### Attributes of Sensations:

There are certain general distinguishable characters of sensa­tions. They are sometimes called **attributes of sensations**. Sensations have quality, intensity, duration (protensity) extensity (volume or voluminousness) and local sign (local character).

**(i) Quality:**

Sensations differ in **quality**. Sensation of colours, sounds, tastes, smells heat and cold; differ from one another in quality. There is **generic difference** among them. They are sensa­tions of different kinds. They have different sense-organs. They are produced by different kinds of stimuli.

Red, green, blue, yellow, etc., differ from one another within the same genus of colour. There is a **specific difference** among them. Red differs from blue specifically, and from heat and cold generically. In the generic difference of sensations, there are different kinds of sense-organs, and different kinds of sensory of different nerves.

**(ii) Intensity:**

Sensations of the same quality may differ in intensity. A light may be dim or bright, a sound faint or loud, a smell mild or strong, a taste weak or strong, a pressure light or heavy. A dim light produces a faint sensation of light.

A bright light produces an intense sensation of light. All sensations differ in intensity; lights, sounds, tastes, smells, temperatures, pains, pressures, hunger, thirst, fatigue, etc., all vary from very weak to very intense. The other conditions remaining the same, greater intensities of stimuli produce greater intensities of sensations.

**(iii) Duration of Protensity:**

Every sensation has a **sensible duration**. A sensation may linger in the mind for a certain duration. A sound sensation may last for a shorter or longer duration. The sound which lasts five seconds feels differently when it ceases from a sound which lasts twenty seconds. This is a difference in duration. Duration is also called potensity or protensive magnitude. Sensations alike in quality and intensity may differ in duration.

**(iv) Extensity:**

**Visual and tactual sensation have extensity**. Visual sensation of a star preceded by the moon - produce two visual sensations. The first visual sensation (moon) has greater extensity than the second (star).

Extensity is the attribute of a sensation which is due to the area of the sensitive surface which is stimulated. Extensity is different from intensity.

Extensity is different from **extension**. Extensity is an attribute of sensations. Extension is an attribute of material bodies. Extension of a material body remains the same but as we recede from it farther, it appears to be smaller.

**Extensity has two peculiarities:**

(a) A sensation having extensity is made up of a number of simultaneous sensations having different local signs.

(b) The **constituent sensations form a continuous whole**.

**(v) Local Sign:**

**Local sign is a peculiar attribute which distinguishes a sensation of one part of an extended sense-organs**, e. g, skin or retina, from an otherwise identical sensation of another part. It is due to the particular locality of the sense-organs stimulated, while extensity is due to the extent or area of the sensitive surface stimulated.

**PSYCHOPHYSICS**

**Stimulus and Response:**

The behaviourist regards psychology as a science of behaviour. Behaviour is a response to a stimulus. It is represented by the formula**: S → R**

The organism responds to stimulus. So the phenomenon is expressed by the formula:- **S → O→ R**

Here S stands for the stimulus; O stands for the organism; R stands for the response. The stimuli come from the environment, and act upon the organism which reacts upon them; its responses effect changes in the environment.

So the formula may be expanded into the following: **W—S—O—R—W**

The individual receives sensations from the **stimuli in the environment**, which act upon the **receptors or sense-organs.** He responds to them through the **effectors or muscles and glands**. He makes muscular movements and glandular reactions in response to the stimulation of the sense-organs. He has central neurons in the spinal cord and the brain connecting receptors and effectors. Muscles and glands are responsive organs.

There are two kinds of muscles, **striped and unstriped**. The striped muscles are under the **control of the will**. They move the arms, legs, trunk, tongue, and larynx. The unstriped muscles are **not subject to the control of the will**. They control the blood-vessels, intestines, the organs of elimination and reproduction. Hence by response we mean “the total striped and unstriped muscular and glandular change which follows upon a given stimulus” (Watson).

Responses may be **simple or complex**. Behaviour consists in simple responses of the organism to stimuli in the environment, such as simple reflexes, or in a complex reaction patterns or systems of responses, such as instinctive actions.

**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 intensity**.

A very faint sound, a very faint light, a very faint odour, may fail altogether to produce a sensation. The point at which a stimulus becomes intense enough to produce sensation is called the **limen or the threshold.**

The least intense stimulus which produces a sensation marks the **absolute threshold**. **Differential threshold** is shown by the smallest change in a stimulus which is appreciated. As the stimuli become more and more intense, they produce more and more intense sensations.

The point **beyond which stimulus cannot be perceived by the organism** upper limit of sensation or **terminal threshold is that point** . The interval between the limen or threshold and the upper limit or the height of sensibility is called the **range of sensibility**.

The German Physiologist, Weber, formulated a law. Between the upper limit and the lower limit or threshold, 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 amount does not produce an increase of sensation.**

The increase of stimulus may be too small to be noticed. It is too small to produce an appreciable sensation. For example, we may increase a weight a little, but the increase is so small that we are unable to perceive it. The stimulus must be increased by a certain amount if the increase is to be noticed. This gives the difference threshold or **least noticeable difference or just noticeable difference (JND)**.

