


# Quality of Incoming Visual Information
by
# Repeating Clinical Tests

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Slides on the homepage 21.7. 2010
www.lea-test.fi

# Assessment of Visual Functioning

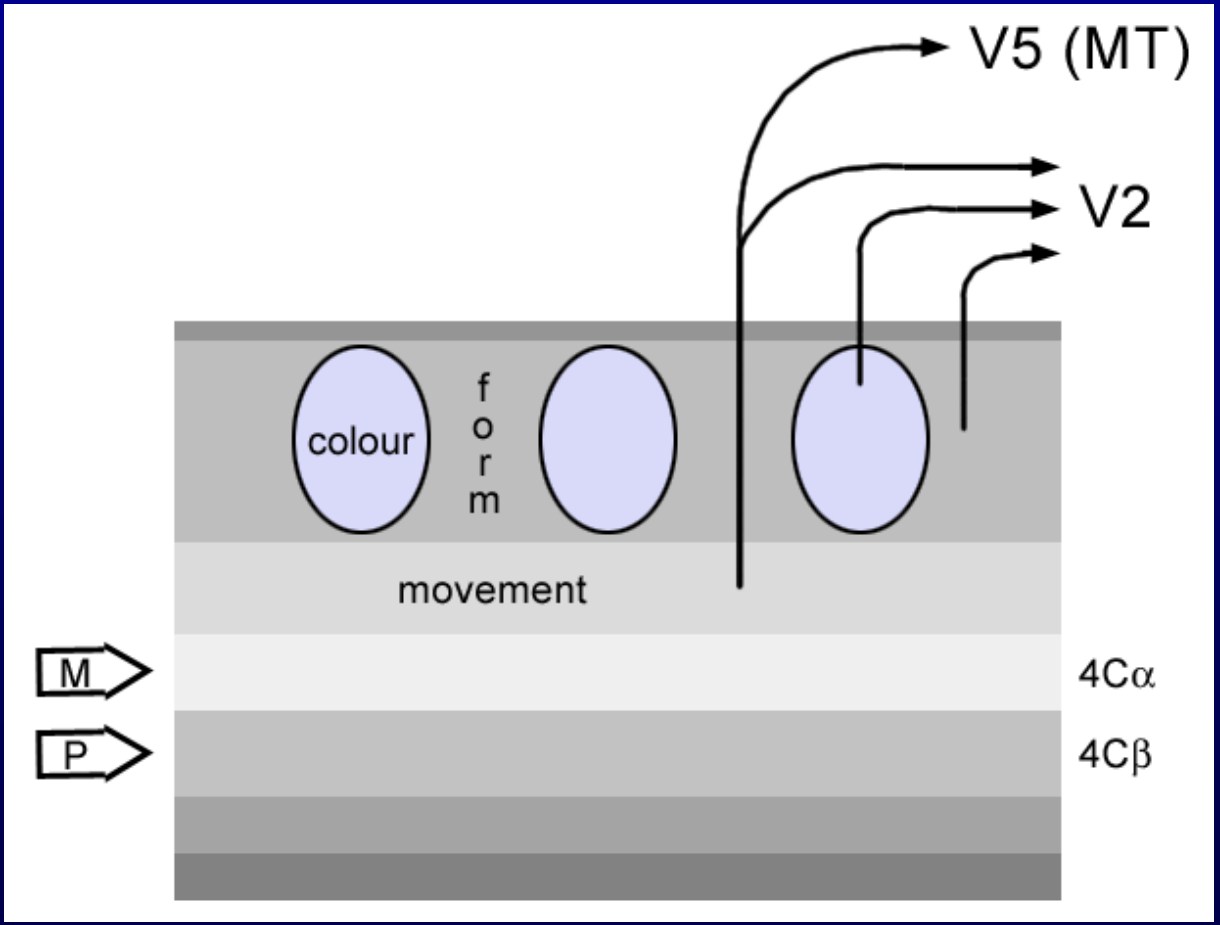
1. OCULOMOTOR FUNCTIONS

**2. QUALITY OF THE INCOMING VISUAL INFORMATION CLINICAL TESTS**

3. OBSERVATIONS ON VISUAL PROCESSING FUNCTIONS

# Components of images

## Primary visual cortex




encoding and processing of incoming information

# Components of images

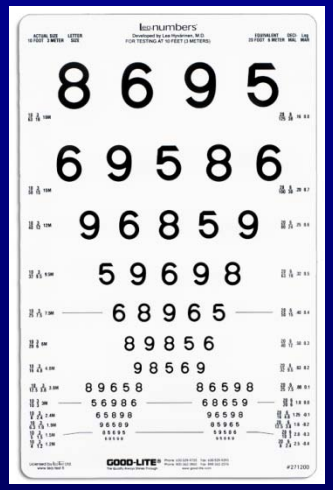
**Forms**

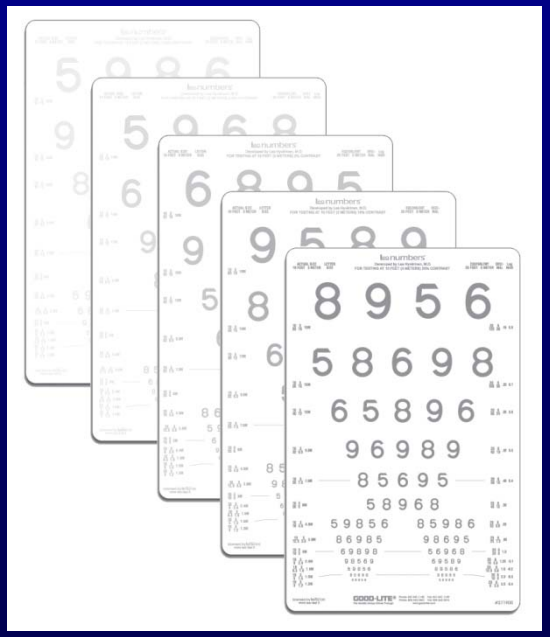
**Colours**

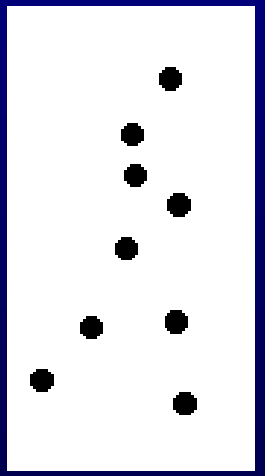
**Movement**

# Forms, Colours, Movement

## Stereovision, near depth in binocular children



Visual field, size and quality & Visual adaptation

# Information gathered from

## Clinical examinations

Foundation for Assessment of Visual Functioning

completed with

Assessment at School and KG

# Clinical examination

gives the foundation for the assessment of visual functioning

Foto: Miguel G. Alvares, MD Brasil

# Assessment of visual functioning

- 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

# Spectacles

Quite often you need to clean the spectacles.
Check, how they fit. Not too small or big.
Bifocals, progressive lenses, correct place?

# Assessment of Visual Functioning

CLINICAL TESTS

Visual acuity at near:

single, line , crowded, 50% - 12%

Visual acuity at distance of 3m:

single, line

Grating acuity, detection, resolving

Contrast sensitivity

as visual acuity, with gratings

Colour vision, quantitative

Motion perception

Visual field:

size, scotomas, Goldmann, flicker

Visual adaptation to different luminance

levels, filter lenses

Optical and nonoptical devices

WORLD HEALTH ORGANIZATION

WHO/PBL/03.91

*Prevention of Blindness & Deafness*

# CONSULTATION ON DEVELOPMENT OF STANDARDS FOR CHARACTERIZATION OF VISION LOSS AND VISUAL FUNCTIONING

Geneva, 4-5 September 2003

# WHO/PBL/03.91

Logarithmic design

Distance & near VA, same optotypes

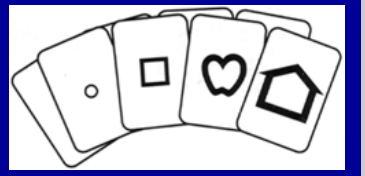
Distances 6m (**4m**) and 40cm; children 3m

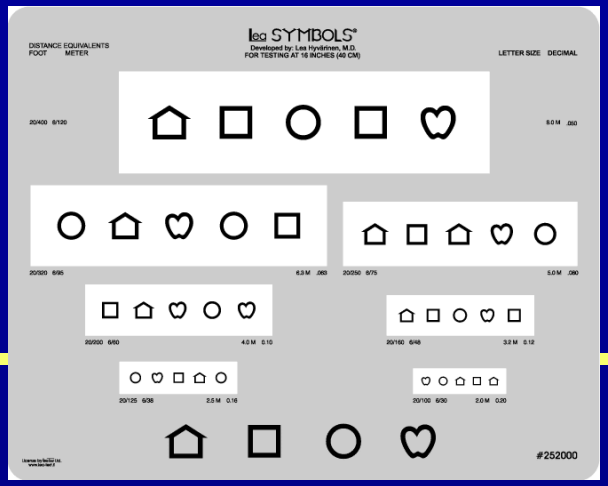
adjust the distance and angle to fit the needs of the child

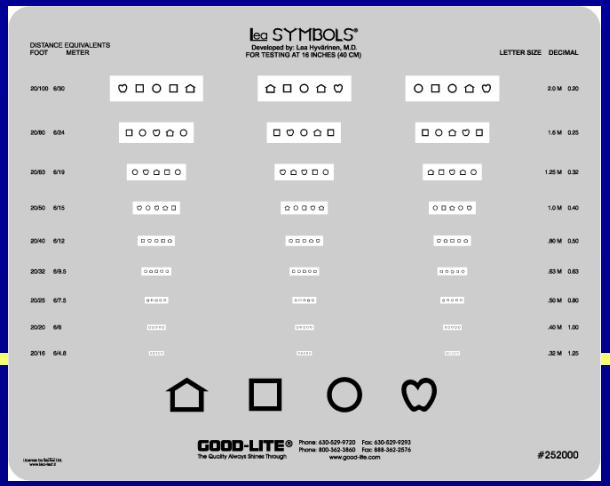
**NOT** to point at the optotypes.

