Speaker Recognition Ability of Blind and Sighted Subjects

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Introduction

Blind individuals have been found to outperform sighted ones in a variety of auditory tasks such as dichotic listening, pitch discrimination or temporary auditory resolution (Starlinger und Nimeyer 1981, Muchnik et al. 1991). They also performed better in a great number of memory studies (e.g. Röder, Rösler 2003). However, does this lead as well to better speaker recognition abilities in blind people?

Unfortunately, studies dealing with that particular question are rare, especially those in which speaker recognition ability of blind individuals was investigated with the help of a voice line-up. In addition, the obtained results were inconsistent (cf. Bull, Rathborn and Clifford 1983; Eladd, Segev and Tobin 1998).

The study presented in this paper is assumed to be the first in which speaker recognition ability of blind listeners was examined in a voice line-up, in which familiarization was not immediately followed by the line-up presentation. Since forensic speaker recognition relies on long-term memory, this set-up was presumed to be more realistic with regard to forensic phonetic casework.

Experiment

A voice line-up was constructed from speech samples of eight male speakers (target + 7 foils). Forty-two secondary school students (8 blind, 31 sighted) participated in the listening experiment and were, first of all, familiarized with the voice of the target speaker. Approximately one week later, they were asked to try to recognize the target's voice among the foils.

To investigate possible influences of different signal qualities on recognition accuracy, there were in fact two line-ups, one in hi-fi quality and one with the same speech samples re-recorded in cell phone quality. Due to the small number of blind subjects, all of the listeners participated in both line-ups. Subsequently, both listener groups (blind vs. sighted) were split up further so that one half of each group received the line-up in hi-fi quality first and the other halves heard the line-up in cell phone quality first. The latter was done to prevent single-sided learning effects.

Results

The results show that the blind performed significantly better ($p<0.05$) than the sighted listeners under hi-fi condition (Fig 1). When solely congenitally blind subjects were compared to the sighted group, i.e. the only late blind subject was excluded (Fig 2), differences were even greater ($p<0.001$). However, no differences between the blind and the sighted group were observed with

regard to the line-up in cell phone quality. Decision criteria and proportion of musical listeners did not differ between both groups either, but within the blind group the musical subjects performed significantly better. Furthermore, a slight correlation between confidence in decision-making and correct answers was established for both groups in both signal qualities. With regard to sentence types, questions in particular were more often related to correct answers than statements or imperative sentences within the blind group.

Within-group comparisons revealed that sighted listeners performed significantly better in the hi-fi line-up compared to the line-up in cell phone quality. This was expected, as in an earlier study by Künzel (1990) it was found that a limitation of acoustic quality elicited a tendency to judge actually different voices to be the same. Surprisingly, however, no significant differences occurred in the blind group.

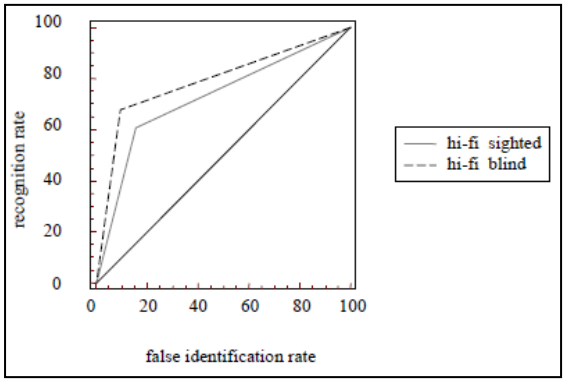

Fig. 1

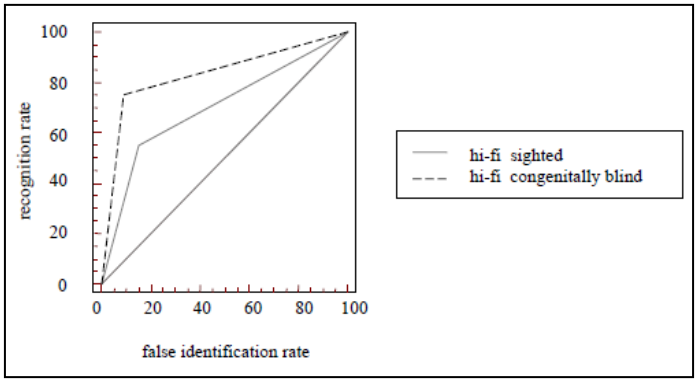

Fig. 2

Figure 1 ROC-curves of speaker recognition performance of 8 blind and 31 sighted subjects in hi-fi quality. AUC blind: 0.801; AUC sighted: 0.738; z statistic: 2.410; level of significance: p = 0.0159 (AUC = area under curve).

Figure 2 ROC-curves of speaker recognition performance of 7 congenitally blind and 31 sighted subjects in hi-fi quality. AUC congenitally blind: 0.832; AUC sighted: 0.738; z statistic: 3.655; level of significance: p = 0.0003.

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