DOCUMENT RESUME

ED 205 918 CS 006 217

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TITLE Multiple Code Activation in Word Recognition: Evidence from Rhyme Monitoring. Technical Report No. 204.
INSTITUTION Bolt, Beranek and Newman, Inc., Cambridge, Mass.; Illinois Univ., Urbana. Center for the Study of Reading.
SPONS AGENCY National Inst. of Education (ED), Washington, D.C.; Wayne State Univ., Detroit, Mich.
PUB DATE May 81
CONTRACT 400-76-0116
NOTE 58p.

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Auditory Stimuli; College Students; Decoding (Reading); *Language Processing; Reaction Time; Reading Processes; *Reading Research; *Research Design; Research Methodology; *Verbal Stimuli; *Word Recognition
IDENTIFIERS *Rhyming

ABSTRACT

Three experiments were conducted to investigate whether the results of previous research on rhymes detection were due to a rhyme production frequency bias (in favor of similar rhymes) in the materials used. The previous results had indicated that orthographically similar rhymes were detected more rapidly than dissimilar rhymes. In the three experiments, 66 college students listened to short word lists in order to select the word that rhymed with a cue presented prior to each list. 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 also indicated that multiple codes were automatically "accessed" in word recognition, a fact necessitating the reinterpretation of phonological "recoding" in visual word recognition. (Author/RL)

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Technical Report No. 204

MULTIPLE CODE ACTIVATION IN WORD RECOGNITION: EVIDENCE FROM RHYME MONITORING

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May 1981

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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.

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.[1]

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 minF' was also significant, $minF'(1,30) = 6.02$, $p < .025$. 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. Twen[illegible] 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 minF' was also significant, minF'(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 minF' was also significant, $minF'(1,33) = 8.75$, $p < .01$. 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 ente. 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.[2]

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

Atknison, 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

[1]Of course, this procedure may slightly overestimate a similar orthography bias in rhyme production since it requires a written response.

[2]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	t.e	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
meek	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

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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 Pr se Comprehension in Adults (No. 110), December 1978. (ERIC Document Reproduction Service No. ED 165 116, 27p., PC-$3.65, MF-$.91)

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Wardrop, J. L., Anderson, T. H., Hively, W., Anderson, R. J., 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)

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