Adaptation and Fatigue

• As defined by Hood (1972)
• Fatigue
  – Results from the application of a stimulus which is usually considerably in excess of that required to sustain the normal physiological response of the receptor, and it is measured after the stimulus has been removed.
  – Referred to post-stimulatory auditory fatigue - Temporary Threshold Shift (TTS)

Factors that affect TTS

• Intensity of the fatiguing stimulus
• Duration of the stimulus
• Frequency of the stimulus
• Frequency of the exposure to the stimulus
• Time between the time where the stimulus is stopped and when it is measured, usually referred to the recovery interval (RI)

TTS

• TTS generally increases with the intensity of the stimulus
  – Low intensities
    • Increases slowly
    • Happens mostly for similar frequency of presentation and frequency of the stimulus
  – As intensity increases
    • TTS increases
    • The range of frequency where it occurs increases
    • Range where TTS is greater is above the frequency of presentation
    • The frequency where TTS is maximum is around 1/2 to an octave above the frequency of presentation

TTS and duration of presentation

• TTS increases with prolonged exposure to a fatiguing stimulus
• For low frequencies, it appears to be reduced
  – May be explained by the middle ear reflex mechanism
TTS and recovery

- Recovery curves tend to be diphasic
  - TTS decreases with increased RI (recovery interval), but...
  - the decreasing recovery slope is interrupted by a “bounce”, especially for high frequencies
- Diphasic recovery slopes may indicate that two processes are involved in recovery
  - Short process, which may indicate neural activity/recovery
  - Longer process, may indicate hair cell and metabolic changes

Loudness Threshold Shifts

Temporary Threshold Shifts

- A TTS lasting up to 16 hours to disappear is called a *physiological fatigue*
- A TTS lasting more than 16 hours to disappear is called a *pathological fatigue*
  - Up to 3 weeks to recover