Mesopic Contrast Sensitivity in a Young Population

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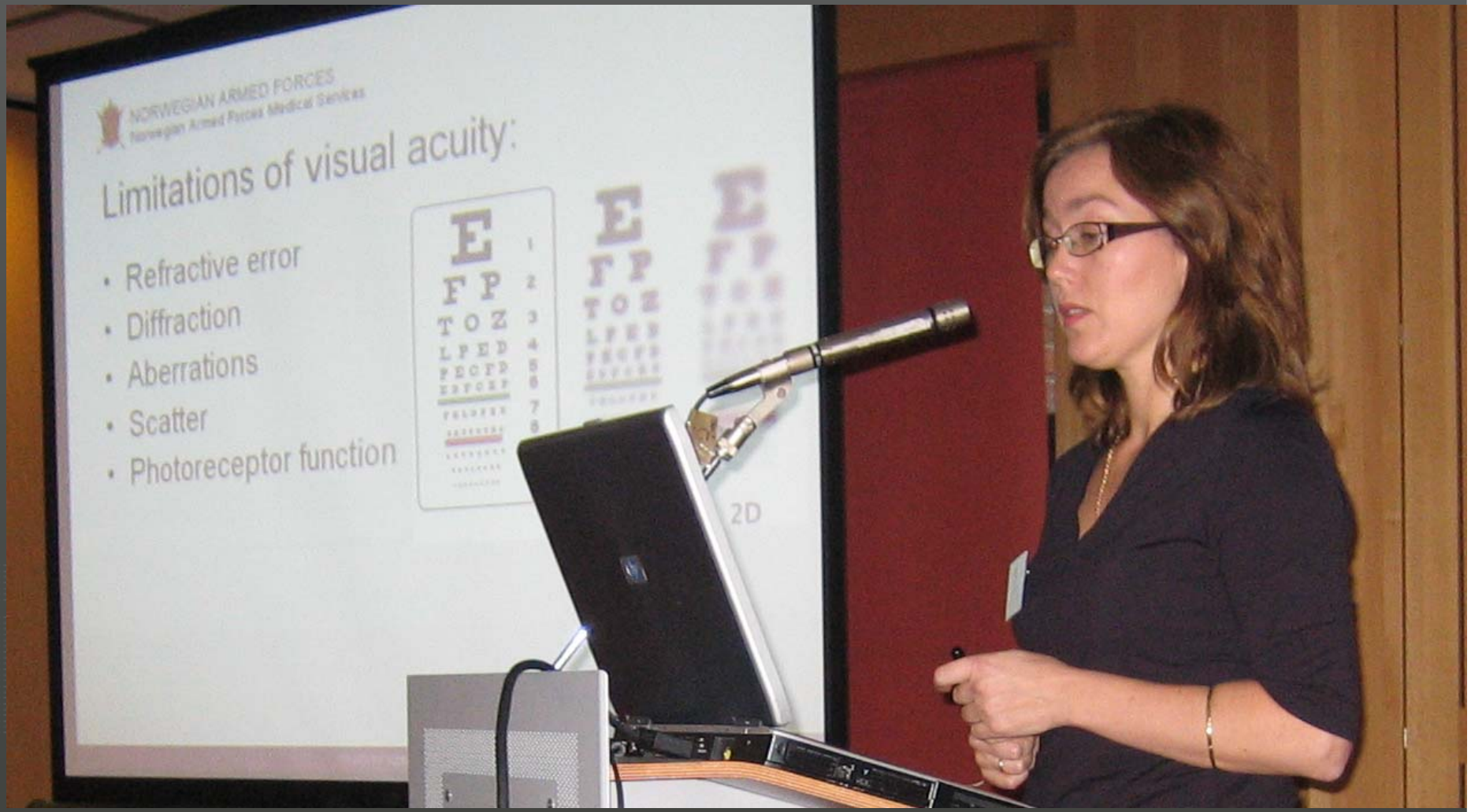
NORWEGIAN ARMED FORCES
Limitations of visual acuity:
Refractive error
Diffraction
Aberrations
Scatter
Photoreceptor function
2D

