

# The senses, neural coding, modularity and psychophysics chp.1

**Sensation:** the ability to detect a stimulus and perhaps to turn that detection into a private experience

**Perception:** the act of giving meaning to a detected sensation

**Qualia (pl.qualia)** = a private conscious experience of sensation or perception

**Thresholds:** what is the faintest or loudest sound you can hear?

**Scaling- measuring private experience:** when you hear or taste something, are these experiences qualia? The same experience of another persons?

**Signal detection theory:** measuring difficult decisions. Eg. Mass on x-ray, determining if benign or not..

**Sensory neuroscience:** perception of the world depends on the activity of our sensory nerves at least as much as it depends on the world itself.

**Neuroimaging:** an image of the mind. "Binocular rivalry"- represents a dissociation of the stimuli presented to the eyes and your own private experience.

## Thresholds and the dawn of psychophysics

**Dualism:** the idea that the mind has an existence separate from the material world of the body

**Materialism:** the idea that the only thing that exists is matter and that all things including mind & consciousness are the result of interaction between bits of matter.

**Panpsychism:** the idea that the mind exists as a property of all matter- that is, that all matter has consciousness

**Psychophysics-** the science of defining quantitative relationships between physical and psychological (subjective) events.

**Two-point touch threshold:** the minimum distance at which two stimuli are just perceptible as separate

**Just noticeable differences (JND) (difference threshold):** the smallest detectable difference between two stimuli, or the minimum change in a stimulus that enables it to be correctly judged from a reference stimulus.

**Webber law:** the principle describing the relationship between stimulus and resulting sensation that says the just noticeable difference (JND) is a constant fraction of the comparison stimulus.

**Fechner's law:** a principle describing the relationship between stimulus and resulting sensation that says the magnitude of subjective sensation increases proportionally to the logarithm of the stimulus intensity.

**Absolute threshold:** the minimum amount of stimulation necessary for a person to detect a stimulus 50% of the time.

**Method of constant stimuli:** creating many stimuli with different intensities in order to find the tiniest intensity that can be detected. (participants respond to each presentation yes/no, same/different etc).

**Method of limits:** instead of random presentation, tones are presented in order of increasing or decreasing intensity. In ascending order from faintest to loudest & vice versa. Participant reports when tone is no longer audible.

**Method of adjustment:** subject controls change in stimulus e.g. volume up & down

### Signal detection theory:

A psychological theory that quantifies the response of an observer to the pre-sensation of a signal in the presence of noise. Measures obtained are:

**Criterion:** an internal threshold that is set by observer. If the internal response is above criterion then the observer gives a response “yes I hear that” or if below criterion: “no, I hear nothing”.

**Sensitivity:** a value that defines the ease with which an observer

**Fourier analysis:** A mathematical procedure by which any signal can be separated into component sine waves at different frequencies. Combining these sine wave will reproduce the original signal.

### Sensory neuroscience & the biology of perception:

**Doctrine of specific nerve energies:** A doctrine formulated by Johannes Muller, stating that the nature of a sensation depends on which sensory fibres are stimulated, not on how fibres are stimulated.

**Cranial nerves:** twelve pairs of nerves (one for each side of the body) that originate in the brainstem and reach sense organs and muscles through openings in the skull. These include:

*Olfactory (I) nerves-* conducts impulses from olfactory epithelia in nose to the olfactory bulb.

*Optic (II) nerves-* arise from the retina and carry info to thalamus.

*Auditory (VIII) nerves-* connect the inner ear with brain, transmitting impulses concerned with hearing and spatial orientation.

*Oculomotor (III) nerves-* innervate all the extrinsic muscles of the eye except the lateral rectus and the superior oblique muscles.

*Trochlear (IV) nerves-* innervate the superior oblique muscles of the eyeball.

*Abducens (VI) nerves-* innervate the lateral rectus of the eyeball.

- neuron firing is electrochemical; positively charged sodium ions (Na<sup>+</sup>) in axon, positively charged potassium ions (K<sup>+</sup>) pushed out of axon.

