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ABSTRACT

Eighteen deaf college students performed two tasks designed to investigate possible alternative codes of reading and remembering. First, Ss judged the meaningfulness of sentences with or without a concurrent task (intended to interfere with either articulatory or visual-spatial coding). Secondly, Ss remembered a list of six letters presented visually, where lists were composed of letters that were similar phonologically, graphemically, or dactylally. In contrast to hearing Ss, deaf Ss showed no effect of concurrent articulations on sentence plausibility judgments. Surprisingly, a concurrent visual imaging task slowed judgements for both groups about equally. Also, the proportion of "phonological" or "visual" errors in the letter-memory task did not correlate with the degree of articulatory or visual inference in the sentence task for either group. The results do not indicate greater reliance on visual codes during reading by the deaf. (CL)

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INTERFERING WITH SENTENCE COMPREHENSION IN THE DEAF

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Abstract

In contrast to hearing subjects, deaf subjects showed no effect of concurrent articulation on sentence plausibility judgements. Surprisingly, a concurrent visual imaging task slowed judgements for both groups about equally. Also, the proportion of "phonological" or "visual" errors in a letter-memory task did not correlate with the degree of articulatory or visual interference in the sentence task for either group. The results do not indicate greater reliance of visual codes during reading by the deaf.

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Interfering with Sentence Comprehension in the Deaf

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Psychonomic Society, San Antonio, November 1984

The study I'll be describing today tried to explore what sort of codes a deaf person might use during reading and remembering. While auditory imagery seems unlikely, the deaf commonly are trained in speech and speech reading, and there is evidence of phonological effects among at least some deaf. Alternatively, since the common form of communication among deaf is signing, it's been suggested that verbal material could be recoded into a sign-based form. Again, recent work on short-term memory and sentence comprehension with profoundly, congenitally deaf has provided some support for this view. The evidence for sign-based codes in these tasks is based the confusability of similar signs, defined in terms of the movements or positions of the hands in space.

Two main procedures were used to investigate possible alternative codes in the deaf. In the first, students judged the meaningfulness of sentences with or without a concurrent task. The concurrent tasks were intended to interfere with either articulatory or with visual-spatial coding. In the second, students remembered a list of six letters presented visually, where lists were composed of letters that were similar phonologically, graphemically or dactylally (that is, the finger-spelling hand positions were similar).

The first task is outlined in Figure 1. A set of sentences were presented with a final word that created either an acceptable (e.g., "the thick mud stuck to her shoes") or incongruous (e.g., "...stuck to her soup") sentence. Since the acceptability of the sentence depended on the final word, the entire sentence had to be read and understood to allow correct decisions. During one block of trials (No Task) the students judged as quickly as they could whether each of 30 sentences was acceptable. During the Articulation block, students were shown three random digits prior to each sentence, and had to recite them repeatedly at about 3 digits/sec until the end of the trial. During the Visualization block, an arrow was shown at one of six orientations around a circle prior to each trial, and students were instructed to imagine the arrow rotating on its center during the sentence judgement task. After a response was made, they indicated which position the arrow had "reached" during the trial. The idea behind this was to make the visual condition as close an analogy to the articulation as possible, requiring some active processing during the trials.

After the completion of the sentence-judgement task, students were given 36 trials in the letter-memory task. These were equally divided among phonologically similar (B,C,D,T,Z,P), dactylically similar (X,H,V,W,R,F) or graphemically similar (J,L,M,N,Y,K) lists. On each trial, the six letters were shown sequentially at 1/sec and were students immediately tried to recall the six letters in their correct order.

Eighteen deaf students at Gallaudet College served as subjects. Their hearing loss was profound (95 dB or greater in better ear), but

they were capable of reading at at least a junior-high level to gain admission to Gallaudet, and some were within the normal range of reading skill for hearing subjects of their age. A comparison Hearing group of eighteen undergraduates at the University of Florida were given an identical sequence of tasks.

The results of the sentence-judgement task for the Deaf students is shown in Figure 2a. The important outcomes are that (1) error rate was generally very low, and was not affected by either concurrent task; (2) decision latency was longer for the Visual condition than for either the Articulation or Control condition; and (3) latency for Articulation and No Task conditions was essentially identical.

Performance of the Hearing group is shown in Figure 2b. Again, error rate was low and unaffected by a concurrent task. The Hearing students were actually somewhat faster in the Articulation condition; this has been observed before, and usually interpreted to mean that the articulation suppresses a phonological code that is producing less efficient performance. A second surprise was that Visualization produced an interference effect that was as large in absolute terms as that found in the Deaf group. Analyses confirmed the equivalent amount of interference produced by this task for Deaf and Hearing subjects.

On the face of it, these results suggest that the articulation task effect, being specific to the Hearing group, involved a code not used by the deaf; the visual task, on the other hand, seems to produce a nonspecific "load" effect that slows both groups equally. The results of the letter memory task are consistent with this interpretation. Figure 3 shows that for the Hearing group, errors show the usual

dominance of phonological coding: the phonologically similar lists produced more than half of all errors, with no significant difference between the remaining two list types. For the deaf, in contrast, errors were randomly distributed across list type. Again, there was no evidence for speech-like codes and no specific evidence for an alternative code based on visual-spatial similarity, in this case of the letters themselves or their fingerspelling form.