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- Refractive error
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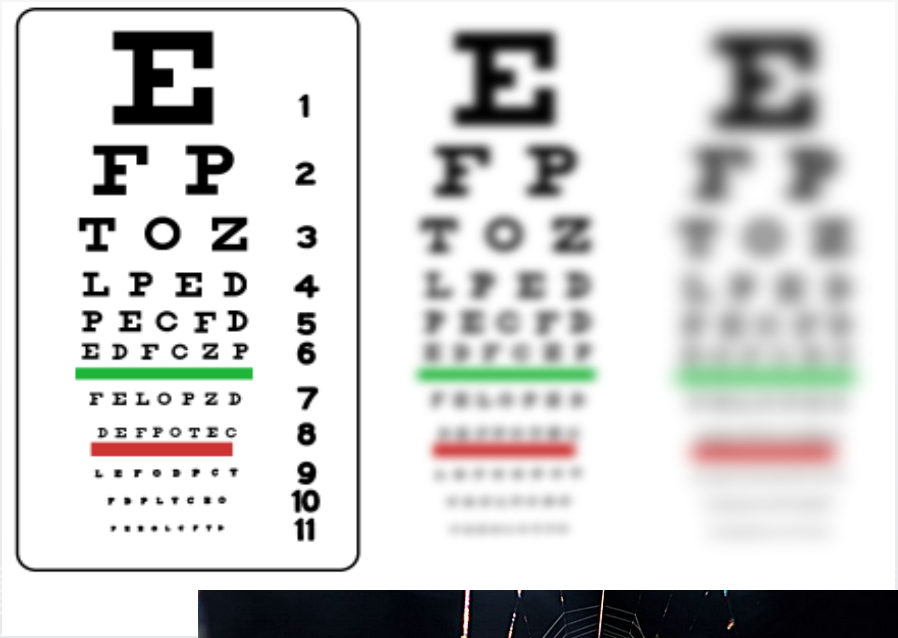
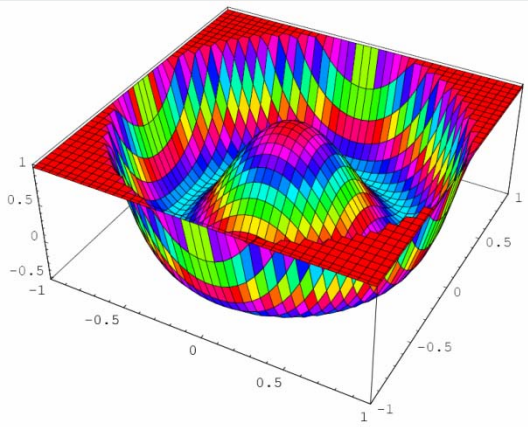




Measuring visual function:

