European Optical Society

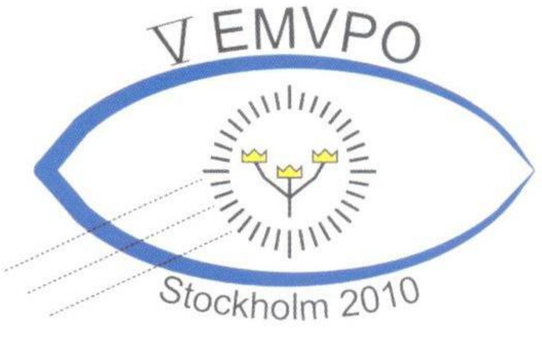
Coherence for Europe ®

EOS Topical Meeting:

5th European Meeting on Visual and Physiological Optics (EMVPO)

22 - 24 August 2010, Royal Institute of Technology, KTH, AlbaNova, Stockholm, Sweden

FINAL PROGRAMME



SESSIONS

- Eye models and IOL design
- Optical Coherence Tomography
- Aberrometry and aberrations
- Novel instrumentation and methodologies
- Peripheral vision and image quality
- Retinal cone function
- Aberrations and vision
- Adaptive optics and retinal imaging

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SOS Svenska OptikSällskapet Swedish Optical Society Branch of the European Optical Society

Contents

Programme at a glance

Saturday, 21 August

16:00 - 17:00 SOCIAL PROGRAMME REGISTRATION
in front of the VASA museum

17:00 AFTERNOON- PROGRAMME
VISIT TO VASA MUSEUM

Sunday, 22 August

08:00 - 09:30 REGISTRATION

09:30 - 09:45 WELCOME
By Hans Hertz, Peter Unsbo & Linda Lundström,
KTH - Royal Institute of Technology (SE)

09:45 - 10:30 **INVITED TALK**
Eye models and model eyes
Sverker Norrby

10:30 - 11:00 Coffee break

11:00 - 12:30 **EYE MODELS AND IOL DESIGN**

12:30 - 13:00 **KEYNOTE TALK**
Thomas Young's contributions to physiological optics
David A. Atchison

13:00 - 14:00 Lunch break

14:00 - 15:00 **POSTER SESSION I**

15:00 - 16:00 **OPTICAL COHERENCE TOMOGRAPHY**

16:00 - 16:30 Coffee break

16:30 - 17:30 **ABERROMETRY AND ABERRATIONS**

17:30 - 18:30 **DISCUSSION**
Night myopia: a classic revisited
Pablo Artal

Monday, 23 August

09:15 - 10:30 **NOVEL INSTRUMENTATION AND METHODOLOGIES**

10:45 - 11:15 Coffee break

11:15 - 12:45 **PERIPHERAL VISION AND IMAGE QUALITY**

12:45 - 21:30 EXCURSION
Lunch and guided tour at the Stockholm City Hall (invited by the City of Stockholm)

15:30 Group photo at the Stockholm City Hall

16:00 Walk through the Old Town

17:30 Excursion to the archipelago

CONFERENCE DINNER

Dinner talk by *Krister Inde*

Tuesday, 24 August

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Evolutionary history of the human eye
Ronald H. H. Kröger

09:45 - 10:30 **RETINAL CONE FUNCTION**

10:30 - 11:00 Coffee break

11:00 - 11:30 **KEYNOTE TALK**
Light-tissue interaction in the retina
Erez N. Ribak

11:30 - 13:00 **ABERRATIONS AND VISION**

13:00 - 14:00 Lunch break

14:00 - 15:00 **POSTER SESSION II**

15:00 - 15:30 **ADAPTIVE OPTICS AND RETINAL IMAGING**

15:30 - 16:00 **KEYNOTE TALK**
In vivo two photon imaging of macaque retina
David R. Williams

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16:30 - 17:15 **ADAPTIVE OPTICS AND RETINAL IMAGING**
(continued)

17:15 - 18:15 **DISCUSSION**
Measuring refractive state and optical quality of the eye across the visual field
Larry N. Thibos

18:15 Farewell

NOTES

Poster presentations

Poster Session I: Sunday, 22 August, 14:00 - 15:00 | Poster Session II: Tuesday, 24 August,14:00 - 15:00

