

Assessment of Vision
for
Early Intervention

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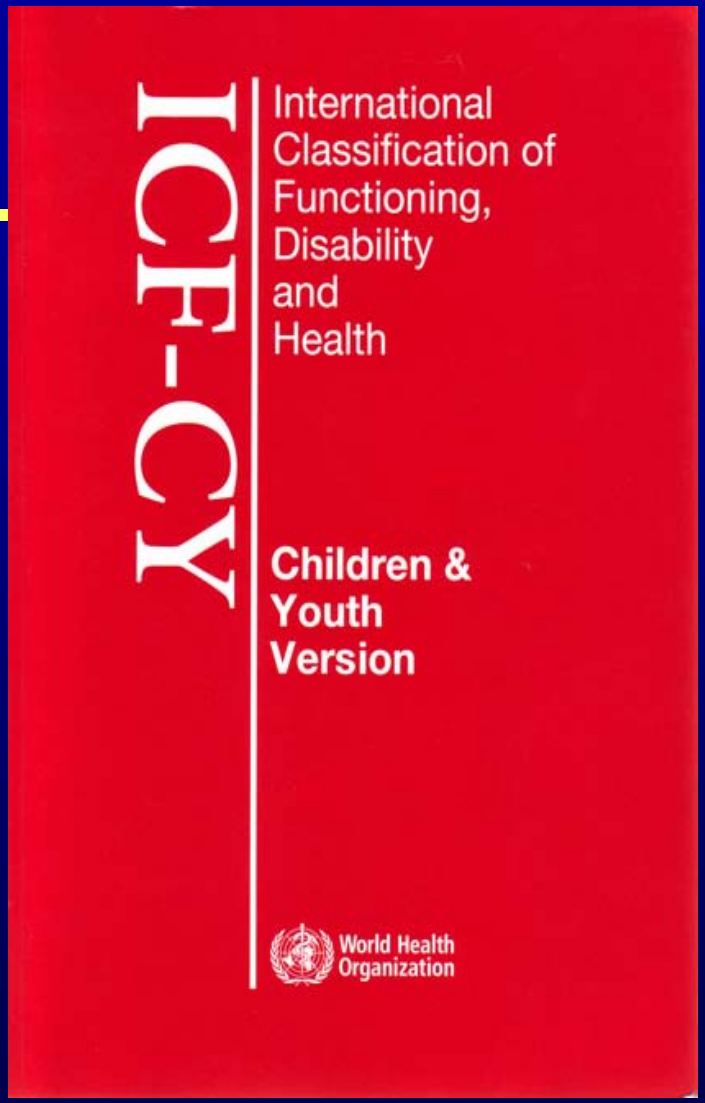
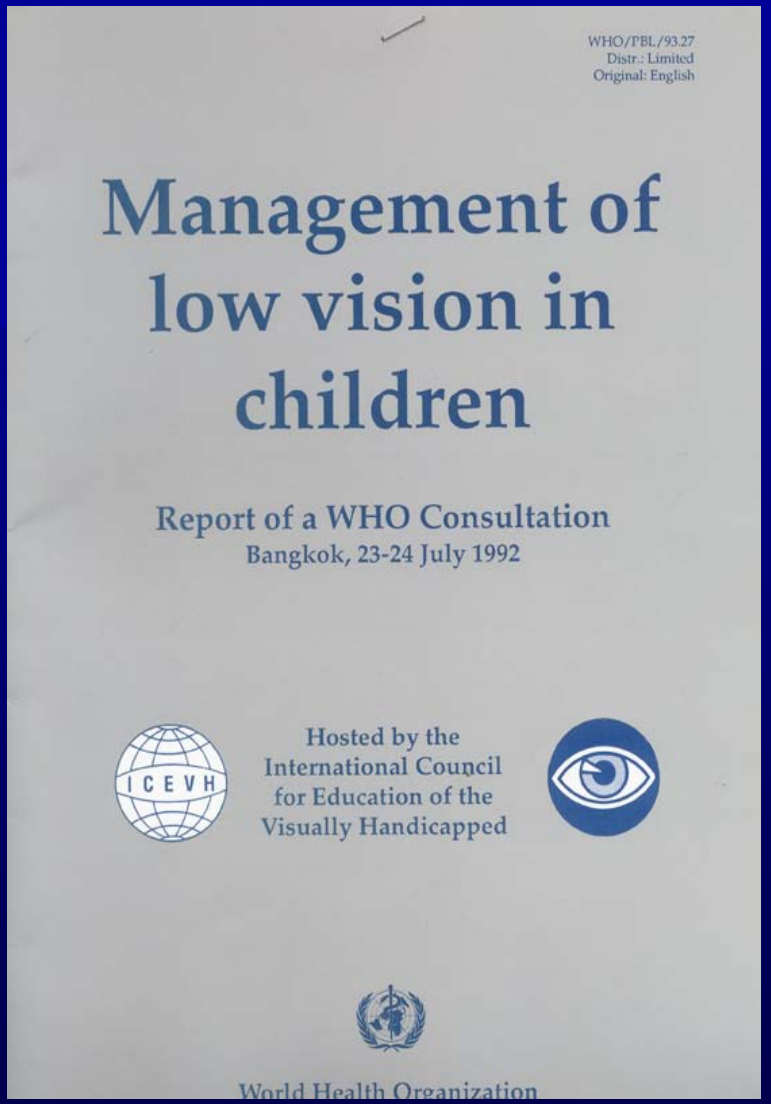
L V Prasad Hyderabdi January 29..2013.

ICF-CY 2007



9 activites/domains



4 activites/domains

International Classification of Functioning, Disability and Health, Child and Youth Version

Visual functioning

- Oculomotor functions
- Quality of the image
- Processing of visual information in brain functions

Assessment of functional vision

- basic information from the eye hospital
  structure of the pathways, refraction,
  glasses (under- or overcorrection?)
  VA, VF, CS, CV, VAd, motor functions
- testing of all visual functions in
  play and teaching situations

Binocularity - Fusion of images

Stereovision

Visual acuity

- Measurement of visual acuity **using optimal refractive correction** that can be used
- in standard luminance + **optimal luminance**
- using varying **postures** when needed, use child's physiotherapist for positioning

Visual acuity

Detection acuity – small objects, ”where”function

– response to grating ”

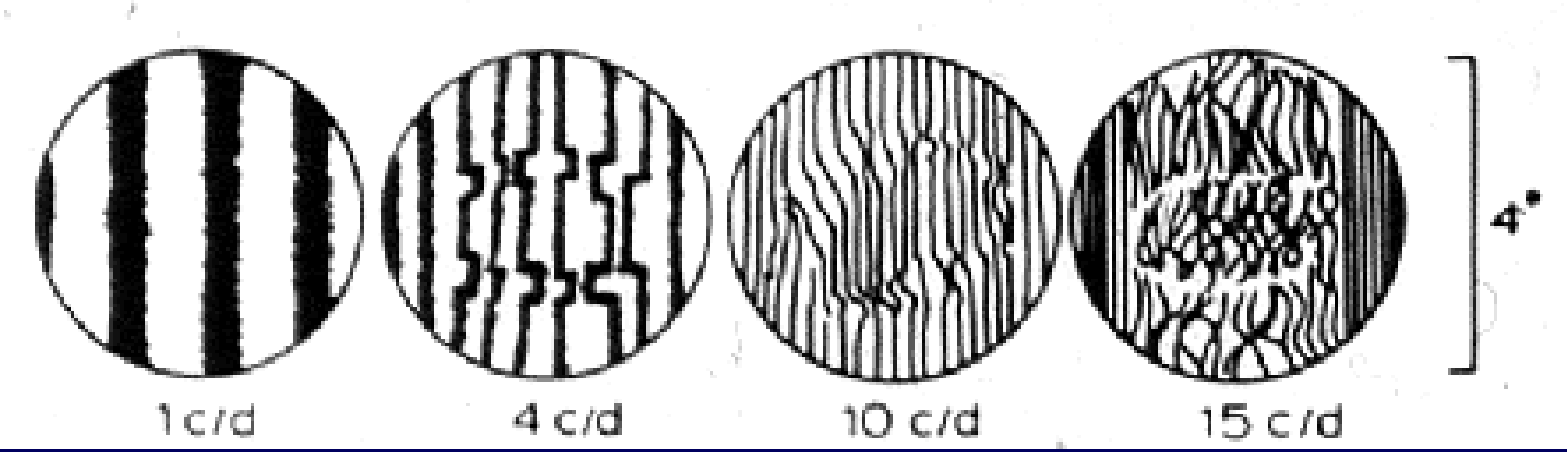
Grating acuity - cpd

Recognition acuity – optotype acuity

Hand movements, light perception/ projection

(no ”counting fingers”, fingers are not standardized)

Grating tests
in preferential looking situation



Detection tests

cpcm @ _ m

Grating response values

MUST NOT

be converted

to

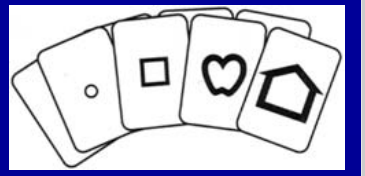
optotype acuity values

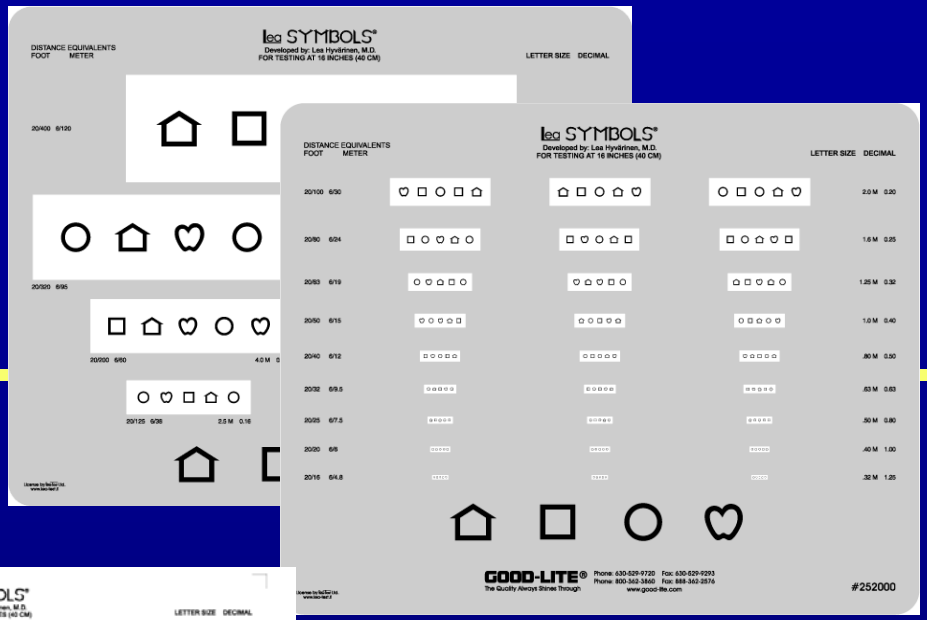
or reported as cycles per degree (cpd)

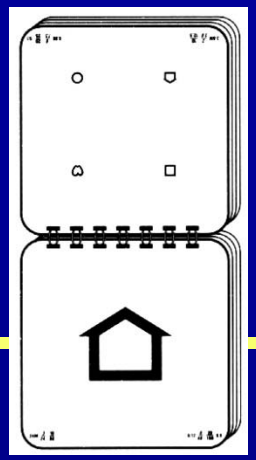
but as response to a grating with _ cpcm lines.

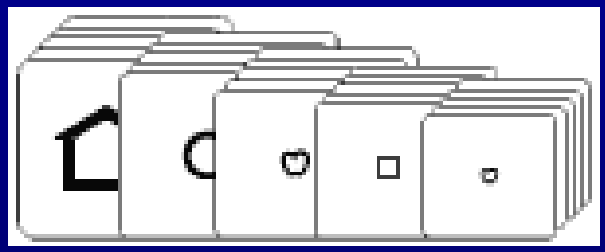
Training before testing

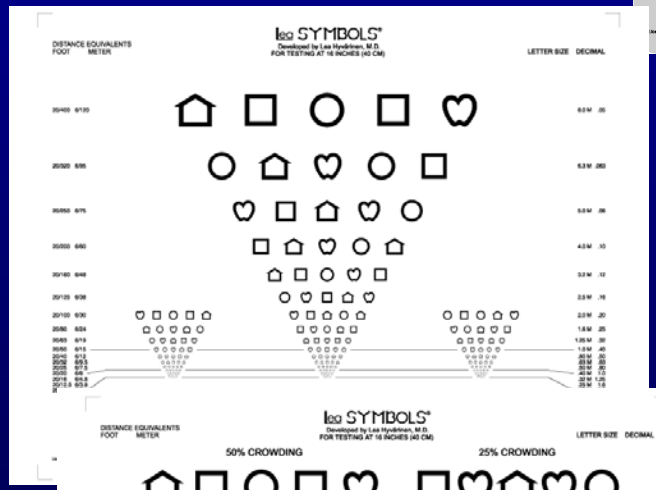
VA

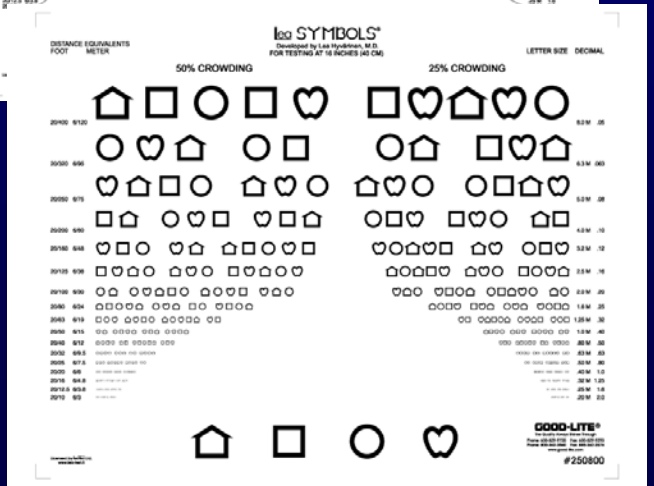


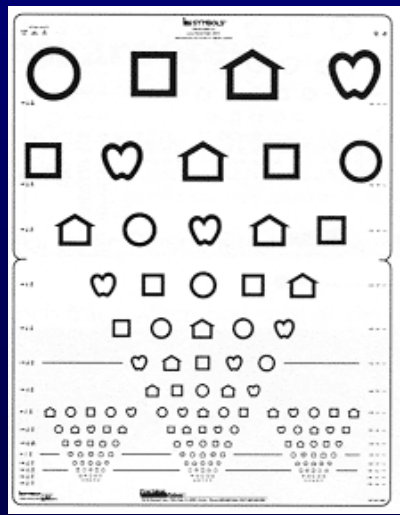


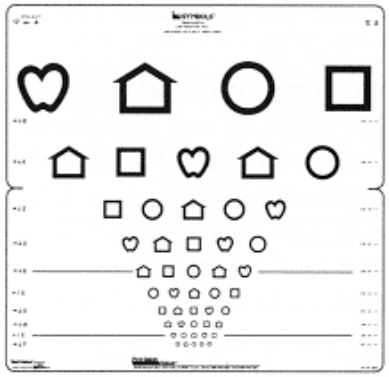


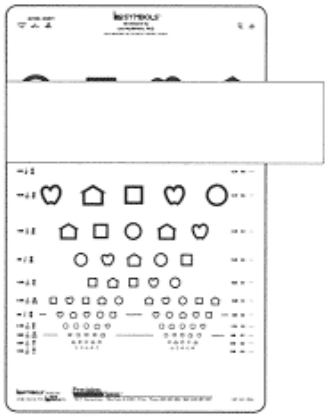












non-translucent charts & charts in lightbox

Increased Crowding

Distance	– single	**1.6, 6/4, 20/12**
	– line 3m/4M =	**0.8, 6/8, 20/25**
Near	– single symbols	**0.40, 6/15, 20/50**
	– screening test	**0.25, 6/24, 20/80**
	– standard test	**0.20, 6/30, 20/100**
	– 50% spacing	**0.16, 6/40, 20/120**
	– 25% spacing	**0.12, 6/50, 20/160**

