

# **Ergophthalmology**

## **- Curriculum for Occupational Physicians<sup>1</sup>-**

Horst Mayer, Sweden, Rolf Breitstadt, Germany, Helga Hahn, Austria  
Gunnar Horgen, Norway, Ellen Kraus - Mackiw, Germany, Uta Müller, Germany, Mordechai  
Rosner, Israel, Bruno Seiffert, Switzerland

Within one single generation the world population has mutated into an information processing and knowledge society. The proportion of highly demanding visual tasks at work is increasing, whilst during the whole ontogenetic process of mankind far vision was of predominant importance. Nowadays computers dominate the working world. Critical factors in visual tasks are among others near vision, sustained accommodation and binocular functions. Mismatch of ergophthalmological requirements and visual conditions at work are responsible for visual complaints and a reduced work performance. The optimal fit of visual tasks to the needs of man has therefore to be considered not only as a health problem but also as an important economic factor.

Ergophthalmology (including Visual Ergonomics) is one among many other topics in the education of occupational physicians. Nevertheless, considering the proportion of visual tasks in today's work, it has received little attention. As a consequence, occupational physicians ask specialists such as optometrists or ophthalmologists to help optimizing workplaces with highly demanding visual tasks. However, not everywhere<sup>2</sup> such specialists are necessarily aware of particular requirements at work or methods essential for occupational medicine.

Whilst the amount of visually highly demanding workplaces is increasing continuously, the average age of the workforce is increasing too. So it is necessary to give more importance to Ergophthalmology / Visual Ergonomics in the education of occupational physicians in order to ensure an efficient optimization of visual conditions at work, which likewise fit individual needs and performance of visual work. An orientation towards the special requirements of an ageing workforce will also lead to better working conditions for younger employees.

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<sup>1</sup> To be presented at the 29th ICOH International Congress, Cape Town, 2009.

<sup>2</sup> Excellent conditions are found in the Scandinavian countries.

Additionally we see that areas of visual work are prime examples for the inseparability of disease and injury prevention and the fostering of health and quality of life at work. In this course we will show that the problems of visual work can only be solved and/or avoided if both the individual and the working conditions are supported.

We therefore have conceptualized a curriculum “Ergophthalmology for occupational physicians” mainly consisting of the following blocks:

1. The extreme sensorimotor complexity of vision:  
(from classical Physiology and Ophthalmology to Quantum Theory and Psychology of Perception).
2. Classical Occupational Medicine of the eyes:  
Risks, injuries and diseases of the eyes with relationship to working conditions and tasks: chemical, physical and microbial agents, eye stressors, noxious visual targets (analogue the first paper of the Scientific Committee ‘Work and Vision’).
3. Consequences of a bad match between system and individual resources:  
The different areas of reaction (direct, indirect, compensatory etc.) and their interrelations; the role of posture: vision and the spine; asthenopic complaints, musculoskeletal pain; clustering methods and their relevance.
4. Optimization of the man-machine interface with regard to both aspects: quality of life and performance:  
Examples of visual work: Computer work; quality control (conveyor belt control) in production; assembling: sewing, jewellery, watch production; film and TV production; earthbound, aerospace and sea traffic; medicine: dentists, ophthalmologists and surgeons etc.. The roles of classical ergonomics, software ergonomics and psychoergonomics.
5. Ergophthalmologic problems: chances for solutions:  
It is our intention to show by these examples how complex the individual situation in performing visual work can be and that simple tests are no guarantee for success. In most problems only a program consisting of three steps leads to satisfying results (G. Horgen):
  1. Analysis of the problem: complaints and ergonomic evaluation plus adjustment of the workplace.
  2. Evaluation and adjustment of the lighting conditions and concomitant sensory situation.
  3. Optometric measurements and adequate intervention.
6. Analysis of the problem: complaints, visual demands and ergonomic evaluation:

Standardized complaints (and health) questionnaires; static and dynamic properties of directions of gaze, visual distances, nature and size of objects, light and lighting (qualities of light, colour temperature, lighting strength, light density, shadow formation), contrasts, size of symbols, characters and details; methods of assessing the workplace and work demands, cognitive costs.

7. Evaluation and adjustment of the lighting conditions and concomitant sensory situation:

8. Optometric measurements and evaluation of visual performance:

Myopics, hyperopics, anisometropics, heterophorics and heterotropics, vision when dazzled, contrast vision, adaptation, colour vision, refraction and accommodation (accommodation width and pathodynamics), binocular cooperation, processing of visual information, validity and reliability of measurement techniques and parameters. Supplementary examinations.

7. Visual aids:

Theoretical understanding of spectacles, contact lenses, work spectacles, status post lens implantation and refractive corneal surgery, magnifying glasses, binoculars.

8. Special topics:

▪ Psychology of visual perception

▪ The ageing workforce

Presbyopia: ageing eyes need examinations of at least medium intervals to detect changes of the vitreous body, retinal alterations or degenerative macular processes, to name only a few. Each employee over 50 with concentrative visual work tasks is a candidate for spectacles in order to give him/her a chance to work under visual conditions comparable with the ones a colleague of 30 years of age has. Decisions for work-spectacles even in aged employees are dependent on tasks and working environment. Multi- or monofocals?

▪ Working with chronic problems and diseases of the eyes (Inflammations, allergies, cataract, etc.)

▪ Visual work of employees with reduced capabilities, handicaps and chronic diseases

Diabetics, epileptics, insufficiency of kidneys, hypertensives, people suffering from rheumatic diseases, ....

▪ Circadian variation and stress reactions of the organ of sight

▪ Dry eyes

▪ VDU based tests for VDU workers

9. Cooperations and what we should know to make them efficient:

Which questions can an occupational physician ask ophthalmologists or optometricians, and how must the answers be structured to have practical consequences at the workplace? The legal situation in the various countries. Cooperation with ergonomists and occupational safety personnel; cooperation with the software and the procuring department of the enterprise.

A 'visually healthy' worker in a properly ergonomic workplace carrying out tasks that are suited to normal human vision will not pose a problem of industrial medicine, or at least very rarely in today's working reality. With - among other things - the increasing problem of an ageing working population, it is becoming clear that there is now a need to act. Even if the effect is only to help the works doctor and the ophthalmologist to work together more efficiently.

In most functional problems of vision at work we have to ask these four questions:

- What can the company do to resolve the problem?
- 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?