Notes and Comment

Three-way identification of sweep tones

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In a recent paper (Schouten, 1985) on the perception of rapid frequency sweeps, I concluded that there was a tendency for subjects to perceive stimuli with zero or low sweep rates as going down, regardless of the actual direction. This finding was based on an identification experiment in which rising, falling, and level stimuli of various durations and sweep rates had to be identified as either rising or falling. This was confirmed in an experiment in which subjects had to discriminate between rising, falling, and level stimuli of equal durations and equal (or zero) sweep rates.

Although these results agree with various findings in the literature (Gardner & Wilson, 1979; Nabelek, 1978; Pisoni, 1976; Smoorenburg & Coninx, 1980), they could, at least to some extent, be due to the experimental task. Subjects were forced to choose between two labels—rising or falling; even tonally level stimuli had to be identified as either rising or falling. This raises the question of whether the same effect would have been apparent if subjects had had a three-way choice, that is, between rising, falling, and level. A three-way choice would not have affected the discrimination results, but the tendency to equate level with falling tones did not show up as clearly in the discrimination experiment as it did in the identification experiment; had the identification results not shown the way, it is doubtful whether this tendency would have been noticed at all in the discrimination results. It was therefore decided to repeat the identification experiment by presenting a subset of the original stimuli, namely sweep tones with a center frequency of 1300 Hz, to 15 new subjects, allowing them a three-way forced choice between “up,” “down,” and “level.”

METHOD

Stimuli

The stimuli were exactly the same as those described for Experiment 1 in Schouten (1985). There were two directions (up and down), six sweep rates (0, 5, 10, 20, 40, and 60 octaves/sec), and four durations (20, 30, 40, and 50 msec). Only one center frequency was used, namely 1300 Hz, which was reached at the time center of the exponentially rising and falling sweep tones. Onset and offset effects were counteracted by embedding the tones in two 100-msec bursts of low-level white noise. Each stimulus occurred 10 times in the experiment.

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Figure 1. Average percentages of “down” (top panel) and “level” (bottom panel) responses. Negative values along the abscissa indicate rates of falling frequency. The parameter within the panels is duration. Stimulus direction is indicated in each half of a panel by means of a rising or falling line.

Procedure

The stimuli were presented in blocks of 24; within a block, stimulus duration was constant. Responses were recorded by ticking the appropriate column on a response sheet. Training was brief, and no feedback was given.

Subjects

Fifteen naive university students took part in the experiment. They were paid for their services and an extra 25 guilders was promised for the subject with the highest number of correct responses.

RESULTS

The results are presented in Figures 1, 2, and 3 for all 15 subjects, for the upper quartile (4 subjects) and for the lower quartile (4 subjects), respectively. Each figure consists of two panels, the one at the top showing the percentage of “down” responses and the one at the bottom

Figure 2. Same as Figure 1, but averaged over the upper quartile.

Figure 3. Same as Figure 1, but averaged over the lower quartile.

showing the percentage of "level" responses. The "up" responses are not shown.

Three separate four-way analyses of variance (subjects $\times$ direction $\times$ duration $\times$ sweep rate) were performed on the correct scores (not shown in the figures) of the 15 subjects and of the two quartiles. The level stimuli (0 oct/sec) were kept out of these analyses. As was to be expected, the subjects factor was significant in all three cases. Direction did not, however, have a significant effect. Duration was highly significant ($p < .0001$) for all 15 subjects and for the upper quartile, but had no effect on the lower quartile; more or less the same applies to sweep rate, although in this case the lower quartile achieved only a 2% significance level.

DISCUSSION

If there were no tendency to perceive level stimuli as "falling," all results could be expected to be like those in Figure 2 (upper quartile). It is clear, therefore, that in a three-way response task the best (upper quartile) subjects provide no evidence of such a tendency. The same degree of symmetry does not appear in Figure 1 (all sub-

jects), however. What is especially noticeable here is that slow sweeps in either direction are more likely to receive "down" responses than are fast sweeps, a tendency that could be characterized by saying that a clearly audible sweep is relatively likely to be perceived as rising, whereas a less clearly rising or falling sweep is relatively likely to be perceived as falling. The "level" responses in the bottom panel of Figure 1 exhibit a very regular pattern.

The lower quartile (Figure 3) give hardly any level responses at all; they seem to be guided almost entirely by the tendency to call fast sweeps "rising" and slow sweeps "falling." They are less extreme in this respect, however, than the lower quartile of Experiment 1a in Schouten (1985). Apart from random variation, there is no ready explanation for this difference: it can hardly be the availability of a third response category, since it is used so little.

In conclusion, we may say that the tendency to perceive level stimuli as falling, which emerged so clearly in the previous experiment, does not disappear entirely when subjects are given a three-way choice. The poorer (lower quartile) subjects, especially, are still guided very strongly by this tendency.

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