Order of testing

Near – single symbols **0.40, 6/15, 20/50**

– standard test **0.20, 6/30, 20/100**

– 25% spacing **0.12, 6/50, 20/160**

Distance – single **1.6, 6/4, 20/12**

– line 3m/4M = **0.8, 6/8, 20/25**

WHO/PBL/03.91

Logarithmic design

Distance & near VA, same optotypes

Distance 6m-4m; children 3m and 40cm,

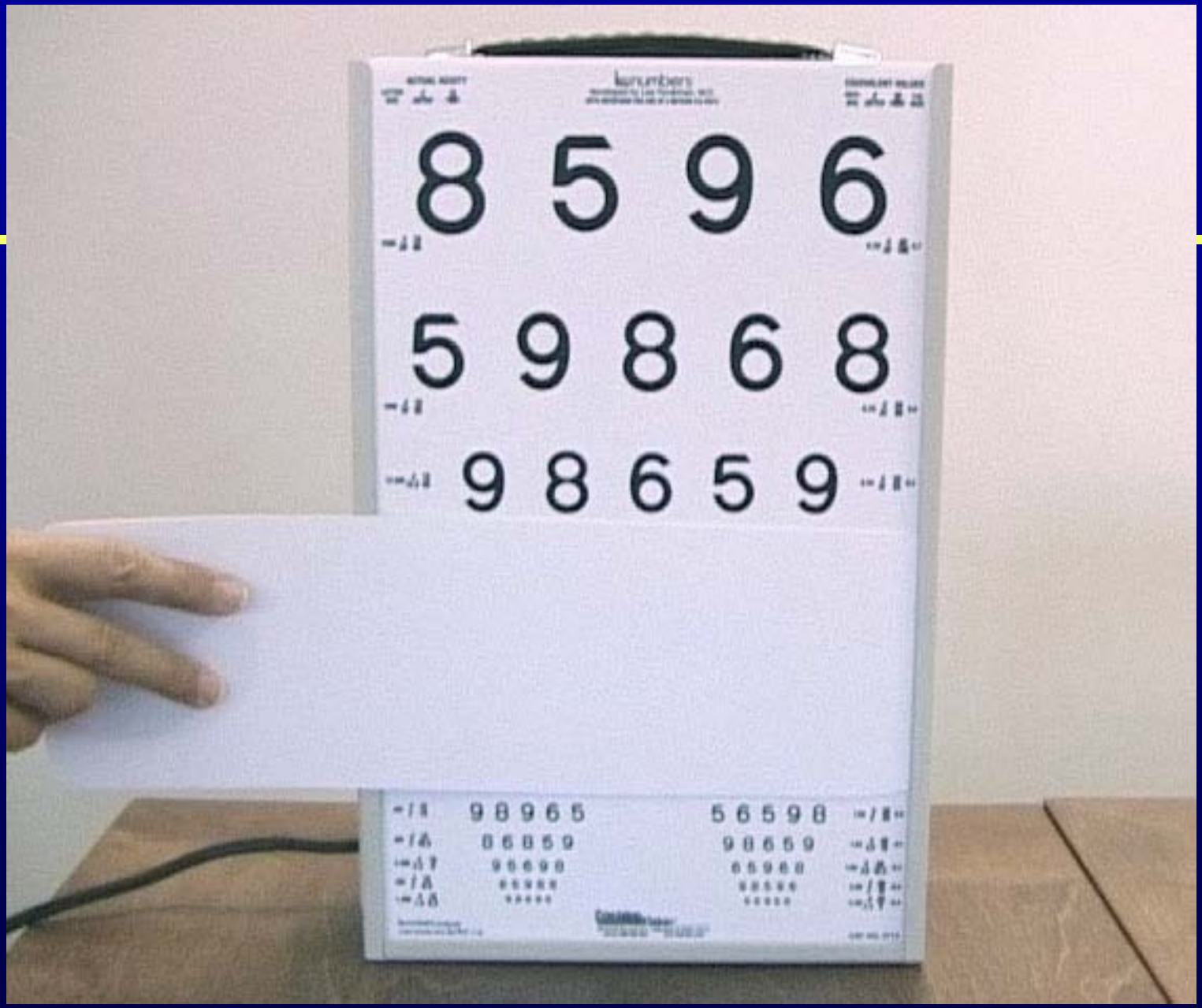
adjust the distance and angle to fit the child's needs

NOT to point at the optotypes.

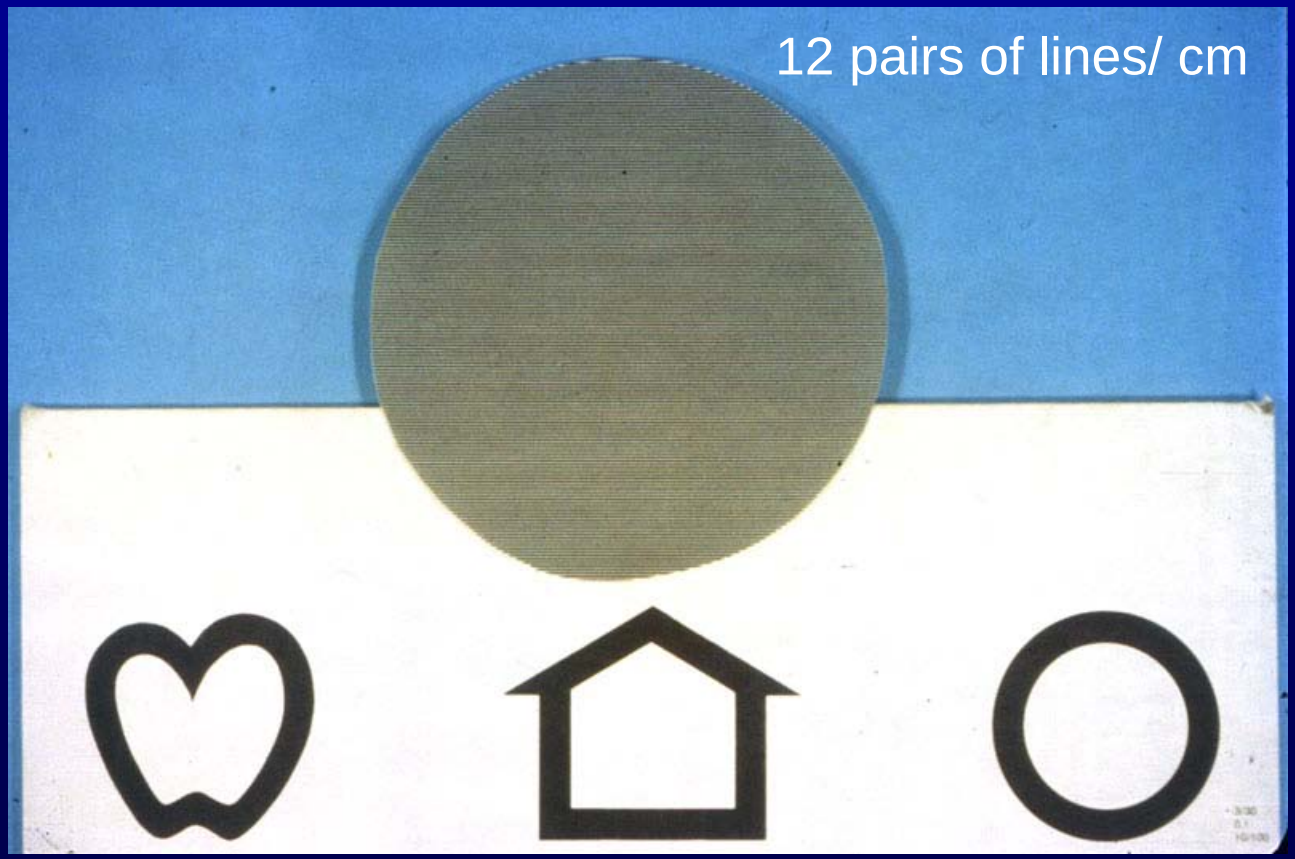
Luminance between 80 and 160 cd/m^2

Standard optotypes: Sloan letters, LEA Numbers & Symbols

Characters of local languages, calibrated with Landolt C


8 5 9 6
5 9 8 6 8
9 8 6 5 9

VA < 0.01, GrA 6cpd



This boy with grating acuity 6cpd was also tested with low contrast gratings, which he saw nearly normally when they were broad.