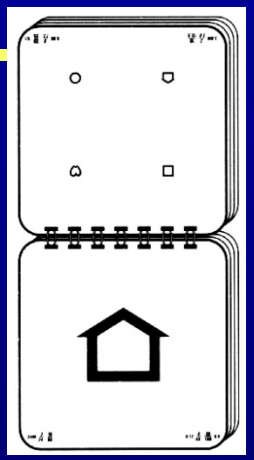
Luminance between 80 and 160 cd/m²

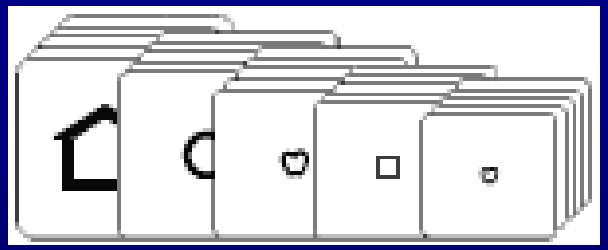
# VA

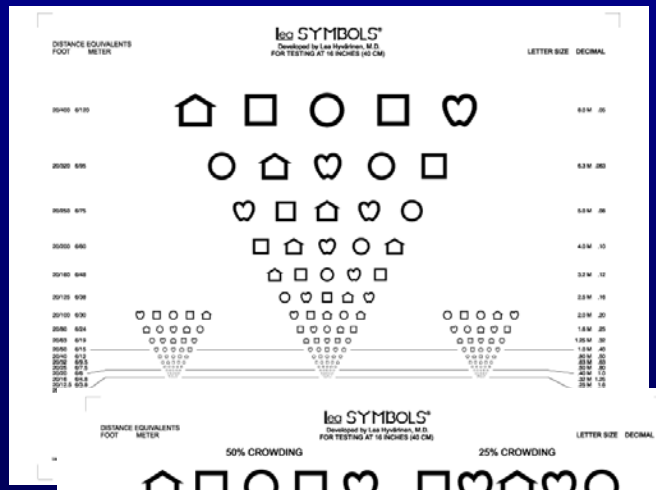


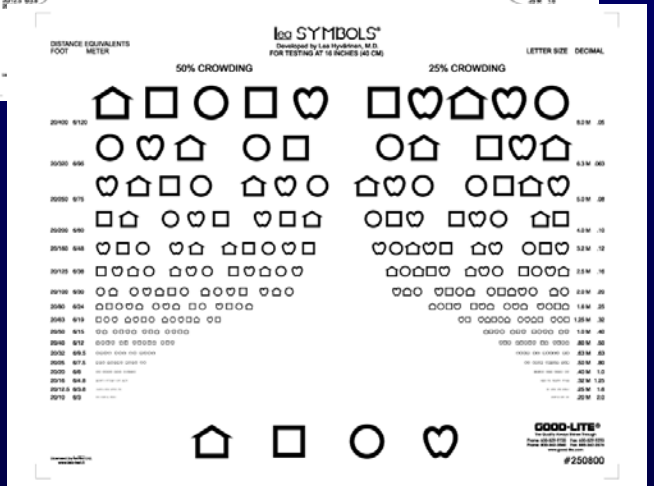


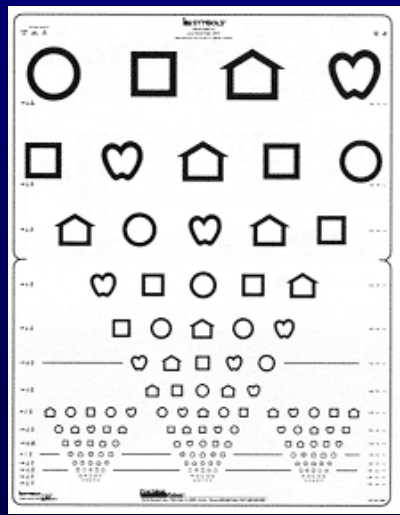



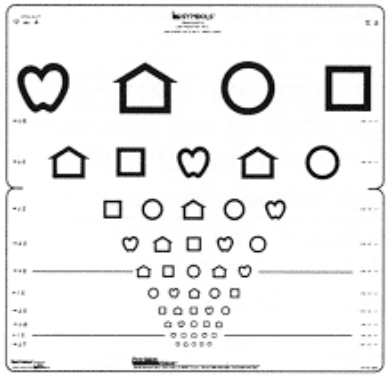



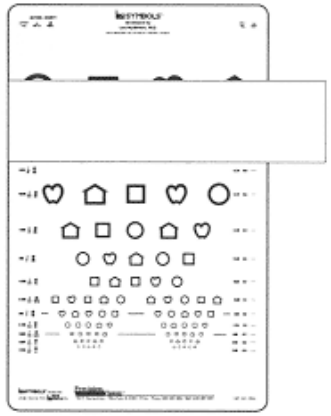




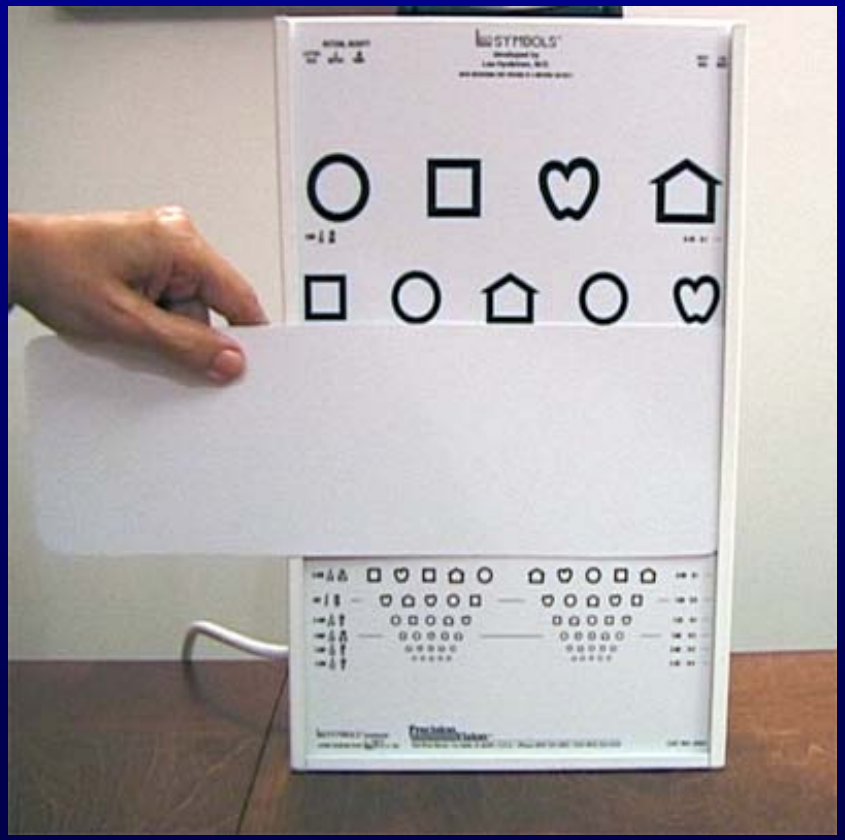




non-illuminated charts

translucent chart

# VA charts on the small lightbox




# Visual acuity

7 tests – 7 different values possible

**Distance** – single **1.63 (10/6, 6/4)**

– line test **0.80**

**Near 40cm** – single **0.40**

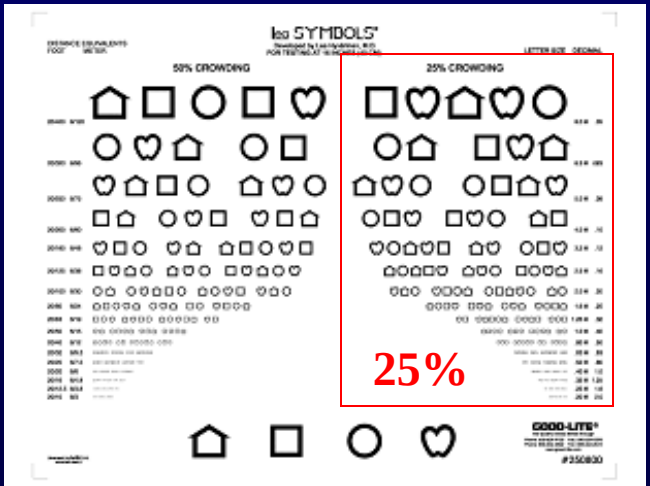
– screening test **0.25 (10/40, 6/24)**

– standard test **0.20**

– 50% spacing **0.16**

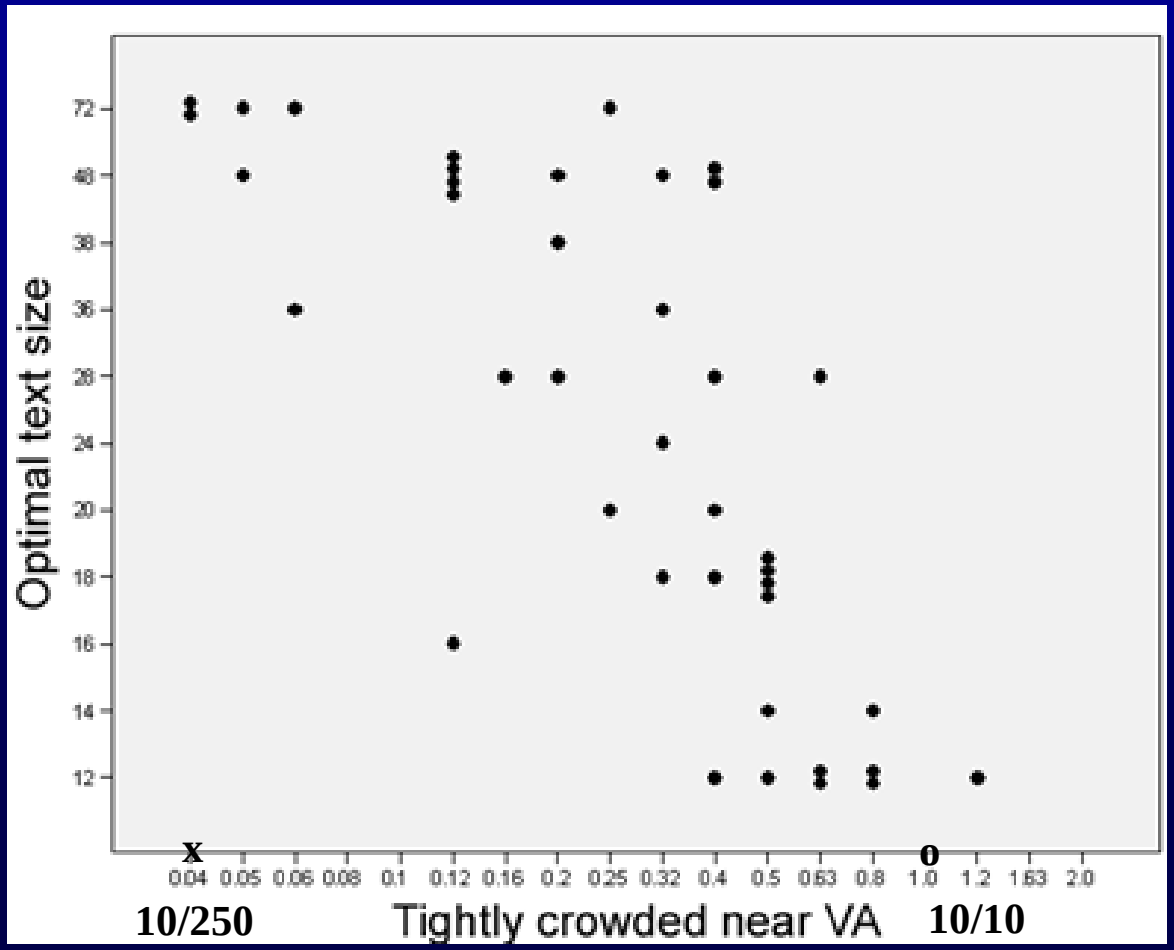