EMVPO 2010_3078_015 **Clinical reference of the objective performance of emmetropic eyes**
E. Tepichín[1], E. López-Olazagasti[1], M. A. Rosales[2], A. S. Cruz-Félix[1], L. Morales-Téllez[2], [1]Instituto Nacional de Astrofísica, Óptica y Electrónica (MX), [2]Universidad de las Américas Puebla, Departamento de Física y Matemáticas (MX)

EMVPO 2010_3079_016 **Astigmatism and pseudoaccommodation in pseudophakic eyes**
P. M.. Serra, M. J. Cox, C. M. Chisholm, University of Bradford, Bradford School of Optometry and Vision Science (UK)

EMVPO 2010_3080_017 **New designs of refractive multifocal intraocular lenses. Optical quality assesment**
L. Remón[1], J. A. Monsoriu[1], C. Casanova[2], W. D. Furlan[2], [1]Centro de Tecnologías Físicas, Univ. Politécnica de Valencia (ES), [2]Departamento de Óptica, Universidad de Valencia (ES)

EMVPO 2010_3082_018 **The algorithm of the wave aberration function recovery from images of pupil isodiopter zones**
I.. H. Chyzh, N. B. Afonchyna, T. M. Yakimenko, National Technical University of Ukraine 'Kyiv Polytechnic Institute' Optical and optoelectronic devices department (UA)

EMVPO 2010_3086_019 **A new method for tracking the accommodation and the 3D position of the eye**
P. P. Monticone, M. Menozzi, Technology and Innovation Management, ETH Zurich (CH)

EMVPO 2010_3088_020 **Modelling changes to optical properties of the eye in patients after the LASIK surgery**
E. A. Szul-Pietrzak[1], A. Hachoł[1], E. Pelczar[2] ,
[1]Wroclaw University of Technology, Group of Biomeasurements and Biomedical Signals Analysis (PL), [2]Eye Laser Centre (PL)

EMVPO 2010_3130_021 **Influence of age on peripheral aberration**
K. Baskaran, B. Theagarayan, S. Carius, J. Gustafsson, School of Optometry, Linnaeus University (SE)

EMVPO 2010_3136_022 **Numerical analysis of IOL position sensitivity against refraction errors**
H. Guo, A. Goncharov, C. Dainty, Applied Optics Group, School of Physics, National University of Ireland (IE)

EMVPO 2010_3137_023 **Zernike and Bessel circular functions in visual optics**
J. P. Trevino-Gutierrez[1], S. Chavez-Cerda[1], R. Iskander[2], Fan Yi[2], [1]Instituto Nacional de Astrofísica, Óptica y Electrónica (MX), [2]QUT. Faculty of Health, School of Optometry. QLD (AU)

EMVPO 2010_3138_024 **Simulating retinal vascular disorders by imposing different types of higher-order aberrations on retinal images**
V. Karitans[1], M. Ozolinsh[1,2], [1]Institute of Solid State Physics, University of Latvia (LV), [2]Department of Optometry and Vision Science, University of Latvia (LV)

EMVPO 2010_3139_025 **Eye movements in myopes and non-myopes for near vision tasks**
A. Hartwig, E. Gowen, W. N. Charman, H. Radhakrishnan, Faculty of Life Sciences, Moffat Building, University of Manchester (UK)

EMVPO 2010_3142_026 **Comparative study of optical quality and intraocular scattering parameters between healthy young and adult population**
J. Martínez-Roda[1], J. C. Ondategui-Parra[1], M. Vilaseca[2], J. Pujol[2], [1]Technical University of Catalonia, University Vision Centre (ES), [2]Technical University of Catalonia, Centre for Sensors, Instruments and Systems Development (ES)

EMVPO 2010_3150_027 **Comparison of accommodative response measurements with double pass and Hartmann Shack techniques.**
M. Aldaba, M. Arjona, M. Vilaseca, J. Antó, J. Pujol, Universitat Politècnica de Catalunya (ES)

EMVPO 2010_3139_025

EYE MOVEMENTS IN MYOPES AND NON-MYOPES FOR NEAR VISION TASKS

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Summary
The present study aims to analyse head and eye movements in myopes and nonmyopes for near-vision tasks. Eye and head movements in myopes were not found to be significantly different from non-myopes. However, significant differences were found in eye movements for different near tasks.

