Classical Psychophysical Methods (*cont.*)

Outline

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

Method of Adjustment

- **AL: the subject is asked to adjust the intensity of the stimulus so that it is just barely detectable. The value adjusted is taken as an estimate of the threshold.**

  Note the asymmetric nature of this experiment caused by the fact that the intensity of the stimulus is never negative: The subject is asked whether the stimulus is present (greater than zero), or absent (zero). This fact makes the estimate of AL very sensitive to

  response bias

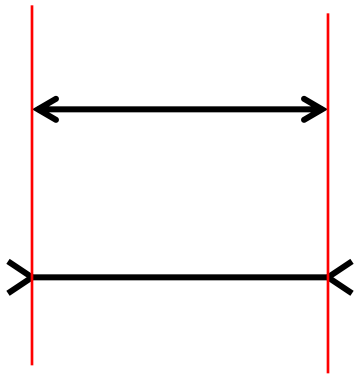
Method of Adjustment

- **DL: the subject is asked to adjust the intensity of the test stimulus so that the difference between test and reference is just barely detectable (asymmetric version). The difference between the value adjusted and the intensity of the reference stimulus is taken as an estimate of the threshold.**
- **DL: the subject is asked to adjust the test stimulus so that it is perceptually identical to the reference stimulus (symmetric version). Standard deviation *sd* of the distribution of the adjustments is taken as an estimate of the threshold. The mean value *m* is an estimate of the point of subjective equality (PSE).**

Lab: Line length discrimination – symmetric version

- The subject runs 20 trials. In each trial the subject adjusts the length of the test line (l_t) so that it is perceptually equal to the length of the reference line (l_r).
- The frequency histogram of the adjusted length is plotted. Its parameters (mean *m* and standard deviation *sd*) are computed.
- The mean *m* is an estimate of PSE and the standard deviation *sd* is an estimate of DL.

The Müller-Lyer Illusion



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- The frequency histogram of the adjusted length is plotted. Its parameters (mean *m* and standard deviation *sd*) are computed.
- The mean *m* is an estimate of PSE and the standard deviation *sd* is an estimate of DL.

Discussion of Results

Asymmetric version	Symmetric version			
DL (*mean*) (in pixels)	PSE (*mean*) (in pixels)		DL (*sd*) (in pixels)	
Line length	Line length	Müller-Lyer	Line Length	Müller-Lyer

- Perceptual illusion is present when (PSE - l_r) >> DL

Summary of the method of adjustment and the method of limits

Both these methods are easy to use. However, the estimates of threshold confound the percept with the response bias. The bias is related to the fact that the participant has full knowledge of the direction of the change of the stimulus intensity and has control over the stimulus. To remove these problems, the individual intensities of the test stimulus should be presented in a random order.

→Method of Constant Stimuli

Strengths and Weaknesses of the Method of Constant Stimuli

- **The method of constant stimuli provides more reliable estimates of the thresholds, as compared to the method of adjustment and the method of limits.**
- **The experimenter has to know the threshold at least approximately in order to choose the levels of the stimulus intensity appropriately. The lowest level should produce about 5% of responses YES, and the highest level should produce about 95% of responses YES.**

(*cont.*)

- When applied to AL (or to DL using an asymmetric design), the method of constant stimuli confounds the percept with response bias. One solution is to introduce "catch trials" in which the intensity of the stimulus is zero. The subject is expected to produce small proportion of errors on these trials. Another solution is to use the Method of Signal Detection.

Discussion of the discrimination results from the three methods

- The method of constant stimuli produces more reliable and accurate estimates of the threshold (AL, DL) and PSE, as compared to the other two classical methods.
- The method of adjustment and limits are often used to provide initial estimates of threshold and PSE. These estimates are then used to design the experiment using the method of constant stimuli.
- Probit Analysis gives not only estimates of the mean and standard deviation. It also gives the estimates of standard errors (i.e., the mean and standard deviations of m and s of cumulative Gaussian distribution).