic priming effects do not interact with word frequency, a variable which is presumed to influence later stages of processing. According to additive factors logic, this would place the locus of semantic facilitation effects at a sensory level. By the same logic, the lack of an interaction between relatedness and orthography in the present study, suggests that orthographic similarity affects a different stage in processing than semantic relatedness.

#### General Discussion

The present studies suggest that Seidenberg and Tanenhaus' (1979) finding that orthographically similar rhymes are monitored more rapidly than dissimilar rhymes is not due to a production frequency bias in their stimuli. In addition, Experiment 3 demonstrates that lexical access occurs in rhyme monitoring. Thus, subjects access both orthographic and semantic codes in a task which, in principle, could be performed with phonological information only.

There is an interesting symmetry between the orthographic activation in auditory word recognition observed in these studies, and the phonological



activation in visual word recognition observed in numerous previous studies (see Shankweiler, Liberman, Marks, Fowler, & Fischer, 1979). This symmetry suggests the possibility that both effects are due to a common mechanism.

One alternative is that the orthographic effect is due to the mechanism commonly assumed to underlie the phonological effect, namely, recoding. On this view, subjects in the rhyming task recode the auditory stimuli into a code based on orthography. However, the presumed motivation for recoding in visual word recognition is that information is better retained in a sound-based code. Thus, the recoding hypothesis does not provide a motivated explanation for subjects' recoding from phonology to orthography in the above experiments.

It might be argued that it is the rhyming task itself which motivates subjects to recode in this way. Subjects might access the orthographic code for a cue word in anticipation of performing the rhyming task, perhaps in the belief that, other factors aside, a target rhyme is more likely to be spelled similarly than dissimilarly. Although this possibility cannot be eliminated entirely, several considerations militate against it. One is that Tanenhaus, Flanigan, and Seidenberg (in press) observed the orthographic effect in a task that did not require rhyme detection. They used a color naming task (Stroop) in which target words printed in a color were preceded by an auditory prime word. Warren (1972) observed color naming interferences in this task when the prime and target words were associatively related. In the Tanenhaus et al. study,

color naming interference obtained when the prime word was either orthographically or phonologically related to the target word (e.g., bead-dead and bed-dead, respectively). While it might be argued that a phonological-to-orthographic recoding strategy could facilitate rhyme detection, it would do nothing to facilitate Stroop performance. Any strategy which facilitates encoding of the target word will have a negative effect on identifying the target color. Although Stroop performance is not immune to strategies (see Logan, 1980), such a strategy would, in fact, have been counter-productive in the Tanenhaus et al. study, given their design.

Another possibility is that the orthographic code became available as an automatic consequence of the word recognition process. The representation of a word in the mental lexicon contains information concerning its spelling, sound, and meaning. When a word is recognized, all three codes become available, as implied by the logogen model (Morton, 1969). It also follows from Morton's model that this outcome should hold regardless of the input modality of the word, since both auditory and visual feature analyzers feed a common set of logogens. Thus, both phonological effects in visual word recognition and orthographic effects in auditory word recognition are subsumed under a single mechanism, the automatic access of multiple codes associated with a logogen. This eliminates the need to postulate a distinct orthographic-to-phonological "recoding" stage in visual recognition.

A second issue concerns the maintenance of the orthographic information during the rhyming task. Although the orthographic code may be initially activated during auditory word recognition, it is likely to decay rapidly. Nonetheless it persisted long enough to enter into the rhyme decision. One explanation for this is that the cue and target words occurred so closely in time that the orthographic code was still active. However, cue-target pairs were separated by as much as several seconds (and three intervening words) in the Seidenberg and Tanenhaus (1979) study. A second possibility is that subjects hold on to the orthographic code because of working memory limitations. In rhyme monitoring, the subject has to hold onto the cue word, decode auditorily presented words, and compare the cue and each target word along phonological dimensions. All of these components of the rhyme monitoring task require processing within the same modality and thus may tax limited capacity memory resources. As a consequence decoding the target words may interfere with memory for the cue word. Holding onto the orthographic code for the cue word may reduce some of this interference and facilitate performance.

A final issue concerns the mechanism by which orthographic information entered into the rhyming decision. Having accessed the orthographic code for a cue word by some means (e.g., automatic activation or "recoding"), how did it contribute to the observed latencies for similarly and dissimilarly spelled targets? Here again a number of mechanisms are

possible. Seidenberg and Tanenhaus (1979) observed that faster latencies to detect orthographically-similar targets could be due to priming. In studies such as Meyer and Schvaneveldt (1971), targets are detected faster when preceded by a semantically related word than by an unrelated word (e.g., doctor-nurse vs. chair-nurse). A common interpretation of these effects is that encoding the initial word produces an automatic spread of activation along pathways in memory. Since the memory network is assumed to be organized in terms of semantic relatedness, activation spreads to nodes for related words but not unrelated ones. When a related word appears as target, its detection is facilitated. One could similarly argue that encoding a word yields priming of a pool of orthographically and/or phonologically related words as well. However, this interpretation is implausible. There is considerable evidence that the mental lexicon is organized in terms of semantic relations among words; since meaningful utterances frequently contain words that are semantically related, spreading activation along the semantic dimension might have some utility. There isn't an obvious functional reason why the mental lexicon would be constructed in such a way as to facilitate recognizing words that are related in spelling (or sound) to an input.

An alternate interpretation is that subjects accessed multiple codes for cues, independently accessed multiple codes for targets, and then detected rhymes by comparing the stimuli along both orthographic and phonological dimensions. A mismatch on the orthographic dimension

required an extra information-processing stage, such as re-checking the phonological match. A response bias could contribute to the observed effect: having recognized a word with a particular sound-spelling relation, subjects may expect that a subsequent word with that sound will have the same spelling as well. This model--similar to one proposed by Meyer, Schvaneveldt, and Ruddy (1974) for visual word recognition--suggests that subjects should find it difficult to reject alternatives that match the cue word orthographically, but mismatch phonologically (e.g., clown-blown; see Tanenhaus et al., in press).

A final possibility is that encoding a cue word primes not a pool of potential targets, but rather a small set of orthographic and phonological feature analyzers. Having processed a word with certain orthographic and phonological features makes it easier to process a subsequent word with these features, i.e., perform some of the same decoding operations again. Similar rhymes benefit from both dimensions, while dissimilar rhymes benefit from only one.

The work of Chomsky and Halle (1968) suggests that the longer latencies in the dissimilar condition are not due to orthographic differences. They propose an underlying phonological representation for words that is much more abstract than the phonemic level. They make the further claim that the underlying phonological representation of a word is usually closely related to its spelling. Thus in Chomsky and Halle's system words which are spelled differently but pronounced similarly

would have different underlying representations, while rhyme words which are spelled similarly would have similar underlying representations. If these underlying representations influence rhyme judgments, then similarity or dissimilarity of underlying representations rather than orthography could account for the effects observed in the present studies. Unfortunately, it is extremely difficult to evaluate this hypothesis empirically because spelling and underlying representation are almost completely confounded in materials such as the ones used in these studies.<sup>2</sup>

Clearly, the present studies do not provide decisive evidence bearing on these alternate interpretations of the orthography effect. It should be possible to evaluate these alternatives empirically, however. For example, the extent to which the observed effect is due to a phonological-to-orthographic recoding strategy, rather than the automatic code activation, could be examined by varying the proportion of similar and dissimilar rhymes, and by testing for orthographic encoding in non-rhyming tasks. If the effect is due to the priming of sensory feature analyzers, rather than a set of orthographically related words, it should appear with non-word targets. If orthographic encoding of auditory stimuli is general phenomenon, not merely restricted to tasks in which subjects process individual words, it should appear with sentential stimuli as well.

What the studies do highlight is the close relationship between the orthographic and phonological codes. Under a wide range of circumstances

(including those studied by Seidenberg & Tanenhaus, 1979; Tanenhaus et al., in press; and in the present studies), subjects access orthographic information in the immediate comprehension of spoken language. This could only occur if the representations of orthographic and phonological codes in memory were highly integrated. This integration most likely occurs when the child is learning to read, and it appears to be an integral part of successful early reading (Shankweiler et al., 1979). Since children are able to perform rhyming tasks at an early age, rhyme monitoring may prove useful in studying how orthographic and phonological code integration develops as the child learns to read. This integration is possible because while each word has alternate orthographic and phonological codes, both codes are used within a single grammatical system. It is important, in this regard, to consider certain exceptional cases in which such integration is not possible. In particular, deaf persons who use American Sign Language for expressive language, and learn to read English, know words that are expressed in two codes governed by different grammars. The resulting absence of an integrated representation may account, in part, for the difficulties they experience in acquiring reading skill (Conrad, 1979).