CVI

Visual acuity

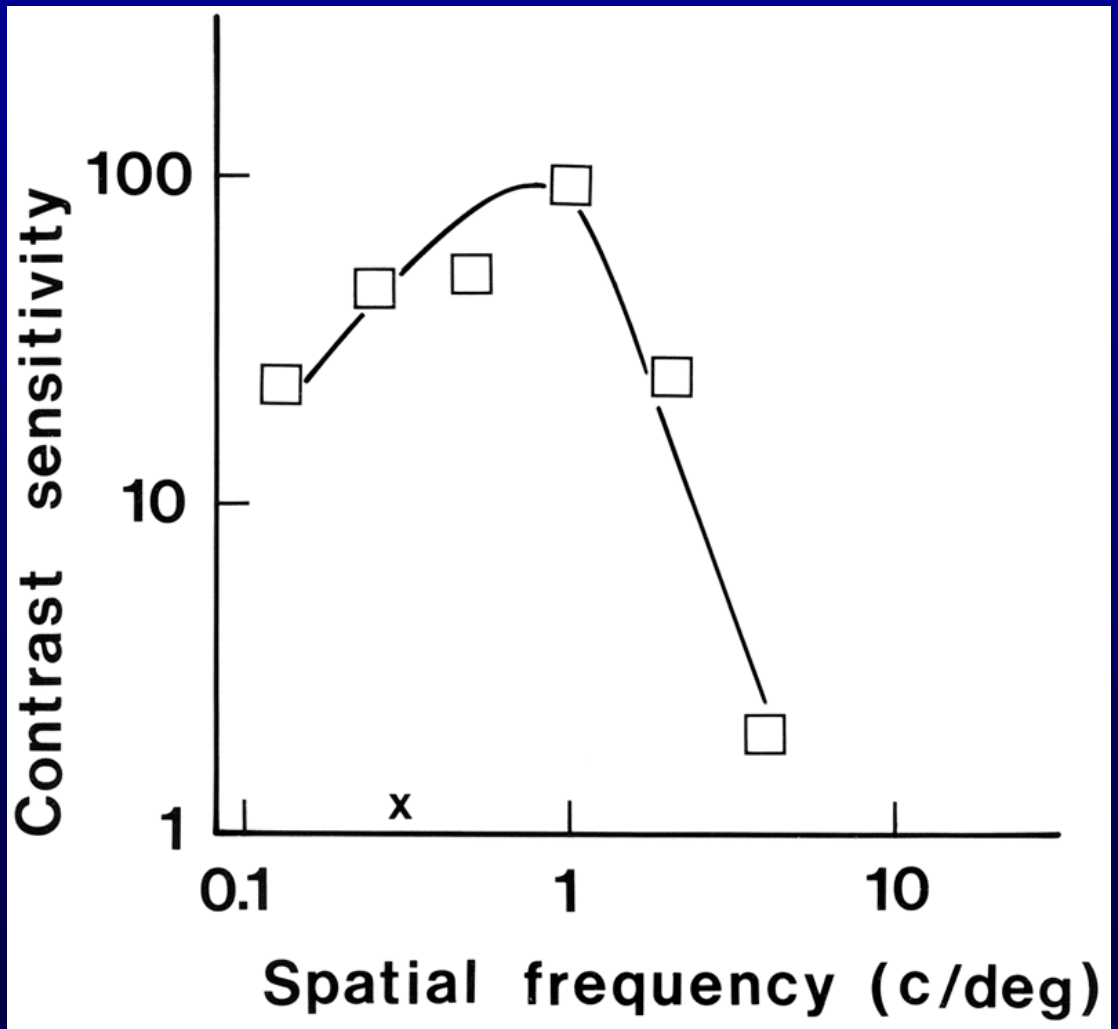
< 0.01, <20/2000

2005: 0.004, 6/1500

Grating acuity

4 cpd

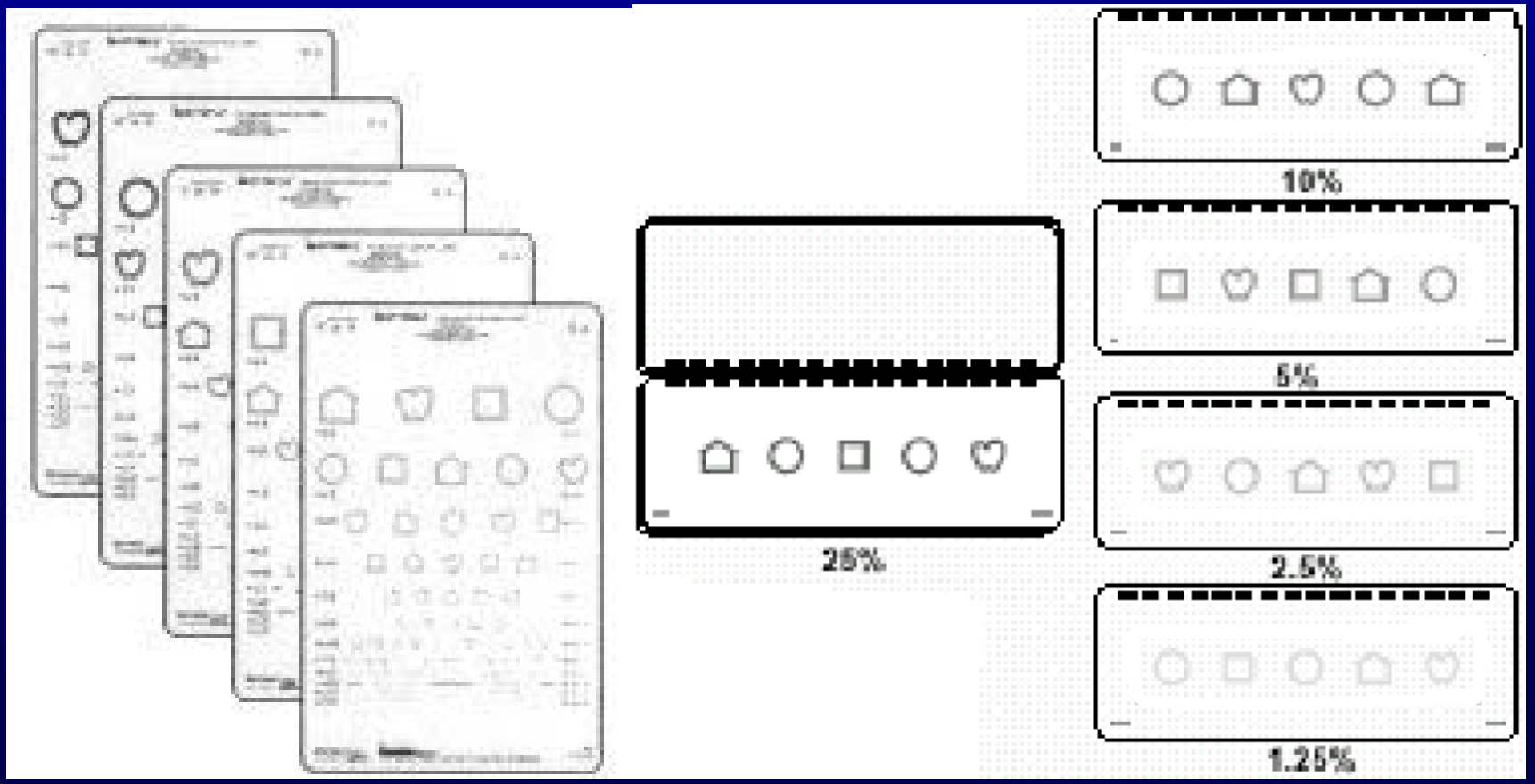
Contrast sensitivity close to normal at low frequencies

