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LEARNING FROM OWN VS OTHER VOICE BY AIR OR BONE CONDUCTION.

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IN A PAIRED-ASSOCIATE LEARNING EXPERIMENT, THE SUBJECT'S OWN VOICE AND THEN THAT OF ANOTHER WERE HEARD TO TEST THE EFFECTIVENESS OF RECALL OF BOTH PRESENTATIONS. HALF OF THE WORDS FROM EACH VOICE WAS PRESENTED BY AIR-CONDUCTED SOUND TO EARPHONES AND HALF BY OCCLUDED BONE CONDUCTION. THE ORDER OF PRESENTATION OF VOICES, WORD-PAIR HALF-BLOCKS, AND SOUND MEDIA WAS COUNTERBALANCED AMONG SUBJECTS WHO WERE PREVIOUSLY SCREENED FOR NORMAL HEARING. TESTS WERE ADMINISTERED TO DIFFERENTIATE SUBJECTS WHO WERE EITHER "FIELD DEPENDENT" OR "FIELD INDEPENDENT." RESULTS SHOWED THAT RECALL OF MATERIAL WAS NO GREATER WHETHER ONE'S OWN VOICE OR ANOTHER'S WAS USED. SUBJECTS CLASSIFIED AS NORMAL, OR AS "FIELD DEPENDENT," LEARNED ABOUT EQUALLY WELL FROM EITHER VOICE AND SHOWED NO PREFERENCE FOR ONE OVER THE OTHER. IN THE EARLY TRIALS, LEARNING BY AIR CONDUCTION APPEARED SUPERIOR TO THAT BY BONE CONDUCTION. IN LATER TRIALS, THE DIFFERENCE BECAME NONSIGNIFICANT. THIS ARTICLE WAS PUBLISHED IN "PERCEPTUAL AND MOTOR SKILLS," 23, 1966. (GD)

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# LEARNING FROM OWN VS OTHER VOICE BY AIR OR BONE CONDUCTION[1]

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*Summary.*—*Ss* who were given a taped, auditory, paired-associate learning task learned equally well when the material was delivered by their own voice as when it was delivered by another person's voice. Superiority of initial learning by air conduction over bone conduction later became insignificant. There was a nonsignificant suggestion that field-dependent scorers learned more from a different voice from trial to trial, while normal to field-independent scorers consistently responded to one voice.

The question of whether people might remember more material delivered to them from their own rather than from another voice occurred to the writer while observing an unpublished experiment of P. Holzman.[2] When a tape of 20 discretely spaced continuous-speech voice samples was presented, *Ss* gave uniquely patterned physiological responses to their own voice, regardless of their ability to identify it. In a sense, the body responded to a part of itself, the voice, as a stimulus input instead of the usual ongoing sound output. The phenomenon of bodily response could be thought of as a type of spontaneous responsiveness that does not require special attention to or identification of the stimulus. Cherry (1953) had a voice deliver a message to one ear while simultaneously another voice delivered a different message to the other ear; *Ss* repeated the message from a particular ear. While this was going on, *E* changed the content of the ignored channel (ear) from English to German and then to reversed English speech. One time he also changed the voice presenting the ignored information: Questioning afterwards revealed that *Ss* knew nothing about the ignored content but nearly all of them noticed a change of voice. Thus it seems that people can exclude the content of a voice-transmitted message but they cannot exclude an awareness of a new voice vehicle. The peculiar responsiveness to one's own voice, as well as the intruding awareness of a new voice through an ignored channel, suggests the question of the usefulness of one's own voice for reviving memory: do people remember more material when it is delivered by their own than by another voice? Holzman (personal communication) suggested that field-dependent people might learn equally well from either their own or another voice but that field-independent people should learn more from their own

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[2]P. Holzman. Progress Report, Menninger Foundation, 1964.

voices. His prediction was derived from the experimental work of Witkin, *et al.* (1962), showing that field-dependent persons have difficulty in differentiating their own personalities and bodies from other people's, while the opposite is true for field-independent persons.

## METHOD

Eleven trials of a taped, auditory, paired-associate task, with number of correctly anticipated response words as the learning criterion, were run. In an initial recording session, 30 females read single words of a long list (actually 24 word pairs) into a tape recorder. The voices were paired off on the basis of their noticeable differences, and 15 tapes (one per *S* pair) were made having each voice-mate deliver a half-block of the word pairs. The words were spaced about 2 sec. apart. To provide a replication of the own vs other delivery voice, in the experimental session the speech was switched back and forth (after the 6th and the 18th word pair) from air-conducted sound through earphones to occluded bone conduction so that half of each voice block was heard through each sound medium. Although the speech was sent at 60 db to the earphones and 90 db to the bone conduction unit, the two media did not result in equal loudness. The inequality could not be avoided because lowering the speech intensity to the earphones reduced intelligibility and raising the intensity to the bone conduction unit would have damaged it. The order of presentation of own or other voice, word-pair half-blocks and sound media were counterbalanced across all *S*s.

