Demonstration 17. Frequency Difference Limen or JND (2:16)

The ability to distinguish between two nearly equal stimuli is often characterized by a *difference limen* (DL) or *just noticeable difference* (jnd). Two stimuli cannot be consistently distinguished from one another if they differ by less than a jnd.

The jnd for pitch has been found to depend on the frequency, the sound level, the duration of the tone, and the suddenness of the frequency change. Typically, it is found to be about 1/30 of the critical bandwidth at the same frequency.

In this demonstration, 10 groups of 4 tone pairs are presented. For each pair, the second tone may be higher (A) or lower (B) than the first tone. Pairs are presented in random order within each group, and the frequency difference decreases by 1 Hz in each successive group. The tones, 500 ms long, are separated by 250 ms. Following is the order of pairs within each group, where A represents (f,f+Δf), B represents (f+Δf,f), and f equals 1000 Hz:

Group	Δf (Hz)	Key	Group	Δf (Hz)	Key
1	10	A,B,A,A	6	5	A,B,A,A
2	9	A,B,B,B	7	4	B,B,A,A
3	8	B,A,A,B	8	3	A,B,A,B
4	7	B,A,A,B	9	2	B,B,B,A
5	6	A,B,A,B	10	1	B,A,A,B

Commentary

"You will hear ten groups of four tone pairs. In each group there is a small frequency difference between the tones of a pair, which decreases in each successive group."

References

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- E.Zwicker (1970), "Masking and psychological excitation as consequences of the ear's frequency analysis," in *Frequency Analysis and Periodicity Detection in Hearing*, ed. R.Plomp and G.F.Smoorenburg (Sijthoff, Leiden).