## References

- Atkinson, R. C., & Shiffrin, R. M. Human memory: A proposed system and its control processes. In K. W. Spence & J. T. Spence (Eds.), The psychology of learning and motivation (Vol. 2). New York: Academic Press, 1968.
- Baron, J. Phonemic stage not necessary for reading. Quarterly Journal of Experimental Psychology, 1973, 25, 241-246.
- Becker, C. A., & Killion, T. H. Interaction of visual and cognitive effects in word recognition. Journal of Experimental Psychology: Human Perception and Performance, 1977, 3, 389-401.
- Chomsky, N., & Halle, M. Sound patterns of English. New York: Harper & Row, 1968.
- Clark, H. H. The language-as-fixed-effect fallacy: A critique of language statistics in psychological research. Journal of Verbal Learning and Verbal Behavior, 1973, 12, 335-359.
- Collins, A. M., & Loftus, E. F. A spreading activation theory of semantic processing. Psychological Review, 1975, 82, 407-428.
- Collins, A. M., & Quillian, M. R. Retrieval time from semantic memory. Journal of Verbal Learning and Verbal Behavior, 1969, 8, 240-247.
- Conrad, C. Cognitive economy in semantic memory. Journal of Experimental Psychology, 1972, 92, 149-154.
- Conrad, R. Speech and reading. In J. F. Kavanagh & I. G. Mattingly (Eds.), Language by ear and by eye. Cambridge, Mass.: M.I.T. Press, 1972.



- Conrad, R. The deaf schoolchild: Language and cognitive function. London: Harper & Row, 1979.
- Cutler, A., & Norris, D. Monitoring sentence comprehension. In W. E. Cooper & E. C. T. Walker (Eds.), Sentence processing: Psycholinguistic studies presented to Merrill Garrett. Hillsdale, N.J.: Erlbaum, 1979.
- Davelaar, E., Coltheart, M., Besner, D., & Jonasson, J. T. Phonological recoding and lexical access. Memory and Cognition, 1978, 6, 391-402.
- Fischler, I. Associative facilitation without expectancy in a lexical decision task. Journal of Experimental Psychology: Human Perception and Performance, 1977, 3, 18-26.
- Foss, D. J., & Blank, M. A. Identifying the speech codes. Cognitive Psychology, 1980, 12, 1-31.
- Kučera, H., & Francis, W. N. Computational analysis of present-day American English. Providence, R.I.: Brown University Press, 1967.
- Logan, G. Attention and automaticity in Stroop and priming tasks: Theory and data. Cognitive Psychology, 1980, 12, 523-553.
- Massaro, D. W. Understanding language: An information processing analysis of speech perception, reading, and psycholinguistics. New York: Academic Press, 1975.
- Mehler, J., Segui, J., & Carey, P. Tails of words: Monitoring ambiguity. Journal of Verbal Learning and Verbal Behavior, 1978, 17, 29-35.
- Meyer, D. E., & Schvaneveldt, R. W. Facilitation in recognizing pairs of words: Evidence of a dependence between retrieval operations. Journal of Experimental Psychology, 1971, 90, 227-234.

- Meyer, D. E., Schvaneveldt, R. W., & Ruddy, M. G. Functions of graphemic and phonemic codes in visual word recognition. Memory and Cognition, 1974, 2, 309-321.
- Meyer, D. E., Schvaneveldt, R. W., & Ruddy, M. G. Locus of contextual effects on visual word recognition. In P. Rabbitt & S. Dornič (Eds.), Attention and performance V. New York: Academic Press, 1974.
- Morton, J. Interaction of information in word recognition. Psychological Review, 1969, 76, 163-178.
- Neely, J. H. Semantic priming and retrieval from lexical memory: Roles of inhibitionless spreading activation and limited capacity attention. Journal of Experimental Psychology: General, 1977, 106, 226-254.
- Newman, J. E., & Dell, G. S. The phonological nature of phoneme monitoring: A critique of some ambiguity studies. Journal of Verbal Learning and Verbal Behavior, 1978, 17, 359-374.
- Seidenberg, M. S., & Tanenhaus, M. K. Orthographic effects on rhyming. Journal of Experimental Psychology: Human Learning and Memory, 1979, 5, 546-554.
- Shankweiler, D., Liberman, I. Y., Marks, L. S., Fowler, C. A., & Fischer, F. W. The speech code and learning to read. Journal of Experimental Psychology: Human Learning and Memory, 1979, 5, 531-545.
- Stanovich, K. E., & West, R. F. Mechanisms of sentence context effects in reading: Automatic activation and conscious attention. Memory and Cognition, 1979, 7, 77-85.
- Tanenhaus, M. K., & Seidenberg, M. S. Discourse context and sentence perception. Discourse Processes, in press.

Tanenhaus, M. K., Flanigan, H. P., & Seidenberg, M. S. Orthographic and phonological priming in auditory and visual word recognition. Memory and Cognition, in press.

Warren, R. E. Stimulus encoding and memory. Journal of Experimental Psychology, 1972, 94, 90-100.

Footnotes

<sup>1</sup>Of course, this procedure may slightly overestimate a similar orthography bias in rhyme production since it requires a written response.

<sup>2</sup>We are grateful to a reviewer for pointing this out.

Table 1  
Monitor Latencies (in msec) for Experiment 3

Semantic Relatedness	Orthographic Relationship	
	Similar	Dissimilar
Related	491	533
Unrelated	565	597

## Appendix

## Text Stimuli Used in Experiments

## Stimuli for Experiment 1

Cue Word	Target Word	
	Orthographically Similar	Orthographically Dissimilar
gum	rum	dumb
blade	grade	laid
pie	tie	rye
vote	note	boat
coal	goal	stole
beak	freak	cheek
dirt	flirt	hurt
pope	rope	soap
dance	glance	pants
blur	slur	stir
fool	spool	cruel
joke	woke	folk
tease	ease	knees
bead	plead	greed
learn	yearn	fern
tune	dune	noon
ghost	post	coast
flame	name	claim
glue	clue	grew

## Stimuli for Experiment 1

Cue Word	Target Word	
	Orthographically Similar	Orthographically Dissimilar
head	dead	bed
kite	bite	flight
lore	store	floor
fad	glad	plaid
tree	fee	key

## Stimuli for Experiment 2

Cue Word		Target Word
Orthographically Similar	Orthographically Dissimilar	
plate	freight	gate
lies	rise	pies
meeek	beak	cheek
dance	pants	trance
learn	burn	yearn
doom	tomb	bloom
boss	sauce	cross
joke	soak	choke
foe	row	hoe
dirt	hurt	skirt
beast	priest	yeast
greed	bead	weed
glad	plaid	lad
rocks	box	shocks
hide	guide	pride
ghost	roast	post
boat	vote	goat
lore	roar	store
coal	bowl	goal
tree	key	knee
blame	claim	dame
crew	clue	grew
goose	juice	noose
gum	numb	drum



## Stimuli for Experiment 3

Cue Words	Word Preceding Target		Target
	Related	Unrelated	
Orthographically Similar Cues			
tune	sand	blind	dune
gum	gin	stern	rum
glue	hint	crane	clue
vote	memo	cute	note
pope	string	track	rope
joke	slept	bridge	woke
blade	mark	bleach	grade
lore	shop	knees	store
kite	chew	vest	bite
tree	price	plain	fee
Orthographically Dissimilar Cues			
dirt	pain	watch	hurt
learn	plant	gland	fern
head	sheet	rude	bed
beak	face	wrong	cheek
fool	mean	climb	cruel
ghost	shore	belt	coast
blur	mix	trail	stir
pie	wheat	vase	rye
fad	print	frog	plaid
dance	shirt	zinc	pants

