Temporary Threshold Shifts Following Monaural and Binaural Exposure to High Frequency Pure Tones*

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TTS at low frequencies following monaural and binaural exposures have revealed that, TTS following binaural exposures is less than the TTS following monaural exposures (Hirsh, 1958 ; Ward, 1965 ; Kerlovich *et al.*, 1972 ; Kerlovich *et al.*, 1974). This difference in TTS was explained on the basis of the middle ear muscles activity which is restricted to low frequencies only (below 2 KHz). During binaural exposure, the middle ear muscles contract more vigorously and reduce the energy reaching the cochlea, thereby there will be reduction in TTS during binaural exposures. In addition to the acoustic reflex action Ward (1965) considers the action of olivo-cochlear bundle and cochleo-cochlear pathways to be present during binaural exposures at low frequencies. Dayal (1973) reports the action of crossed olivo-cochlear bundle (COCB) at high frequencies and revealed that, the COCB is not responsible for adaptation at high frequencies as he still could find some inhibitory responses even when COCB was cut. He assumes that, homolateral olivo-cochlear bundle may play a role in the adaptation mechanism at high frequencies.

The present study was an attempt to investigate whether there is any significant difference in TTS between monaural and binaural exposures to high frequency tones at equal intensity levels for equal duration of time.

Madsen dual channel clinical audiometer Model OB 70 calibrated to ANSI (1969) specifications was used in this study. TTS for monaural and binaural exposures was measured in thirty normal subjects. These subjects were divided into three groups G_1, G_2 and G_3 and were exposed to three different frequencies 2 KHz, 3 KHz and 4 KHz respectively at equal intensity levels in both monaural and binaural conditions, continuously for 15 minutes. TTS at the fatiguing frequency was measured immediately after the cessation of the stimulus (TTS_0), after 1 minute of recovery time (TTS_1) and after 2 minutes of recovery time (TTS_2). TTS after 3 minutes of recovery time (TTS_3) was measured one step beyond the fatiguing frequency and TTS after 4 minutes of recovery time (TTS_4) was also measured two steps beyond the fatiguing frequency.

Conclusions

It was found that there was no significant difference in TTS between monaural and binaural exposures to high frequency tones at equal intensity levels for equal duration of time, except for 3 KHz at TTS_3 (fatiguing frequency being 2 KHz tone). As the T value at this frequency

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was equal to the table value, it is difficult to accept the hypothesis or reject the hypothesis. Further research data at this frequency are very much essential.

No significant difference in TTS following monaural and binaural exposures to high frequency tones at equal intensity levels, for equal duration of time could be attributed to the action of homolateral olivocochlear bundle.

It is reasonable if one would expect a high value of TTS during binaural exposures to high frequencies, as the acoustic reflex hypothesis is restricted to low frequencies only (Ward, 1973). But the results of the present study are in contrary to the expectation. The results show that there is no significant difference in TTS between monaural and binaural exposures to high frequency tones at equal intensity levels for equal duration of time. This result could be attributed to the action of homolateral olivo-cochlear bundle which might inhibit the responses of the higher centres, as crossed olivo-cochlear bundle result could be attributed to the action of homolateral olivo-cochlear bundle which might inhibit the responses of the higher centres, as crossed olivo-cochlear bundle (COCB) does not play a role in the adaptation mechanism at high frequencies (Dayal, 1973).

More research data are warranted on these lines.

It is quite evident from the present study that the results support the acoustic reflex hypothesis, as TTS during binaural exposures to high frequency tones was not less than the TTS produced for monaural exposures to high frequency tones at equal intensity levels for equal duration of time.

Recommendations

(1) Studies pertaining to TTS_3 at 3 KHz after monaural and binaural exposures to 2 KHz tone at equal intensity levels for equal duration of time can be undertaken to verify the results obtained in the present study.

(2) It may be worth while to study whether there is any significant difference in the recovery process after monaural and binaural exposures to high frequencies.

(3) TTS at a fixed recovery interval after monaural and binaural exposures to a particular frequency can be studied at different test frequencies in the same subjects.

(4) It may be worth while to study the monaural *versus* binaural TTS for high frequency noise exposures.