Journal of Experimental Psychology:
Human Learning and Memory
1979, Vol. 5, No. 6, 546–554

Orthographic Effects on Rhyme Monitoring

Mark S. Seidenberg
Psycholinguistics Program
Columbia University

Michael K. Tanenhaus
Center for the Study of Cognitive Processes
Wayne State University

Three experiments examined the role of orthography in rhyme detection. Subjects in Experiments 1 and 2 monitored lists of aurally presented words for a word that rhymed with a cue word. The critical variable was whether the target word was orthographically similar or different from the cue word (e.g., *pie–tie* and *rye–tie,* respectively). In Experiment 1, monitor latencies to detect orthographically different rhymes were longer than latencies to detect orthographically similar rhymes, whether cue words were presented aurally or visually. Experiment 2 replicated this orthography effect using only auditory presentation of the cue word and a larger sample of items. In Experiment 3, orthographic similarity yielded shorter reaction times to decide that two words rhymed and longer reaction times to decide that they did not rhyme. The results are interpreted in terms of some recent models of semantic memory.

Recent theories of memory emphasize the importance of the auditory characteristics of words for recognition, memory storage, and retrieval. Several classic experiments have provided evidence of auditory coding in the perception of both visually and aurally presented stimuli (e.g., Baddeley, 1966; R. Conrad, 1964; Sperling, 1967; Wickelgren, 1965). As a result, as Norman (1972) has noted, "it was (and is) commonly accepted that linguistically based material—printed words—entered the visual system and then was transformed into an auditory or articulatory form in the short term memory (p. 277)." This notion is incorporated into memory models such as Atkinson and Shiffrin's (1968).

Some of these findings were presented at the 49th meeting of the Eastern Psychological Association, Washington, D.C., April 1978. We thank T. G. Bever, C. L. Raye, E. Saltz, R. E. Warren, and especially B. A. Dosher for advice and comments. Marie Bienkowski provided valuable assistance in conducting Experiment 3.

Requests for reprints should be sent to Michael K. Tanenhaus, Department of Psychology, Wayne State University, 764 Mackenzie Hall, Detroit, Michigan 48202.

Current models of semantic memory, such as Morton's (1969) logogen model and the spreading activation model of Collins and Loftus (1975), make assumptions that are analogous to the auditory recording assumption of earlier models.

Morton's model associates each word or concept with a location (logogen) in memory. The logogen for a word is thought to contain or provide access to information about the word's meaning, spelling, and pronunciation (semantic, orthographic, and phonological information, respectively). A word is recognized when its logogen passes a threshold and the semantic, orthographic, and phonological codes become available for output. According to this model, auditory recoding can be seen as simply a consequence of contacting the phonological information stored at a logogen. This outcome is predicted to obtain regardless of the modality of the input string, since both auditory and visual feature analyzers feed a single set of logogens.

In the Collins and Loftus (1975) model, the recognition of a word has certain consequences that are subsumed under the notion of "spreading activation." They

postulate the existence of interconnected semantic and lexical networks; each node in a network represents a word or feature. Recognition of a word entails activation of a node in memory, and activation subsequently spreads automatically along interconnected pathways to other locations. It follows, then, that presentation of a word may lead to activation of semantically related words that are assumed to be represented at nodes closely connected to the node of the input word and to each other. One consequence of this process is that recognition thresholds for activated words are lowered. The model predicts results from priming studies such as Meyer and Schvaneveldt (1971), in which lexical decision times to a target word were faster when the word was preceded by a semantically related priming word than when preceded by an unrelated priming word. The notion of spreading activation along semantic dimensions can explain a wide range of other results from priming studies, including those of Meyer and Schvaneveldt (1975), Neely (1977), Fischler (1977), and Warren (1977). These results can also be interpreted within the Morton model, however, if one assumes that logogens that share semantic features are functionally interconnected.

The Collins and Loftus (1975) model also appears to cast a somewhat different light on the issue of auditory recoding. Within this model, information concerning the sound and spelling of a word is represented within the lexical network. Although Collins and Loftus are not explicit on the matter, it appears that this information can be accessed either by direct activation of a node in that network or by the automatic spread of activation from a node in the interconnected semantic network (see Collins & Loftus, 1975, p. 413). In either case, the auditory code becomes available not as a result of an explicit recoding stage, but rather as a consequence of contacting a location in the memory network. Since both the semantic and phonological codes of a word are represented and accessed similarly, phonological priming analogous to semantic priming should be observable (see Flanigan, Tanenhaus, & Seidenberg, Note 1; Seidenberg & Dosher, Note 2).

A perhaps overlooked and unexpected implication of both these models concerns a third type of information, orthographic. Just as the semantic and phonological codes of a word become available in both auditory and visual word recognition, so should the orthographic code, since it is represented and accessed in each model in the same ways as the other two codes. The orthographic code also becomes available in word recognition as a consequence of contacting either a logogen or a node in the lexical network. This outcome should hold regardless of the modality of the input string. This entails the somewhat counterintuitive prediction that the orthographic code should become available in auditory word recognition.

The present experiments were designed to explore the role of orthography in auditory word recognition. This research is related to the work of Meyer, Schvaneveldt, and Ruddy (1974). Meyer et al. found that lexical decision times to the second word in orthographically and phonologically similar pairs such as *pouch–couch* were faster than those to orthographically similar but phonologically dissimilar pairs such as *touch–couch.* They explained their results in terms of a response bias model in which subjects encoded the first word orthographically and phonologically and, when they subsequently saw a target that matched orthographically, expected a phonological match as well. In the case of pairs such as *touch–couch,* this bias was in error, leading to the increased lexical decision times that were observed.[1]

The studies reported in this article are concerned with a complimentary effect. Rather than examining effects of acoustic similarity in the visual perception of linguistic stimuli, they are concerned with

[1] It is interesting to note that Meyer, Schvandeveldt, and Ruddy (1974) interpret the effects of phonological similarity of word pairs within a model that is very different from the one they invoke in the case of semantic similarity. The former are attributed to a response bias, the latter to priming following automatic spreading activation.