Classical Psychophysical Methods (*cont.*)

Outline

- **Method of Constant Stimuli (Probit Analysis)**
- **Method of Limits**
- **Method of Adjustment**

Method of Limits

- **AL (*ascending* series):**
  1. **A series begins with a stimulus intensity well *below* threshold, at a value that will be called the lower limit.**
  2. **Stimulus intensity is increased using small steps until it reaches the upper limit.**
  3. **On each trial the subject responds whether she can perceive the stimulus.**
  4. **Threshold for this series is estimated as the midpoint between the stimulus intensities for the last *NO* response and the first *YES* response.**

Method of Limits (*cont.*)

- **AL (*descending* series):**
  1. **A series begins with a stimulus intensity at the upper limit.**
  2. **Stimulus intensity is decreased using small steps until it reaches the lower limit.**
  3. **On each trial the subject responds whether she can perceive the stimulus.**
  4. **Threshold for this series is estimated as the midpoint between the stimulus intensities for the last *YES* response and the first *NO* response.**

Method of Limits (*cont.*)

- **AL (summary)**
  - **Run many ascending and descending series**
  - **Alternate or randomize the order**
  - **Threshold is estimated as the average of the transition points from an equal number of ascending and descending series.**

Method of Limits (*cont.*)

- **DL (asymmetric design):**
  - **The reference stimulus is fixed and the subject makes judgments about the difference between the test and the reference.**
  - **In the asymmetric design, the lower limit for the test stimulus is well below the value corresponding to the transition from responses "equal" to responses "greater".**
  - **DL is estimated as the average of the transition points from an equal number of ascending and descending series.**

Method of Limits (*cont.*)

- **DL (symmetric design)**
  - ◆ **In the symmetric design, the lower limit is well below PSE and the subject's task is to decide whether the test is greater or less than the reference.**
  - ◆ **DL is estimated as the standard deviation of the transition points from an equal number of ascending and descending trials.**

Truncated Method of Limits

- **To save the subject's time, each trial is stopped after the first change of response types. This version is used much more often than the "full" version.**

In the method of limits, the subject has less control over the stimulus intensity. This eliminates some sources of the response bias.

Lab: Truncated Method of Limits - Line Length Discrimination

- The subject runs 20 *ascending/descending* series. In each series, the length of the test line (l_t) is *increased /decreased*, starting with one well *below/above* the length of the reference line (l_r). The subject's task is to decide whether the test line is longer or shorter than the reference line. The transition point for each *ascending/descending* series is recorded.

- The frequency histogram of the thresholds is plotted, separately for the ascending series, descending series and the combined series. The corresponding parameters (mean and standard deviation) are computed in each case.

- The mean of the combined series is an estimate of PSE. The standard deviation is an estimate of DL.

Discussion of Results

- **Ascending and descending series lead to systematic errors in estimating thresholds. These errors are produced by two types of response biases:**
  - ◆ **habituation**
  - ◆ **expectation**