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)

- Adaptation
  - The response of a receptor to a steady stimulus declines as a function of time until it reaches a steady value at which the energy expended by the receptor is just balanced by the metabolic energy which is available to sustain it.
  - Appears as the decline in apparent magnitude of the stimulus, followed by a period where the magnitude remains constant.

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

- For high levels
  - TTS grows very rapidly
  - Above 90 to 100dB SPL extremely fast increase in TTS
  - Some researchers have stated this may be a transition point from temporary and physiological, to permanent and pathological

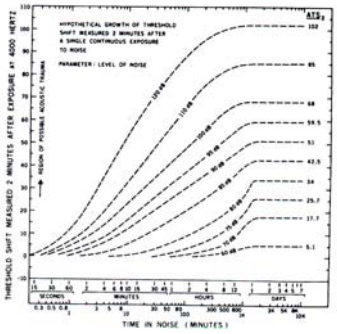
TTS and duration of presentation

- TTS increases with prolongued exposure to a fatiguing stimulus
- For low frequencies, it appears to be reduced
  - May be explained by the middle ear reflex mechanism

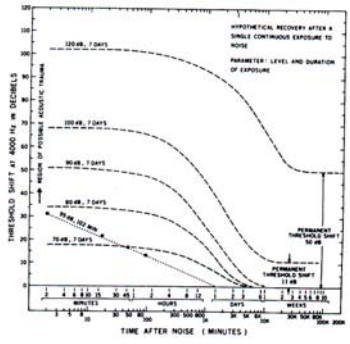
TTS and recovery

- 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



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