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Dichotic singer and speaker recognition*

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The hypothesis of no difference between the recognition of sung and spoken voices was tested by presenting 24 Ss with two dichotic voice recognition tests which were similar in all respects except that stimuli were spoken on one and sung on the other. A finding of significantly more accurate speaker recognition indicated differences in the processing of singing and speaking voices. Results of the singer recognition test replicated a previous finding of no significant difference between ears. A similar lack of lateralization for speaker recognition could not be unambiguously interpreted because the absence of ear asymmetry was significantly related to very high levels of overall accuracy.

The significant right-ear superiority obtained on dichotic voice recognition tasks involving spoken stimuli (Doehring & Bartholomeus, 1971) was not observed in a later study involving a different experimental paradigm and the recognition of dichotic voices from samples of sung speech (Bartholomeus, 1974). Although these contrasting findings might simply be attributable to procedural variables, they could also reflect actual differences in the processing of sung and spoken voices. The present study was designed to test this hypothesis by presenting each S with two voice identification tests which were similar in all respects except that the stimuli were sung on one test and spoken on the other.

METHOD

Ss were 15 females and 8 males ranging in age from 18 to 26 years. All were university students who reported that they used their right hand for writing and ball throwing and were unfamiliar with the terms "laterality effects," "dichotic listening," and "ear asymmetry."

Preparation of the singer recognition test has been fully described elsewhere (Bartholomeus, 1974). Briefly, the test consisted of 24 trials with each trial involving the dichotic presentation of two different singers who each sang a different sequence of letters to a different 4-sec melody. Following a 4-sec silent interval, four binaural recognition stimuli were presented, separated by 3-sec intervals. The 4-sec recognition stimuli, which consisted of four different melodies sung to four different letter sequences by four different people, included the two voices, two letter sequences, and two melodies heard in the dichotic sample, but the particular combination of melodies, letters, and voices was never identical to that of the sample. The Ss' task was to identify which two of the four recognition stimuli included singers heard in the dichotic sample. Order of stimulus presentation was counterbalanced so that each of the eight female singers was presented as a sample voice an equal number of times to each ear and was presented both as a correct and as an incorrect matching stimulus equally often at each position in the sequence of four recognition stimuli.

The speaker recognition test included exactly the same population, ordering, timing of voices, and letter sequences as the singer recognition test, the only difference between the two tests being that on the speaker recognition test the six letters of each letter sequence were spoken as uninflected monosyllabic words rather than being sung to melodies.

All testing was done in a sound-treated room with stimuli presented via TDH-39 earphones from a Revox 77A recorder. Sound level meters were used at the start of each testing session to verify that the output from each channel of the tape recorder averaged 56 dB SPL.

All testing was done individually, with each S receiving the second voice recognition test not less than 7 nor more than 14 days after the first. Of the 12 Ss who received the speaker recognition test first, 6 wore the right earphone on the right ear and the remaining 6 wore the earphones in the reverse position. Earphone placement was similarly counterbalanced for the 12 Ss who received the singer recognition test first.

Following instructions regarding the required responses, two practice trials were presented and any questions were answered before proceeding to the test trials. Approximately 30 min were required to complete each test.

RESULTS

Recognition accuracy averaged 79.4% for spoken voices compared to only 63.7% for sung voices. Although the mean right-ear score exceeded the left-ear score on both the singer recognition (64.8% vs 62.7%) and speaker recognition (81.4% vs 77.3%) tests, inspection of the data indicated several reversals to the weak right-ear trend. On the singer recognition test, the R-L score was equal to zero for 3 Ss, positive for 13 Ss, and negative for 8 Ss. On the speaker recognition test, the R-L score was zero for 7 Ss, positive for 12, and negative for 5. Results of an Ears by Tests analysis of variance for repeated measures indicated a significant difference between the accuracy of speaker and singer recognition ($F = 85.30$, $df = 1/23$, $p < .01$) but no significant difference between ears ($F = 2.85$, $df = 1/23$, $p > .05$) nor any significant interaction between ears and tests ($F = 0.27$, $df = 1/23$, $p > .05$).

In view of the difference in overall accuracy of singer and speaker recognition, ear differences on the two tests were further examined by computing a laterality coefficient for each S on each test. This coefficient, which relates observed ear difference to overall accuracy,

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was obtained using the procedure described by Kaplan (1973) for cases where total accuracy is greater than 50%, i.e., by using the formula:

$$\text{Laterality Coefficient} = \frac{\%\text{ Correct Right Ear} - \%\text{ Correct Left Ear}}{200 - (\%\text{ Correct Right Ear} + \%\text{ Correct Left Ear})}$$

Results of previous research (Doehring & Bartholomeus, 1971; Bartholomeus, 1974) would suggest that the mean laterality coefficient for speaker recognition should be positive and larger than that obtained for singer recognition. While the observed mean coefficient of +0.10 for speaker recognition did exceed that of +0.02 for singer recognition, comparison of the two coefficients for individual Ss by means of a Wilcoxen matched pairs test indicated that the differences did not reach significance at the 0.05 level of confidence ($N = 23$, $T = 106.5$, $p > .05$).

Since more than one quarter of the Ss showed no ear difference on the speaker recognition test, it seemed important to examine the relationship between overall accuracy and the occurrence of zero R-L scores. Results of a Mann-Whitney test indicated that the mean speaker recognition score of 84.1% obtained by Ss showing no ear difference was significantly higher ($N = 19.5$, $p < .02$) than that of 76.2% obtained by Ss who showed an ear difference. A similar comparison was not possible for the singer recognition test because of the much smaller number of zero R-L scores.

DISCUSSION

Possible differences in the processing of sung and spoken voices were suggested by previous findings of significant right-ear superiority in the recognition of spoken voices (Doehring & Bartholomeus, 1971) but no significant ear asymmetry in the recognition of sung voices (Bartholomeus, 1974). The present finding of a significant difference in overall recognition accuracy provides more direct evidence that sung and spoken voices are not processed in an identical fashion.

While the assessment of speaker and singer recognition by use of the same experimental procedures permitted a demonstration of differences in the processing of sung and spoken voices, it precluded a demonstration that these differences were related to hemispheric specialization. The previous finding of no significant ear difference for singer recognition was replicated, but the previously reported right-ear superiority for speaker recognition was not observed. However, the absence of ear asymmetry for spoken voices was significantly related to very high levels of accuracy, suggesting that the speaker recognition test used in the present study was not an adequately sensitive procedure for the assessment of laterality effects.

The results of the present study suggest that comparison of laterality effects for sung and spoken voices within the same experimental paradigm may be possible only if certain parameters, such as stimulus duration, are manipulated in order to produce singer and speaker recognition tasks of comparable difficulty. Provided that attention is given to this methodological problem, further comparative studies should be attempted, since precise knowledge of laterality effects in voice recognition should contribute to the identification of variables determining hemispheric specialization.

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