CENTER FOR THE STUDY OF READING

READING EDUCATION REPORTS

- Adams, M. J., Anderson, R. C., & Durkin, D. Beginning Reading: Theory and Practice (No. 3), November 1977. (ERIC Document Reproduction Service No. ED 151 722, 15p., PC-\$2.00, MF-\$0.91)
- Adams, M., & Bruce, B. Background Knowledge and Reading Comprehension (No. 13), January 1980. (ERIC Document Reproduction Service No. ED 181 431, 48p., PC-\$3.65, MF-\$0.91)
- Anderson, R. C., & Freebody, P. Vocabulary Knowledge and Reading (No. 11), August 1979. (ERIC Document Reproduction Service No. ED 177 470, 52p., PC-\$5.30, MF-\$0.91)
- Anderson, T. H. Another Look at the Self-Questioning Study Technique (No. 6), September 1978. (ERIC Document Reproduction Service No. ED 163 441, 19p., PC-\$2.00, MF-\$0.91)
- Anderson, T. H., Armbruster, B. B., & Kantor, R. N. How Clearly Written are Children's Textbooks? Or, Of Bladderworts and Alfa (includes a response by M. Kane, Senior Editor, Ginn and Company) (No. 16), August 1980. (ERIC Document Reproduction Service No. ED 192 275, 63p., PC-\$5.30, MF-\$0.91)
- Asher, S. R. Sex Differences in Reading Achievement (No. 2), October 1977. (ERIC Document Reproduction Service No. ED 146 567, 30p., PC-\$3.65, MF-\$0.91)
- Baker, L. Do I Understand or Do I not Understand: That is the Question (No. 10), July 1979. (ERIC Document Reproduction Service No. ED 174 948, 27p., PC-\$3.65, MF-\$0.91)
- Bruce, B. What Makes a Good Story? (No. 5), June 1978. (ERIC Document Reproduction Service No. ED 158 222, 16p., PC-\$2.00, MF-\$0.91)
- Collins, A., & Haviland, S. E. Children's Reading Problems (No. 8), June 1979. (ERIC Document Reproduction Service No. ED 172 188, 19p., PC-\$2.00, MF-\$0.91)
- Durkin, D. Comprehension Instruction--Where are You? (No. 1), October 1977. (ERIC Document Reproduction Service No. ED 146 566, 14p., PC-\$2.00, MF-\$0.91)
- Durkin, D. What is the Value of the New Interest in Reading Comprehension? (No. 19), November 1980.
- Jenkins, J. R., & Pany, D. Teaching Reading Comprehension in the Middle Grades (No. 4), January 1978. (ERIC Document Reproduction Service No. ED 151 756, 36p., PC-\$3.65, MF-\$0.91)
- Joag-dev, C., & Steffensen, M. S. Studies of the Bicultural Reader: Implications for Teachers and Librarians (No. 12), January 1980. (ERIC Document Reproduction Service No. ED 181 430, 28p., PC-\$3.65, MF-\$0.91)

- Pearson, P. D., & Kamil, M. L. Basic Processes and Instructional Practices in Teaching Reading (No. 7), December 1978. (ERIC Document Reproduction Service No. ED 165 118, 29p., PC-\$3.65, MF-\$91)
- Rubin, A. Making Stories, Making Sense (includes a response by T. Raphael and J. LaZansky) (No. 14), January 1980. (ERIC Document Reproduction Service No. ED 181 432, 42p., PC-\$3.65, MF-\$91)
- Schallert, D. L., & Kleiman, G. M. Some Reasons Why Teachers are Easier to Understand than Textbooks (No. 9), June 1979. (ERIC Document Reproduction Service No. ED 172 189, 17p., PC-\$2.00, MF-\$91)
- Steinberg, C., & Bruce, B. Higher-Level Features in Children's Stories: Rhetorical Structure and Conflict (No. 18), October 1980.
- Tierney, R. J., & LaZansky, J. The Rights and Responsibilities of Readers and Writers: A Contractual Agreement (includes responses by R. N. Kantor and B. B. Armbruster) (No. 15), January 1980. (ERIC Document Reproduction Service No. ED 181 447, 32p., PC-\$3.65, MF-\$91)
- Tierney, R. J., Mosenthal, J., & Kantor, R. N. Some Classroom Applications of Text Analysis: Toward Improving Text Selection and Use (No. 17), August 1980. (ERIC Document Reproduction Service No. ED 192 251, 43p., PC-\$3.65, MF-\$91)

CENTER FOR THE STUDY OF READING

TECHNICAL REPORTS

- Adams, M. J. Failures to Comprehend and Levels of Processing in Reading (No. 37), April 1977. (ERIC Document Reproduction Service No. ED 145 410, 51p., PC-\$5.30, MF-\$ .91)
- Adams, M. J. Models of Word Recognition (No. 107), October 1978. (ERIC Document Reproduction Service No. ED 163 431, 93p., PC-\$6.95, MF-\$ .91)
- Adams, M. J. What Good is Orthographic Redundancy? (No. 192), December 1980.
- Adams, M. J., & Collins, A. A Schema-Theoretic View of Reading Comprehension (No. 32), April 1977. (ERIC Document Reproduction Service No. ED 142 971, 49p., PC-\$3.65, MF-\$ .91)
- Alessi, S. M., Anderson, T. H., & Biddle, W. B. Hardware and Software Considerations in Computer Based Course Management (No. 4), November 1975. (ERIC Document Reproduction Service No. ED 134 928, 21p., PC-\$2.00, MF-\$ .91)
- Alessi, S. M., Anderson, T. H., & Goetz, E. T. An Investigation of Lookbacks During Studying (No. 140), September 1979. (ERIC Document Reproduction Service No. ED 177 494, 40p., PC-\$3.65, MF-\$ .91)
- Anderson, R. C. Schema-Directed Processes in Language Comprehension (No. 50), July 1977. (ERIC Document Reproduction Service No. ED 142 977, 33p., PC-\$3.65, MF-\$ .91)
- Anderson, R. C., & Freebody, P. Vocabulary Knowledge (No. 136), August 1979. (ERIC Document Reproduction Service No. ED 177 480, 71p., PC-\$5.30, MF-\$ .91)
- Anderson, R. C., Goetz, E. T., Pichert, J. W., & Halff, H. M. Two Faces of the Conceptual Peg Hypothesis (No. 6), January 1976. (ERIC Document Reproduction Service No. ED 134 930, 29p., PC-\$3.65, MF-\$ .91)
- Anderson, R. C., & Pichert, J. W. Recall of Previously Unrecallable Information Following a Shift in Perspective (No. 41), April 1977. (ERIC Document Reproduction Service No. ED 142 974, 37p., PC-\$3.65, MF-\$ .91)
- Anderson, R. C., Pichert, J. W., Goetz, E. T., Schallert, D. L., Stevens, K. C., & Trollip, S. R. Instantiation of General Terms (No. 10), March 1976. (ERIC Document Reproduction Service No. ED 134 933, 30p., PC-\$3.65, MF-\$ .91)
- Anderson, R. C., Pichert, J. W., & Shirey, L. L. Effects of the Reader's Schema at Different Points in Time (No. 119), April 1979. (ERIC Document Reproduction Service No. ED 169 523, 36p., PC-\$3.65, MF-\$ .91)
- Anderson, R. C., Reynolds, R. E., Schallert, D. L., & Goetz, E. T. Frameworks for Comprehending Discourse (No. 12), July 1976. (ERIC Document Reproduction Service No. ED 134 935, 33p., PC-\$3.65, MF-\$ .91)