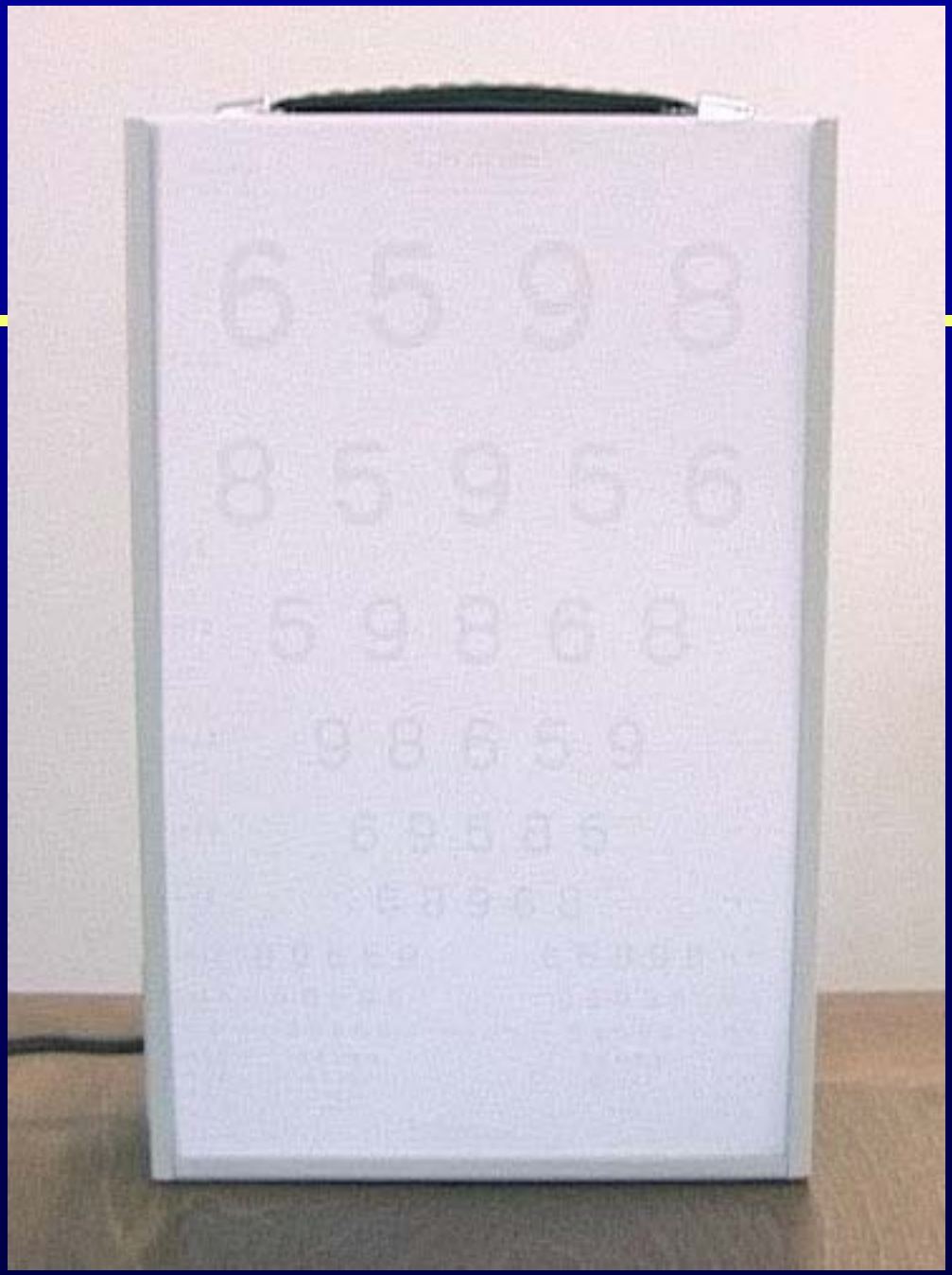


Low contrast pictures of smiling face

to assess communication distance

Contrast sensitivity



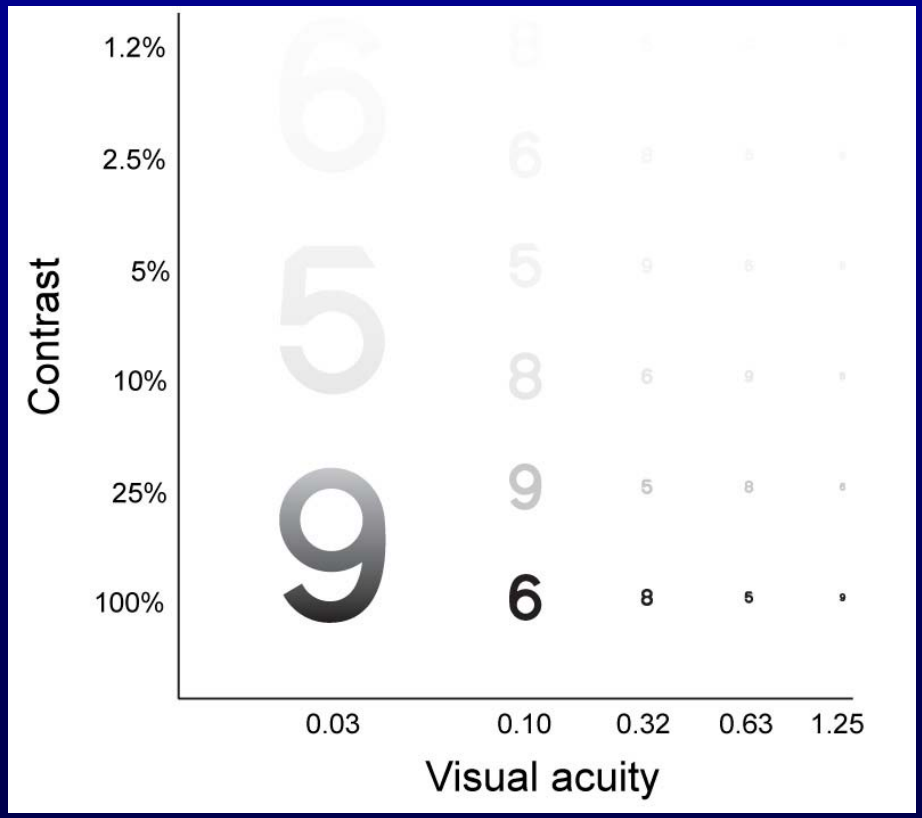


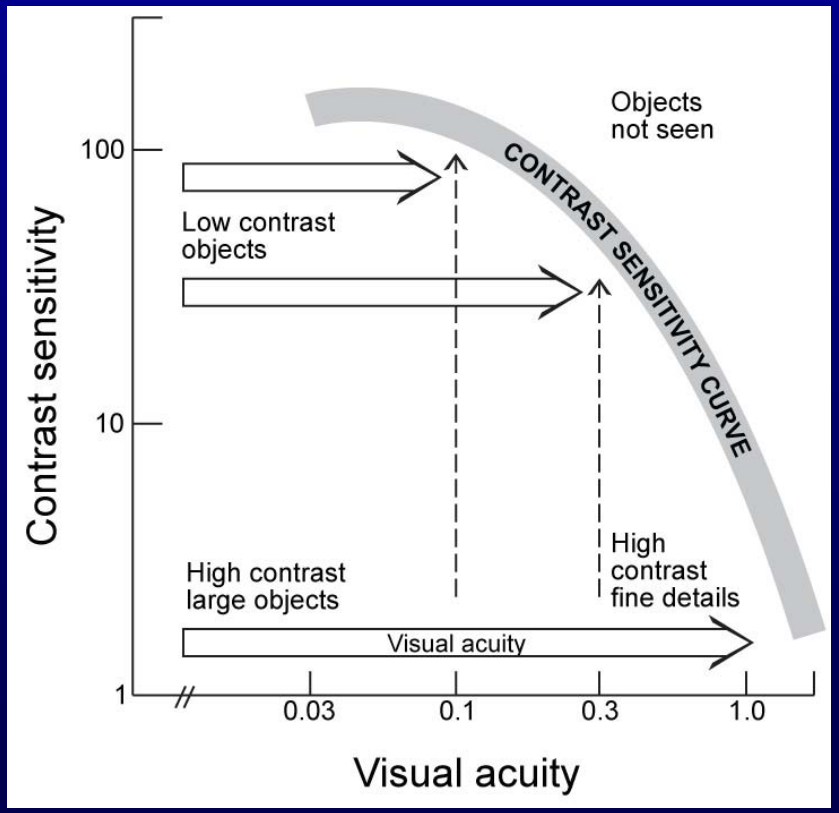
Cambridge Low Contrast Gratings

Detection test

Contrast sensitivity

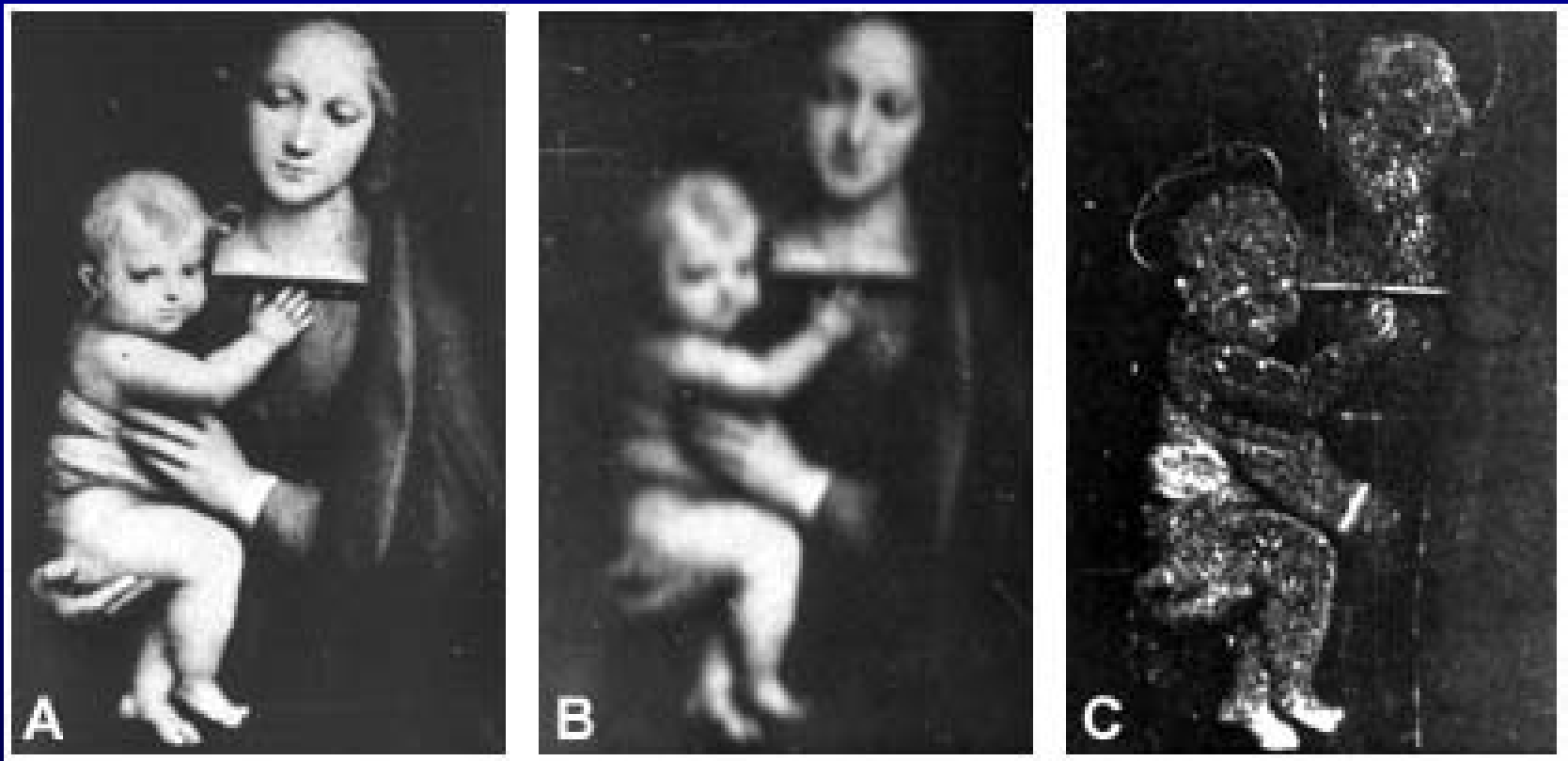
is not depicted by a number but a curve





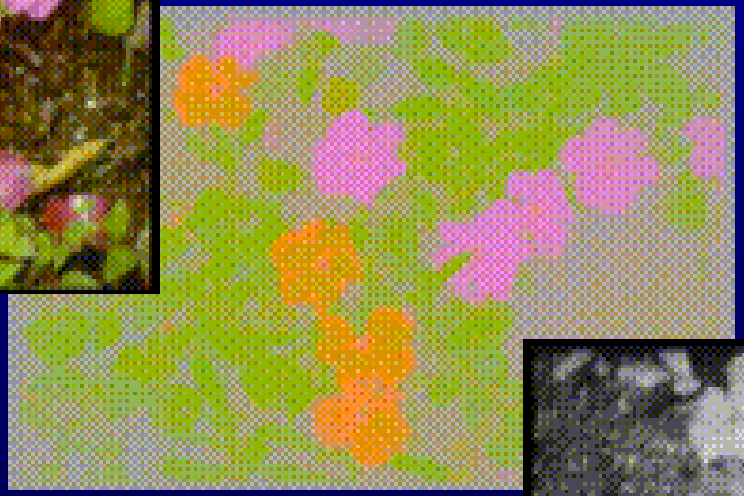
Low contrast information & image quality

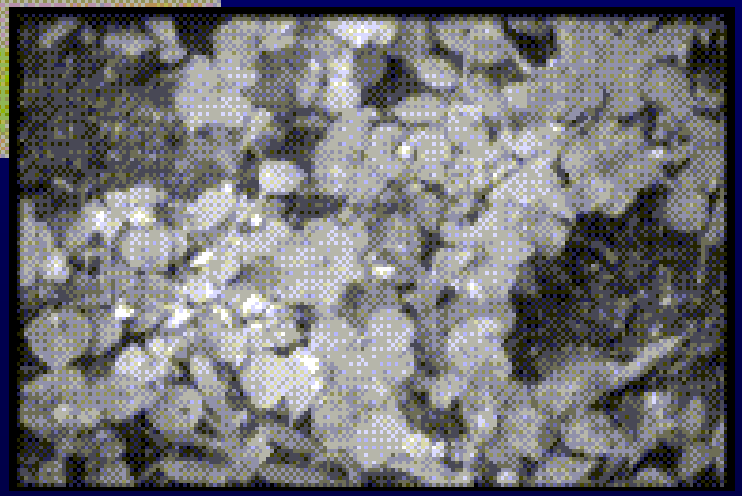
Lamberto Maffei 1981



Visual information for percetion of round forms and in communication is NOT transferred by fine lines (high VA) but broad lines (low VA) at low contrast.

Contrast – Form - Colours





Karl R. Gegenfurtner, Max-Planck-Institut, Tübingen
http://www.allpsych.uni-giessen.de/karl/teach/farbe.html

Colour vision

SCREENING

- Ishihara
- Waggoner
- HRR

ASSESSMENT

- Farnsworth D-15
- LEA Panel 16

Sorting colours like an adult

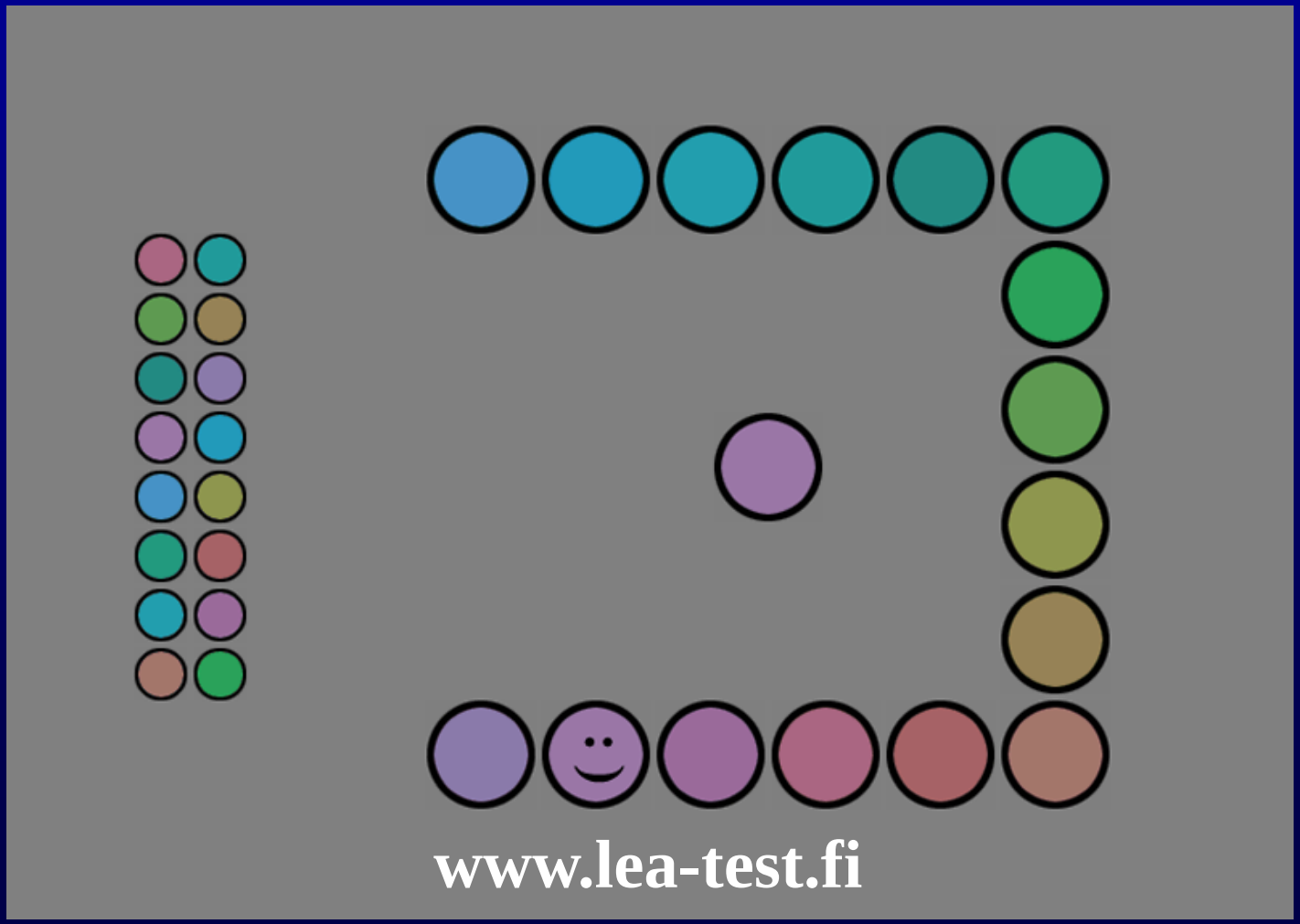
Small colour areas

same size as in Panel D-15

Test caps in a row

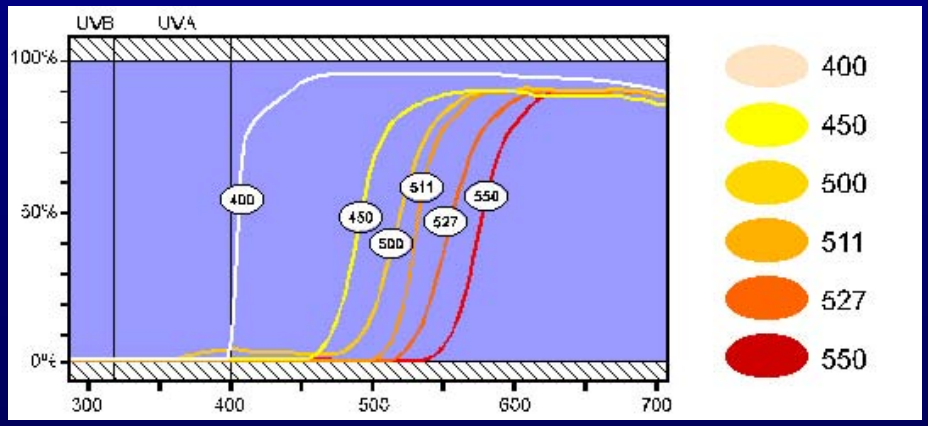
Facilitation

Colour Vision Game

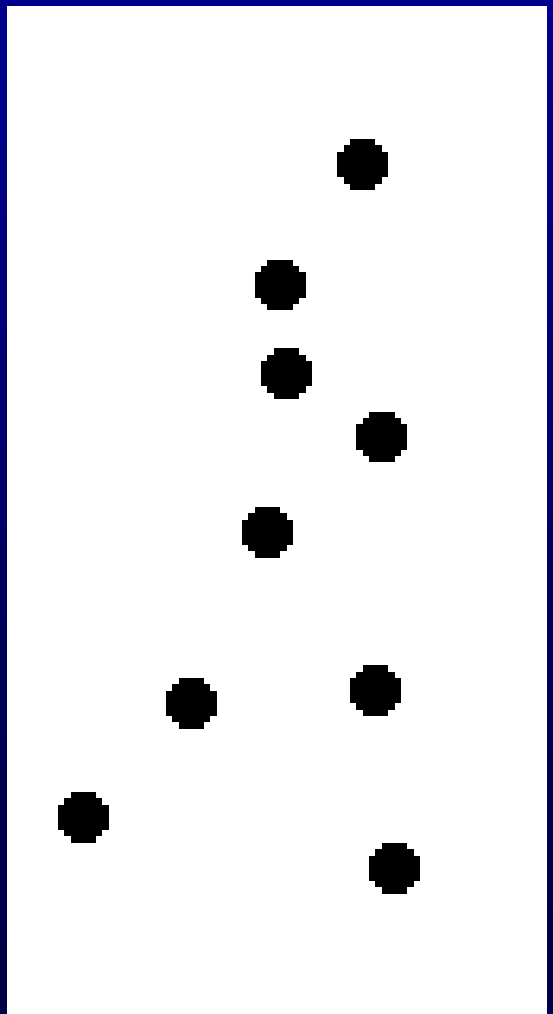


CONE Adaptation Test

Filter transmission & filters



Perception of movement



Motion perception

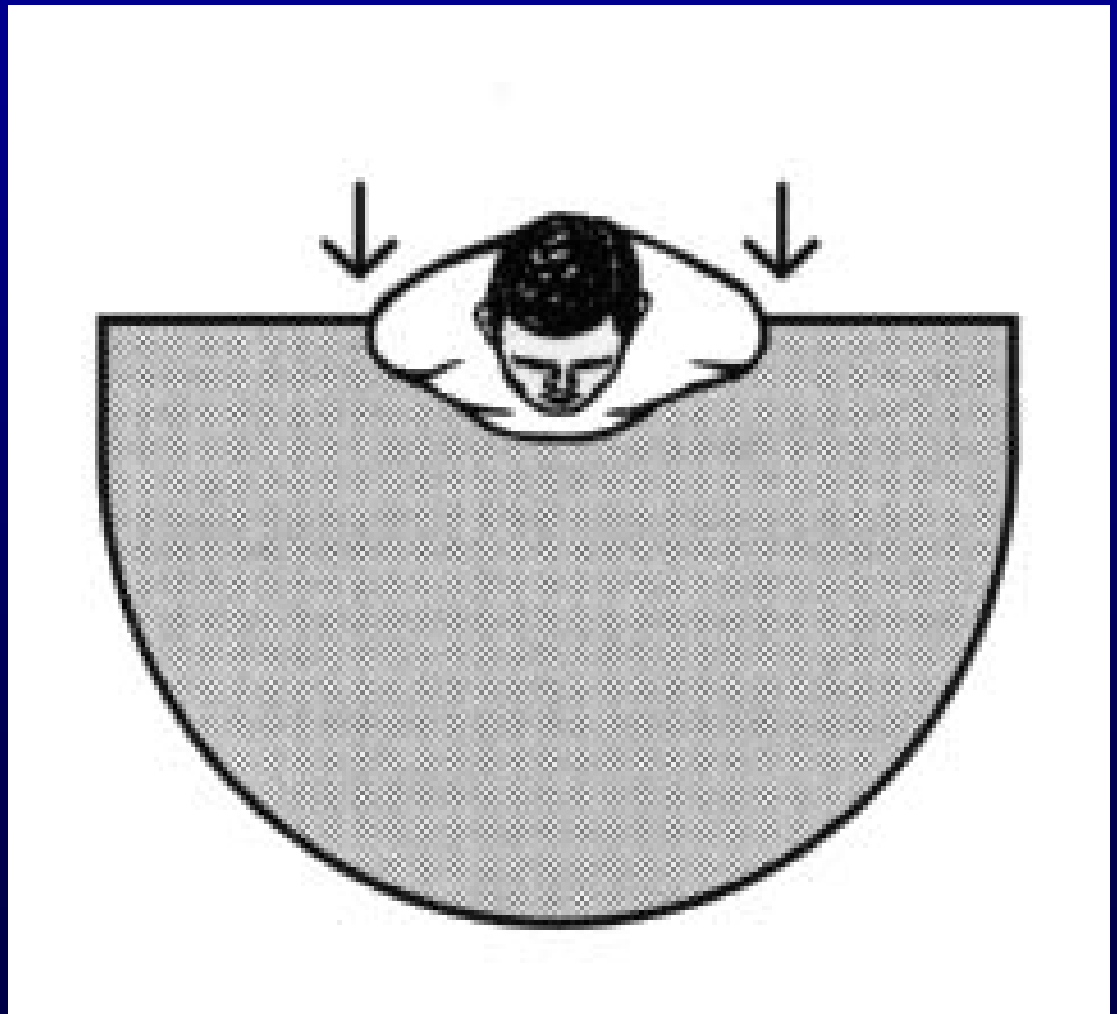
In most activities visual information is in motion: either the object moves. the observer moves or at least the eyes move.

