

Friday, October 26

Posters are available 10:00 AM – 5:00 PM

Posters are displayed for the entire poster session from 9:00am to 5:00pm

Posters taken down between 5:00 and 5:30pm

Authors of ODD numbered posters present from 10:00am to 1:00pm

Authors of EVEN numbered posters present from 2:00 to 5:00pm

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Topics

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Macular Pigment

Color Vision

Electrophysiology

Reading Eye Movement, etc.

Low Vision

Optics and Refraction

Miscellaneous

1. THE AUSTRALIAN COLLEGE OF OPTOMETRY (ACO) "CLOSING THE GAP" IN INDIGENOUS EYE CARE (125913)

Jonathan A. Jackson, Sarah L. Hosking, Timothy R. Fricke, Genevieve A. Napper, PhD, MPH, MScOptom, The Australian College of Optometry, Jimi Peters, Victorian Aboriginal Community Controlled Health Organisation, Mitchell D. Anjou, MScOptom, FACO, University of Melbourne

RESULTS: Organisational commitment and building an experienced team of optometrists and support staff have been integral to improving services. Our first clinic in an ACC space opened in 1998. Eye care is now available at 19 ACC sites and we facilitate integrated care at 24 mainstream sites. The number of eye exams we provide to Aboriginal people has increased from 278 in 2006 to 1388 in 2011. Qualitative outcomes have been positive. Federal and State government funding for VASSS and new clinics have been major catalysts to improved services.

PURPOSE: The prevalence of blindness in Aboriginal Australians is 6.2x higher than in non-Aboriginal Australians. 94% of vision loss in Aboriginal communities is preventable or treatable. Cataract (32%) and diabetic retinopathy (9%) are major causes of blindness, while uncorrected refractive error (54%) and cataract (27%) are major causes of low vision. Only 35% of Aboriginal adults have ever had an eye examination. This paper outlines the solutions to accessibility and under-utilization offered by the ACO and its partners.

METHODS: As the result of a statewide population mapping exercise (1990s) the ACO established clinics in Aboriginal Community Controlled (ACC) spaces and supported local optometric involvement in Aboriginal eye care. Community feedback indicated that the cost of spectacles was a barrier, and resulted in government funding the Victorian Aboriginal Spectacle Subsidy Scheme (VASSS), which facilitates delivery of glasses for \$10. Internal and external evaluations of the outcomes are presented.

CONCLUSIONS: The ACO has demonstrated that by working in partnership with Indigenous communities and strategically removing known barriers to care it is possible to dramatically increase access to eye care services. The rapid growth in VASSS illustrates that culturally appropriate and community supported services can address some of the challenges identified in "Closing the Gap".

ADDITIONAL COMMENTS: Napper, Fricke, Hosking, Jackson (Australian College of Optometrists) Peters (Victorian Aboriginal Community Controlled Health Organisation)

2. PREVALENCE OF PRESBYOPIA AND NEAR VISION IMPAIRMENT IN THE POPULATION OVER 34 YEARS OLD IN NICARAGUA, CENTRAL AMERICA (125013)

Larry A. Hookway, OD, BS, Optometry Giving Sight, Prasidh Ramson, BOptom, Luis Carballo, MD, MPH, Kovin S. Naidoo, OD, PhD FAAO, Brien Holden Vision Institute

RESULTS: 1303 subjects were examined, 57.9% were female and the overall mean age was 54.1 years. 86.2% reported that they did not own spectacles. 58.9% had uncorrected binocular VA's that were equal to or worse than 20/40 at distance. 91.5% had near VA's equal to or worse than 20/40. Presbyopia was defined as uncorrected near vision equal to or worse than 20/40. The prevalence of presbyopia in this group of subjects was 91.5%. The unmet need was 84.8%. Autorefractor data indicated that the majority of subjects were low hyperopes with small amounts of astigmatism (mean +.999 sphere and -.93 cylinder). Of those examined 9.7% did not require spectacles, 41.1% were given reading only, 40.4% bifocals and 4.4% distance only spectacles.

PURPOSE: Uncorrected presbyopia is known to cause limitations in activities of daily living and negatively affects productivity. Very little population-based data has been reported about Nicaragua or other Latin American countries.

METHODS: Population-based household samples were selected through random cluster sampling. All enumerated household members over the age of 34 were offered free visual screenings and those with uncorrected visual acuity (VA) worse than or equal to 20/40 in either eye at distance or near were offered free eye examinations and free spectacle correction. The examination included uncorrected and presenting monocular and binocular VA's at 4 meters and 40 cm, lensometry, autorefraction, refraction, and best corrected VA's at distance and near.

CONCLUSIONS: Presbyopia is highly prevalent in Nicaragua and the vast majority of the population over the age of 34 do not have the necessary spectacles. Interventions should include improving availability of simple reading glasses and training local eyecare providers.

ADDITIONAL COMMENTS: This study was designed by a committee of the World Health Organization conducted by VOSH International and ICEE with a grant from Optometry Giving Sight.

