A listener's impression of the apparent speaker is informed primarily by the fundamental frequency (f0) and average formant range (FR) of the voice. When investigating the relationship between speech perception and the apparent speaker, collecting speaker characteristics which are only partly determined by a voice's formant frequencies (FFs) is an indirect way of obtaining information regarding a listener's estimation of that voice's FR. If listeners could report estimated f0 and FR information separately, the independent effect of either of these estimates on vowel perception could be investigated.

**Objectives**
1. To develop a training procedure during which listeners learn to report the f0 and FR of a voice independently.
2. To see how well listeners can learn to report the f0 and FR of a voice independently.
3. To see how small an FF difference listeners can learn to identify.

**Methods**

**Participants:** 71 listeners. Each listener was randomly assigned to each one of four scale factor groups.

**Stimuli:** Instances of /iæ/ from 15 synthetic ‘voices’ which differed from each other in their FRs and/or their f0s. Voices’ FFs differed from each other by a constant across all scaling levels.

**Procedure:** Participants were presented with a computer interface consisting of a board with a series of buttons on it. Each button was always associated with the same voice.

**Analysis of Errors.**
- Listeners scored an average of 7% more (t(40) = 3.1, p = 0.003) correct FR identifications when they correctly identified a voice’s f0. Only participants who made at least 5 f0 errors were considered.
- When listeners made both FR and f0 errors, there was a strong tendency to trade-off FR overestimations with f0 underestimations and vice-versa (see Table 1).

**Results**

**Listeners are able to dissociate f0 and FR information to a good degree.**
- [1] estimated a JND of 8% for changes in FFs. By the end of this training, listeners were able to absolutely identify voices with FF differences as low as 7% between them.

There was an association between FR and f0 errors.
- When listeners made both f0 and FR errors, these errors were negatively correlated.
- When listeners were presented with high f0 voices, they were more likely to underestimate FR. When listeners were presented with low f0 voices, they were more likely to overestimate FR.

Listeners with musical training showed an advantage in every level and in both f0 and FR identifications.
- In the future, we will keep track of musical training to see if it has any effects on other tasks involving listener judgments.

**References**


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