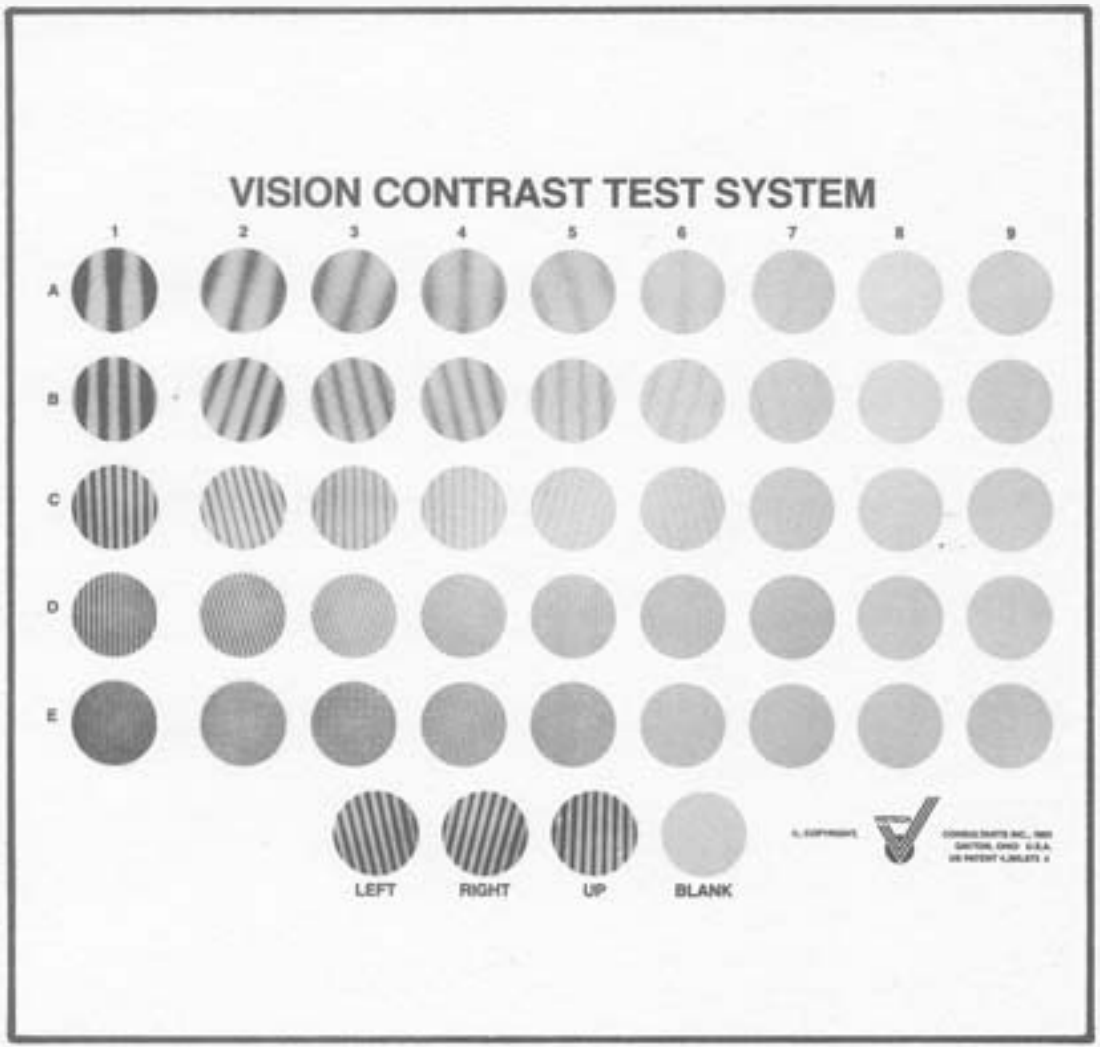
- Objective:
  - Ocular wavefront aberration calculations
- Subjective:
  - Visual acuity
  - Contrast sensitivity:
    - Pelli-Robson Chart (same size letters)
    - Small Letter Contrast Test
    - ETDRS Low contrast chart
    - Mesotest II, Oculus
    - Vistech / FACT