3. EYE DISEASE AND VISUAL IMPAIRMENT AMONG HISPANICS LIVING IN SOUTH TEXAS (125022)

Narges Kasraie, OD, Roya Attarhousseini, BS, Noah Kasraie, MS, MBA, PhD, The University of the Incarnate Word Rosenberg School of Optometry

BACKGROUND: Recent studies have found that Latinos living in the US have high rates of eye disease and visual impairment and a significant number may be unaware of their eye disease. In fact Latinos suffer from various eye diseases more than other ethnic groups in the nation. Unfortunately researchers have not been able to fully explain the reasons that are causing these widespread phenomena. According to the 2010 US Census Bureau, Hispanics or Latinos constitute more than sixteen percent of the total United States population and are the second largest ethnic group, after non-Hispanic White Americans. The US Census estimates that in the year 2050, the Hispanic/Latino population will number more than 98 million people, or 24.3% of the total population.

CASE REPORT(S): The purpose of this quantitative study is to investigate the most common eye diseases and visual impairments among the Hispanic population living in South Texas. This study aimed to answer the following questions: (1) What are the most common eye diseases and visual impairments reported among the Hispanics/Latinos living in South /Texas? (2) Is there a statistically significant difference between eye diseases and visual impairments of Hispanic/Latinos and other ethnic groups in South Texas? This study utilized a correlational design. A sample of 250 was randomly chosen from past records of patients that have visited a vision clinic in the past one year. 145 Hispanic participants and 105 Non-Hispanic participants

CONCLUSIONS: Hispanics have higher rates of refractive error than non-Hispanics. Sixty percent of the Hispanic participants had refractive error at least in one eye. Even though we did not find a statistically significant difference between Hispanics and Non-Hispanics for Glaucoma, Cataracts, Age-related Macular Degeneration and Diabetic Retinopathy; however, the Hispanics in our study had higher rates than non-Hispanics for these ocular diseases.

4. **RAISING EYE CARE AWARENESS THROUGH WORLD SIGHT DAY AND WORLD OPTOMETRY DAY (125179)**

Lakshmi Shinde, OD, International Centre for Eyecare Education, Aditya Goyal, BOpt, MOptom, Rajesh Wadhwa, BOpt, MOptom, Prema Chande, BOpt, MOptom, Yogita Rajgandhi, BOpt, Vivek Mendonsa, BOpt, Rajbir Berwal, DOA, Courtney Holden

BACKGROUND: The Indian Optometry Federation (IOF) in partnership with Association of Schools and Colleges of Optometry India (ASCO) and Optometry Giving Sight (OGS) campaigned to raise public awareness of eyecare and optometry in India.

CASE REPORT(S): Two occasions were identified by IOF and ASCO as key vehicles to raise awareness of eye care and optometry. World Sight day (13th October 2011) date) was supported as a health promotion campaign and the World Optometry day (23rd March 2012) to raise awareness of the roles, responsibilities of optometrists as a primary eye care providers. For World Sight Day, 1500 banners and posters were distributed across India to encourage the public to have regular eye exams. Screening camps were arranged by local optometry associations, optometry institutions and schools. For World Optometry Day, IOF and ASCO prepared a presentation on common eye ailments and an optometrist being the primary eye care provider and were delivered by optometrists to the public. These presentations were made available in flip chart format, with 75 flip charts distributed across India. On World Sight Day, 12870 people were screened and

571spectacles were provided by Essilor India. World Sight day message featured in 15 newspapers, both national and local. World Optometry Day message was featured in 5 newspapers and 92 presentations conducted.

CONCLUSIONS: Initiatives such as World Sight Day and World Optometry Day are important events in providing services and also raising the awareness of eye care among the public. It informs the public of the importance of optometry as part of the eye health team.

ADDITIONAL COMMENTS: The projects were conducted through a grant from Optometry Giving Sight (OGS)

5. A PILOT OPTOMETRY SERVICE IN GENERAL OUTPATIENT CLINIC (GOPC) IN HONG KONG (125256)

Rita Sum Wing Man, BScOpt(Hons), FAAO, The Hong Kong Polytechnic University School of Optometry

RESULTS: 1030 patients were seen in the optometry service from September 2010 to January 2012. Blurry vision (78%) was the most common symptom, but 60% of these patients had uncorrected refractive error. Only 12% of patients who attended for cataract assessment required surgery. Overall, 129 out of the 1030 patients (12.5%) were referred to ophthalmologist. 80% referred cases concurred with ophthalmologist diagnosis, including cases of significant cataract, glaucoma and macular degeneration. 14% of cases had partially agreement. There was disagreement in 6% of the cases. They included a case of false positive diagnosis of retinal vascular occlusion. During the 3-month study period in 2010 and 2011, patients presented with eye symptoms accounted for 2.6% and 3.1% of the consultations. After implementation of the optometrist service, referral rate to ophthalmologist significantly decreased from 36.2% to 23.5%.

