"Phenomenal displacement" in delayed auditory feedback: I. Disparate inter-aural intensities

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Abstract

College undergraduates were required to read standardized passages twice under a condition of delayed auditory feedback (DAF) in which the intensity of the fed-back input to each ear was equal, and once under DAF with highly disparate inter-aural intensities. Reading under the latter condition showed a highly significant reduction in the speech disruptive effect of DAF.

Problem

Speech disruption by delayed auditory feedback (DAF) has been explained in terms of specifiable servosystems (Fairbanks, 1954). The fact, however, that Ss adapt more readily during prolonged exposure to DAF if trained "not to listen to it" (Goldiamond et al, 1962) suggests to us a "phenomenal basis" for speech-programming confusion, at present specifiable in terms of perceptual response but not in terms of known physiological structure. By the latter hypothesis, conditions which displace the apparent source of the DAF from the speaker's "ego center" should reduce DAF's disruptive effects.

Method

Ten Ss (all with normal measured hearing in both ears) received DAF (delay = 0.25 sec.) via a tape loop and a Warren D-1 2-channel power amplifier and high-fidelity headphones with independent intensity controls for each ear, while reading aloud three passages (134 syllables each) under three test conditions: (A) 60 db in each ear; (B) 40 db in right ear, 80 db in left ear (a setting found with 10 pretest Ss to produce "phenomenal localization" at the left ear); (C) repetition of Condition

A. Paragraphs were randomized across conditions. Readings were tape recorded.

Results

Recordings of the readings were judged by each of two qualified speech clinicians, who scored an "error" (with exceptionally good agreement, one noting a total of 540 errors, the other, a total of 545 errors, and visual inspection showing virtually no disagreement for each): (a) misarticulation; (b) omission; (c) repetition; or (d) "miscellaneous error," such as laughter or marked distortion of voice quality or control. The averages of two judges' total error scores for 10 Ss on the respective conditions were: A, 242.5; B, 84.0; C, 216.0; and total, 542.5.

One-way analysis of variance yields an F-score of 6.15 ($df = 27/2$, $p < 0.01$). Conditions A and C do not differ significantly ($t = 0.76$); hence, the error-reduction in Condition B is not simply due to adaptation.

Discussion

"Phenomenal displacement" of DAF reduces speech disruption, suggesting that DAF speech disruption depends at least to some extent on the failure of the delayed feedback stimuli to be perceived as "external" to the speaker's "control center."

References

- FAIRBANKS, G. Systematic research in experimental phonetics: A theory of the speech mechanism as a servosystem. *J. speech hear. Disord.*, 1954, 19, 133-139.
- GOLDIAMOND, I., ATKINSON, C., & BILGER, R. Stabilization of behavior and prolonged exposure to delayed auditory feedback. *Science*, 1962, 135, 437-438.

II. High intensity effects

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Abstract

It was previously demonstrated with 10 Ss that the speech disruptive effect of delayed auditory feedback (DAF) was significantly reduced when there was, instead of equal intensity of fed-back input to each ear, a marked disparity of inter-aural intensity. The findings were interpreted as implying that the disruptive effect of DAF was related to the phenomenal localization of the feedback. It was later suggested that the effect noted might simply reflect a reduction of intensity in one headphone to a degree allowing the Ss to receive some non-delayed feedback. The experiment was redesigned to overcome this objection by achieving dis-

parity of intensities by raising rather than lowering the input to one headphone. The originally reported effect was retained.

Problem

The concept of "phenomenal displacement" of delayed auditory feedback was discussed in a previous article Hochberg & Berko, 1965: Unbalanced auditory intensities between a pair of headphones "phenomenally displaces" the localization of the perceived sound source from "the middle of the head" (for balanced intensity) towards the "louder ear." It was hypothesized that the speech disruptive effects of DAF would be greatest