Psychophysics

- Stimulus & Response
- Weber - Fechner Law (IND)
- criticisms of Weber - Fechner law
- Methods of psychophysics

Psychophysics — the branch of psychology that deals with the relations between physical stimuli and mental phenomena.
OR scientific study of the relationship b/w stimuli & the sensations & perceptions evoked by these stimuli.

The behaviourists regards psychology as a science of behaviour.

Behaviour is the response to a stimulus.

$$S \longrightarrow R$$

organisms responds to stimulus so -

$$S \longrightarrow O \longrightarrow R$$

S - stimulus
O - organism
R - Response

The stimuli comes from surrounding environment & act upon the organisms which react upon them, its responses effects changes in the environment

$$W - S - O - R - W$$

W = World environment

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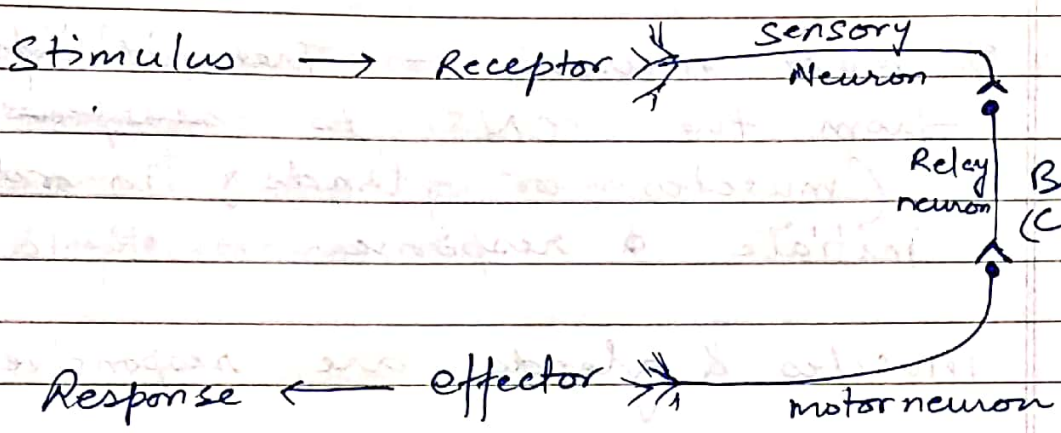
explanation of Pathway – 6 step

(1) – A stimulus is a change in the environment (either external or internal) that is detected by a receptor (organism)

(2) – Receptors transforms environmental stimuli into electrical nerve impulses etc.

(6) A response is a change in the organism resulting from the detection of a stimulus

Pathway of stimulus – Response



ex. – glass of water (stimulus) – Receptor (eye) देखा

Brain → effector (हाथ की muscles) → response हाथ से glass उठाया.

(3) These impulses are then transmitted via neurons to the CNS (Central N-system) where decision making occurs.

(4) When a response is selected (consciously or unconsciously) the signal is transmitted via neurons to effectors.

(5) effectors – are organs (either muscles or glands) that produce a response to a stimulus

Three types of neurons are required to transfer informations via stimulus – response pathway

1- Sensory neurons - Transmit information from sensory receptors to CNS

2) Relay neurons – Transmit information within the CNS as part of the decision making process.

3) Motor neurons – Transmit information from the CNS to ~~receptors~~ effectors (muscles or glands) in order to initiate a response.

Muscles & glands are responsive organs.

There are 2 types of muscles –

Striped Muscles (Voluntary M)	Unstriped M (Involuntary M)
– Under the control of will – (control CNS)	– not subject to the control of will. (control ANS)
– They move arms, legs, trunk, tongue, larynx etc.	muscle of blood vessels, intestines, middle ear muscle diaphragm muscles etc.
– They are attached to bone	– They are ~~attached~~ present in the walls of internal organs
– ~~Response means~~	
– fatigued easily	fatigue slowly
Contraction powerful & rapid	contraction & Rhythmic [illegible]

ANS – Autonomic Nervous system.

The Response — The total striped & unstriped muscular & glandular change which follows upon a given stimulus — (Watson)

Responses may be simple or complex -

Simple Response	complex Response
- Behaviours consist of S.R. of the organism to stimuli in the environment as simple reflexes	

Weber - Fechner law -

Stimuli of various intensities act upon our sense organs but we cannot be conscious of all of them.
Stimuli of very low degrees of intensity cannot produce sensations. Similar is the case with stimuli of very high degrees of stimuli.

A very faint sound, a very faint light, a very faint colour, a very faint odor, may fail together to produce a sensation.

