

DEFINITION

- When a normal individual fixes his visual attention on an object of regard, the image is formed in the fovea of both the eyes separately but the individual perceives a single image

OR

- Coordinated use of both eyes so as to produce a single mental impression

DEVELOPMENT OF BINOCULAR SINGLE VISION

- Basic visual functions are innate and therefore present at birth
- Binocular single vision being a conditioned reflex is not present at birth
- It is acquired during the first 6 months and completed in few years

MILESTONES

- Birth-No central fixation
- First month-central fixation starts developing
- Six months-central fixation established
Macular stereopsis and accommodation reflex fully developed
- Six years-visual acuity 6/6 attained and binocular vision fully developed

PREREQUISITES

MOTOR MECHANISM

Correct neuromuscular development so that the visual axes are directed at the object

SENSORY MECHANISM

Approximately equal image
clarity and size in the two eyes

Normal visual pathways

MENTAL PROCESS

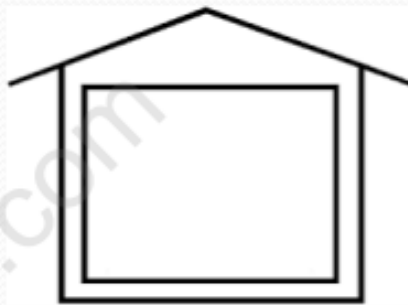
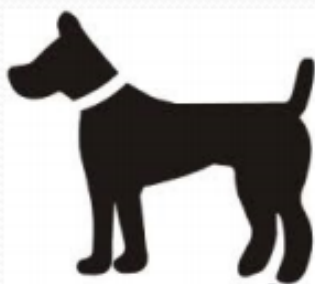
Ability of visual cortex to promote
binocular single vision

GRADES OF BINOCULAR SINGLE VISION

GRADE 1 - SIMULTANEOUS PERCEPTION

Simultaneous perception exist when signals transmitted from the two eyes to the visual cortex are perceived at the same time.

It consist of the ability to see two dissimilar objects simultaneously.

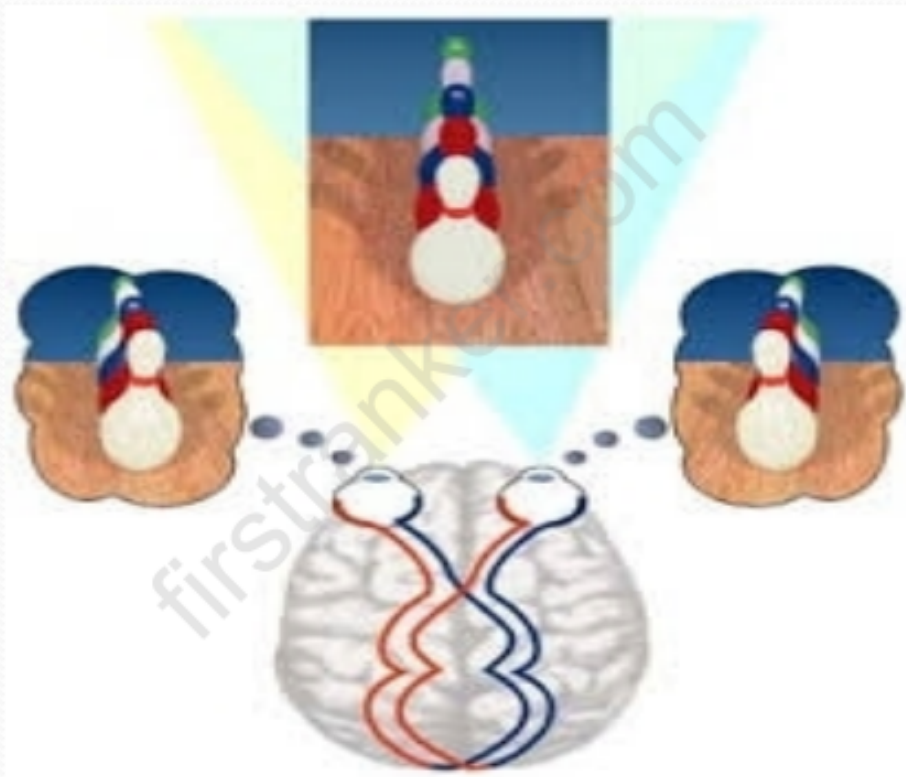


GRADE 2-FUSION

- It is the ability of the two eyes to produce a composite picture from two similar pictures each of which is incomplete in one small detail

GRADE 3-STEREOPSIS

- Ability to obtain impression of depth by superimposition of two images of the same object seen from two slightly different angles.
- Tested with stereopsis slides in synoptophore



ANOMALIES OF BINOCULAR VISION

- Suppression
- Amblyopia
- Abnormal retinal correspondence (ARC)
- Diplopia
- Confusion

SUPPRESSION

It is a temporary active cortical inhibition of the image of an object formed on the retina of the squinting eye

Occurs only during binocular vision

AMBLYOPIA

- Partial reversible loss of vision in one or both eyes for which no cause can be found by physical examination of the eye
- Also called LAZY EYE

PATHOGENESIS

- Improper visual development of visual pathway due to operation of **AMBLYOGENIC FACTORS** during the critical period of visual development(birth to 6 years of age)
- **AMBLYOGENIC FACTORS**
 - ☐ Visual deprivation-anisometropia
 - ☐ Light deprivation-congenital cataract
 - ☐ Abnormal binocular interaction-strabismus

TYPES OF AMBLYOPIA

- Strabismic Amblyopia
- Stimulus Deprivation Amblyopia
- Anisometric Amblyopia
- Isoametropic Amblyopia
- Meridional Amblyopia

CLINICAL FEATURES

- Visual acuity is reduced
- Effect of neutral density filter
- Crowding phenomenon
- Central or eccentric fixation pattern
- Colour vision may be affected

TREATMENT

- Occlusion therapy
- Penalization- atropine/ optical
- Pleoptic exercise
- Pharmacologic manipulation-levodopa /carbidopa
- Perceptual learning
- Computerised vision therapy

OCCLUSION THERAPY

- Occlusion of the normal eye to force use of amblyopic eye.
- It should be ensured that opacity should be removed and refractive error should be corrected fully.