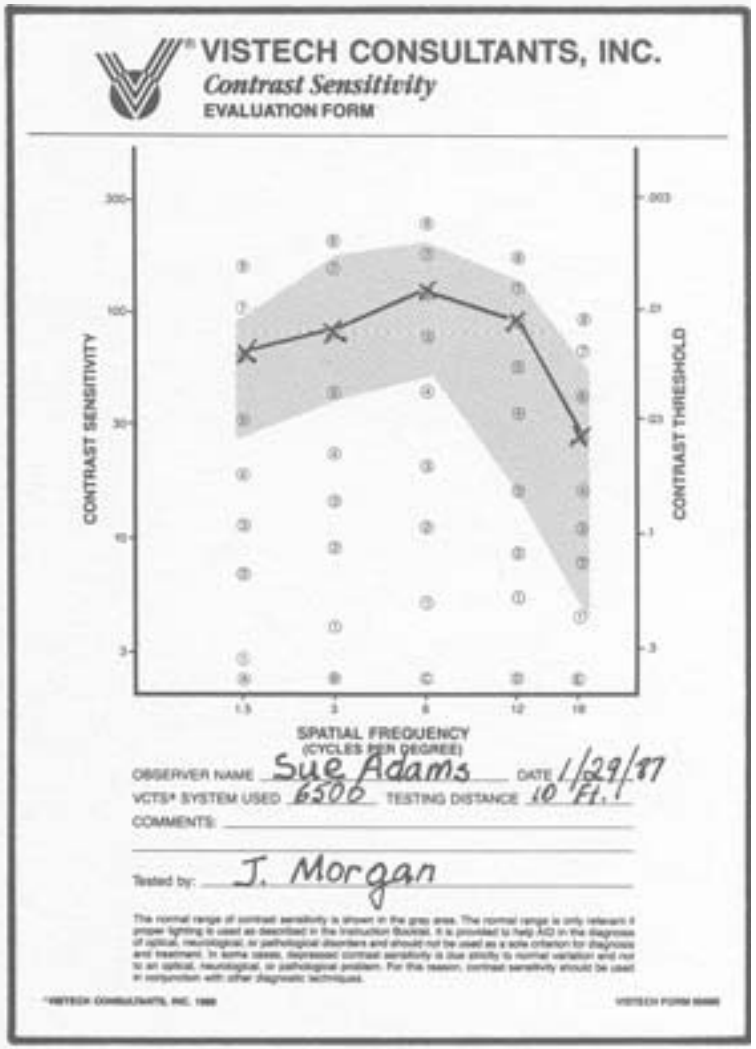
Contrast sensitivity tests

Why measure contrast sensitivity?

- JAR-FCL requires that a candidate undergoing refractive surgery can be considered fit for flying provided that glare sensitivity is within “normal standards” and mesopic contrast sensitivity is not “impaired”.

How do we measure?

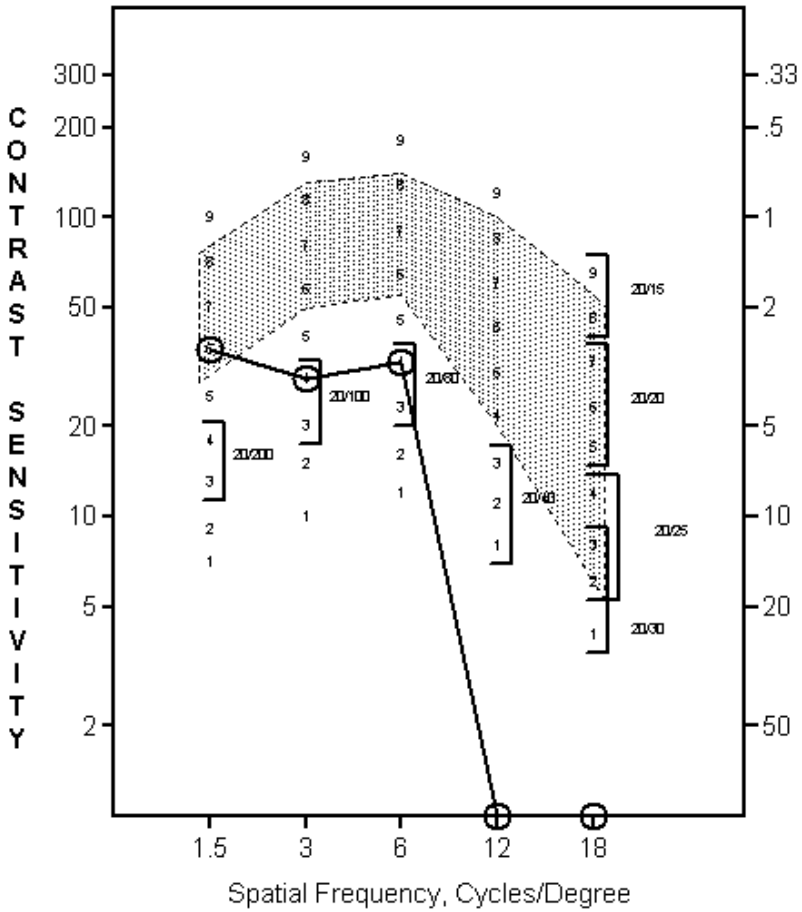




CS is influenced by:

- Ageing
- Cataract
- Amblyopia
- Refractive error
- Aberrations
- And more

Mesopic cs (without glare) several years after LASIK in 60 year old:



Method:

- Test: Optec 6500, 3 and 85 cd/m^2
  - Mesopic test with and without glare
  - Dark adaptation 10 minutes
  - Encouraged to guess/answer (not forced choice)
  - No strict time limit

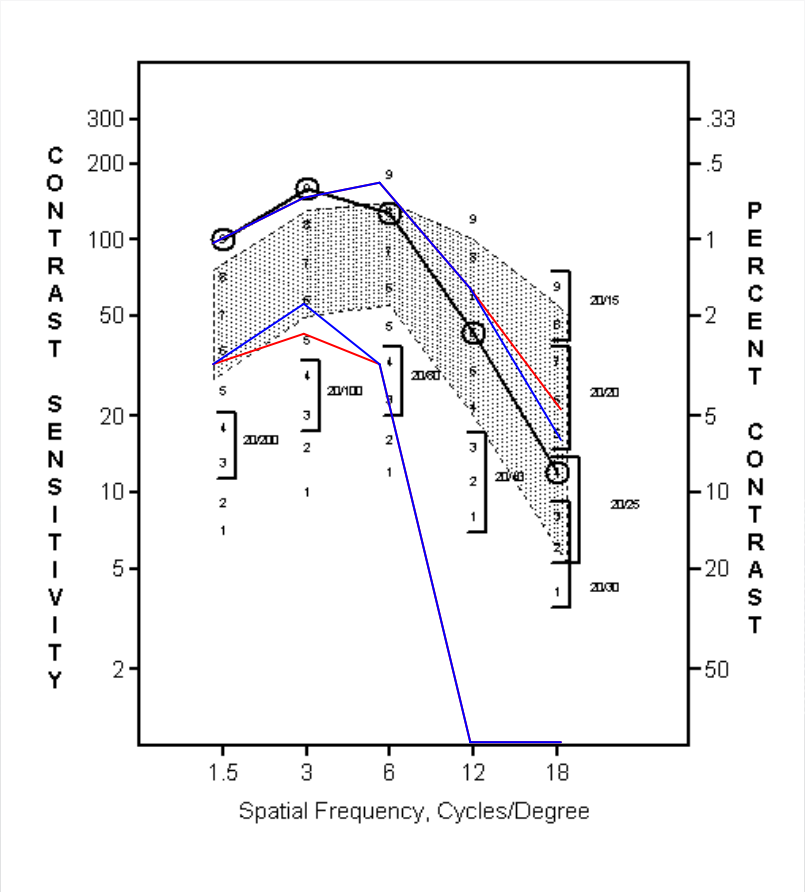
Study population:

- 202 examined, n=165 after exclusion
- Binocular test
- Median age 22, range 17-54
- 92% males
- 39% army pilots

Ophthalmic findings:

- 16% had corrective lenses, refractive error range: Sphere +2 to -4,75, cylinder up to -2
- No eye pathology, amblyopia, colour deficiency or night vision problems , IOP under 21
- VA monocularly ≥0,7 VA ou ≥ 1,0
- 93% had normal photopic contrast sensitivity
- Pupil size: Not measured

