B.A.II
PSYCHOLOGY
PSYCHOPHYSICS:METHODS

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THE PSYCHOPHYSICAL METHODS

• The methods traditionally used to determine the threshold were devised by G.T. Fechner (1801-1887), a German physicist and philosopher, regarded as the founder of psychophysics.
• Fechner was concerned with the relation between physical stimulation and mental experience.
• In order to study the above mentioned relationship, he devised a series of methods.

G.T. Fechner (1801-1887)
THE PSYCHOPHYSICAL METHODS

1. Method of limits (Method of Minimal Change)

2. Method of Constant Stimuli

3. Method of Average Error (Method of Adjustment)
Method of limits (Method of Minimal Change)

1. This method is also known as Method of Serial Exploration.
2. For computing threshold by this method, two modes of presenting stimulus are adopted ---- the increasing mode and the decreasing mode( the ascending series and the descending series).
3. For computing RL( Reiz Limen, German equivalent to absolute threshold), standard stimulus is needed and the subject simply reports whether or not he has detected change in the stimulus presented in the ascending and descending series.
4. RL maybe affected by two constant errors – the error of habituation and the error of anticipation. These two errors work in opposite direction. Alternate ascending and descending series control these errors to a great extent.
DETERMINATION OF RL OF SOUND INTENSITY BY THE METHOD OF LIMITS
(Hypothetical data)

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DETERMINATION OF RL OF SOUND INTENSITY BY THE METHOD OF LIMITS

• Individual Thresholds: 6.5  6.5  8.5  8.5  9.5  7.5

• Mean Ascending Threshold: \frac{6.5+8.5+9.5}{3} = 8.16

• Mean Descending Threshold: \frac{6.5+8.5+7.5}{3} = 7.5

• Mean Absolute Threshold: \frac{8.16+7.5}{2} = 7.83
DETERMINATION OF DL FOR WEIGHT LIFTING BY THE METHOD OF LIMITS
(Hypothetical data)

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DETERMINATION OF DL FOR WEIGHT LIFTING BY THE METHOD OF LIMITS

Upper Threshold: 107.5 106.5 106.5 105.5 106.5 106.5 106.5 105.5 107.5 105.5

Lower Threshold: 105.5 104.5 104.5 103.5 104.5 104.5 104.5 103.5 105.5 104.5

Mean Upper Threshold: \[
\frac{1064}{10} = 106.4
\]

Mean Lower Threshold: \[
\frac{1045}{10} = 104.5
\]
DETERMINATION OF DL FOR WEIGHT LIFTING BY THE METHOD OF LIMITS

• Interval of Uncertainty: Mean U Threshold – Mean L Threshold
  \(106.4 - 104.5 = 1.9\)

• Difference Limen: Interval of Uncertainty
  \(\frac{1.9}{2} = 0.95\)

• Point Of Subjective Equality: Mean U Threshold + Mean L Threshold
  \(\frac{106.4 + 104.5}{2} = 105.45\)

• Constant Error: PSE – St = 105.45 – 105 = 0.45
Method of Constant Stimuli

- This method requires a series of forced-choice trials.
- A fixed number of stimuli of different intensities, extending over a relatively wide range, are singly presented many times in random order.
- On each presentation the observer must make a detection response – either “Yes“( detection) or “No”( no detection).
- For each stimulus intensity, the percentage of trials in which the stimulus value is detected is computed.
- The intensity of the stimulus value detected on 50% of the trials is generally used as the measure of the Absolute Threshold.
DETERMINATION OF RL OF SOUND INTENSITY BY THE METHOD OF CONSTANT STIMULI (stimulus presented 100 times) (Hypothetical data)

<table>
<thead>
<tr>
<th>Stimulus Value</th>
<th>f (detection)</th>
<th>%( detection)</th>
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<tr>
<td>50</td>
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Calculation of RL by the method of Linear Interpolation:

50% point falls between the stimulus value of 42(43%) and 44(65%).

65 - 43 = 22

43 + 7 = 50%

By interpolation, we calculate $(7/22) \times 2 = .636$ (as there are 2 step intervals between stimulus value of 44 and 42).

42 + .636 = 42.636 or 42.64

RL by interpolation method = 42.64
Method of Average Error

- This method is also known as the Method of Adjustment.
- The intensity of the stimulus is under the observer’s control i.e. the observer is required to adjust the intensity to a just detectable level.
- Once the observer adjusts the stimulus intensity until it is just detectable, the value of that intensity level defines the threshold.
- The difference between St and Co defines the error in each judgment.
- A large number of such judgments are obtained and the average of those judgments is calculated.
- Hence the name, ‘method of average error’ is given.
Method of Average Error

- This method will be illustrated with data obtained from the experiment on Muller Lyer Illusion (hypothetical data). The arrow-headed line is the standard stimulus and the feather-headed line is the comparable stimulus. The subject has to adjust the feather-headed line until it appears equal to arrow-headed line. Subject uses two kind of movements to make the adjustment --- Inward and Outward. The movement and space errors are controlled by the experimenter by using the counterbalancing design.
DETERMINATION OF PSE and CE (extent of Muller-Lyer Illusion) by the METHOD OF CONSTANT STIMULI (hypothetical data)

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<th>Trials</th>
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<th>RI</th>
<th>LI</th>
<th>LO</th>
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DETERMINATION OF PSE and CE (extent of Muller-Lyer Illusion) by the METHOD OF CONSTANT STIMULI

- Mean RO: \[ \frac{\text{Total RO}}{10} = \frac{84.8}{10} = 8.48 \]
- Mean RI: \[ \frac{\text{Total RI}}{10} = \frac{85.4}{10} = 8.54 \]
- Mean LO: \[ \frac{\text{Total LO}}{10} = \frac{85.5}{10} = 8.55 \]
- Mean LI: \[ \frac{\text{Total LI}}{10} = \frac{85.7}{10} = 8.57 \]
DETERMINATION OF PSE and CE (extent of Muller-Lyer Illusion) by the METHOD OF CONSTANT STIMULI

- **PSE:** \[\frac{8.48 + 8.54 + 8.55 + 8.57}{4} = 8.535 \text{ or } 8.54\]

- **Constant Error (CE):** \[\text{PSE} - \text{St} = 8.54 - 10 = -1.46\]

The value of CE indicates the underestimation of the standard arrow-headed line. The subject on the average perceives the arrow-headed line to be shorter than the feather-headed line to the extent of 1.46 cm.
CONCLUSIONS

• Psychophysical Methods are the generalized models, the experimental approaches to the measurement of discrimination – absolute and differential.

• These methods help to investigate the quantitative relationship between the magnitude of sensation and the magnitude of physical stimulus.