How does the world look like without movement?

Coherent Motion – ’Pepi’

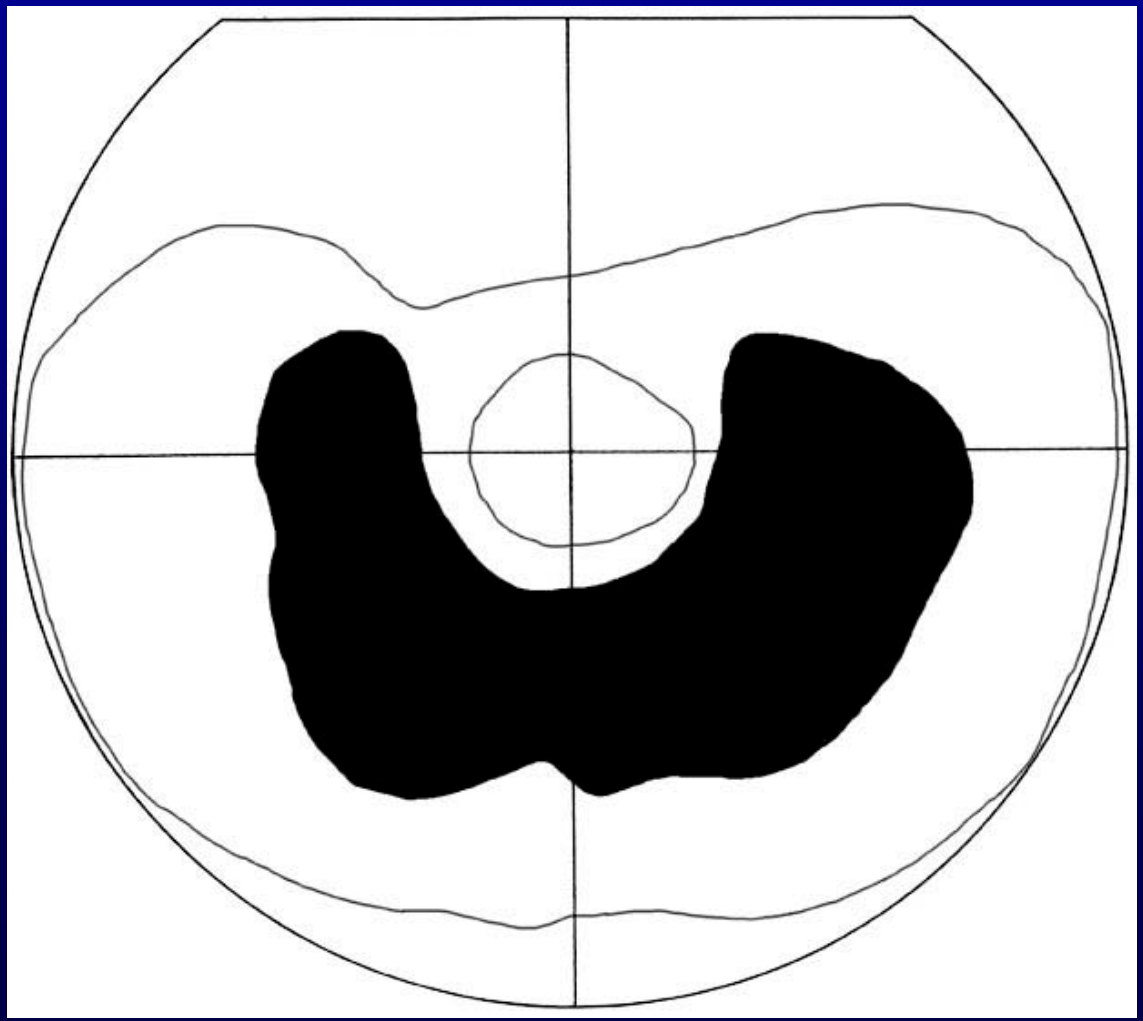
MOTION PERCEPTION, www.lea-test.fi

Visual field – Confrontation

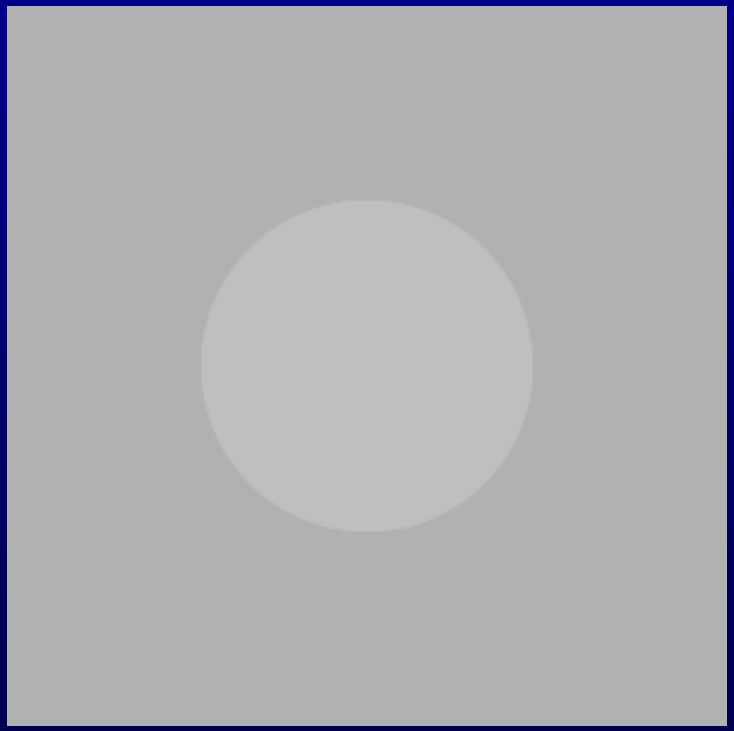


Goldmann perimetry

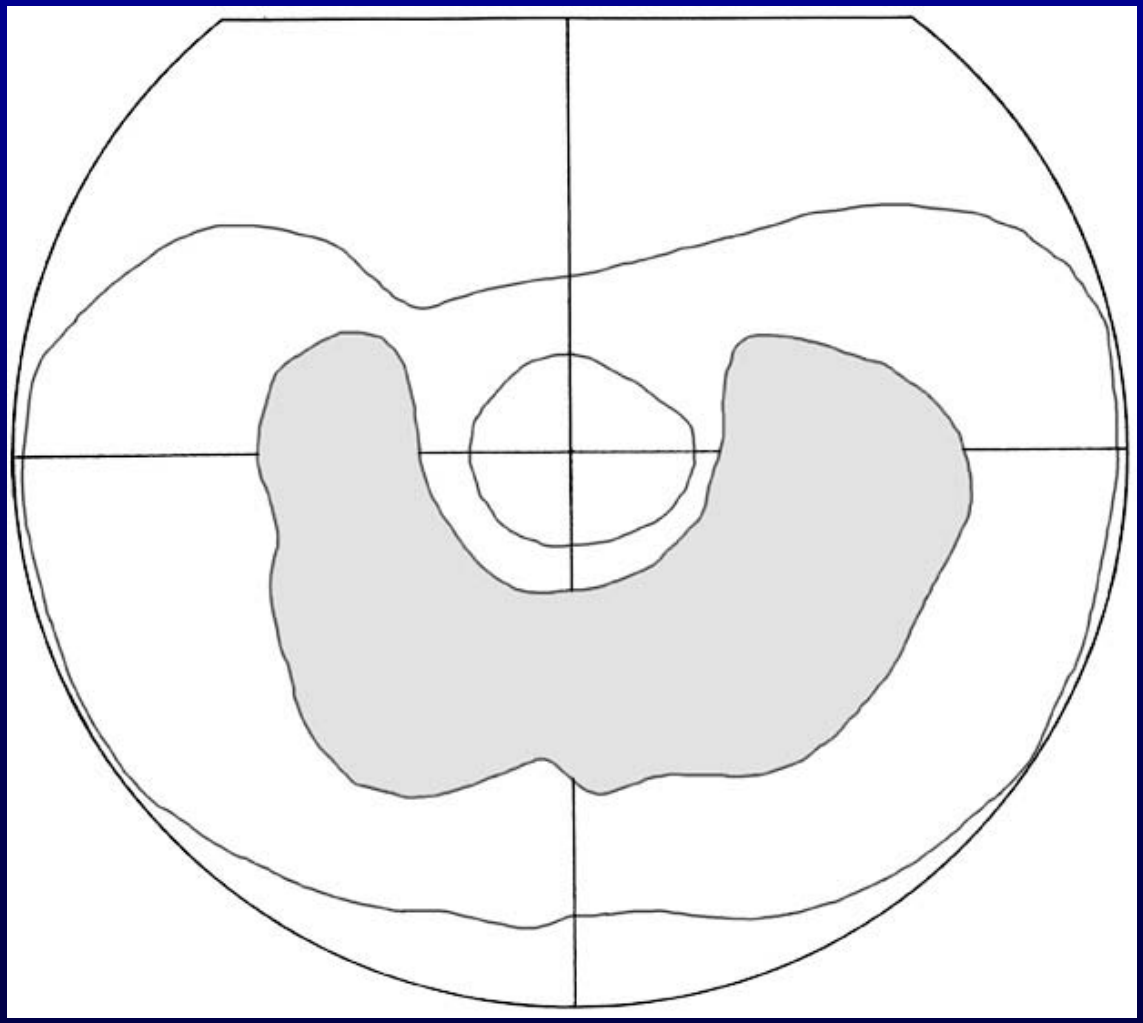
RP – goal keeper



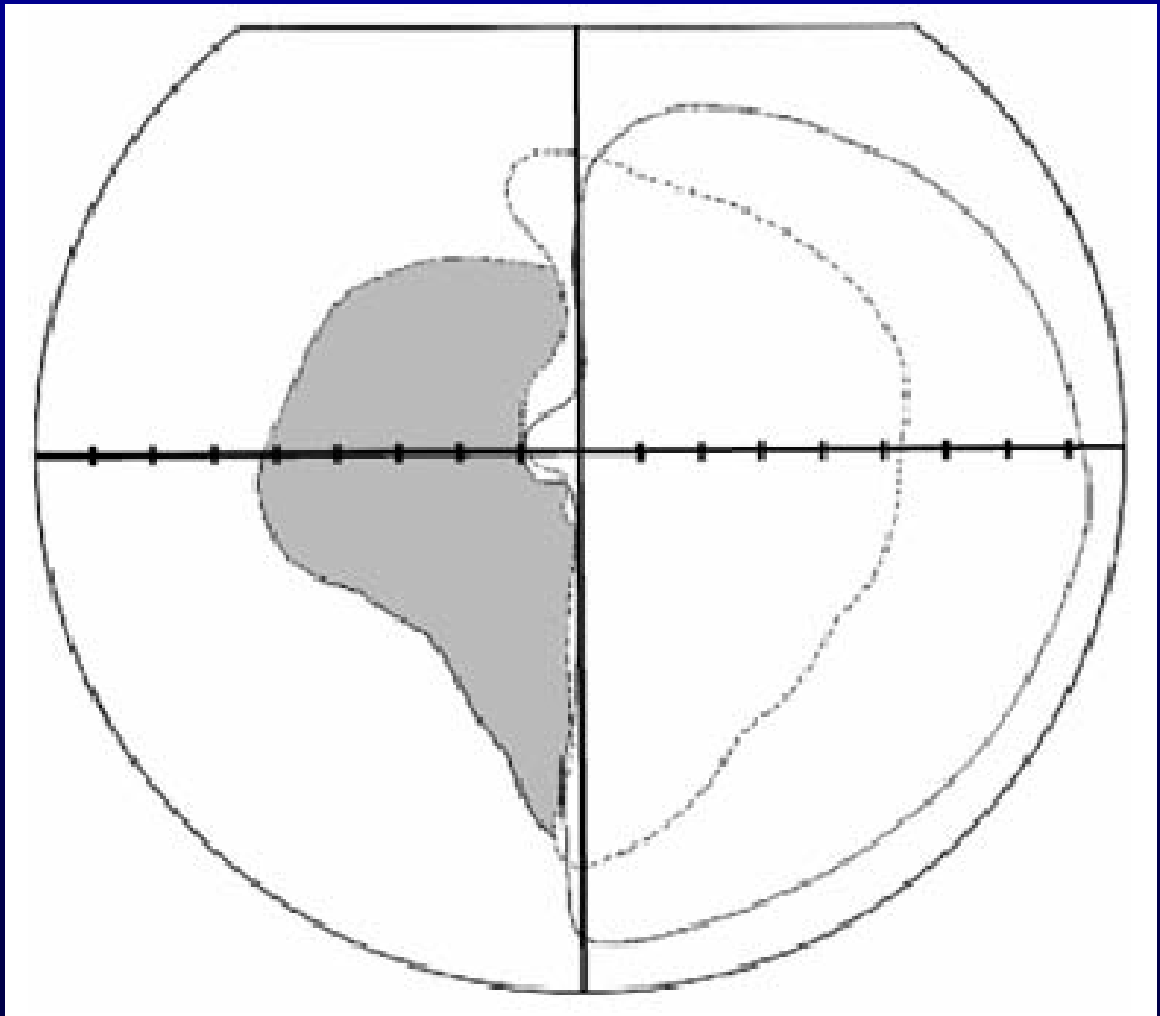
Luminance flicker



RP – goal keeper



Homonymous hemianopia