The point of intensity at which the organisms ~~can just~~ detect the presence of a stimulus which produce sensation is called limen or the threshold.

- ~~The point~~ The point of intensity at which the organism can just detect (ie least intense stimulus) the presence of stimulus, which produce sensation is called absolute threshold. or (detection threshold)
- The point of intensity at which the organism can detect the presence of a difference between two stimuli which produce sensation is called difference threshold (or just noticeable difference JND) *

isKa ex. peche hai -

JND is not a fixed quantity, it depends

Fechner – student of Weber

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on how intense the stimuli being measured are and the particular sense being measured.

Weber's Law states - that the JND of a stimulus is a constant proportion despite variation in intensity.

JND – smallest change in stimuli that can be perceived

Ernst Heinrich Weber – was first ~~person~~ to approach the study of the human response to a physical stimulus in a quantitative fashion.

– formulated law between the upper limit & lower ~~Fechner~~ ~~Fechner~~ limit or threshold.

As stated above –

JND dS is proportional to the initial stimuli intensity (S).

$$dS = K^* S$$

S = reference stimulus
K = constant

Weber law always fails at low intensities, near and below the absolutes detection threshold, and often at high intensities

~~Fechner law states~~ -

The point beyond which stimulus can not be perceived by organisms is upper limit of sensation or terminal ~~threshold~~ threshold and upper limit or the height of sensibility is called the range of sensibility. e.g. JND is proportional to initial stimuli.

Weber formulated.

The greater is the intensity of the stimulus the greater is the intensity of the corresponding sensation. But every increase of stimulus above a certain amt does not produce an increase in sensation.

Ex of JND. When we put wt of 20gm upon hand — we must add one whole gm so that we may observe the change in the pressure sensation as if we put 100 gm — then must add 5 gm before we can observe the any change in intensity.

Fechner's law —

simple differential sensitivity is inversely proportional to the size of the components of the difference, relative differential sensitivity remains the same regardless of size — means that the perceived change in stimuli is proportional to the initial stimuli

- states that the subjection sensation is proportional to the logarithm of the stimulus intensity.

Acc. to this law — human perceptions of sight + sound work as follows —

perceived loudness / brightness is proportional

to logarithm of the actual intensity measured with an accurate nonhuman instrument

$$p = k \ln \frac{S}{S_0}$$

The relationship b/w stimulus & sensation is logarithmic. ie - means if a stimulus S varies as a geometric progression, the corresponding sensation is altered in an arithmetic progression.

"To increase the intensity of a sensation in arithmetical progression, the stimulus must be increase in geometrical progression".
The sensation increase as a logarithm of the stimulus — Rnown as ~~Weber~~ Weber - Fechner Law
— Means stimulus must by multiplied by a constant fraction — in order to that the corrosponding sensation may increase by the addition of a fixed unit.

JND is proportional to intial stimuli
Fechner fond that JND is constant for any sense.

Deriving Fechner law — ⇒ Fechner formulated rule of Thumb regarding human perception.
⇒ Fechner law is a mathematical derivation Weber contrast.

Differentiate

$dp \propto \frac{ds}{s}$ OR $dp = k \frac{ds}{s}$ OR $\frac{ds}{s}$

S - Stimulus
ds - differential increase in the Stimulus

dp = differential change in perception
k = constant factor — determined experimentally

integrating the mathematical expression derivation of weber contrast.

$$p = k \ln S + C$$

(C ⇒ constant of integration & ln is the natural algorithm)

To solve for c, assume that the perceived Stimuli become zero at some threshold Stimuli S_0 — using this as constraint set $p = 0$ & $S = S_0$

$$C = -k \ln S_0$$

Substituting C in the integrated expression for Webers law —

$$p = k \ln \frac{S}{S_0}$$

Constant K is sense specific & must be determined depending on the sense & type of stimuli.

the Weber Fechner law has been explained physiologically, as due to the nature of nervous system. As a sensory nerve is stimulated by a stimulus it gradually becomes less sensitive. So a stronger stimulus is required to produce an appreciable effect in the cortical centre belonging to that sense.

The law has also been explained psychologically. Wundt explains it by the general psychological law of relativity, according to which the conscious effect of a mental state depends upon previous mental states.
Thus the law is interpreted in terms of physiological & psychological laws.

Criticisms — do as same as ma'am notes

Methods of Psychophysics –

(classical psychophysical methods)

Same as wikipedia — और कुछ लिखा नहीं
ma'am ने wahi se chapa है।
To वहीं से पढ़ लो।

3 हैं।

1)
2)
3.

Attributes of sensation –

ma'am se Padh lo.
Same hai online
Chapa hai - line by line.