- Anderson, R. C., Spiro, R. J., & Anderson, M. C. Schemata as Scaffolding for the Representation of Information in Connected Discourse (No. 24), March 1977. (ERIC Document Reproduction Service No. ED 136 236, 18p., PC-\$2.00, MF-\$ .91)
- Anderson, R. C., Stevens, K. C., Shifrin, Z., & Osborn, J. Instantiation of Word Meanings in Children (No. 46), May 1977. (ERIC Document Reproduction Service No. ED 142 976, 22p., PC-\$2.00, MF-\$ .91)
- Anderson, T. H. Study Skills and Learning Strategies (No. 104), September 1978. (ERIC Document Reproduction Service No. ED 161 000, 41p., PC-\$3.65, MF-\$ .91)
- Anderson, T. H., & Armbruster, B. B. Studying (No. 155), January 1980. (ERIC Document Reproduction Service No. ED 181 427, 48p., PC-\$3.65, MF-\$ .91)
- Anderson, T. H., Standiford, S. N., & Alessi, S. M. Computer Assisted Problem Solving in an Introductory Statistics Course (No. 56), August 1977. (ERIC Document Reproduction Service No. ED 146 563, 26p., PC-\$3.65, MF-\$ .91)
- Anderson, T. H., Wardrop, J. L., Hively, W., Muller, K. E., Anderson, R. I., Hastings, C. N., & Fredericksen, J. Development and Trial of a Model for Developing Domain Referenced Tests of Reading Comprehension (No. 86), May 1978. (ERIC Document Reproduction Service No. ED 157 036, 69p., PC-\$5.30, MF-\$ .91)
- Andre, M. E. D. A., & Anderson, T. H. The Development and Evaluation of a Self-Questioning Study Technique (No. 87), June 1978. (ERIC Document Reproduction Service No. ED 157 037, 37p., PC-\$3.65, MF-\$ .91)
- Antos, S. J. Processing Facilitation in a Lexical Decision Task (No. 113), January 1979. (ERIC Document Reproduction Service No. ED 165 129, 84p., PC-\$6.95, MF-\$ .91)
- Armbruster, B. B. Learning Principles from Prose: A Cognitive Approach Based on Schema Theory (No. 11), July 1976. (ERIC Document Reproduction Service No. ED 134 934, 48p., PC-\$3.65, MF-\$ .91)
- Armbruster, B. B., & Anderson, T. H. The Effect of Mapping on the Free Recall of Expository Text (No. 160), February 1980. (ERIC Document Reproduction Service No. ED 182 735, 49p., PC-\$3.65, MF-\$ .91)
- Armbruster, B. B., Stevens, R. J., & Rosenshine, B. Analyzing Content Coverage and Emphasis: A Study of Three Curricula and Two Tests (No. 26), March 1977. (ERIC Document Reproduction Service No. ED 136 238, 22p., PC-\$2.00, MF-\$ .91)
- Arter, J. A., & Jenkins, J. R. Differential Diagnosis-Prescriptive Teaching: A Critical Appraisal (No. 80), January 1978. (ERIC Document Reproduction Service No. ED 150 578, 104p., PC-\$8.60, MF-\$ .91)
- Asher, S. R. Referential Communication (No. 90), June 1978. (ERIC Document Reproduction Service No. ED 159 597, 71p., PC-\$5.30, MF-\$ .91)

- Asher, S. R. Influence of Topic Interest on Black Children and White Children's Reading Comprehension (No. 99), July 1978. (ERIC Document Reproduction Service No. ED 159 661, 35p., PC-\$3.65, MF-\$ .91)
- Asher, S. R., Hymel, S., & Wigfield, A. Children's Comprehension of High- and Low-Interest Material and a Comparison of Two Cloze Scoring Methods (No. 17), November 1976. (ERIC Document Reproduction Service No. ED 134 939, 32p., PC-\$3.65, MF-\$ .91)
- Asher, S. R., & Wigfield, A. Influence of Comparison Training on Children's Referential Communication (No. 139), August 1979. (ERIC Document Reproduction Service No. ED 177 493, 42p., PC-\$3.65, MF-\$ .91)
- Asher, S. R., & Wigfield, A. Training Referential Communication Skills (No. 175), July 1980. (ERIC Document Reproduction Service No. ED 191 014, 54p., PC-\$5.30, MF-\$ .91)
- Baker, L. Processing Temporal Relationships in Simple Stories: Effects of Input Sequence (No. 84), April 1978. (ERIC Document Reproduction Service No. ED 157 016, 54p., PC-\$5.30, MF-\$ .91)
- Baker, L. Comprehension Monitoring: Identifying and Coping with Text Confusions (No. 145), September 1979. (ERIC Document Reproduction Service No. ED 177 525, 62p., PC-\$5.30, MF-\$ .91)
- Baker, L., & Anderson, R. I. Effects of Inconsistent Information on Text Processing: Evidence for Comprehension Monitoring (No. 203), May 1981.
- Baker, L., & Brown, A. L. Metacognitive Skills and Reading (No. 188), November 1980.
- Baker, L., & Stein, N. L. The Development of Prose Comprehension Skills (No. 102), September 1978. (ERIC Document Reproduction Service No. ED 159 663, 69p., PC-\$5.30, MF-\$ .91)
- Barnitz, J. Interrelationship of Orthography and Phonological Structure in Learning to Read (No. 57), August 1977. (ERIC Document Reproduction Service No. ED 150 546, 62p., PC-\$5.30, MF-\$ .91)
- Barnitz, J. G. Reading Comprehension of Pronoun-Referent Structures by Children in Grades Two, Four, and Six (No. 117), March 1979. (ERIC Document Reproduction Service No. ED 170 731, 51p., PC-\$5.30, MF-\$ .91)
- Brewer, W. F. Memory for the Pragmatic Implications of Sentences (No. 65), October 1977. (ERIC Document Reproduction Service No. ED 146 564, 27p., PC-\$3.65, MF-\$ .91)
- Brewer, W. F., & Lichtenstein, E. H. Event Schemas, Story Schemas, and Story Grammars (No. 197), December 1980.
- Brown, A. L. Knowing When, Where, and How to Remember: A Problem of Metacognition (No. 47), June 1977. (ERIC Document Reproduction Service No. ED 146 562, 152p., PC-\$11.90, MF-\$ .91)
- Brown, A. L. Theories of Memory and the Problems of Development: Activity, Growth, and Knowledge (No. 51), July 1977. (ERIC Document Reproduction Service No. ED 144 041, 59p., PC-\$5.30, MF-\$ .91)

- Brown, A. L. Learning and Development: The Problems of Compatibility, Access, and Induction (No. 165), March 1980. (ERIC Document Reproduction Service No. ED 184 093, 76p., PC-\$6.95, MF-\$91)
- Brown, A. L., & Campione, J. C. Memory Strategies in Learning: Training Children to Study Strategically (No. 22), March 1977. (ERIC Document Reproduction Service No. ED 136 234, 54p., PC-\$5.30, MF-\$91)
- Brown, A. L., & Campione, J. C. Permissible Inferences from the Outcome of Training Studies in Cognitive Development Research (No. 127), May 1979. (ERIC Document Reproduction Service No. ED 170 736, 34p., PC-\$3.65, MF-\$91)
- Brown, A. L., & Campione, J. C. Inducing Flexible Thinking: The Problem of Access (No. 156), January 1980. (ERIC Document Reproduction Service No. ED 181 428, 44p., PC-\$3.65, MF-\$91)
- Brown, A. L., Campione, J. C., & Barclay, C. R. Training Self-Checking Routines for Estimating Test Readiness: Generalization from List Learning to Prose Recall (No. 94), July 1978. (ERIC Document Reproduction Service No. ED 158 226, 41p., PC-\$3.65, MF-\$91)
- Brown, A. L., Campione, J. C., & Day, J. D. Learning to Learn: On Training Students to Learn from Texts (No. 189), November 1980.
- Brown, A. L., & DeLoache, J. S. Skills, Plans, and Self-Regulation (No. 48), July 1977. (ERIC Document Reproduction Service No. ED 144 040, 66p., PC-\$5.30, MF-\$91)
- Brown, A. L., & French, L. A. The Zone of Potential Development: Implications for Intelligence Testing in the Year 2000 (No. 128), May 1979. (ERIC Document Reproduction Service No. ED 170 737, 46p., PC-\$3.65, MF-\$91)
- Brown, A. L., & Smiley, S. S. The Development of Strategies for Studying Prose Passages (No. 66), October 1977. (ERIC Document Reproduction Service No. ED 145 371, 59p., PC-\$5.30, MF-\$91)
- Brown, A. L., Smiley, S. S., Day, J. D., Townsend, M. A. R., & Lawton, S. C. Intrusion of a Thematic Idea in Children's Comprehension and Retention of Stories (No. 18), December 1976. (ERIC Document Reproduction Service No. ED 136 189, 39p., PC-\$3.65, MF-\$91)
- Brown, A. L., Smiley, S. S., & Lawton, S. C. The Effects of Experience on the Selection of Suitable Retrieval Cues for Studying from Prose Passages (No. 53), July 1977. (ERIC Document Reproduction Service No. ED 144 042, 30p., PC-\$3.65, MF-\$91)
- Bruce, B. C. Plans and Social Actions (No. 34), April 1977. (ERIC Document Reproduction Service No. ED 149 328, 45p., PC-\$3.65, MF-\$91)
- Bruce, B. Analysis of Interacting Plans as a Guide to the Understanding of Story Structure (No. 130), June 1979. (ERIC Document Reproduction Service No. ED 174 951, 43p., PC-\$3.65, MF-\$91)