– 25% spacing **0.12 (10/80, 6/50)**

**closest to reading**



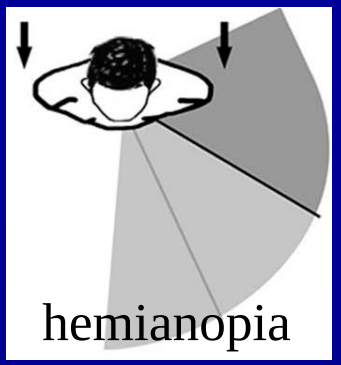
# Optimal text size

## its relationship to VA values measured with tightly crowded test




alternating exotropia

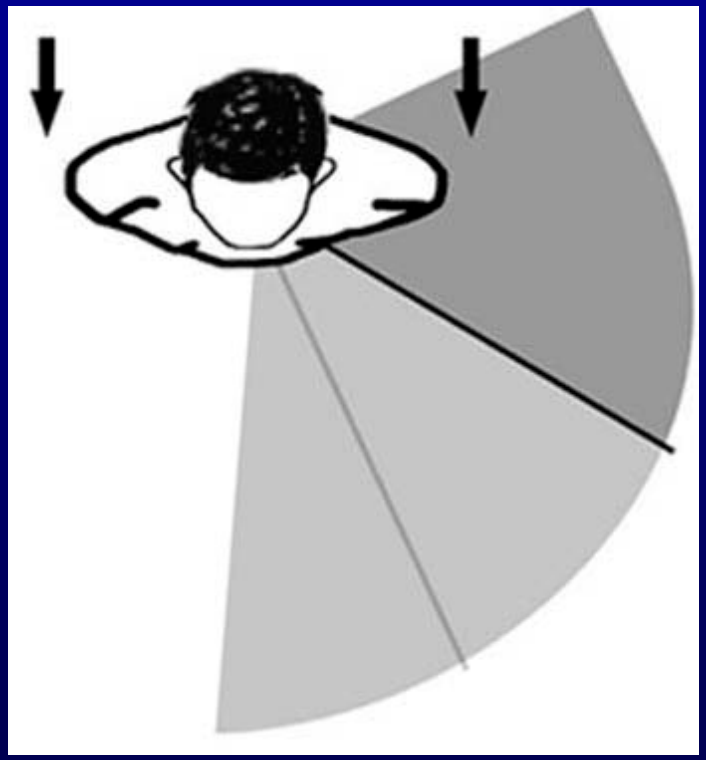
# Ergonomics


hemianopia

Testing working ergonomics at the resource centre, JNK 2008
Condition after removal of a brain tumour: loss of convergence, accommodation, vertical eye movements, right hemianopia and hemiplegia.

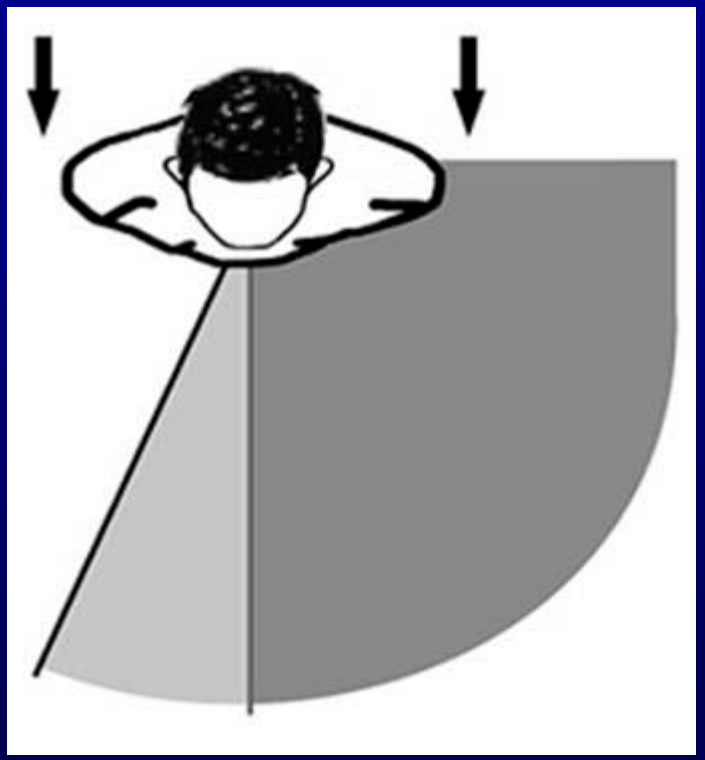
# Visual field

## right eye or left eye fixating



Right eye fixating

5 degrees of VF on
the right side.



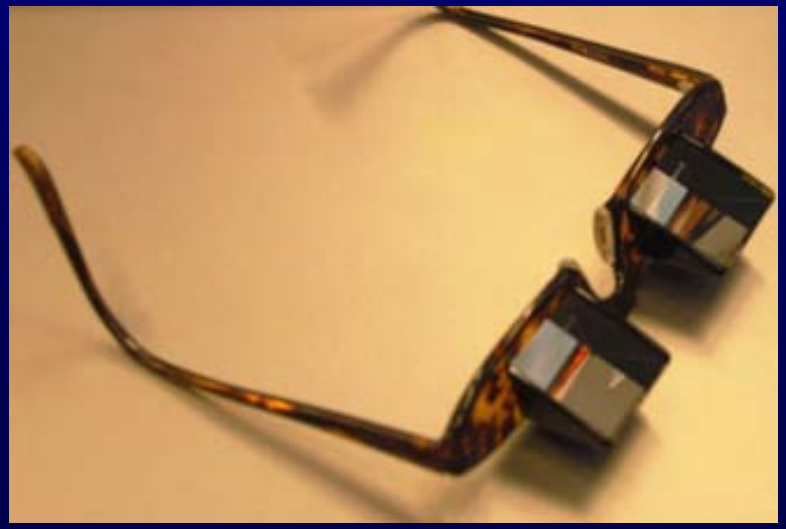
Left eye fixating

VF of the right eye increases
the functional field by 30 degrees.