Finally, there was no correlation between the distribution of errors on the letter-memory task, and the degree of visual or articulatory interference for the Deaf. For the Hearing group, there was an interesting trend for students with a greater proportion of phonological errors to show of an advantage for articulation, but this did not reach significance.

To summarize, these results imply little reliance either on phonological or visual-spatial recoding among these deaf students in short-term memory or sentence comprehension. It may be that, like their hearing counterparts, that the more skilled deaf readers studied here are less reliant on surface representations of language than are less-skilled readers. It remains to be seen if the majority of deaf persons, who are substantially less skilled readers of English than these Gallaudet students, would show more evidence of explicitly visual codes during reading.

INTERFERENCE CONDITION

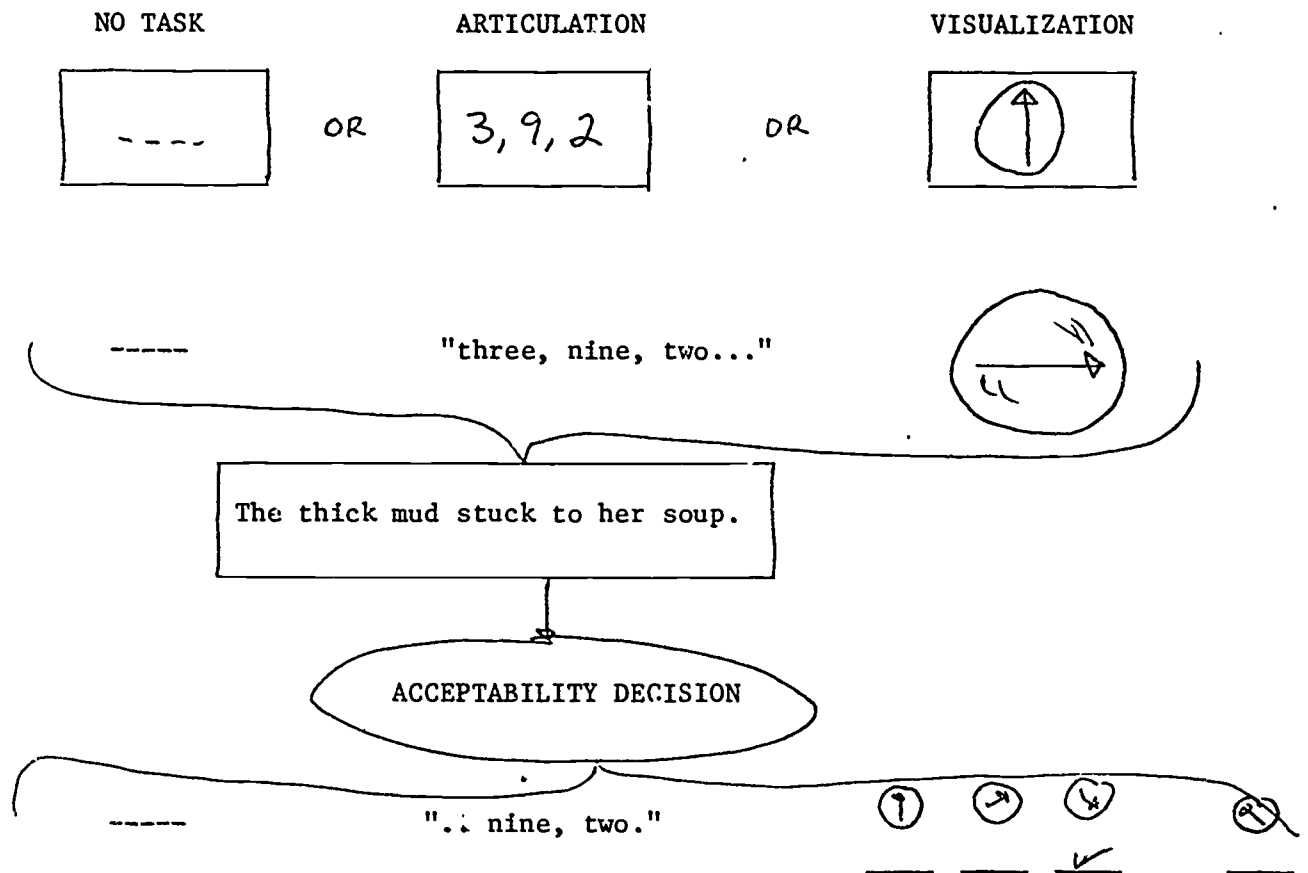


Figure 1. Outline of events during the task for two concurrent-processing tasks and the control task.

	NO TASK	ARTICULATION	VISUALIZATION
<u>(a) Deaf students</u>			
SENTENCE TYPE			
Acceptable	2723 (1.1)	2720 (1.4)	2928 (1.2)
Incongruous	2919 (2.7)	2962 (2.7)	3208 (3.0)
<u>(b) Hearing students</u>			
Acceptable	2015 (1.3)	1823 (1.5)	2225 (1.3)
Incongruous	2146 (1.4)	1968 (1.7)	2350 (1.4)

Figure 2. Judgement latency and accuracy for sentence acceptability decision under two concurrent task conditions and control condition.