Frequency DL in Normals - Effect of Frequency, Sensation Level, Ear Difference, Sex and Interaction Effects

Sheela Kamath
Student, A.I.I.S.H., Mysore.

This experiment was conducted to find out the minimum change in frequency which normal subjects can detect. This minimum change in frequency (Difference limen - DL for frequency) was denoted in terms of percentges. The test was conducted at five frequcies in octave levels (250Hz to 4000Hz) and at four sensation levels (20 dBSL to 80 dBSL). Twenty males and twenty females were taken as subjects and both the groups were tested for DL measures in both the ears.

The following hypotheses were made prior to the experiment:

1. Male subjects and female subjects perform the test alike i.e., there is no significant difference in DL scores between the two groups.
2. There is no ear difference seen for DL values i.e., right ear DL values are similar to left ear DL values in both the groups (males and females).
3. DL values show no significant difference across five frequencies and across four SLs i.e., there is no significant change in DL values with increase in frequency and increase in sensation level.
4. There is no interaction effect seen between frequency and sensation level i.e., frequency does not bear any effect on intensity.

From this experiment, it was concluded that mean frequency DL values showed no significant difference across frequencies tested (250Hz to 4KHz at octave intervals) among all subjects. Frequency did not bear any effect on sensation level during DL measurement. Moreover, neither were better DL values observed with increase in sensation level. These are in direct contradiction to Shower and Biddulph's (1931), data cited in literature. This could be due to great subject variability and experimental methodology. All the four null hypothesis were thro accepted.

The normal DL value was computed to be anywhere between 1 % to 1.25% of the frequency under consideration. This value can be used as a standard value to compare with test results obtainable from the clinical population.

Recommendations:

1. Ascending vs. descending method of testing can be used to find out DL values. Whether there is any significant difference can be noted.
2. Very high frequcies can be used as a part of the DL test i.e., frequencies above 4KHz. This data can then be used to compare with studies cited in literature.
3. Wider normal population can be subjected to this test to note significant variance in DL values.
4. This test should be used over a wide range of clinical population, especially so becaouse frequency discrimination is very consistently cited to be effected in SN loss cases (more so in cochlear patients). The scores

computed by measurement of DL values in cochlear patients can be used as an indication of the true significant difference that exists between normal hearing subjects and hearing loss patients. This would play a very significant role in differential diagnosis. Another possibility s the presence of significant difference in DL values among different pathological conditions Eg. Meniere's disease, Noise Induced Hearing Loss, etc. Now that standard mean DL value has been calculated (1% to 1.25%) any change could be a significant aid to differnetial diagnosis. Perhaps, different pathologies show a significantly different performance in frequency discrimination measures. This is a very valid area of consideration for further investigations. It could further be analyzed as to whether cochlear patients show any significant frequency and sensation level interactions, and also whether DL values differ across sensation levels and requencies. This might leed us to interpret the phenomenon of recruitment (Evidence by Langenbeck, 1965).

5. Specifically, the folloawign population can be studied and their DL values can be compared with the adult DL values obtained from this experiment.a. Children, b.Cases exhibiting diplacusis, c. Patients exhibiting presbycusis, d. Menieres disease and other cochlear hearing losses.

More investigations needs to be done in this area to reach a final conclusion regarding differential diagnosis.