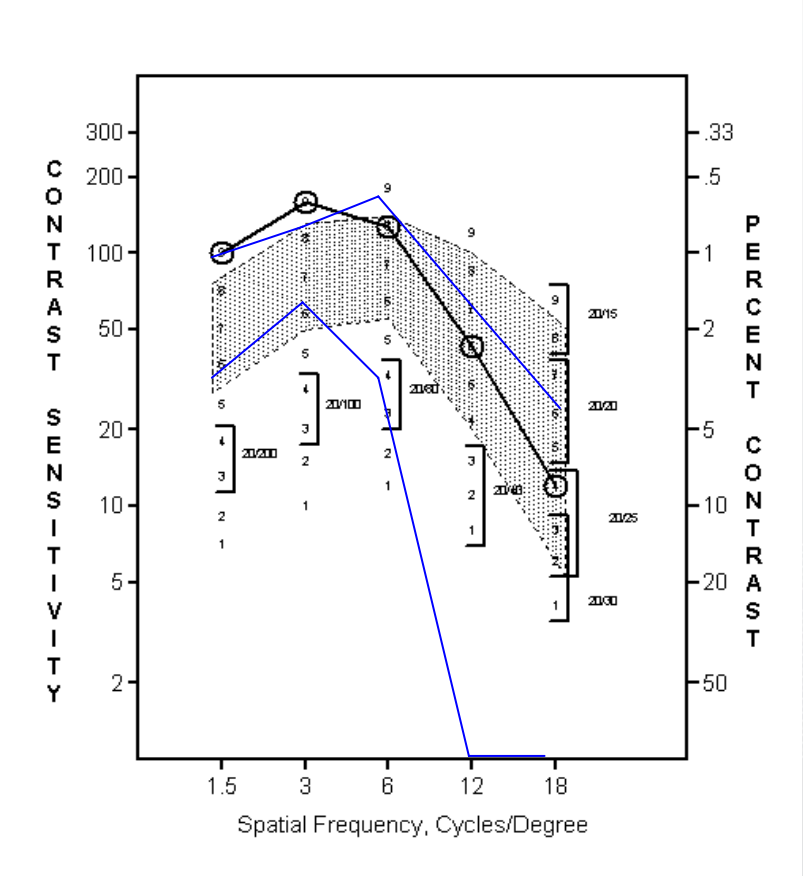
Results mesopic data:

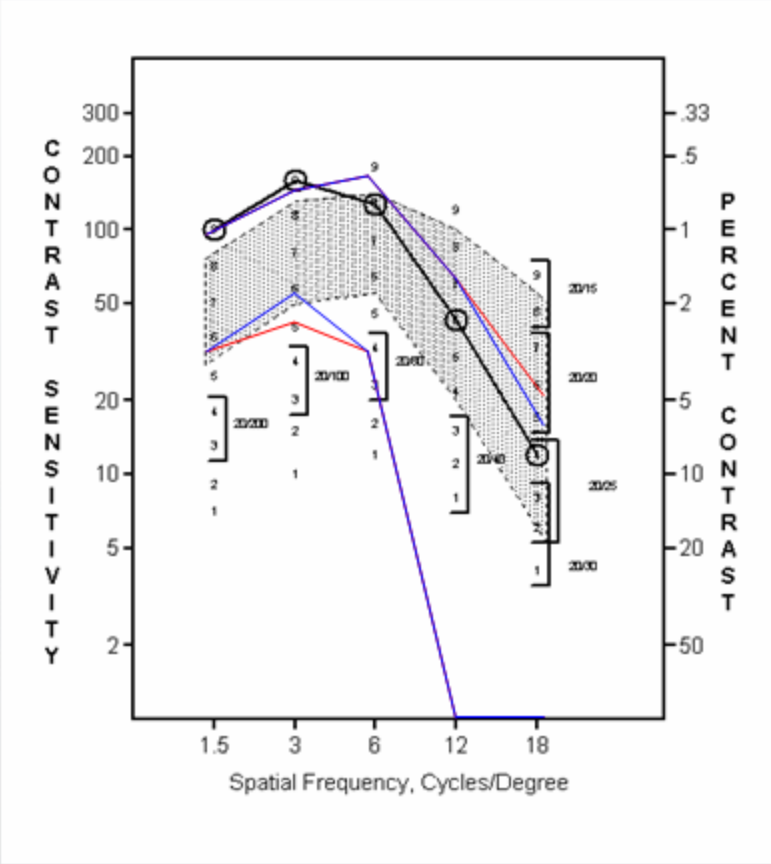


Mesopic range (no glare)
2,5 and 97,5 percentile

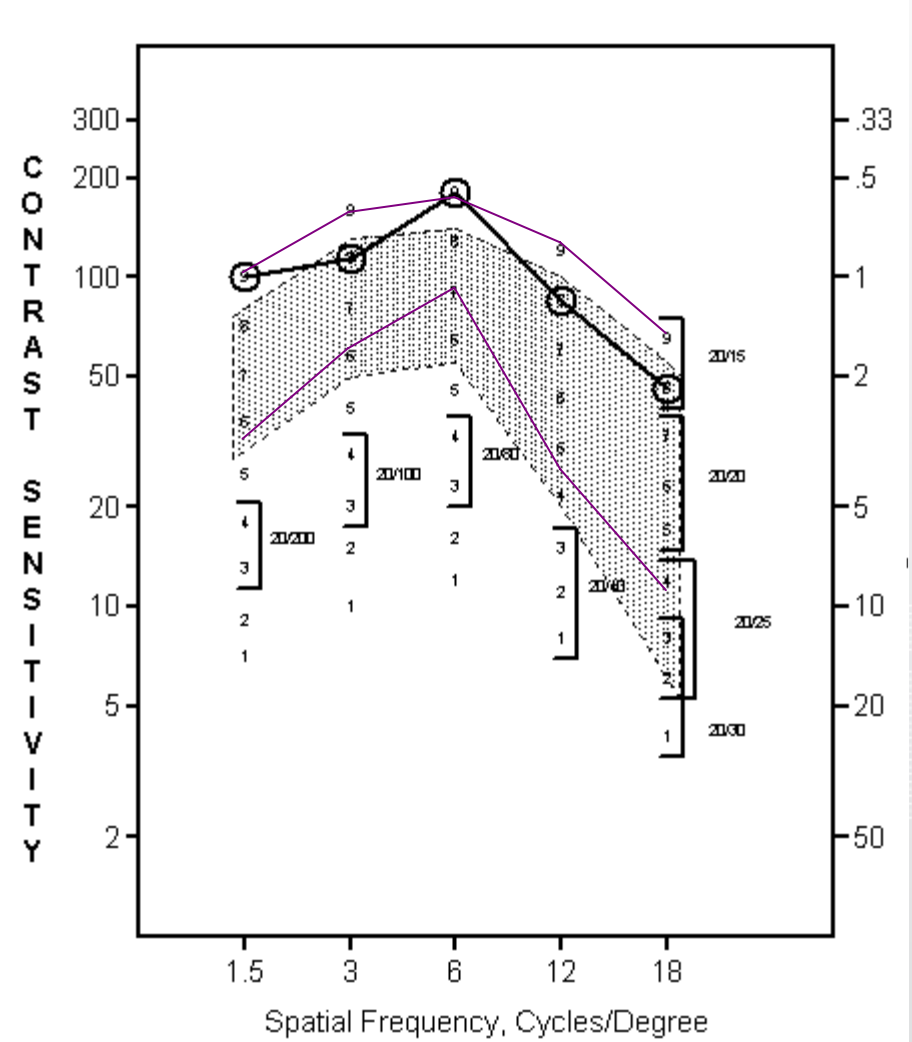
Mesopic range (no glare)
5 and 90 percentile

Mesopic with glare:





Photopic data:



Photopic range (no glare)
5 and 90 percentile

Conclusions:

1. Mesopic data: There is a wide range in contrast sensitivity in the higher spatial frequencies.
2. Photopic data: Our material correlates well with the population norms.

Future research:

- Expand the sampled population
- CS in hypoxia?
- CS after +Gz acceleration?