The word pairs contained nonsense syllables as stimuli and English words as responses. The nonsense words, chosen from the Glaze association norms (1928), were words to which 6½% of the people or fewer had associations. The English syllables, selected from Cieutat's list (1963), were those described as having a medium-low association value. The words were randomly paired, then if necessary rearranged to eliminate sound similarities or meaningful sequences within pairs or between contiguous ones.

About a week after the recording session, *S*s were screened for normal hearing, given Jackson's Embedded Figures Test Form V (Jackson, *et al.*, 1964) in 12 min., then a 5-min. warm-up session, and finally the verbal learning task (lasting nearly 9 min.). A 5-pair French-English warm-up word list was used, each *S* hearing the stimulus word and speaking aloud the response before the tape gave the correct answers.

## RESULTS

Of the 30 score sheets, 23 were usable.[3] To compare the effects of own vs other delivery voice and of air- and bone-conducted sound, one-tailed $t$ tests for the difference between means of correlated groups were calculated. There was no significant difference between amount learned from own or other voice on either the seventh or the eleventh trial, or across all trials. On the seventh trial, learning was better for air- than for bone-conducted sound ($t = 1.98$, $p < .05$), but later on the eleventh trial there was no significant difference. The initial air-earphone superiority over the occluded bone conduction also showed up whether by own or other delivery voice, and it was due to the unequal loudness of the sound at the receivers.

[3]Seven trials for 20 *S*s were planned, plus 10 extra *S*s for safety. As the seventh trial learning was not good (less than half right), later *S*s received 11 trials. No score sheets were discarded because of low learning or noisy tapes. But the sheets of 5 7th-trial-only *S*s and 2 "exam panic" *S*s were dropped, resulting in 3 noisy-tape score sheets being discarded (leaving 2 bad tape sheets in the calculations).

The number of people who learned at least one more correct answer to own or other voice were compared for the seventh trial, eleventh trial, and across all trials; there was no majority preference for either voice. But there seemed to be no group preference for either voice because about half of the *S*s' voice-voting changed from trial to trial, while the other half of the *S*s always responded to the same voice. Those *S*s whose voice preference fluctuated could be called *switchers*, the voice switching being due to either forgetting response words which had been learned from a particular voice or by ultimately learning more words from the alternative voice. The *switcher* category excluded people who had reached the ceiling of available words in one voice and who then began to learn words delivered by the alternative voice. *Nonswitchers* learned more from the same voice on the seventh and eleventh trials.

Inspection of the EFT scores in relation to own or other voice preference yielded nothing. But the median EFT score of the *switchers* ($N = 10$) was 7.0, while that of the *nonswitchers* ($N = 13$) was 13.0. Lower scores indicate field dependence and higher ones field independence (scores from 0 to 16). A rank test comparing EFT performance of *switchers* vs *nonswitchers* showed a nonsignificant difference ($Z = 1.18, p = .12$) in the plausible direction whereby *switchers* were somewhat field dependent and *nonswitchers* were normal or field-independent scorers. A sign test for the same purpose showed that the EFT score difference was outside but close to the 10% level ($\chi^2 = 2.09$ with 1 $df$). There was no significant difference in number of words learned by *switchers* vs *nonswitchers*. Also, there was no coincidence of voice switching with switching between air- and bone-conducted sections of the material. In general the actual amount learned was small compared to other auditory verbal learning results, perhaps because the word list was long and two variables were manipulated for each person in one session. As expected, the amount learned in this auditory task was smaller than that which could be expected from a visual task because in auditory situations the stimuli disappear almost immediately whereas visual stimuli do not, and the decay for the ear is quite short compared to that for the eye.

## Discussion and Conclusion

This experiment leads to the primary conclusion that people do not remember more material if it is delivered by their own instead of another voice. However, some of the discarded score sheets (responses to poorly intelligible tapes), showed better learning from *S*s' own voice. Thus one could hypothesize that under normal listening conditions people learn as well from either voice, but that under difficult listening conditions, own delivery voice might facilitate more accurate perception and subsequent learning of the material.

The secondary prediction (Holzman's) was that field-dependent persons would learn equally well from either voice but that field-independent ones would learn more from their own voice. First, although there were some field-depend-

ents and normals in the sample, there were not enough field-independents to answer the question. Second, normals and field-dependents learned about the same from either own or other voice, and they did not show a preference for either voice.

The relationship between the *switcher* category and field dependence is in accord with Holzman's rationale. If one starts with the basic idea that field-dependent people have trouble differentiating figure from ground (or one voice from another in this experiment), it seems plausible that field-dependent scorers would be found more often in the *switcher* category and normal to field independent ones in the *nonswitcher* category. The real question indicated by the *ad hoc switcher* category is whether field dependents switch voices and field independents focus on a single voice. Field dependents in this experiment did show difficulty in guessing how many voices were on the tape (really only two).

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