Motion perception+Visual field

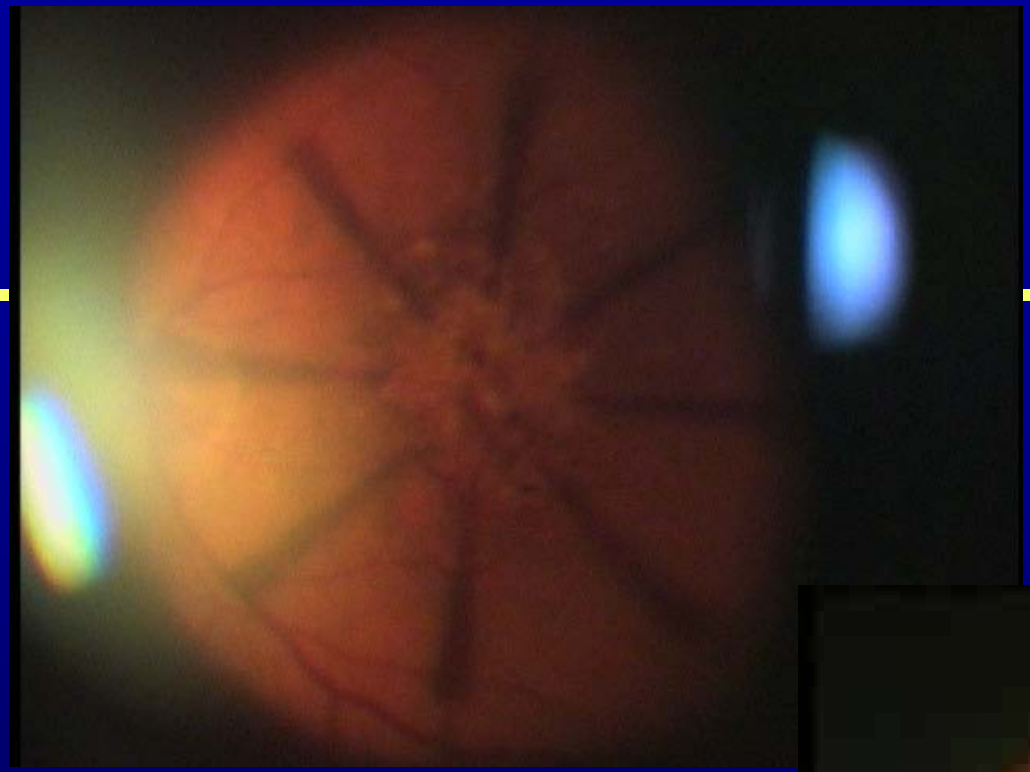
Central Scotoma

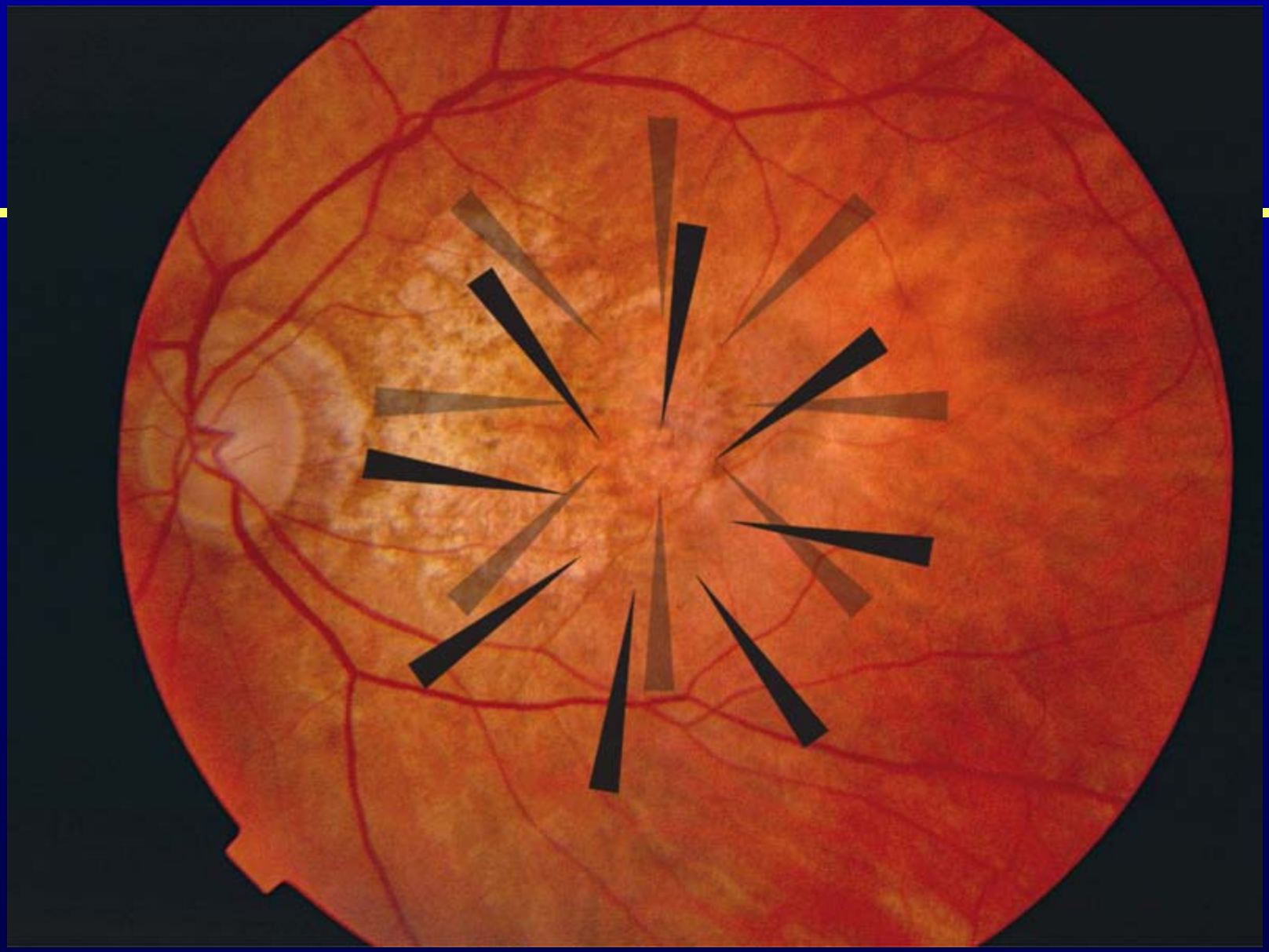
- **fixation is shifted** to an area with best resolution in a large enough a field

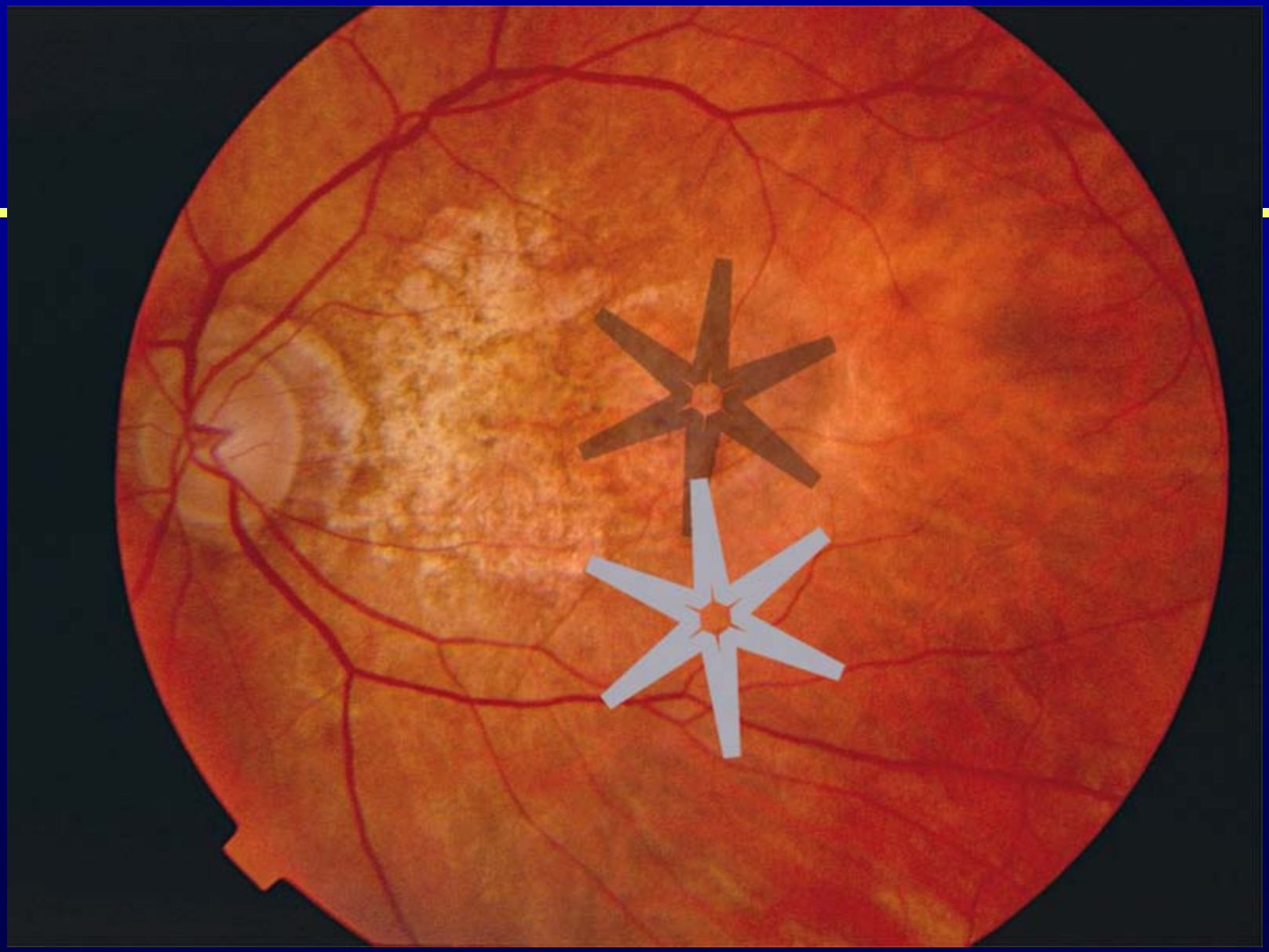
- a child may use **varying fixation** areas depending on the visual tasks –

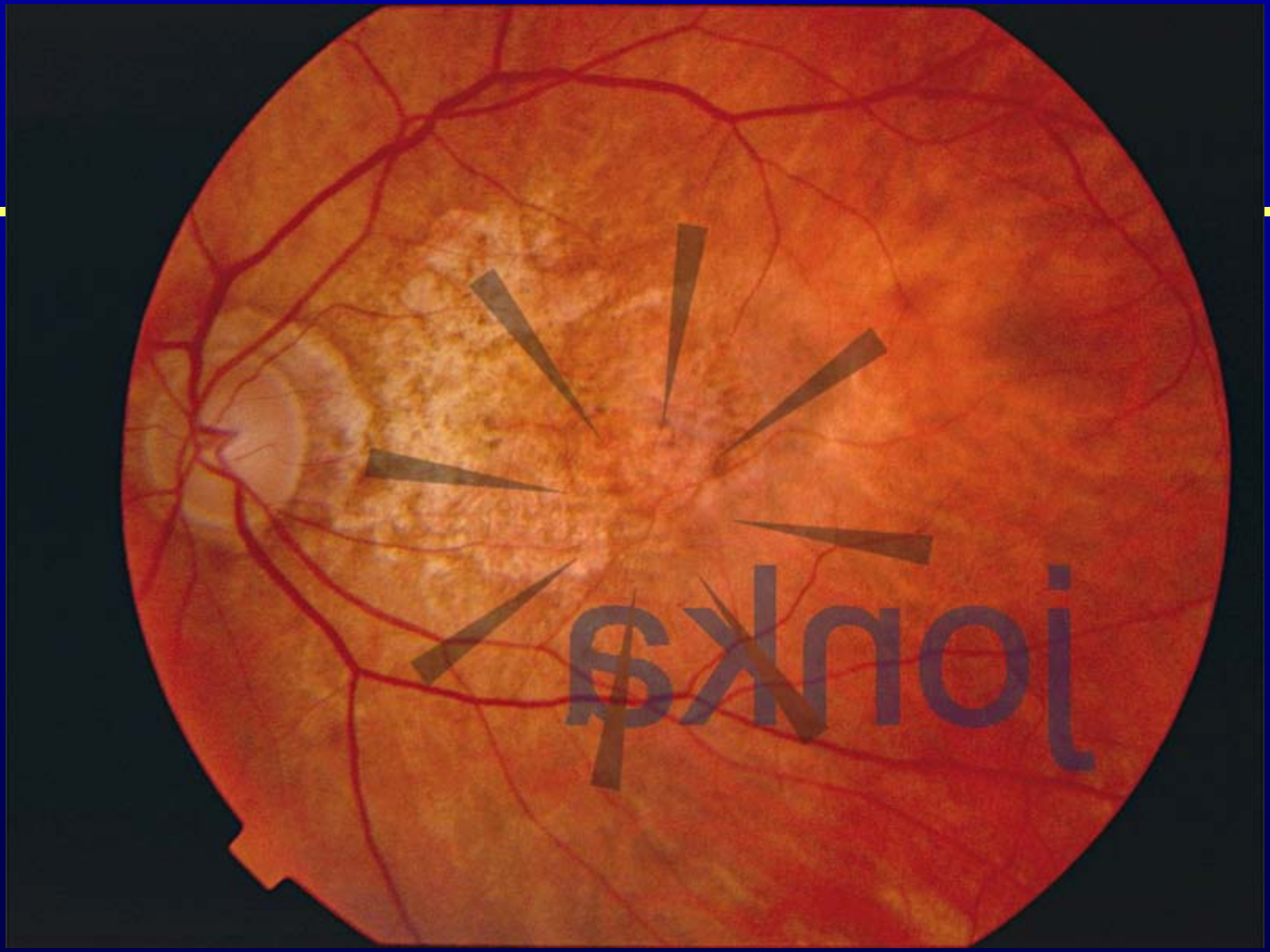
Turku – modified slitlamp for direct observation of fixation