- Bruce, B. C., Collins, A., Rubin, A. D., & Gentner, D. A Cognitive Science Approach to Writing (No. 89), June 1978. (ERIC Document Reproduction Service No. ED 157 039, 57p., PC-\$5.30, MF-\$0.91)
- Bruce, B. C., & Newman, D. Interacting Plans (No. 88), June 1978. (ERIC Document Reproduction Service No. ED 157 038, 100p., PC-\$6.95, MF-\$0.91)
- Campione, J. C., Nitsch, K., Bray, N., & Brown, A. L. Improving Memory Skills in Mentally Retarded Children: Empirical Research and Strategies for Intervention (No. 196), December 1980.
- Canney, G., & Winograd, P. Schemata for Reading and Reading Comprehension Performance (No. 120), April 1979. (ERIC Document Reproduction Service No. ED 169 520, 99p., PC-\$6.95, MF-\$0.91)
- Cohen, P. R., & Perrault, C. R. Elements of a Plan-Based Theory of Speech Acts (No. 141), September 1979. (ERIC Document Reproduction Service No. ED 177 497, 76p., PC-\$6.95, MF-\$0.91)
- Collins, A., Brown, A. L., Morgan, J. L., & Brewer, W. F. The Analysis of Reading Tasks and Texts (No. 43), April 1977. (ERIC Document Reproduction Service No. ED 145 404, 96p., PC-\$6.95, MF-\$0.91)
- Collins, A., Brown, J. S., & Larkin, K. M. Inference in Text Understanding (No. 40), December 1977. (ERIC Document Reproduction Service No. ED 150 547, 48p., PC-\$3.65, MF-\$0.91)
- Collins, A., & Smith, E. E. Teaching the Process of Reading Comprehension (No. 182), September 1980. (ERIC Document Reproduction Service No. ED 193 616, 43p., PC-\$3.65, MF-\$0.91)
- Davison, A. Linguistics and the Measurement of Syntactic Complexity: The Case of Raising (No. 173), May 1980. (ERIC Document Reproduction Service No. ED 186 848, 60p., PC-\$5.30, MF-\$0.91)
- Davison, A., Kantor, R. N., Hannah, J., Hermon, G., Lutz, R., Salzillo, R. Limitations of Readability Formulas in Guiding Adaptations of Texts (No. 162), March 1980. (ERIC Document Reproduction Service No. ED 184 090, 157p., PC-\$11.90, MF-\$0.91)
- Dunn, B. R., Mathews, S. R., II, & Bieger, G. Individual Differences in the Recall of Lower-Level Textual Information (No. 150), December 1979. (ERIC Document Reproduction Service No. ED 181 448, 37p., PC-\$3.65, MF-\$0.91)
- Durkin, D. What Classroom Observations Reveal about Reading Comprehension Instruction (No. 106), October 1978. (ERIC Document Reproduction Service No. ED 162 259, 94p., PC-\$6.95, MF-\$0.91)
- Fleisher, L. S., & Jenkins, J. R. Effects of Contextualized and Decontextualized Practice Conditions on Word Recognition (No. 54), July 1977. (ERIC Document Reproduction Service No. ED 144 043, 37p., PC-\$3.65, MF-\$0.91)



- Fleisher, L. S., Jenkins, J. R., & Pany, D. Effects on Poor Readers' Comprehension of Training in Rapid Decoding (No. 103), September 1978. (ERIC Document Reproduction Service No. ED 159 664, 39p., PC-\$3.65, MF-\$ .91)
- Freebody, P., & Anderson, R. C. Effects of Differing Proportions and Locations of Difficult Vocabulary on Text Comprehension (No. 202), May 1981.
- Gearhart, M., & Hall, W. S. Internal State Words: Cultural and Situational Variation in Vocabulary Usage (No. 115), February 1979. (ERIC Document Reproduction Service No. ED 165 131, 66p., PC-\$5.30, MF-\$ .91)
- Gentner, D. On Relational Meaning: The Acquisition of Verb Meaning (No. 78), December 1977. (ERIC Document Reproduction Service No. ED 149 325, 46p., PC-\$3.65, MF-\$ .91)
- Gentner, D. Semantic Integration at the Level of Verb Meaning (No. 114), February 1979. (ERIC Document Reproduction Service No. ED 165 130, 39p., PC-\$3.65, MF-\$ .91)
- Gentner, D. Verb Semantic Structures in Memory for Sentences: Evidence for Componential Representation (No. 151), December 1979. (ERIC Document Reproduction Service No. ED 181 424, 75p., PC-\$5.30, MF-\$ .91)
- Goetz, E. T. Sentences in Lists and in Connected Discourse (No. 3), November 1975. (ERIC Document Reproduction Service No. ED 134 927, 75p., PC-\$5.30, MF-\$ .91)
- Goetz, E. T. Inferences in the Comprehension of and Memory for Text (No. 49), July 1977. (ERIC Document Reproduction Service No. ED 150 548, 97p., PC-\$6.95, MF-\$ .91)
- Goetz, E. T., Anderson, R. C., & Schallert, D. L. The Representation of Sentences in Memory (No. 144), September 1979. (ERIC Document Reproduction Service No. ED 177 527, 71p., PC-\$5.30, MF-\$ .91)
- Goetz, E. T., & Osborn, J. Procedures for Sampling Texts and Tasks in Kindergarten through Eighth Grade (No. 30), April 1977. (ERIC Document Reproduction Service No. ED 146 565, 80p., PC-\$6.95, MF-\$ .91)
- Green, G. M. Discourse Functions of Inversion Construction (No. 98), July 1978. (ERIC Document Reproduction Service No. ED 160 998, 42p., PC-\$3.65, MF-\$ .91)
- Green, G. M. Organization, Goals, and Comprehensibility in Narratives: Newswriting, a Case Study (No. 132), July 1979. (ERIC Document Reproduction Service No. ED 174 949, 66p., PC-\$5.30, MF-\$ .91)
- Green, G. M. Linguistics and the Pragmatics of Language Use: What You Know When You Know a Language . . . and What Else You Know (No. 179), August 1980. (ERIC Document Reproduction Service No. ED 193 666, 73p., PC-\$5.30, MF-\$ .91)

- Green, G. M., Kantor, R. N., Morgan, J. L., Stein, N. L., Hermon, G., Salzillo, R., & Sellner, M. B. Analysis of "Babar Loses His Crown" (No. 169), April 1980. (ERIC Document Reproduction Service No. ED 185 514, 89p., PC-\$6.95, MF-\$0.91)
- Green, G. M., Kantor, R. N., Morgan, J. L., Stein, N. L., Hermon, G., Salzillo, R., & Sellner, M. B. Analysis of "The Wonderful Desert" (No. 170), April 1980. (ERIC Document Reproduction Service No. ED 185 515, 47p., PC-\$3.65, MF-\$0.91)
- Green, G. M., Kantor, R. N., Morgan, J. L., Stein, N. L., Hermon, G., Salzillo, R., Sellner, M. B., Bruce, B. C., Gentner, D., & Webber, B. L. Problems and Techniques of Text Analysis (No. 168), April 1980. (ERIC Document Reproduction Service No. ED 185 513, 173p., PC-\$11.90, MF-\$0.91)
- Green, G. M., & Laff, M. O. Five-Year-Olds' Recognition of Authorship by Literary Style (No. 181), September 1980. (ERIC Document Reproduction Service No. ED 193 615, 44p., PC-\$3.65, MF-\$0.91)
- Grueneich, R., & Trabasso, T. The Story as Social Environment: Children's Comprehension and Evaluation of Intentions and Consequences (No. 142), September 1979. (ERIC Document Reproduction Service No. ED 177 496, 56p., PC-\$5.30, MF-\$0.91)
- Halff, H. M. Graphical Evaluation of Hierarchical Clustering Schemes (No. 1), October 1975. (ERIC Document Reproduction Service No. ED 134 926, 11p., PC-\$2.00, MF-\$0.91)
- Hall, W. S., & Dore, J. Lexical Sharing in Mother-Child Interaction (No. 161), March 1980. (ERIC Document Reproduction Service No. ED 184 066, 39p., PC-\$3.65, MF-\$0.91)
- Hall, W. S., & Guthrie, L. F. On the Dialect Question and Reading (No. 121), May 1979. (ERIC Document Reproduction Service No. ED 169 522, 32p., PC-\$3.65, MF-\$0.91)
- Hall, W. S., & Guthrie, L. F. Cultural and Situational Variation in Language Function and Use: Methods and Procedures for Research (No. 148), October 1979. (ERIC Document Reproduction Service No. ED 179 944, 49p., PC-\$3.65, MF-\$0.91)
- Hall, W. S., Linn, R. L., & Nagy, W. E. Spoken Words (No. 177), August 1980.
- Hall, W. S., & Nagy, W. E. Theoretical Issues in the Investigation of Words of Internal Report (No. 146), October 1979. (ERIC Document Reproduction Service No. ED 177 526, 108p., PC-\$8.60, MF-\$0.91)
- Hall, W. S., & Tirre, W. C. The Communicative Environment of Young Children: Social Class, Ethnic, and Situational Differences (No. 125), May 1979. (ERIC Document Reproduction Service No. ED 170 788, 30p., PC-\$3.65, MF-\$0.91)