# No vertical movements

## Mirror spectacles

Mirror spectacles to see
at close distances

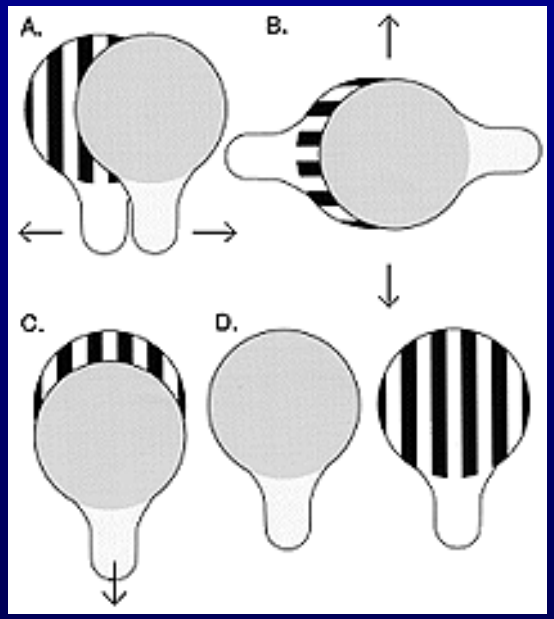


# Tactile information and movement

## to help visual perception

# Visual & Grating Acuity

## single, line, 25% spacing; grating acuity as a detection task




”dog house”;  VA = 0.04 (6/150)

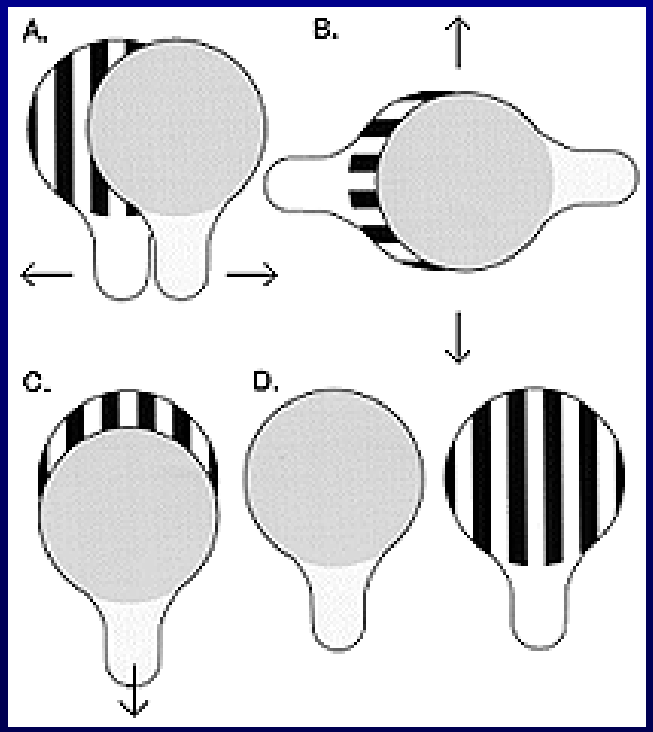
# Grating acuity 4cpd, detection test

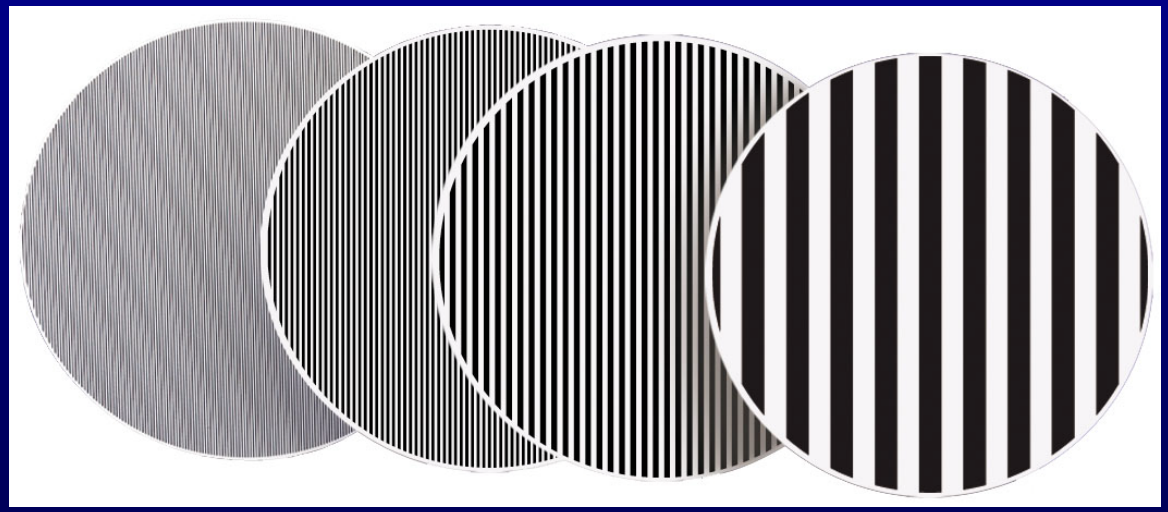
# Tactile exploration

Lack of visual control of movements

# Grating Acuity Tests

## Detection and Discrimination tests

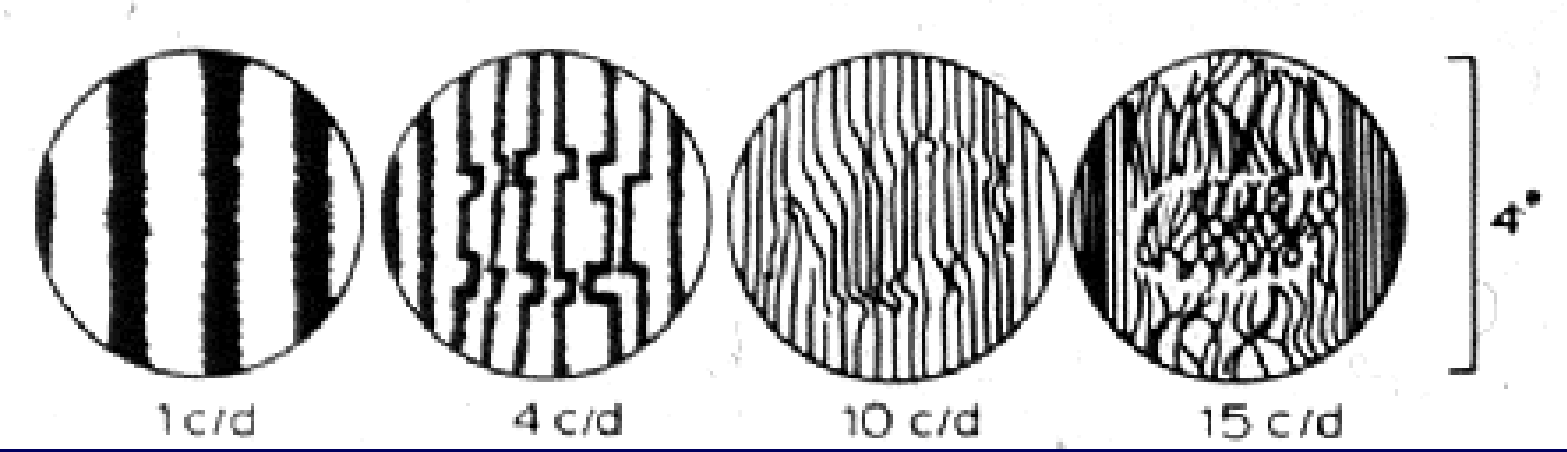


cycles per degree, cpd

Grating acuity values MUST NOT be converted to optotype acuity values.

# Grating acuity




Discrimination is possible even if the lines are distorted.