Haag-Streit slitlamp
markku.leinonen@iki.fi





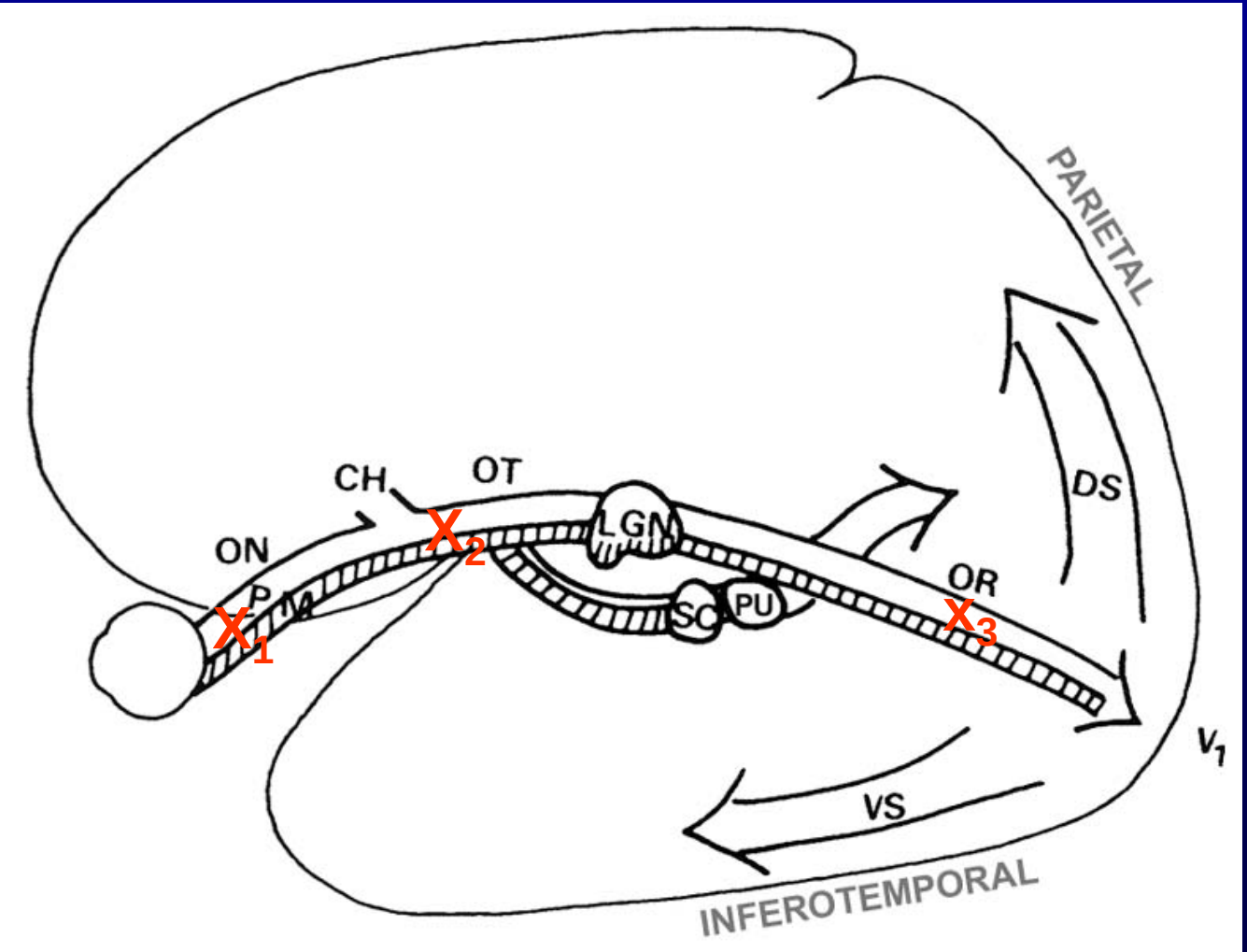




Tiny visual field defects

Effect varies
depending on
whether the lesion is
posterior or **anterior to**
beginning of tectal pathway

Calcarine v. Tectal



dorsal stream

ventral stream

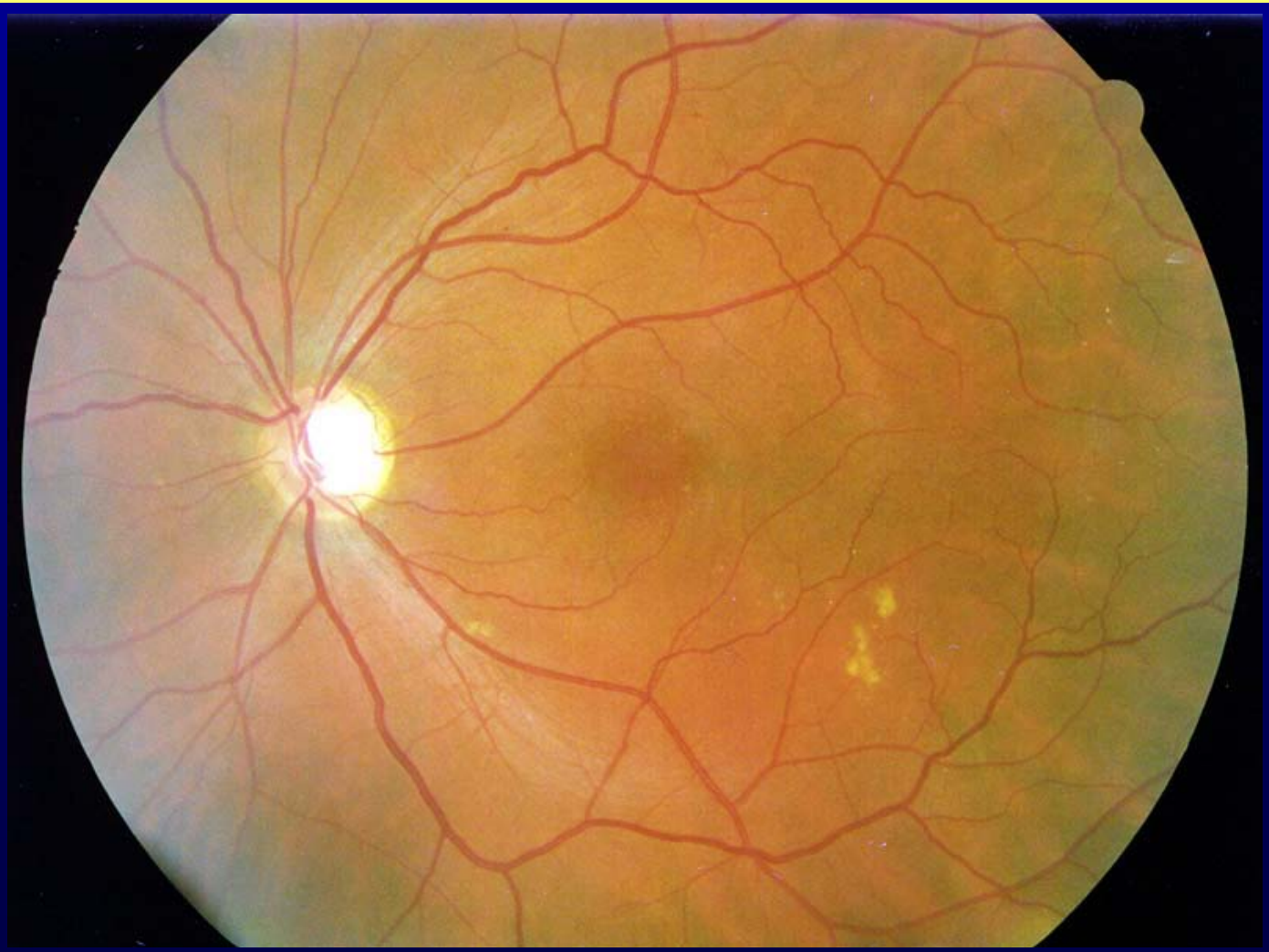
When a child makes errors in reading

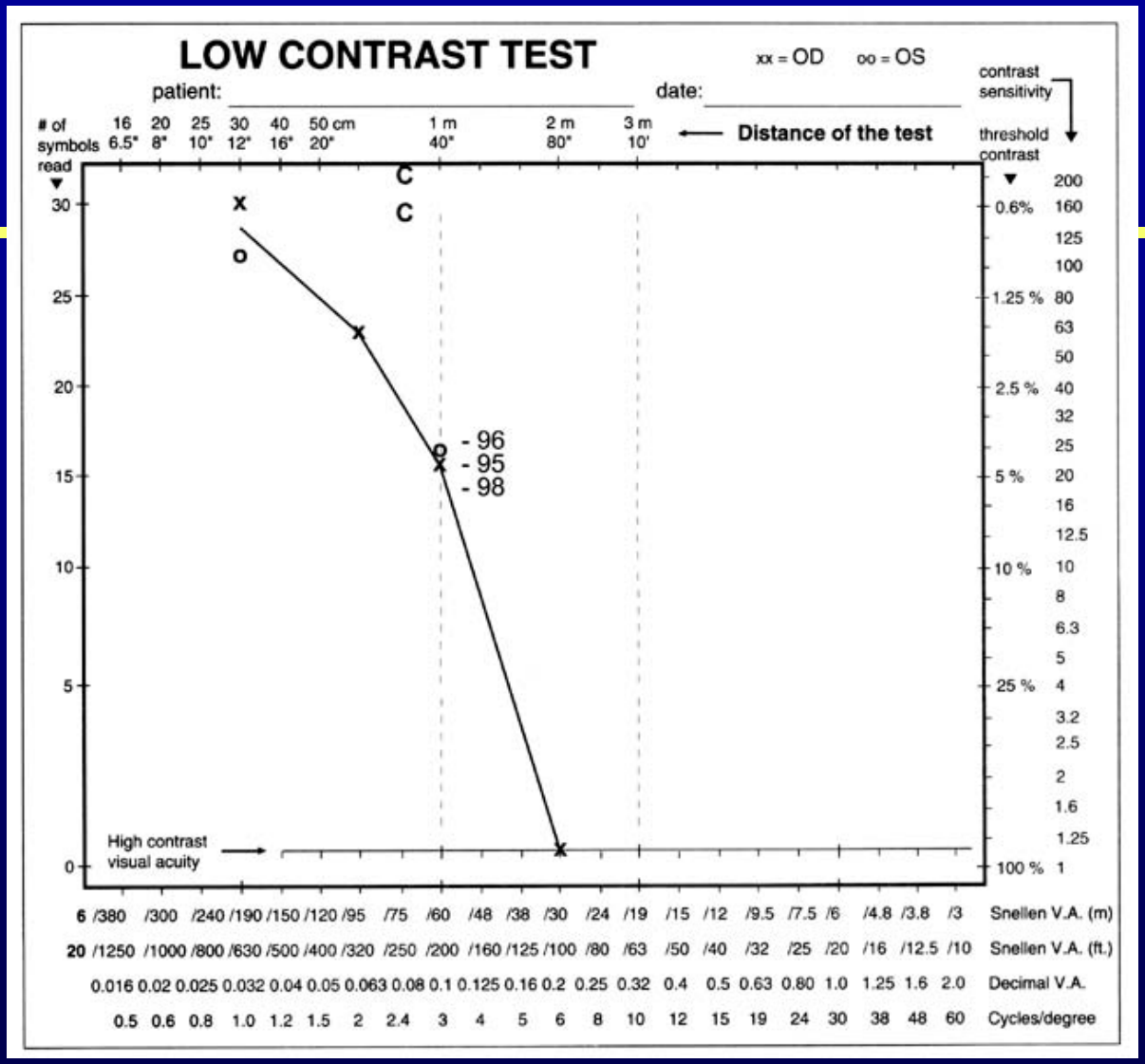
test with texts of

DIFFERENT SIZES

Retinoschisis

VA 0.2, 6/30, 20/100





If a boy has a contrast sensitivityt curve like this, he will be able to drive.

Visual processing disorders

Visual processing disorders

- Children with problems in visual processing functions
- 1) with good, clear image
- 2) with distorted or blurred image due to anterior visual impairment

- The effect of other disorders and diseases on visual functioning
    1) intellectual disability
    2) motor problems, often cerebral palsy
    3) executive functions
    4) other disorders and diseases affecting the child's functioning

Assessment requirements

- Variation in age of children
- Variation in cognitive functions
- Variation in communication
- Variation in motor functions
- Variation in visual functions

INDIVIDUAL TESTING - many tests needed

OBSERVATIONS - by all team members

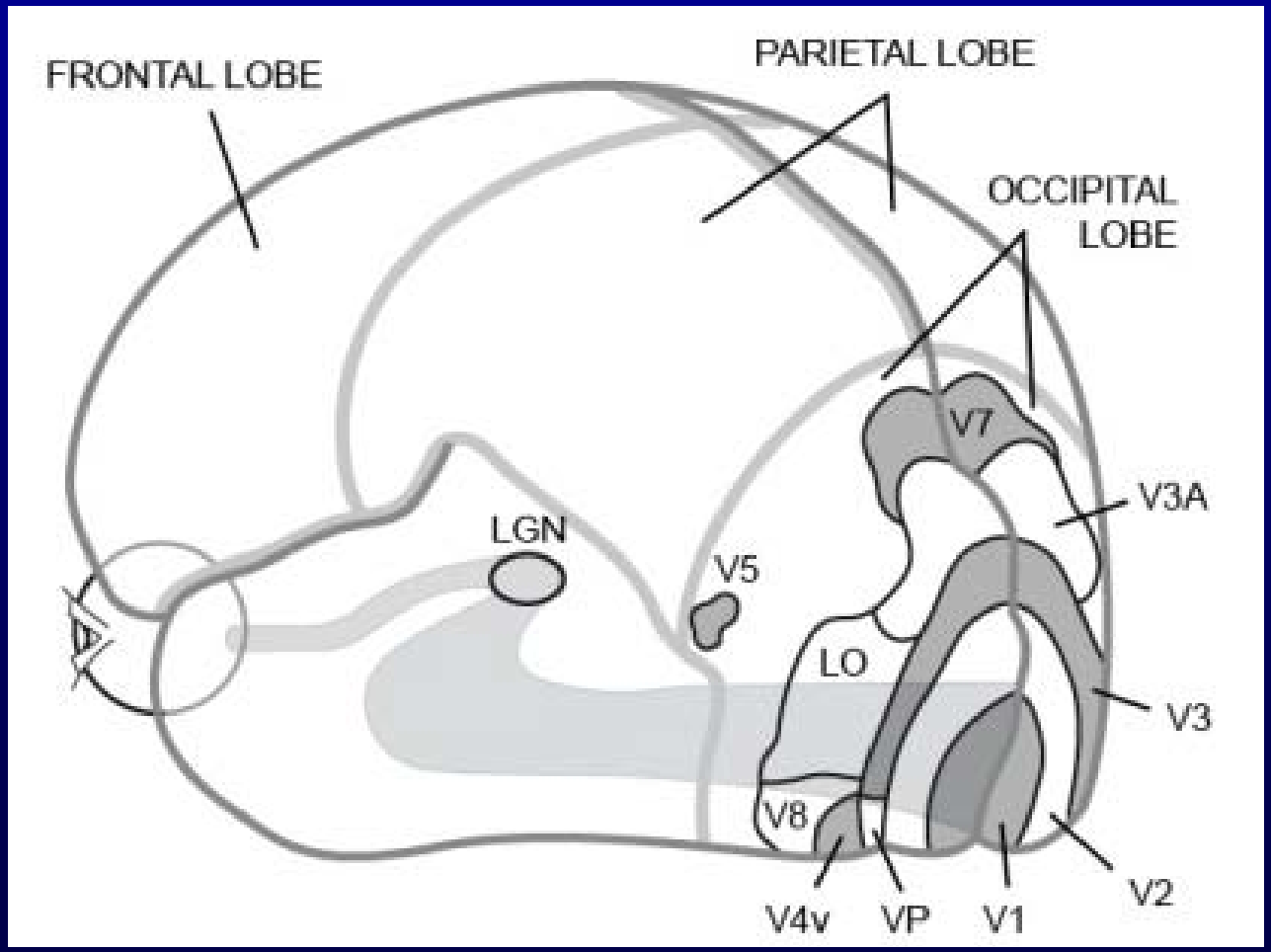
TRAINING - of all persons involved

EVERY CHILD IS A NEW CHALLENGE.