- Hansen, J., & Pearson, P. D. The Effects of Inference Training and Practice on Young Children's Comprehension (No. 166), April 1980. (ERIC Document Reproduction Service No. ED 186 839, 53p., PC-\$5.30, MF-\$ .91)
- Hayes, D. A., & Tierney, R. J. Increasing Background Knowledge through Analogy: Its Effects upon Comprehension and Learning (No. 186), October 1980.
- Hermon, G. On the Discourse Structure of Direct Quotation (No. 143), September 1979. (ERIC Document Reproduction Service No. ED 177 495, 46p., PC-\$3.65, MF-\$ .91)
- Huggins, A. W. F. Syntactic Aspects of Reading Comprehension (No. 33), April 1977. (ERIC Document Reproduction Service No. ED 142 972, 68p., PC-\$5.30, MF-\$ .91)
- Iran-Nejad, A. The Schema: A Structural or a Functional Pattern (No. 159), February 1980. (ERIC Document Reproduction Service No. ED 181 449, 46p., PC-\$3.65, MF-\$ .91)
- Iran-Nejad, A., Ortony, A., & Rittenhouse, R. K. The Comprehension of Metaphorical Uses of English by Deaf Children (No. 184), October 1980. (ERIC Document Reproduction Service No. ED 193 618, 34p., PC-\$3.65, MF-\$ .91)
- Jenkins, J. R., & Larson, K. Evaluating Error Correction Procedures for Oral Reading (No. 55), June 1978. (ERIC Document Reproduction Service No. ED 158 224, 34p., PC-\$3.65, MF-\$ .91)
- Jenkins, J. R., & Pany, D. Curriculum Biases in Reading Achievement Tests (No. 16), November 1976. (ERIC Document Reproduction Service No. ED 134 938, 24p., PC-\$2.00, MF-\$ .91)
- Jenkins, J. R., Pany, D., & Schreck, J. Vocabulary and Reading Comprehension: Instructional Effects (No. 100), August 1978. (ERIC Document Reproduction Service No. ED 160 999, 50p., PC-\$3.65, MF-\$ .91)
- Kane, J. H., & Anderson, R. C. Depth of Processing and Interference Effects in the Learning and Remembering of Sentences (No. 21), February 1977. (ERIC Document Reproduction Service No. ED 134 942, 29p., PC-\$3.65, MF-\$ .91)
- Kleiman, G. M. The Effect of Previous Context on Reading Individual Words (No. 20), February 1977. (ERIC Document Reproduction Service No. ED 134 941, 76p., PC-\$6.95, MF-\$ .91)
- Kleiman, G. M. The Prelinguistic Cognitive Basis of Children's Communicative Intentions (No. 19), February 1977. (ERIC Document Reproduction Service No. ED 134 940, 51p., PC-\$5.30, MF-\$ .91)
- Kleiman, G. M. The Scope of Facilitation of Word Recognition from Single Word and Sentence Frame Contexts (No. 133), July 1979. (ERIC Document Reproduction Service No. ED 174 947, 61p., PC-\$5.30, MF-\$ .91)

- Kleiman, G. M., Winograd, P. N., & Humphrey, M. M. Prosody and Children's Parsing of Sentences (No. 123), May 1979. (ERIC Document Reproduction Service No. ED 170 733, 28p., PC-\$3.65, MF-\$0.91)
- Linn, R. L., Levine, M. V., Hastings, C. N., & Wardrop, J. L. An Investigation of Item Bias in a Test of Reading Comprehension (No. 163), March 1980. (ERIC Document Reproduction Service No. ED 184 091, 97p., PC-\$6.95, MF-\$0.91)
- Mason, J. M. Questioning the Notion of Independent Processing Stages in Reading (No. 8), February 1976. (Journal of Educational Psychology, 1977, 69, 288-297.
- Mason, J. M. Reading Readiness: A Definition and Skills Hierarchy from Preschoolers' Developing Conceptions of Print (No. 59), September 1977. (ERIC Document Reproduction Service No. ED 145 403, 57p., PC-\$5.30, MF-\$0.91)
- Mason, J. M. The Role of Strategy in Reading in the Mentally Retarded (No. 58), September 1977. (ERIC Document Reproduction Service No. ED 145 406, 28p., PC-\$3.65, MF-\$0.91)
- Mason, J. M. Prereading: A Developmental Perspective (No. 198), February 1981.
- Mason, J. M., & Kendall, J. R. Facilitating Reading Comprehension Through Text Structure Manipulation (No. 92), June 1978. (ERIC Document Reproduction Service No. ED 157 041, 36p., PC-\$3.65, MF-\$0.91)
- Mason, J. M., Knisely, E., & Kendall, J. Effects of Polysemous Words on Sentence Comprehension (No. 85), May 1978. (ERIC Document Reproduction Service No. ED 157 015, 34p., PC-\$3.65, MF-\$0.91)
- Mason, J., & McCormick, C. Testing the Development of Reading and Linguistic Awareness (No. 126), May 1979. (ERIC Document Reproduction Service No. ED 170 735, 50p., PC-\$3.65, MF-\$0.91)
- Mason, J., Osborn, J., & Rosenshine, B. A Consideration of Skill Hierarchy Approaches to the Teaching of Reading (No. 42), December 1977. (ERIC Document Reproduction Service No. ED 150 549, 176p., PC-\$13.55, MF-\$0.91)
- McClure, E. Aspects of Code-Switching in the Discourse of Bilingual Mexican-American Children (No. 44), April 1977. (ERIC Document Reproduction Service No. ED 142 975, 38p., PC-\$3.65, MF-\$0.91)
- McClure, E., Mason, J., & Barnitz, J. Story Structure and Age Effects on Children's Ability to Sequence Stories (No. 122), May 1979. (ERIC Document Reproduction Service No. ED 170 732, 75p., PC-\$5.30, MF-\$0.91)
- McClure, E., & Steffensen, M. S. A Study of the Use of Conjunctions across Grades and Ethnic Groups (No. 158), January 1980. (ERIC Document Reproduction Service No. ED 182 688, 43p., PC-\$3.65, MF-\$0.91)
- McConkie, G. W. Evaluating and Reporting Data Quality in Eye Movement Research (No. 193), December 1980.