ABNORMAL RETINAL CORRESPONDENCE

A state in which fovea of the normal eye and an extra foveal point on the retina of the squinting eye acquire a common visual direction.

Crude type of binocular single vision

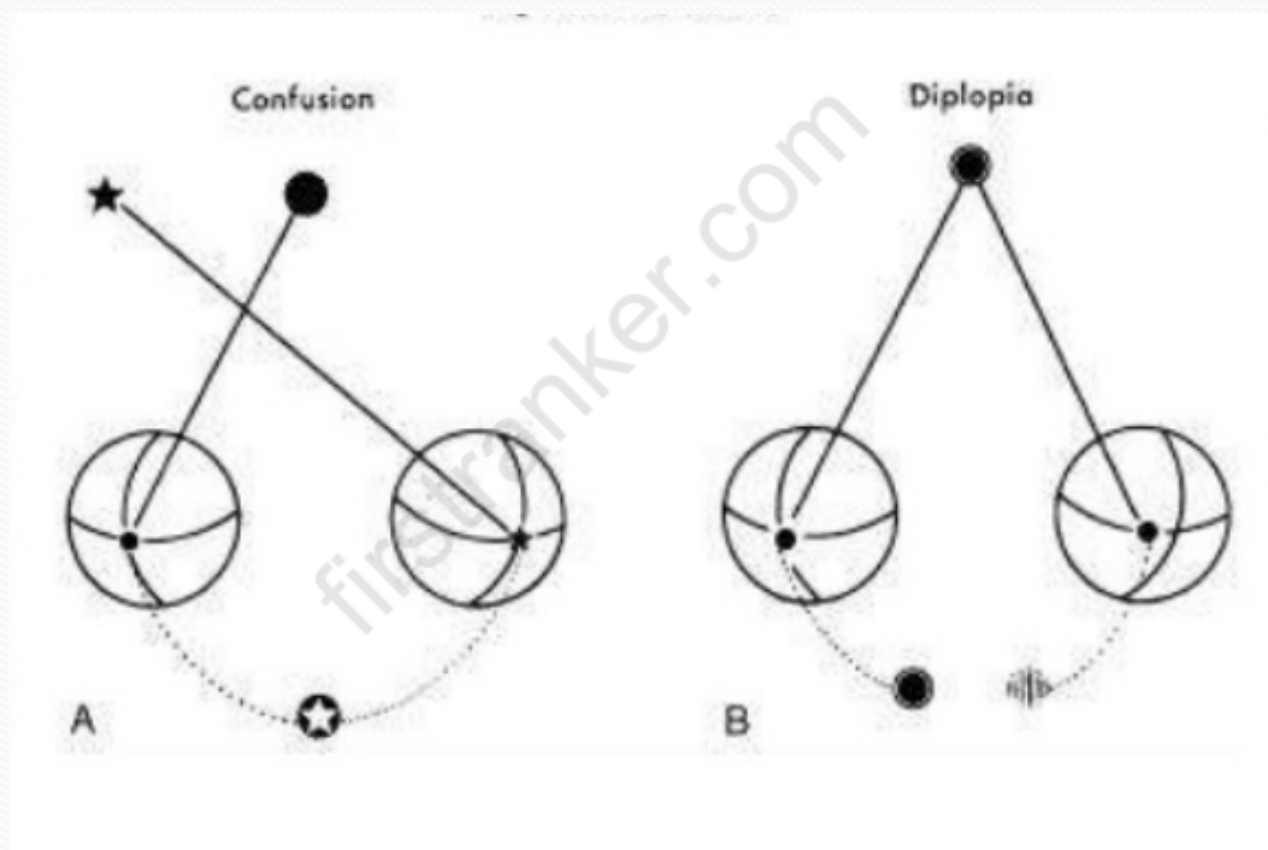
CONFUSION

- When squinting occurs the two foveas view two different objects that are physically separated in objective space and send two different images to a single cortical perceptual area.

DIPLOPIA

Simultaneous perception of two images of a single object

When squinting occurs an object in space is perceived by the fovea of one eye and extrafoveal point of the other eye, which has a different projection. Thus an object will be localized twice in space.



BINOCULAR DIPLOPIA

CAUSES

- Paralysis of extraocular muscles
- Space occupying lesion
- Restriction of ocular movements
- Anisometropia

TYPES

- Uncrossed diplopia
- Crossed diplopia

UNIOcular DIPLOPIA

CAUSES

- Subluxated clear lens
- Subluxated introcular lens
- Double pupil
- Incipient cataract
- Keratoconus

TESTS TO DETECT ABNORMALITIES

- Suppression-Worth's 4-dot test, 4 dioptre base out prism test, Red glass test, Synoptophore test.
- ARC- Worth's 4 -dot test, Litmus stereo test, Bagolini striated glass test, After image test, Synoptophore test