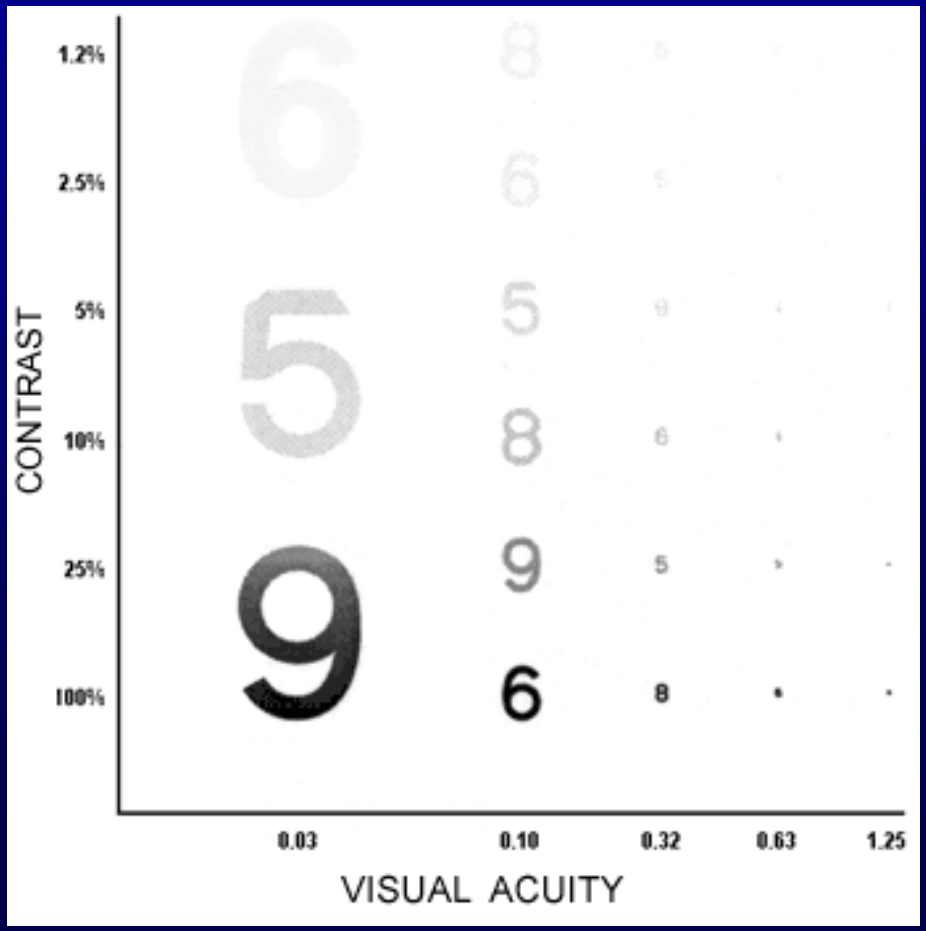
Modified froma slide of J.Atkinson

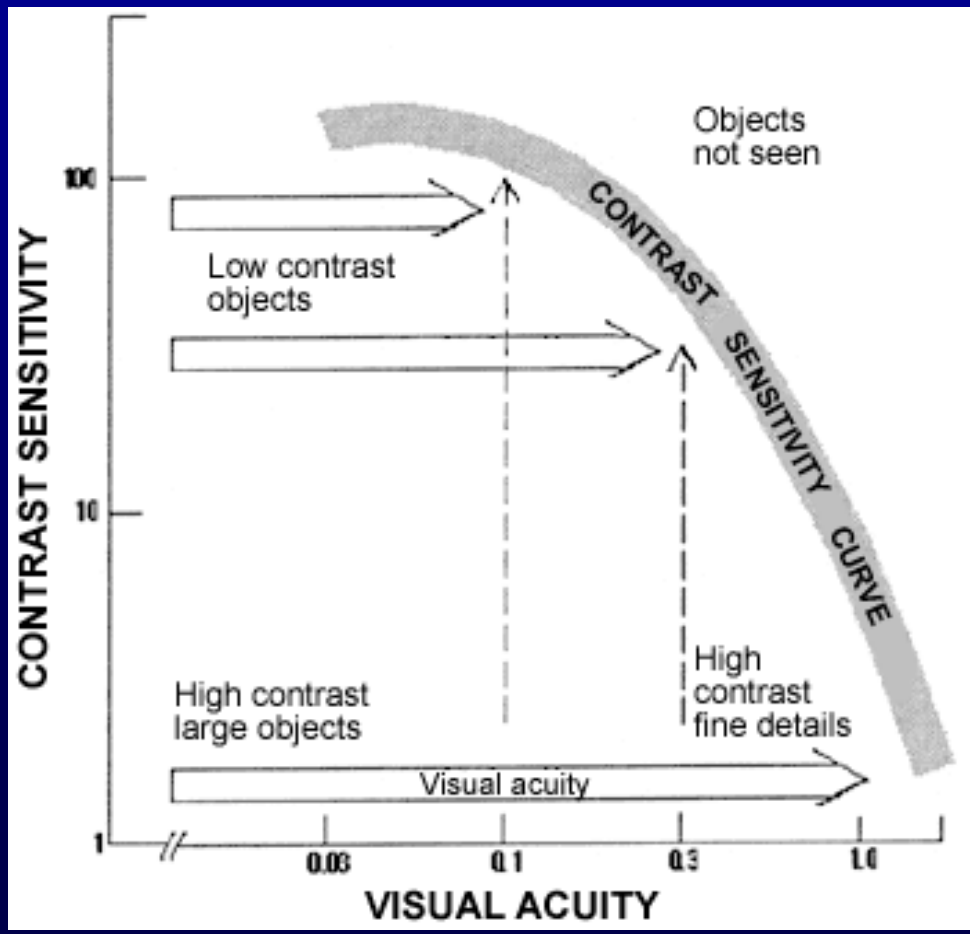
# Grating Acuity Test

Grating acuity 4cpd

Optotype acuity 0.004, 4/1000 or **10/2500**; if converted: 4cpd >> 0.12; 1**0/80**

# Contrast sensitivity & CS curve



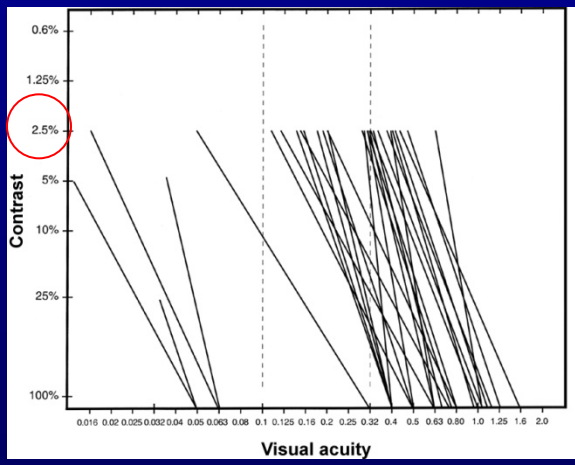



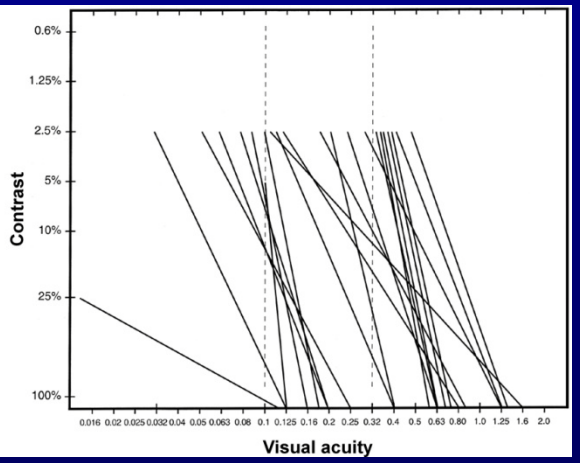
# Contrast sensitivity

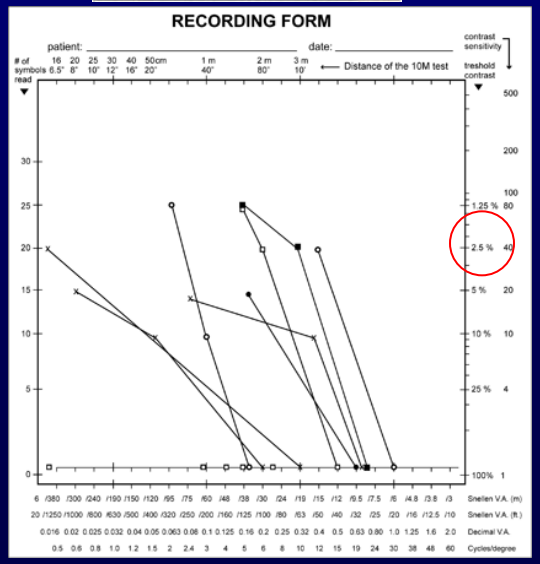
## Variation in the angle of the slope of the CS curve