- McConkie, G. W., Hogaboam, T. W., Wolverton, G. S., Zola, D., & Lucas, P. A. Toward the Use of Eye Movements in the Study of Language Processing (No. 134), August 1979. (ERIC Document Reproduction Service No. ED 174 968, 48p., PC-\$3.65, MF-\$0.91)
- McConkie, G. W., & Zola, D. Language Constraints and the Functional Stimulus in Reading (No. 194), December 1980.
- Morgan, J. L. Two Types of Convention in Indirect Speech Acts (No. 52), July 1977. (ERIC Document Reproduction Service No. ED 145 405, 40p., PC-\$3.65, MF-\$0.91)
- Nash-Webber, B. Anaphora: A Cross-Disciplinary Survey (No. 31), April 1977. (ERIC Document Reproduction Service No. ED 144 039, 43p., PC-\$3.65, MF-\$0.91)
- Nash-Webber, B. L. Inferences in an Approach to Discourse Anaphora (No. 77), January 1978. (ERIC Document Reproduction Service No. ED 150 552, 30p., PC-\$3.65, MF-\$0.91)
- Nash-Webber, B., & Reiter, R. Anaphora and Logical Form: On Formal Meaning Representation for Natural Language (No. 36), April 1977. (ERIC Document Reproduction Service No. ED 142 973, 42p., PC-\$3.65, MF-\$0.91)
- Nezworski, T., Stein, N. L., & Trabasso, T. Story Structure Versus Content Effects on Children's Recall and Evaluative Inferences (No. 129), June 1979. (ERIC Document Reproduction Service No. ED 172 187, 49p., PC-\$3.65, MF-\$0.91)
- Nicholson, T., Pearson, P. D., & Dykstra, R. Effects of Embedded Anomalies and Oral Reading Errors on Children's Understanding of Stories (No. 118), March 1979. (ERIC Document Reproduction Service No. ED 169 524, 43p., PC-\$3.65, MF-\$0.91)
- Nolan, S. D., Tanenhaus, M. K., & Seidenberg, M. S. Multiple Code Activation in Word Recognition: Evidence from Rhyme Monitoring (No. 204), May 1981.
- Ortony, A. Names, Descriptions, and Pragmatics (No. 7), February 1976. (ERIC Document Reproduction Service No. ED 134 931, 25p., PC-\$2.00, MF-\$0.91)
- Ortony, A. Remembering and Understanding Jabberwocky and Small-Talk (No. 28), March 1977. (ERIC Document Reproduction Service No. ED 137 753, 36p., PC-\$3.65, MF-\$0.91)
- Ortony, A. Beyond Literal Similarity (No. 105), October 1978. (ERIC Document Reproduction Service No. ED 166 635, 58p., PC-\$5.30, MF-\$0.91)
- Ortony, A. Some Psycholinguistic Aspects of Metaphor (No. 112), January 1979. (ERIC Document Reproduction Service No. ED 165 115, 38p., PC-\$3.65, MF-\$0.91)
- Ortony, A. Understanding Metaphors (No. 154), January 1980. (ERIC Document Reproduction Service No. ED 181 426, 52p., PC-\$5.30, MF-\$0.91)

- Ortony, A., Reynolds, R. E., & Arter, J. A. Metaphor: Theoretical and Empirical Research (No. 27), March 1977. (ERIC Document Reproduction Service No. ED 137 752, 63p., PC-\$5.30, MF-\$ .91)
- Ortony, A., Schallert, D. L., Reynolds, R. E., & Antos, S. J. Interpreting Metaphors and Idioms: Some Effects of Context on Comprehension (No. 93), July 1978. (ERIC Document Reproduction Service No. ED 157 042, 41p., PC-\$3.65, MF-\$ .91)
- Pany, D., & Jenkins, J. R. Learning Word Meanings: A Comparison of Instructional Procedures and Effects on Measures of Reading Comprehension with Learning Disabled Students (No. 25), March 1977. (ERIC Document Reproduction Service No. ED 136 237, 34p., PC-\$3.65, MF-\$ .91)
- Pearson, P. D., Hansen, J., & Gordon, C. The Effect of Background Knowledge on Young Children's Comprehension of Explicit and Implicit Information (No. 116), March 1979. (ERIC Document Reproduction Service No. ED 169 521, 26p., PC-\$3.65, MF-\$ .91)
- Pearson, P. D., Raphael, T., TePaske, N., & Hyser, C. The Function of Metaphor in Children's Recall of Expository Passages (No. 131), July 1979. (ERIC Document Reproduction Service No. ED 174 950, 41p., PC-\$3.65, MF-\$ .91)
- Pichert, J. W. Sensitivity to What is Important in Prose (No. 149), November 1979. (ERIC Document Reproduction Service No. ED 179 946, 64p., PC-\$5.30, MF-\$ .91)
- Pichert, J. W., & Anderson, R. C. Taking Different Perspectives on a Story (No. 14), November 1976. (ERIC Document Reproduction Service No. ED 134 936, 30p., PC-\$3.65, MF-\$ .91)
- Raphael, T. E., Myers, A. C., Freebody, P., Tirre, W. C., & Fritz, M. Contrasting the Effects of Some Text Variables on Comprehension and Ratings of Comprehensibility (No. 190), December 1980.
- Reder, L. M. Comprehension and Retention of Prose: A Literature Review (No. 108), November 1978. (ERIC Document Reproduction Service No. ED 165 114, 116p., PC-\$8.60, MF-\$ .91)
- Reichman, R. Conversational Coherency (No. 95), July 1978. (ERIC Document Reproduction Service No. ED 159 658, 86p., PC-\$6.95, MF-\$ .91)
- Reynolds, R. E., & Anderson, R. C. Influence of Questions on the Allocation of Attention during Reading (No. 183), October 1980. (ERIC Document Reproduction Service No. ED 193 617, 44p., PC-\$3.65, MF-\$ .91)
- Reynolds, R. E., & Ortony, A. Some Issues in the Measurement of Children's Comprehension of Metaphorical Language (No. 172), May 1980. (ERIC Document Reproduction Service No. ED 185 542, 42p., PC-\$3.65, MF-\$ .91)
- Reynolds, R. E., Standiford, S. N., & Anderson, R. C. Distribution of Reading Time When Questions are Asked about a Restricted Category of Text Information (No. 83), April 1978. (ERIC Document Reproduction Service No. ED 153 206, 34p., PC-\$3.65, MF-\$ .91)

- Reynolds, R. E., Taylor, M. A., Steffensen, M. S., Shirey, L. L., & Anderson, R. C. Cultural Schemata and Reading Comprehension (No. 201), April 1981.
- Royer, J. M. Theories of Learning Transfer (No. 79), January 1978. (ERIC Document Reproduction Service No. ED 149 326, 55p., PC-\$5.30, MF-\$ .91)
- Royer, J. M., & Cunningham, D. J. On the Theory and Measurement of Reading Comprehension (No. 91), June 1978. (ERIC Document Reproduction Service No. ED 157 040, 63p., PC-\$5.30, MF-\$ .91)
- Royer, J. M., Hastings, C. N., & Hook, C. A Sentence Verification Technique for Measuring Reading Comprehension (No. 137), August 1979. (ERIC Document Reproduction Service No. ED 176 234, 34p., PC-\$3.65, MF-\$ .91)
- Rubin, A. D. A Theoretical Taxonomy of the Differences between Oral and Written Language (No. 35), January 1978. (ERIC Document Reproduction Service No. ED 150 550, 61p., PC-\$5.30, MF-\$ .91)
- Rubin, A. D., Bruce, B. C., & Brown, J. S. A Process-Oriented Language for Describing Aspects of Reading Comprehension (No. 13), November 1976. (ERIC Document Reproduction Service No. ED 136 188, 41p., PC-\$3.65, MF-\$ .91)
- Schallert, D. L. Improving Memory for Prose: The Relationship between Depth of Processing and Context (No. 5), November 1975. (ERIC Document Reproduction Service No. ED 134 929, 37p., PC-\$3.65, MF-\$ .91)
- Schallert, D. L., Kleiman, G. M., & Rubin, A. D. Analyses of Differences between Written and Oral Language (No. 29), April 1977. (ERIC Document Reproduction Service No. ED 144 038, 33p., PC-\$3.65, MF-\$ .91)
- Schwartz, R. M. Strategic Processes in Beginning Reading (No. 15), November 1976. (ERIC Document Reproduction Service No. ED 134 937, 19p., PC-\$2.00, MF-\$ .91)
- Schwartz, R. M. Relation of Context Utilization and Orthographic Automaticity in Word Identification (No. 45), May 1977. (ERIC Document Reproduction Service No. ED 137 762, 27p., PC-\$3.65, MF-\$ .91)
- Schwartz, R. M. Levels of Processing: The Strategic Demands of Reading Comprehension (No. 135), August 1979. (ERIC Document Reproduction Service No. ED 177 471, 45p., PC-\$3.65, MF-\$ .91)
- Seidenberg, M. S., Tanenhaus, M. K., & Leiman, J. M. The Time Course of Lexical Ambiguity Resolution in Context (No. 164), March 1980. (ERIC Document Reproduction Service No. ED 184 092, 58p., PC-\$5.30, MF-\$ .91)
- Shoben, E. J. Choosing a Model of Sentence Picture Comparisons: A Reply to Catlin and Jones (No. 81), February 1978. (ERIC Document Reproduction Service No. ED 150 577, 30p., PC-\$3.65, MF-\$ .91)
- Shoben, E. J., Rips, L. J., & Smith, E. E. Issues in Semantic Memory: A Response to Glass and Holyoak (No. 101), August 1978. (ERIC Document Reproduction Service No. ED 159 662, 85p., PC-\$6.95, MF-\$ .91)

