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Investigating the limits of complex pitch perception

The limits of pitch perception were investigated in three experiments. The first measured fundamental frequency (F0) difference limens (F0DLs) as a function of the average lowest harmonic (ALH) number for F0s ranging from 30 Hz to 2 kHz. Consistent with earlier findings, the results showed a significant increase in thresholds (decrease in performance) as the ALH increased from 9 to 12 for F0s of 100 and 200 Hz. For F0s lower than 100 Hz or greater than 200 Hz, the increase in thresholds occurred for ALHs between 6 and 9. This novel finding extends earlier results and reveals that the transition from low ("good") to high ("poor") yields a "bowl-shaped" pattern as a function of ALH and F0. Additionally, the results from Experiment 1 revealed that listeners can perceive the "residue pitch" of complex tones containing no harmonics below 6 kHz – previously thought to be impossible. Experiment 2 measured this more directly using a pitch matching task between a pure tone and a harmonic complex tone (HCT) with HCT stimuli containing no harmonics below 6 kHz. The results showed that the perception of residue pitch begins to deteriorate for ALH frequencies between 9.6 and 12 kHz, regardless of F0. Experiment 3 measured listeners' performance (*d'*) in a same-different melody perception task using highpass filtered stimuli containing F0s between 1-2 kHz and harmonics above 6 kHz. The results confirmed those of Experiment 2. Overall, these results demonstrate that listeners can derive pitch information from harmonics filtered above 6 kHz, and that this ability starts to deteriorate between 9.6 and 12 kHz. [Supported by NIDCD grant R01 DC 05216.]

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