50 children with brain damage related motor problems, 46 with CP

2.5%




2.5%

**50 children with brain damage, 46 with CP**

**Visus at 2.5% contrast**

**≥ 0.3 18**

**< 0.3 & ≥ 0.1 20**

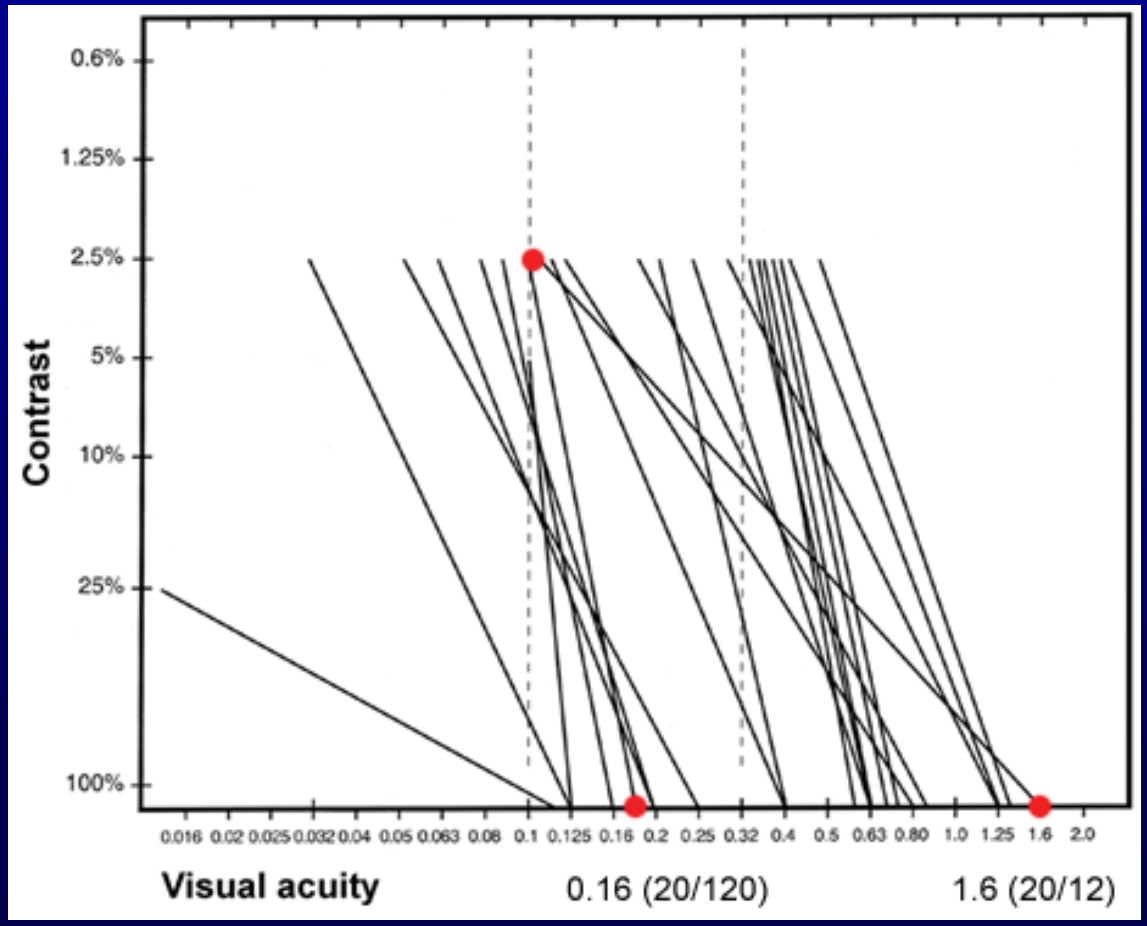
**< 0.1 7**

**Visus threshold at 5% contrast 3**

**Visus threshold at 25% contrast 2**

Children with tumours

# Contrast sensitivity

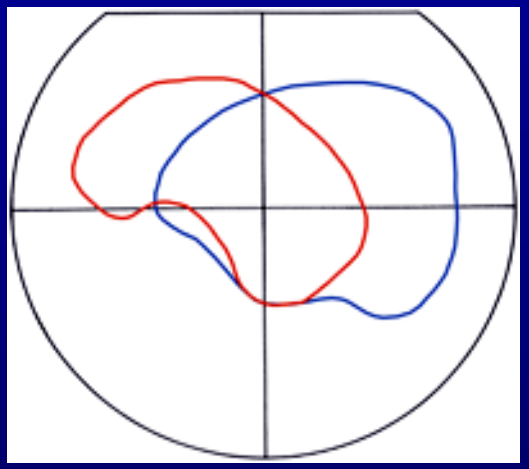



20/120 – 20/12

Great variation in the angle of the slope; i.e. VA at high contrast may not depict CS.

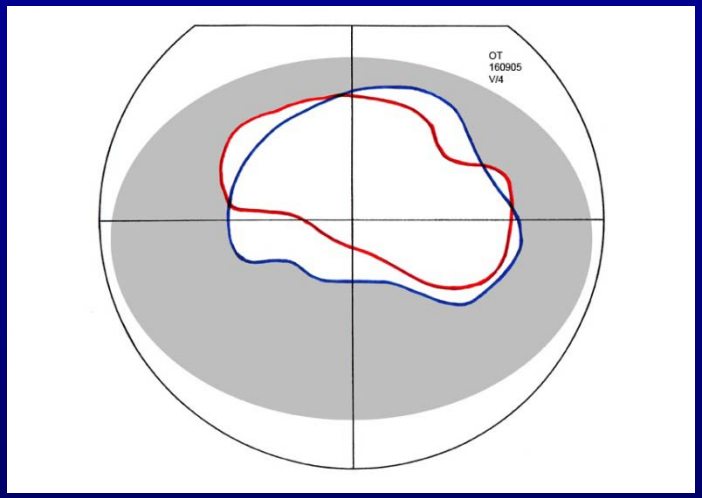
# Visual field

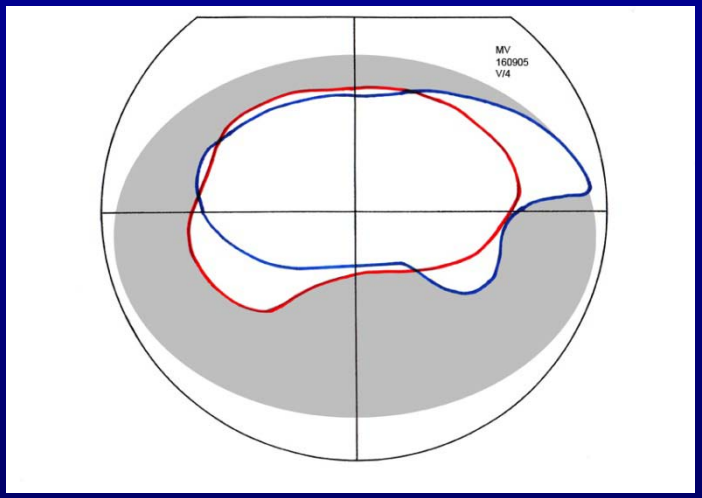
## Confrontation field, Goldmann field

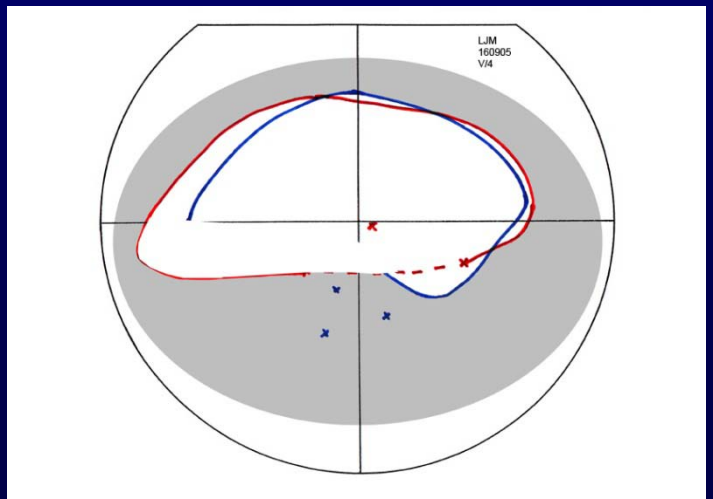


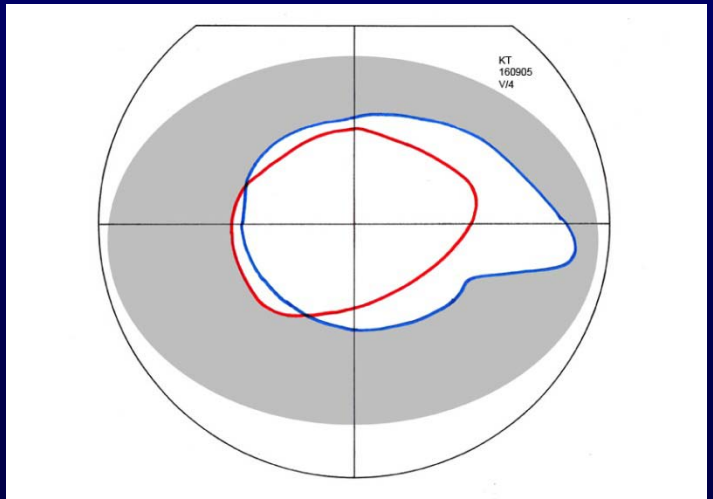
Normal size in 30/50 with Flicker Wand
Goldmann: (N=9), lower field loss 5
concentric 2;  central hemifield 1
left hemianopia 1

# CP visual fields



# Colour vision

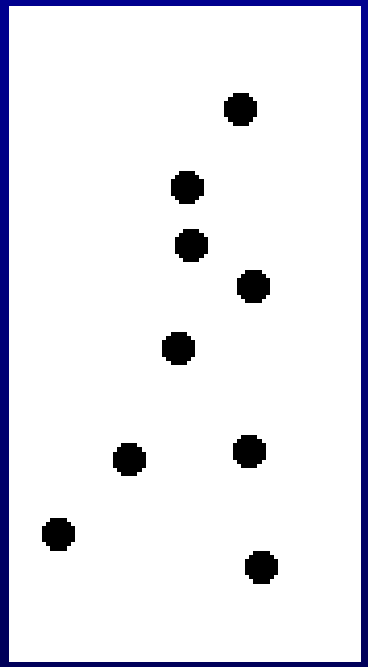
Panel 16, quantitative test

Waggoner test
LEA Panel 16 test

(N=46)
normal 34;
<4 crossings 8;
4-9 crossings 4
in 6 cases unable to test

# Motion perception

## biological motion – Johansson's Walking Man
## figure-in-motion – Pepi-test



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(N=50)