Introduction
Myopia affects a significant number of the individuals around the world. So far, reasons for myopia development and progression remain unclear. Some studies show high prevalence of myopia in certain occupational groups [1-3], which might imply that certain head and eye movements lead to ocular elongation, perhaps as a result of forces from the extraocular muscles, lids or other structures. On the basis of these findings, the present study analysed head and eye movements in a cohort of 30 young adults. The group included 14 myopes (SE between –6.86 D and –0.60 D; mean: -1.59 ± 1.50 D) and 16 non-myopes (SE between –0.50 D and +1.50 D; mean: +0.18 ± 0.50 D). Eye and head movements were monitored by an eye tracker and a motion sensor while the subjects performed three near tasks, which included reading on a screen, reading a book and writing. Horizontal eye and head movements were measured in terms of amplitudes. Vertical eye and head movements were analysed in terms of the range of the whole movement during the recording. All values were also assessed as a ratio based on the width of the printed text, which changed between participants due to individual working distances.

Discussion
The values of eye and head movements were comparable to a previous study [4]. Horizontal eye and head movements were significantly different between the three tasks ($p = 0.03$ and $p= 0.014$, for eye and head movements respectively, repeated measures ANOVA). Horizontal and vertical eye and head movements did not differ significantly between myopes and non-myopes. As expected eye movements preponderate over head movements for all tasks and in both meridians. A correlation between spherical equivalent and the working distance for reading a book was found ($p=0.025$). However, no significant differences between myopes and nonmyopes.were found in eye and head movements.

Conclusions
The results show similar pattern of eye movements in all the participants included in the study, although the amplitude of these movements varied considerably between the individuals. It is likely that some individuals when exposed to certain occupational tasks might show different eye and head movement patterns.

References
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[2] B. Simensen and L.O. Thorud, *Acta Ophthalmol (Copenh)*, **72,** p. 469-71, 1994.
[3] R. Zylbermann, D. Landau, and D. Berson, *J Pediatr Ophthalmol Strabismus*, **30,** p. 319-22, 1993
[4] Y. Han, et al., *Invest Ophthalmol Vis Sci*, **44,** p. 145-53, 2003.

EMVPO 2010_3142_026

COMPARATIVE STUDY OF OPTICAL QUALITY AND INTRAOCULAR SCATTERING PARAMETERS BETWEEN HEALTHY YOUNG AND ADULT POPULATION

J. Martínez-Roda[1], J.C. Ondategui-Parra[1], M. Vilaseca[2], J. Pujol[2].
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[2] Technical University of Catalonia, Centre for Sensors, Instruments and Systems Development, Terrassa, 08222, Spain
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Summary
We evaluated the normal values of optical quality (OQ) and intraocular scattering (IS) provided by a double-pass system of two healthy groups of young and adult population.

Introduction
We evaluated and compared the retinal image quality and CSF of 181 eyes (of 107 healthy young subjects (YPG)) and 112 eyes (of 77 healthy adult subjects (APG)). Their best spectacle-corrected visual acuity (BSCVA) was 20/20 or better assessed with a standard logMAR chart. Retinal images were measured with a clinical double-pass instrument (OQAS, Visiometrics, Spain) [1][2] with a pupil diameter of 4 mm. Normal values for several parameters related to the OQ of the eye (MTF, Strehl^{2D} ratio and OQAS values (OV) at contrasts 100%, 20% and 9%) [3] and to the IS (Objective Scatter Index, OSI) [4] were obtained from the double-pass images. CSF was measured with a CSV-1000 test (Vector Vision, Greenville, OH).

Discussion
Mean ages [Mean ± SD (range)] were of 22.47 ± 3.04 (19 to 30 yr.) for the YPG and 44.06 ± 7.64 (31 to 60 yr.) for the APG. 43.92% in YPG and 47.30% in APG were men. No statistically significant differences were found between the two groups (YPG/APG) for the mean values of the following OQAS parameters: MTF cutoff (cpd) 44.54/44.48 ($p=0.708$) and OV 100% 1.48/1.48 ($p=0.792$). However, statistically significant differences between the two groups were found for the values of the following parameters: OV 20% 1.58/1.51 ($p=0.043$); OV 9% 1.64/1.46 ($p<0.001$); Strehl^{2D} ratio 0.27/0.24 ($p<0.001$) and OSI: 0.38/0.60 ($p<0.001$).

