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Notes and Comment

Octave generalization and melody identification

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In a recent article, House (1977) describes an experiment which he interprets as evidence against the two-channel theory for the abstraction of pitch relationships proposed by Deutsch (1969). The methodology used in this experiment was, however, inappropriate for a test of this theory.

According to the model of Deutsch (1969), the abstraction of pitch relationships takes place along two separate and parallel channels. Along one of these channels, there is convergence of information from neural units underlying tones which are separated by octaves. This gives rise to the strong perceptual similarity between single tones which stand in octave relationship. Such tones are said to have the same "tone chroma." It is further proposed that the harmonic equivalence of chords whose components are placed in different octaves are mediated by higher order convergence of information along this channel. Along the second channel, there is no such octave convergence, but instead abstraction of musical intervals takes place—that is, abstraction of the ratios between tonal frequencies. This second channel thus mediates transposition of tonal sequences or melodies.

The two-channel hypothesis therefore predicts that where judgments of single tones are concerned, octave generalization effects should occur. However, where judgments of melodic relationship are concerned, provided that there is no artifact due to octave generalization for single tones, octave generalization effects should not operate.

This theory was supported in an experiment by Deutsch (1972), in which subjects were played the first half of the tune "Yankee Doodle" with its components placed randomly in three octaves (with the restriction that no two successive tones occurred as in the untransformed melody). The subjects were asked to name the tune, but were provided with no clues to its identity, apart from being assured that it was well known. It was found that the percentage correct recognition under these conditions was no better than when the sequence was played as a series of clicks with the pitch information removed entirely. It was concluded that octave generalization does not occur along the channel that processes melodic relationships.

However, the discussion proceeds with the following caution: "Another finding of interest is that when the experimental group was played Condition D (randomized octaves) after they had heard Condition A (and so knew the identity of the tune), the Subjects reported that they were now able to follow the tune to a large extent. Thus the Subjects were able to use octave generalization to *confirm* the identity of the tune, though not to *recognize* it in the absence of prior information. It may be supposed that this was achieved by the Subjects' imagining the tune to themselves simultaneously with hearing the 'randomized octaves' version. In this way, they could match each note as it arrived with their auditory image and so could confirm that each note was either correct or separated by exactly an octave from the correct note. *This would not require the making of any judgment involving successive intervals or tunes* [italics added]."

Thus, if we are provided with cues as to what the tune might be and, as a result, we form the right hypothesis, we can then confirm this hypothesis using the tone chroma information provided. A proper test of the theory should therefore ensure that the subject is not provided with such cues.

In House's (1977) experiment, subjects were presented repetitively with four well-known tunes under various conditions. The tunes were presented, over a single session, on nine trials each. On one-third of these trials, the tunes were undistorted; on one-third, the octave placement of the notes was varied, maintaining their "chroma"; and on one-third, the notes were displaced by intervals other than an octave. Thus the subjects were exposed on one-third of the trials to the undistorted tunes. Further, each trial consisted of two repetitive presentations, so that the subjects were able to listen to the tune twice before making a judgment; this providing them with ample opportunity for hypothesis testing. And to aid the subjects in such guessing, they were even provided with the names of the four tunes. These names were embedded in a list of 10; however, since only 4 tunes were ever presented, and this was in undistorted form once in every three trials, we can reasonably expect that the subjects would give these 4 tunes a very high priority in forming their hypotheses. House found that recognition of the tunes when the "chroma" was maintained was better than when it was not. However, it would have been surprising, given the experimental conditions, had such a result not been obtained. The finding from House's experiment are completely consistent with the two-channel model.

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