

CURRICULUM ERGOPHTHALMOLOGY

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Do we really need this?

There are at least five reasons:

- ▣ The predominance of visual work with millions of employees suffering from the results of maladjustment.
- ▣ The ongoing phylogenetic process with shift from far to near vision.
- ▣ The ageing society and workforce.
- ▣ Unclear limitations of salaried vision (presently determined by trial and error).
- ▣ New research results about eyes and brain.
- ▣ Quality of work (performance) and life.

From far vision to near

- ▣ Far vision was most important in the phylogenesis of mankind.
- ▣ Likewise, the peripheral retina needed the fastest image processing (without colors) to detect lateral risks and fast movements.
- ▣ Within a few generations we mutated into an information society, which makes near color vision with high resolution a “*conditio sine qua non*”.

Ageing society – ageing workforce

- ▣ Presently we are confronted with a dramatic change in age-distribution, especially on the shop-floor.
- ▣ Ageing eyes are characterized by presbyopia, a narrow accommodation range, and gland dysfunctions.
- ▣ Ageing eyes need more light, but are more sensitive to glare.
- ▣ Eyes need more frequent examinations in order to detect structural changes of the inner eye, retinal and ocular surface alterations, degenerative macula processes etc.

New knowledge on vision

Four main functions of coding environmental signals:

- ▣ Detecting the signals for cortical comparisons: control of body position in space and time, reafference of activities/behaviour
- ▣ Coding the environmental matrices for permanent comparisons of external vs. internal world
- ▣ Synchronization of circadian rhythm
- ▣ Performance of cognitive tasks (e. g. visual work)

Outer eyes – inner eyes - brain

Summarizing present knowledge on visual work, clustering of problems into three categories seems reasonable:

- ▣ Mechanisms predominantly focusing on the outer eyes
- ▣ Mismatch of demands (visual targets, size, colour, contrast) on and abilities of the inner eyes (adaptation , accommodation, binocularity etc.), and
- ▣ Mismatch of demands of visual tasks and neuropsychophysiology

Topics concerning the „outer eye“

- ▣ Ocular surface physiology; the role of blinking
- ▣ Occupational Medicine of the “outer eyes”
- ▣ Dry Eye Disease (DED)
- ▣ Diagnostic tools for tear film quality and signs
- ▣ Indoor and outdoor environmental risk factors
- ▣ Gaze, monitor position and working habits
- ▣ Impact of using contact lenses
- ▣ Medication, eye drops, cosmetics
- ▣ Hygienic habits
- ▣ Influence of geographical location

Topics concerning the „inner eye“

- ❑ Mismatch of requirements and individual resources.
- ❑ Optometric measurements, evaluation of visual performance incl. binocularity, heterotropia and heterophoria.
- ❑ Visual aids: Theoretical understanding of glasses, contact lenses, refractive surgery; working spectacles and relevant legislation.
- ❑ Diurnal rhythm and transient myopia.
- ❑ Status post implantationem lentis and after refractive surgery.

Occupational psychophysiology of vision

- Sensorimotor complexity of visual information processing: diverse functions of the eyes; direct vs. cerebral coding, etc.
- Arbitrariness of vision is clearly limited due to compulsory coupling of vision with other senses, emotions and the regulation of body position.
- Psychology of visual perception, i.a.: even visual performance is governed by understanding and motivation.
- Software ergonomics has to include the relevant parts of cognitive and emotional psychoergonomics!

Other topics

- ▣ Vision and workload, stress, strain and fatigue
- ▣ Circadian/diurnal variation of visual functions
- ▣ Lighting at different visual works
- ▣ Asthenopia, health complaints, symptoms, signs, sensations, pains
- ▣ Ageing workforce – ageing eyes – ageing brain
- ▣ Working with eye diseases, after eye surgery, and with prostheses like artificial intraocular lenses
- ▣ Visual work of employees with reduced capabilities, handicaps and chronic general diseases
- ▣ Validity and reliability of tests and parameters
- ▣ The legal situation in different countries

Examples

- Posture and vision in assembling (jewelry, sewing).
- Multiple screen work under time pressure in TV production.
- The role of glare in earthbound, aerospace and sea traffic.
- CAD-work in the car industry.
- Visional work of ophthalmic surgeons and dentists.
- etc.

R e c o m m e n d a t i o n s

1. Analysis of the problems: symptomatology, complaints
2. Ergonomic evaluation and adjustment of the workplace
3. Evaluation of the environmental conditions, i.e. thermal climate
4. Selected environmental measurements
5. Evaluation and adjustment of the lighting conditions and concomitant sensory situation
6. Evaluation of the relevant personal characteristics, e.g. “contact lens user”, medication, etc.
7. Optometric measurements and adequate intervention
8. Precorneal tear film measurements and assessment
9. Integral assessment
10. Cost-benefit assessment (extended accountability analysis etc.)

Better cooperation

Encouragement of **problem-oriented** and **pertinent cooperation** of occupational physicians – both general and case-centred - with

- ▣ ophthalmologists,
- ▣ optometrists,
- ▣ occupational hygienists,
- ▣ indoor air scientists,
- ▣ ergonomists ,
- ▣ safety engineers,
- ▣ software specialists and
- ▣ the procuring department of the enterprise.

Summary: four important questions

- ▣ What can the company do to resolve the problem (e.g. regulation of the climatic or lighting conditions)?
- ▣ What can the employee do?
- ▣ Which "prosthetic aid" (e.g. spectacles) will support the workplace-specific role?
- ▣ What can the enterprise learn from this particular case?

Einstein had postulated that science must explain reality, not merely explain our knowledge about it.

I apologize for only talking about our knowledge on vision at work.