The intensity of the stimulus must be increased by a constant fraction of it in order to produce an appreciable difference in the intensity of the sensation. The addition to the intensity of the stimulus must be a definite fraction of the original stimulus. In the case of pressure, the stimulus must be increased by **1/20** in order to produce a change in the pressure sensation.

When we put a weight of 20 grams upon the hand, we must add one whole gram so that we may observe a change in the pressure sensation. If we place 100 grams upon the hand, we must add 5 grams before we can observe any change in intensity.

In the case of sounds, the stimulus must be increased by 1/3; in the case of brightness, the stimulus must be increased by **1 /100**. The stimulus must be increased by a constant fraction so that we may observe any change in intensity.

**Fechner formulated the law as follows:**

“To increase the intensity of a sensation in **arithmetical progression**, the stimulus must be increased in **geometrical progression**.” “The sensation increases as the logarithm of the stimulus”. This is known as **Weber-Fechner Law**.

It means that the stimulus must be multiplied by a **constant fraction**, in order that the corresponding sensation may increase by the **addition of a fixed unit**.

What this means is that the perceived change in stimuli is proportional to the initial stimuli.

Weber's law also incorporates the **just noticeable difference (JND)**. This is the smallest change in stimuli that can be perceived.

JND is proportional to the initial stimuli. Fechner found that the JND is constant for any sense.

**(JND)dS/S = C**, where **dS is the differential increase in the stimulus** , **S is the stimulus, C is the Constant**

Fechner’s rule of thumb regarding human perception. This rule of thumb has been expressed mathematically, as  **dp = dS/S or dp = k dS/S** where **dp is the differential change in perception** and constant factor **‘k’ is to be determined experimentally**

The Weber-Fechner Law has been explained physiologically, as due to the nature of nervous action. 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 and psychological laws.

**Criticisms of Weber-Fechner Law**

But the Weber-Fechner law is approximately true within ertain

limits.

* First, the law has **not been verified in the case of taste and smell sensations**. The results are uncertain in the case of temperature. The law has been approximately verified in the case of hearing, sight, pressure, and the muscular sense.
* Secondly, the law holds true most accurately in the medium ranges of intensity. **The results are quite uncertain towards the upper and lower limits.** The sensation increases more rapidly towards the lower limit, and less rapidly towards the upper limit than is demanded by the law.
* Thirdly, implicitly the law assumes that the **sensation increases by a fixed unit**. But this is not true. The addition of 1 gram to 20 gram may not be felt in the same way as the addition of 1 milligram to 20 milligram .
* Lastly, James and Munsterberg point out that a strong sensation is not a compound of many weak sensations, but an entirely new sensation in quality.

**Methods of Psychophysics**

Psychophysical experiments have traditionally used **three** methods for **testing subjects**' perception in stimulus detection and difference detection experiments:

* the method of limits,
* the method of constant stimuli and
* the method of adjustment

**Method of limits**

Method of limits is of two direction

* **Ascending** - In the ascending method of limits, some property of the stimulus starts out at a level so low that the stimulus could not be detected, then this level is gradually increased until the participant reports that they are aware of it. For example, if the experiment is testing the minimum amplitude of sound that can be detected, the sound begins too quietly to be perceived, and is made gradually louder.
* **Descending** - In the descending method of limits, this is reversed. In each case, the threshold is considered to be the level of the stimulus property at which the stimuli are just detected.

In experiments, the ascending and descending methods are used alternately and the thresholds are averaged. A possible disadvantage of these methods is that the subject may become accustomed to reporting that they perceive a stimulus and may continue reporting the same way even beyond the threshold (**the error of**[**habituation**](https://en.wikipedia.org/wiki/Habituation)). Conversely, the subject may also anticipate that the stimulus is about to become detectable or undetectable and may make a premature judgment (**the error of anticipation**).

**Method of constant stimuli**

Instead of being presented in ascending or descending order, in the method of constant stimuli the levels of a certain property of the stimulus are not related from one trial to the next, but **presented randomly.**

This prevents the subject from being able to predict the level of the next stimulus, and therefore **reduces errors of habituation and expectation.**

For 'absolute thresholds' again the subject reports whether he or she is able to detect the stimulus.

For 'difference thresholds' there has to be a constant comparison stimulus with each of the varied levels.

**Method of adjustment**

The method of adjustment asks the subject

* to control the level of the stimulus,
* instructs them to alter it until it is just barely detectable against the background noise, or is the same as the level of another stimulus.

This is repeated many times. This is also called **the method of average error.**

In this method the observer himself controls the magnitude of the variable stimulus beginning with a variable that is distinctly greater or lesser than a standard one and he varies it until he is satisfied by the subjectivity of two. The difference between the variable stimuli and the standard one is recorded after each adjustment and the error is tabulated for a considerable series. At the end mean is calculated giving the average error which can be taken as the measure of sensitivity.