42 saw the walking man

45 saw movement, 43 figure

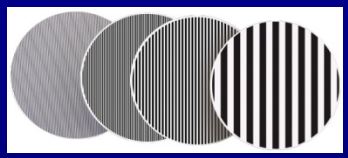
Motion perception is important in 1) COMMUNICATION, facial expressions are low contrast visual information in motion.; 2) MOVING, relative speed of objects' apparent movement creates experience of depth and distances

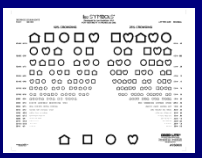
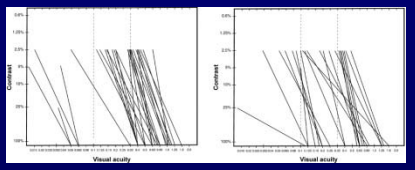
# At school

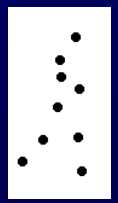
- Most of the teaching is audio-visual.
- Therefore we need to know WHAT and **HOW** children perceive through vision…
- ...to create the IEPs/ILPs so that they meet the needs of each child,
- …to observe in teaching and therapy situations HOW the child uses his sensory information.
- When we test children's learning, especially in mathematics, visual functioning should be considered.

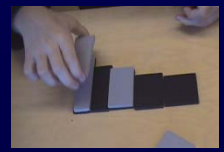
# ”Clinical” test situations at schools

- Oculomotor functions, **fixation, saccades, accommodation**
- Grating acuity, detection & discrimination tests
- Recognition VA, single, line, crowded
- Contrast sensitivity, optotype & grating test
- Visual field, confrontation, Goldmann, flicker
- Adaptation, to low & high luminance, filtters
- Motion perception, Pepi-test, biological motion
- Visual processing, directions & size/length

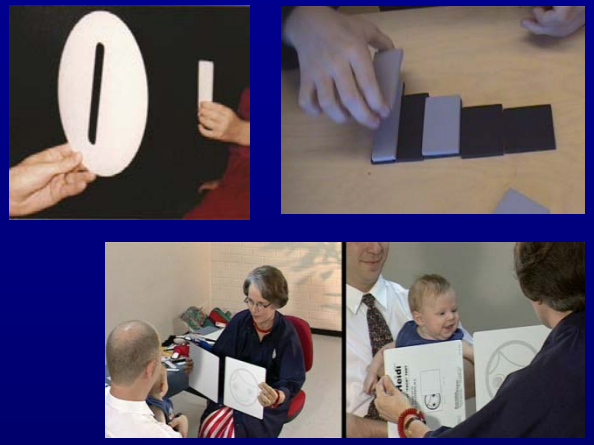



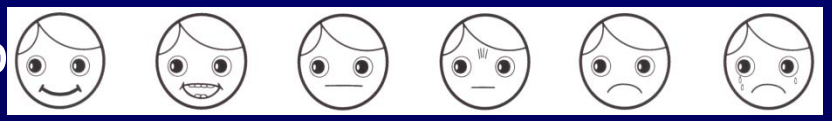



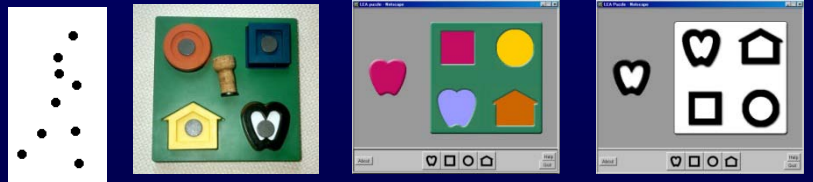



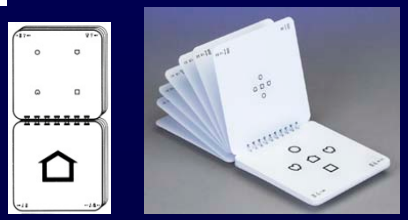
# Cognitive Tests

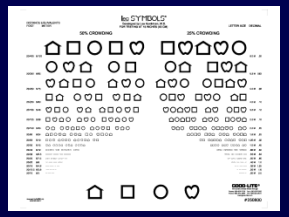
- Orientation of lines, LEA-Mailbox
- Length of lines, LEA-Rectangles
- Photographs of faces
- Hiding Heidi for communication
- Heidi Expressions
- LEA Puzzle, Form, Eye-Hand co-op
- VA tests, Crowding effect
- Motion Perception, **Pepi & Walking Man**
- Tactual Profile for compensatory functioning









# Visual processing and its problems

## VENTRAL STREAM

Direction and length of lines and objects
Object-background
Crowding – increased crowding

**RECOGNITION FUNCTIONS:**
Concrete objects
Pictures of concrete objects
Visual closure – Filling in
Order of 3-4 pictures
Copying basic drawings, lines, cross, angle
used for planning motor functions
Perception of textures, surface qualities

**Reading as a visual task**
Recognition of letters and words
Saccades in reading, reading without saccades

**Recognition of numbers and numerals**

**Recognition of landmarks**

**Recognition of facial features**
**Recognition of facial expressions**

**Perception/recognition of body language**

## DORSAL STREAM

**Awareness of space**
Map based orientation in space
Orientation based on routes

**Visual imagination**; **mathematical** abstract space

**Detection and discrimination of motion**

**Perception of distances and depth**

**Simultan perception, - agnosia**

**Neglect**

**Eye-hand- co-ordination**
Copying from near space, from far
Use of egocentric near space
Use of allocentric space

**Integration problems**, sensory, sensomotor

**Hypersensitivity to noise,** visual, auditory
Inhibitory functions, their insufficiencies

# Profile of visual functioning

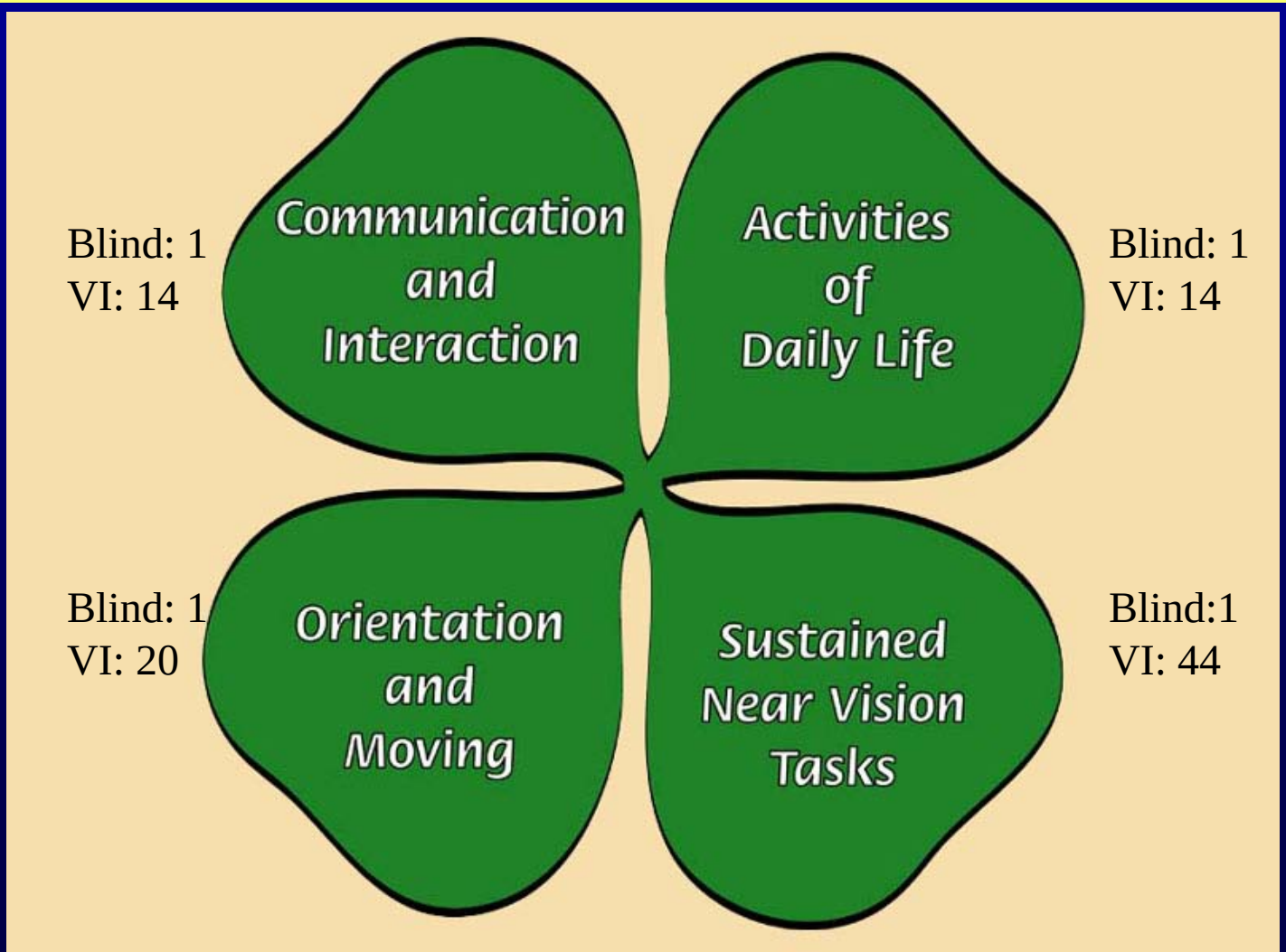
based the learning strategy that will be used

| | N | I | P |
|---|---|---|---|
| DORSAL STREAM | | | |
| A2 Perception of near and far space | | | |
| B1 Observation of surrounding | | | |
| C3 Orientation in space, map based | | | |
| D2 Route based orientation | | | |
| E1 Simultaneous perception | | | |
| F1 Eye-hand coordination | | | |
| G1 LEA-Rectangles | | | |
| H1 LEA-Mailbox | | | |
| I1 LEA-Puzzle | | | |
| J1 Grasping and throwing objects | | | |
| K2 Drawing, free hand | | | |
| L2 Copying from blackboard | | | |