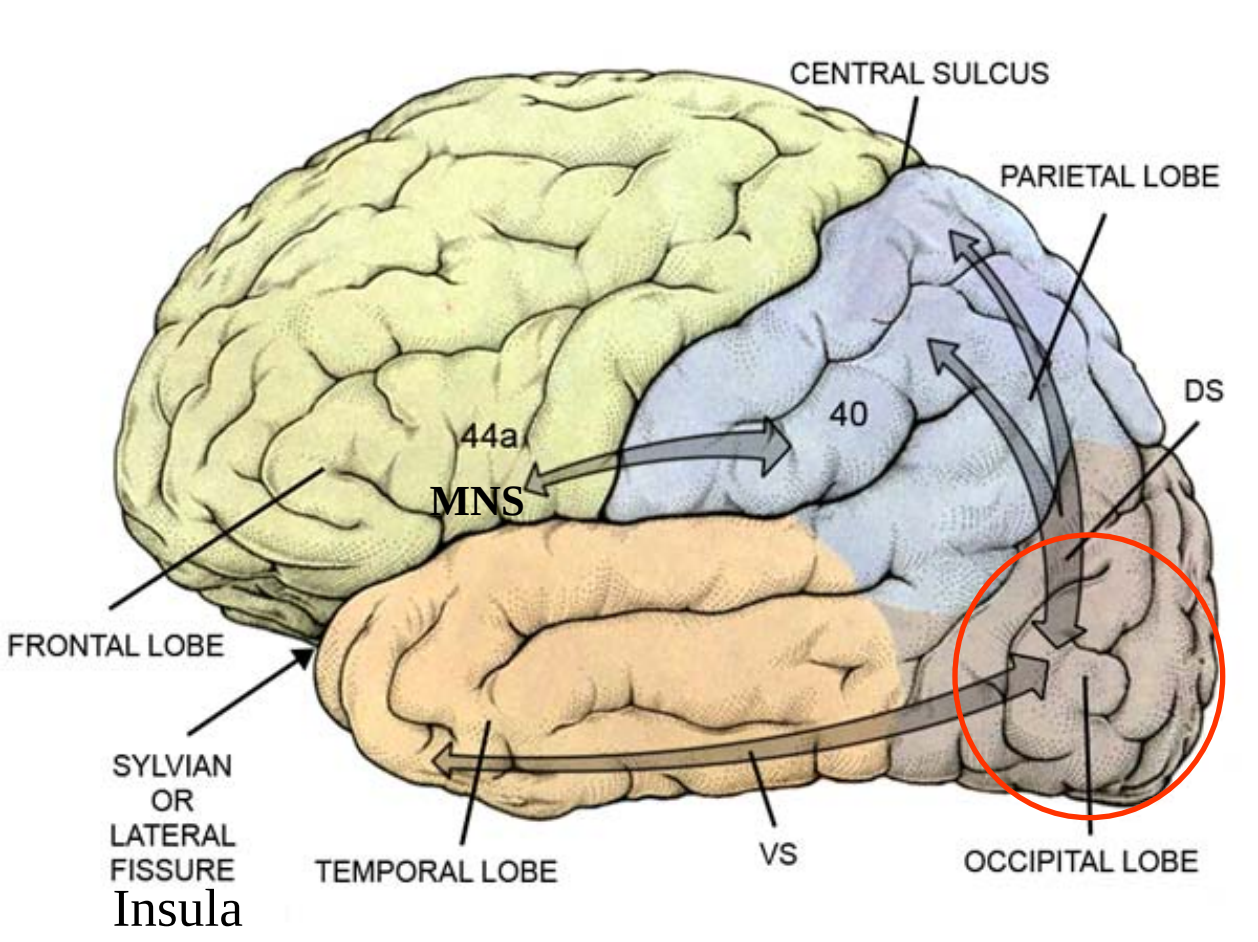
Quality of incoming visual information

- ocular motor functions, fixation, saccades, strabismus, nystagmus
- form perception, visual acuity and grating acuity at full contrast
- contrast sensitivity, with optotype and grating tests
- visual field, confrontation, perimetry, ball games
- motion perception, figure in motion, ball games, traffic
- colour perception, matching, Panel 16
- visual adaptation to lower and higher luminance level, filter lenses

Retinocalcarine pathway



Early processing in occipital lobe
Ventral and dorsal stream/network

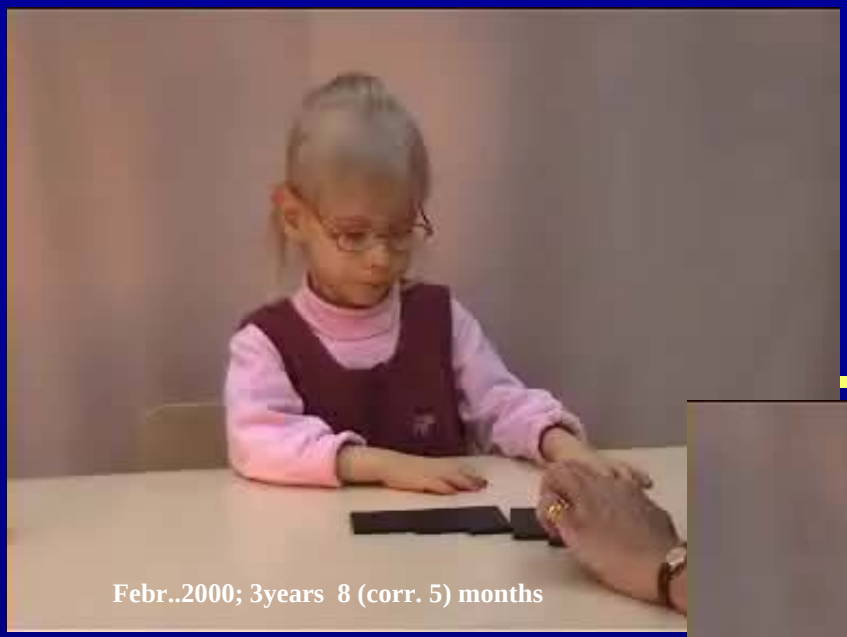


Colours
Contrast edges
Movement/ motion

Early processing:
Line directions & length
Stereovision
Object/ background
Figure/ ground
Visual closure, filling-in
Visual illusions

Figure-in-motion

Rectangles – Mailbox
Heidi Expressions- Colorama



Testing early and higher visual processing

Table 2.

RECOGNITION and READING
Concrete objects
Landmarks
Faces, familiar and unfamiliar
Facial expressions, Body language
Pictures of concrete objects
Geometric forms
Letters
Numbers
Words
Crowding effect
Reading speed
Scanning lines of text
Efficiency of reading

PERCEPTION OF PICTURES
Length of lines
Orientation of lines
Details of pictures
Figure-ground
Visual closure
Noticing errors
Noticing missing details
Comparison with pictures in memory
'Reading' series of pictures
Visual problems in copying pictures
Geometric pictures depicting 3D forms

MATHEMATICS
Calculations, logical reasoning

AWARENESS OF AND ORIENTATION IN SPACE
Perception of one's body in space
Depth perception
Perception of near space and far space
Simultanagnosia
Perception of textures and surface qualities
Orientation in space
Memorising routes
Vision in traffic situations and in playgrounds

EYE-HAND COORDINATION
Grasping and throwing objects
Drawing, free hand
Copying, from near/ from blackboard
Copying, motor pl anning and execution

INTEGRATION PROBLEMS
Vision not used when listening or exploring
Vision not used when moving
Balance

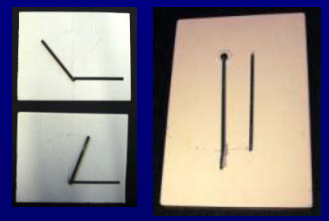
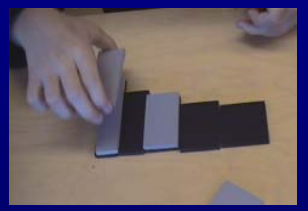
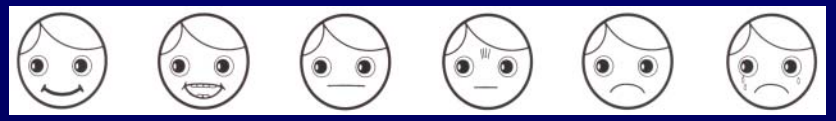
COMPENSATORY STRATEGIES
Auditory information
Tactile, kinaesthetic and haptic information
Memory, reasoning

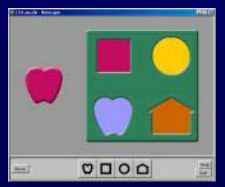
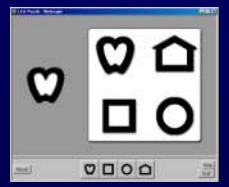
DISTURBING FACTORS
Environmental noise, visual and auditory
Balance problems and motor problems
Medications, epilepsy

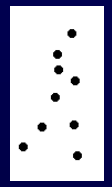
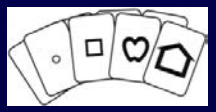
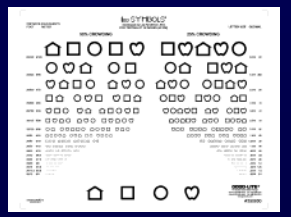
Cognitive vision tests

- Hiding Heidi for communication
- LEA-Mailbox
- LEA-Rectangles
- Face pictures
- Heidi Expressions
- LEA Puzzle
- Crowding effekt
- Pepi-test, Johansson’s Walking Man
- **Reading tests**
- OBSERVATIONS



CASE	N	I	P
OCULAR MOTOR FUNCTIONS			
A Fixation			
B Following movements			
C Saccades			
D Nystagmus			
E Strabismus			
F Accommodation			
G Convergence			
CLINICAL FINDINGS, sensory			
H Binocularity			
I Visual Acuity			
J Grating Acuity			
K Contrast sensitivity, optotype, grating			
L Colour Vision			
M Adaptation speed, observation			
N Photophobia			
O Visual field, central scotoma?			
P Visual field, peripheral			
Q Motion perception, Pepi-test			
R Biological motion, Walking Man			
S Refraction			
T Correction of refractive errors			

EARLY PROCESSING				
V Length of lines				
W Orientation of lines				
X Objects/figures on a patterned background				
Y Textures and surface qualities				

DORSAL STREAM				
A Perception of near and far space				
B Observation of surrounding				
C Orientation in space, map based				
D Route based orientation				
E Simultaneous perception				
F Eye-hand coordination				
G Length of lines				
H Direction of lines				
I LEA-Puzzle				
J Grasping and throwing objects				
K Drawing, free hand				
L Copying from blackboard				
M Spatial problems in mathematics				
N Spatial problems in reading				

OTHER PROFILES AVAILABLE				
A Developmental level				
B Motor Functions				

	N	I	P
VENTRAL STREAM			
A Lenght of lines, purely visual test			
B Direction of lines, purely visual test			
C Recognition of details			
D Noticing missing details in pictures			
E Recognition of faces			
F Interpretation of facial expressions			
G Reading body language			
H Landmarks			
I Concrete objects			
J Pictures of concrete objects			
K Abstract pictures of objects of different categ			
L Abstract forms (Roman letters, numbers)			
M Reading words, characters			
N Cartoons			
O Visual problems in copying pictures			
P Increased crowding effect			
Q Recognition problems n math tasks			

MIRROR NEURON SYSTEM				
A Early communication and interaction				
B Interpretation of emotions and intentions				
C Observation and copying of movements				
D Effect of image quality, motion perception				
E Effect of image quality, contrast sensitivity				
F				
G				

OTHER COMMON PROBLEMS				
M Integration of sensory information				
N Visual and auditory overload				
O Specific memory problems				
P Head control				
Q Body control				
R Hand functions				
S Moving				
T Hearing				
U Executive functions				
V Other				
W Use of devices at school, KG, work				
X Use of devices at home				
Y Services of educational resource centre				
Z Vision services as medical care				

MAIN FUNCTIONAL AREAS				
A Communication				
B Orientation and moving				
C Activities of daily living				
D Demanding vision tasks				

PROFOUND loss of function in __visual funcitions
IMPAIRED but useful visual functions in __
NORMAL visual function in __ functions

Environmental disturbance

Visual acuity alone

DOES NOT

depict visual functioning

Assessment
of
FUNCTIONAL VISION
for Early Intervention & Rehabilitation

DISCUSSION