- Siegel, M. A. Teacher Behaviors and Curriculum Packages: Implications for Research and Teacher Education (No. 9), April 1976. (ERIC Document Reproduction Service No. ED 134 932, 42p., PC-\$3.65, MF-\$ .91)
- Smiley, S. S., Oakley, D. D., Worthen, D., Campione, J. C., & Brown, A. L. Recall of Thematically Relevant Material by Adolescent Good and Poor Readers as a Function of Written Versus Oral Presentation (No. 23), March 1977. (ERIC Document Reproduction Service No. ED 136 235, 23p., PC-\$2.00, MF-\$ .91)
- Smith, E. E. Organization of Factual Knowledge (No. 185), October 1980.
- Spiro, R. J. Inferential Reconstruction in Memory for Connected Discourse (No. 2), October 1975. (ERIC Document Reproduction Service No. ED 136 187, 81p., PC-\$6.95, MF-\$ .91)
- Spiro, R. J. Etiology of Reading Comprehension Style (No. 124), May 1979. (ERIC Document Reproduction Service No. ED 170 734, 21p., PC-\$2.00, MF-\$ .91)
- Spiro, R. J. Prior Knowledge and Story Processing: Integration, Selection, and Variation (No. 138), August 1979. (ERIC Document Reproduction Service No. ED 176 235, 41p., PC-3.32, MF-\$ .91)
- Spiro, R. J. Schema Theory and Reading Comprehension: New Directions (No. 191), December 1980.
- Spiro, R. J., & Esposito, J. J. Superficial Processing of Explicit Inferences in Text (No. 60), December 1977. (ERIC Document Reproduction Service No. ED 150 545, 27p., PC-\$3.65, MF-\$ .91)
- Spiro, R. J., & Taylor, B. M. On Investigating Children's Transition from Narrative to Expository Discourse: The Multidimensional Nature of Psychological Text Classification (No. 195), December 1980.
- Spiro, R. J., & Tirre, W. C. Individual Differences in Schema Utilization During Discourse Processing (No. 111), January 1979. (ERIC Document Reproduction Service No. ED 166 651, 29p., PC-\$3.65, MF-\$ .91)
- Steffensen, M. S. Bereiter and Engelmann Reconsidered: The Evidence from Children Acquiring Black English Vernacular (No. 82), March 1978. (ERIC Document Reproduction Service No. ED 153 204, 31p., PC-\$3.65, MF-\$ .91)
- Steffensen, M. S., & Guthrie, L. F. Effect of Situation on the Verbalization of Black Inner-City Children (No. 180), September 1980. (ERIC Document Reproduction Service No. ED 193 614, 37p., PC-\$3.65, MF-\$ .91)
- Steffensen, M. S., Jogdeo, C., & Anderson, R. C. A Cross-Cultural Perspective on Reading Comprehension (No. 97), July 1978. (ERIC Document Reproduction Service No. ED 159 660, 41p., PC-\$3.65, MF-\$ .91)
- Steffensen, M. S., Reynolds, R. E., McClure, E., & Guthrie, L. F. Black English Vernacular and Reading Comprehension: A Cloze Study of Third, Sixth, and Ninth Graders (No. 199), February 1981.



- Stein, N. L. How Children Understand Stories: A Developmental Analysis (No. 69), March 1978. (ERIC Document Reproduction Service No. ED 153 205, 68p., PC-\$5.30, MF-\$ .91)
- Stein, N. L., & Goldman, S. Children's Knowledge about Social Situations: From Causes to Consequences (No. 147), October 1979. (ERIC Document Reproduction Service No. ED 177 524, 54p., PC-\$5.30, MF-\$ .91)
- Stein, N. L., & Nezworski, T. The Effects of Organization and Instructional Set on Story Memory (No. 68), January 1978. (ERIC Document Reproduction Service No. ED 149 327, 41p., PC-\$3.65, MF-\$ .91)
- Stein, N. L., & Trabasso, T. What's in a Story: An Approach to Comprehension and Instruction (No. 200), April 1981.
- Straker, D. Y. Situational Variables in Language Use (No. 167), April 1980. (ERIC Document Reproduction Service No. ED 185 619, 49p., PC-\$3.65, MF-\$ .91)
- Tanenhaus, M. K., Flanigan, H., & Seidenberg, M. S. Orthographic and Phonological Activation in Auditory and Visual Word Recognition (No. 178), August 1980. (ERIC Document Reproduction Service No. ED 193 620, 46p., PC-\$3.65, MF-\$ .91)
- Tanenhaus, M. K., & Seidenberg, M. S. Discourse Context and Sentence Perception (No. 176), July 1980. (ERIC Document Reproduction Service No. ED 191 015, 45p., PC-\$3.65, MF-\$ .91)
- Thieman, T. J., & Brown, A. L. The Effects of Semantic and Formal Similarity on Recognition Memory for Sentences in Children (No. 76), November 1977. (ERIC Document Reproduction Service No. ED 150 551, 26p., PC-\$3.65, MF-\$ .91)
- Tierney, R. J., & Cunningham, J. W. Research on Teaching Reading Comprehension (No. 187), November 1980.
- Tierney, R. J., & Mosenthal, J. Discourse Comprehension and Production: Analyzing Text Structure and Cohesion (No. 152), January 1980. (ERIC Document Reproduction Service No. ED 179 945, 84p., PC-\$6.95, MF-\$ .91)
- Tirre, W. C., Freebody, P., & Kaufman, K. Achievement Outcomes of Two Reading Programs: An Instance of Aptitude-Treatment Interaction (No. 174), June 1980. (ERIC Document Reproduction Service No. ED 193 619, 34p., PC-\$3.65, MF-\$ .91)
- Tirre, W. C., Manelis, L., & Leicht, K. L. The Effects of Imaginal and Verbal Strategies on Prose Comprehension in Adults (No. 110), December 1978. (ERIC Document Reproduction Service No. ED 165 116, 27p., PC-\$3.65, MF-\$ .91)
- Trabasso, T. On the Making of Inferences During Reading and Their Assessment (No. 157), January 1980. (ERIC Document Reproduction Service No. ED 181 429, 38p., PC-\$3.65, MF-\$ .91)

- Wardrop, J. L., Anderson, T. H., Hively, W., Anderson, R. I.,  
Hastings, C. N., & Muller, K. E. A Framework for Analyzing Reading  
Test Characteristics (No. 109), December 1978. (ERIC Document  
Reproduction Service No. ED 165 117, 65p., PC-\$5.30, MF-\$ .91)
- Wigfield, A., & Asher, S. R. Age Differences in Children's Referential  
Communication Performance: An Investigation of Task Effects (No. 96),  
July 1978. (ERIC Document Reproduction Service No. ED 159 659, 31p.,  
PC-\$3.65, MF-\$ .91)
- Winograd, P., & Johnston, P. Comprehension Monitoring and the Error  
Detection Paradigm (No. 153), January 1980. (ERIC Document  
Reproduction Service No. ED 181 425, 57p., PC-\$5.30, MF-\$ .91)
- Woods, W. A. Multiple Theory Formation in High-Level Perception (No. 38),  
April 1977. (ERIC Document Reproduction Service No. ED 144 020, 58p.,  
PC-\$5.30, MF-\$ .91)
- Zehler, A. M., & Brewer, W. F. Acquisition of the Article System in  
English (No. 171), May 1980. (ERIC Document Reproduction Service No.  
ED 186 907, 51p., PC-\$5.30, MF-\$ .91)