Conclusions
No difference in optical quality for high contrast is seen between the young and adults up to 60 years old, although a decrease for low contrasts is seen in adults. In addition, intraocular scattering increases significantly in adults. However, contrast sensitivity does not undergo such a decrease

References
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[3] Vilaseca et al., J Refr Surg., 25, 689, 2009.
[4] Alcón et al. ARVO Ann. Meeting, 8821/B559, 2007.

EMVPO 2010_3150_027

COMPARISON OF ACCOMMODATIVE RESPONSE MEASUREMENTS WITH DOUBLE PASS AND HARTMANN SHACK TECHNIQUES.

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Summary
In our aim of measuring accommodative response with a double pass system, we found differences with other existing methods. In this work we studied if those differences can be attributed to measuring the accommodative response based on retinal image quality and not on defocus.

Introduction
In previous works we developed a method for measuring accommodative response with a double pass system based on retinal image quality, and we found lower lags of accommodation than the previously published using other methods [1]. We also compared the double pass results with those obtained by means of an aberrometer and an autorefractometer in the same patients, and lower lags when measuring with the double pass technique were found too [2].

In the last years it has been suggested that defocus or retinal image quality based accommodative response measurements could provide different results [3]. In order to verify this hypothesis, we built a laboratory setup that combined a double pass system and a Hartmann-Shack aberrometer. We measured accommodative response in the range from 0 to 4D in 10 young adults with a mean age of 28.4 years ± 2.7 (SD) with both techniques simultaneously and compared the obtained results.

Discussion
The comparison of preliminary results achieved by means of the double pass system and the aberrometer, based on the defocus, highlighted a mean difference of 0.3D, although they were reduced to less than 0.1D when we used the retinal image quality based method for the aberrometer instead of the defocus one.

Conclusions
Simultaneous Hartmann Shack and double pass accommodative response measurements, with reduced differences when comparison is based on retinal image quality, could show the validity of our system.

References
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[2] M. Aldaba, and J. Pujol, EMVPO, 2008.
[3] T. Buehren, and M.J. Collins, Vision Research, 46, 1633,2006.

EMVPO 2010_3152_028

THE EFFECT OF GLARE ON BINOCULAR VISION

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Summary
The aim of the study was to investigate if binocular vision is affected by glare while performing tasks on a computer. The effect on binocular vision was evaluated by the use of a computerized fixation disparity test. Based on preliminary results slight glare from a window (directly behind the observer), a lamp (in front), ceiling lighting, and a desktop lamp (to the right) had no effect upon binocular vision.

Introduction
High luminance levels in the field of view create glare discomfort [1]. Asthenopia is one of the major subjective symptoms. This is a well-known phenomenon, however the physiological basis for glare discomfort is not known [1]. Luminance ratios has been established in American National Standard Institute, Report No ANSI/IESNA RP-1-1993. The luminance ratio between the central task and the immediate visual surroundings (within a radius of 25 degrees) should not exceed 3:1. The luminance of a computer display is 80-120 cd/m^2. Suggested luminance level in an office environment is 400 cd/m^2. The presence of fixation disparity (FD) often indicates that binocular vision is under stress and FD is a useful diagnostic tool because it is related to fusional convergence effort. Stress associated with the use of fusional convergence can result in asthenopia [2].

Discussion
A previous study showed that blur had a strong effect on fixation disparity and became more exophoric [3]. Considering the working environment, blurred image can arise from reflected glare [1]. In the present study luminance levels had a range of 400-2000 cd/m^2, however, preliminary results indicate that slight glare resulting from our luminance sources did not stress binocular vision.

Conclusions
Slight glare, caused by light reflection from a window, ceiling lighting, and a desktop lamp was not found to effect binocular vision in this study.

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[2] Goss, D. A. Ocular accommodation, convergence, and fixation disparity: a manual of clinical analysis (2nd Ed.). Butterworth-Heinemann. 1995; 67-75.
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