

ROUGHNESS AND DISSONANCE OF MUSICAL DYADS

Andrzej Miskiewicz

Tomira Rogala

Chopin Academy of Music, Warsaw, Poland

Background

Dissonance of musical dyads arises due to rapid beats between the harmonics of complex tones. In psychoacoustics, the sensation produced by rapid beats is called roughness. Roughness is the main psychoacoustic correlate of dissonance. It is generally accepted that roughness and dissonance of two simultaneously sounding harmonic complex tones reach their minima when the tones are related by a simple frequency ratio so that certain harmonics of the upper tone coincide in frequency with harmonics of the lower tone.

Aims

The purpose of the present study was to determine the roughness of dyads that formed various musical intervals.

Method

Roughness of 35 dyads composed of harmonic complex tones was assessed by absolute magnitude estimation. The dyads formed musical intervals ranging from a unison to an octave, in various scale systems. The judgments of roughness were obtained in individual listening sessions from 16 students of music.

Results

Results demonstrate that roughness substantially varies with the interval's frequency ratio, what is a well-known phenomenon. A new finding is that many equally-tempered intervals are perceived as less rough than the corresponding Just intervals, i.e., dyads whose fundamental frequencies are in simple ratios. This finding may be explained by the effect of slow beats that are produced between the harmonics of two tones when the interval's frequency ratio slightly departs from exact simple ratio. Slow beats are heard as fluctuations in loudness and produce a pleasant quality of sound.

Conclusions

Roughness of dyads decreases below the values obtained for Just intervals when the interval slightly departs from exact simple frequency ratio, so that fluctuations in loudness produced by slow beats can be heard.