N= normal (1), I= impaired but useful (2), P=profound VI or blindness (3)

# Visual Functioning in the 4 main areas

in 50 children with motor disability (46 with CP)



# Participation

- How does the student experience his/her participation in activities?
- How does (s)he experience daily communication at school, evening activities, camps, during trips.
- How does the student see **his/her** future?
- Family's experience/opinions.

# Effect of environment

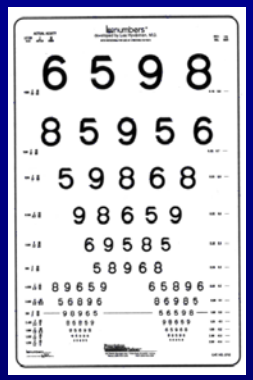
- parents, extended family
- teachers, therapists, other personnel
- doctors, vision rehab personnel
- attitudes
- knowledge
- availability of devices
- integration
- career planning

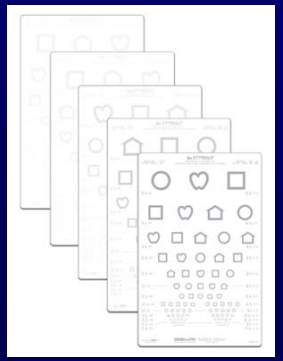
# Transdisciplinary assessment

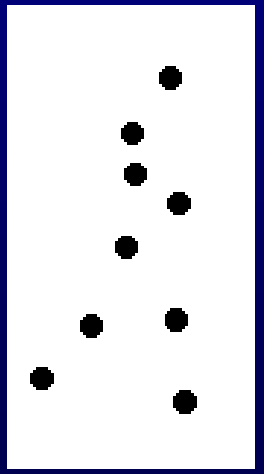
# School assistant

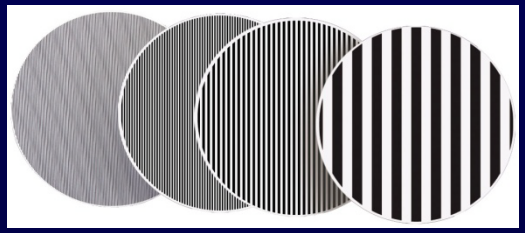
# Our Goal

## Training of Doctors and Teams in EI and Schools







# Training of Teachers

## in developing countries

# Tests


+ Lightbox with tests and Panel-16 Color Vision Test

# Filter lenses


Locally tinted filter lenses require good workmanship.

# Assessment of Visual Functioning

- Basic information from the eye hospital

  structure of the pathways, refraction,

  glasses (under- or overcorrection?)

  VA, VF, CS, CV, VAd, oculomotor functions

Letter to the ophthalmologist

and

optometrist/optician

(other medical specialists)

# Assessment of Visual Functioning

- 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

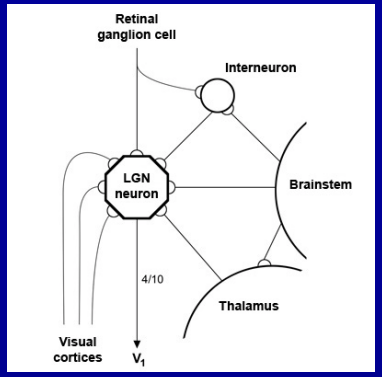
# Assessment of Visual Functioning

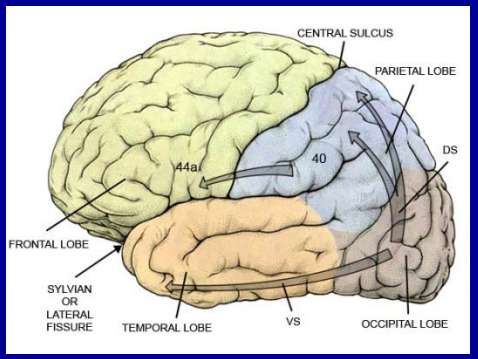
- Basic information from the eye hospital
  structure of the pathways, refraction
  glasses (under- or overcorrection?)
  VA, VF, CS, CV, oculomotor functions
- testing of all visual functions at KG and school
  in play and teaching situations
- observations on visual processing functions
- effect of **posture** in multidisabled children
- **compensating functions**


# Quality of Incoming Visual Information
by
# Repeating Clinical Tests

Lea Hyvärinen, MD, PhD, FAAP

Slides on the homepage 21.7. 2010
www.lea-test.fi




# Visual Functioning

## in Children with Brain Damage

Lea Hyvärinen, MD, PhD, FAAP

Professor h.c., Rehabilitation Sciences, Technical University of Dortmund

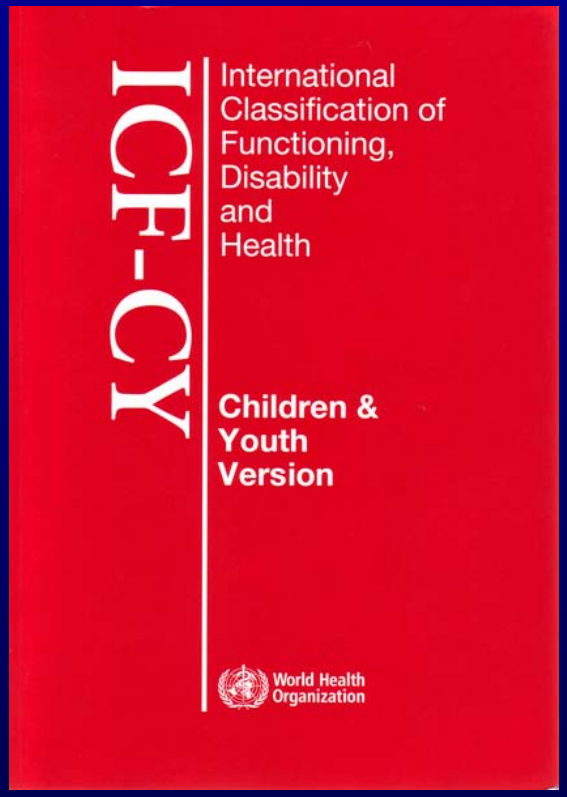
Lecturer, Developmental Neuropsychology, University of Helsinki

**Slides on the homepage 21.7. 2010**

www.lea-test.fi

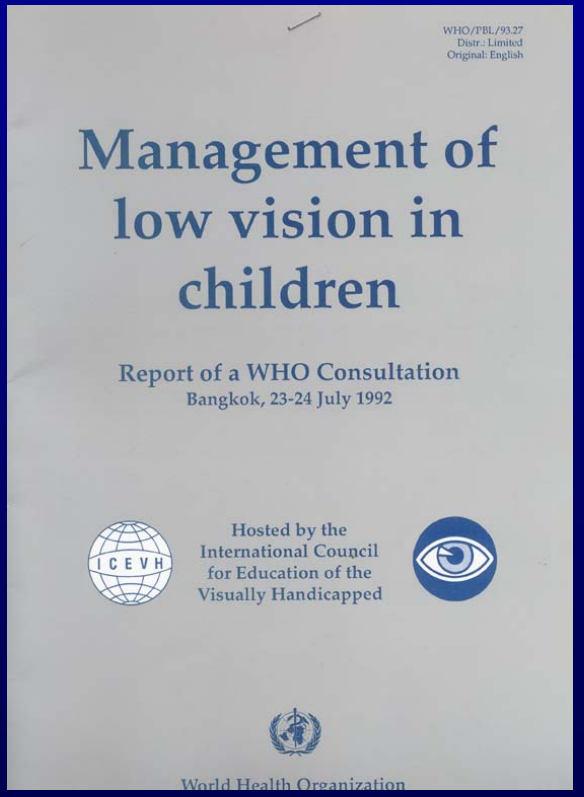
# ICF-CY

## Children with visual, motor, intellectual and/or hearing impairment




2007

**9 domains, 5 suitable for young children**




1993

**4 domains, main functional areas.**