PURPOSE: Review the referral agreement of the optometry service to compare referral rate to ophthalmologist before and after implementation of optometry service.

METHODS: An optometrist-led service was set up in 2010. Six GOPCs in Hong Kong referred patients with chronic eye symptoms to the service. The service included measurement of vision, anterior and posterior segment assessment and intraocular pressure measurement. Diagnoses made by the optometrist were compared with ophthalmologists in hospital. The agreement of the diagnosis was categorized as 'Agree', 'Partially agree' and 'disagree'. To evaluate the referral rate before and after implementation of optometry service, data were extracted from June to August 2010 (three months prior to availability of optometry service) and June to August 2011 (one year after implementation of service).

CONCLUSIONS: The results show that the number of eye specialist referral was reduced after implementation of the optometry service. The considerable agreement of diagnoses among the referred cases was comparable with overseas findings. With good collaboration with family physicians, optometric care can be enhanced in the community.

6. ESTABLISHING A COMMUNITY OUTREACH REFRACTION CLINIC PROGRAMME AT QUIHA EYE HOSPITAL, TIGRAY, FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA (125282)

Karen N. Sparrow, BSc, MCOptom, FAAO, Nuranyi Mehamedhagos Nuruhsyen, BSc (Optometry), Lucy Jenkins, BA (Hons), Vision Aid Overseas, Victoria Cox, BA, MA, Vision Aid Overseas, Tilahun Kiros, MD, MSc (Ophthalmology), Mekele, Ethiopia

BACKGROUND: Refractive error in Ethiopia has been identified as the fourth major cause of blindness (7.8%). The Ministry of Health has identified a shortage of trained eye health personnel and a limited infrastructure for eye health. Vision Aid Overseas has installed a Vision Centre and delivered refraction training for 15 personnel at the new Quiha Eye Hospital, Tigray. The hospital currently runs small refraction clinics daily onsite and is now in a position to establish community refraction clinics.

CASE REPORT(S): Outreach clinics were scheduled to train local hospital staff to set up and direct clinics in an unfamiliar environment away from their base hospital, collect data and dispense spectacles. 652 patients were examined in 4.5 days. 29% had moderate visual impairment and 16% severe visual impairment/blindness. 27% were found to need distance correction, 39% near correction. 11% of patients were referred for further ophthalmological investigation. 237 pairs of spectacles were dispensed or ordered from the Vision Centre. Prior to the programme the resident Optometrist averaged 7 refractions per day. During the programme she achieved 33 refractions per day. The Vision Centre averaged 216 pairs of spectacles produced per month prior to the project and 279 per month in the 3 months since the project. The hospital optometry team are now proficient at running community outreach refraction services and will be able to set up an ongoing programme for refraction service delivery across their region.

CONCLUSIONS: Establishing community outreach programmes results in a sustained increase in capacity and long term improvement in eye care provision for the region in an integrated, sustainable manner in line with Ethiopia's National Eye Care Plan.

ADDITIONAL COMMENTS: This programme was made possible with funding from Vision Aid Overseas, a UK registered charity, and the support of the staff of the Quiha Eye Hospital, Tigray, and the Ethiopian Ministry of Health.

7. PREVALENCE OF POST CATARACT SURGERY COMPLICATIONS AND THEIR MANAGEMENT AT TWO MAIN HOSPITALS IN MALAWI (125292)

Meng Meng Xu, OD, FAAO, Samuel Chagwadira, International Centre for Eyecare Education

RESULTS: At day one post-op, 68% of patients had complications. The most prevalent was increased IOP (57%), followed by increased IOP with corneal edema (9%), wound leak (1%) and other (1%). At day two post-op, the complication rate was 70% with increased IOP with corneal edema as the most prevalent (39%), followed by increased IOP alone (25%), iris prolapse (2%), wound leak and anterior uveitis. Only 10% and 11% of patients returned for the two week and one month follow respectively. The most commonly seen complications of these, were peripheral corneal edema, suture induced astigmatism and chronic uveitis. The visual acuity taken prior to surgery revealed that 51% of patients had a vision of hand movement and worse. At day two post-op, 72% of patients had a vision of 6/36 and better. The post-op visits were managed by ophthalmic clinical officers and ophthalmic nurses.

PURPOSE: Cataract is a major cause of blindness in developing countries. Even if access to appropriate care is a major factor, little is known about the outcome of cataract surgery in Sub-Saharan African nations for those who do receive care. The purpose of this study is to determine the prevalence of post-cataract surgery complications, their management and the visual outcome, at two main hospitals in Malawi.

METHODS: The complications and their management were assessed retrospectively, with a sample of 400 extra-capsular cataract extraction surgery patients' record cards, seen between 2010 and 2011 at Kamuzu Central Hospital Lions Sightsavers Eye clinic and Nkhoma Hospital.

CONCLUSIONS: The rate of post-operative cataract surgery complications is high. There is however significant improvement in visual outcomes immediately following surgery. Due to the low return rates, the long term visual benefits could not be studied. The introduction of refractive services by optometrists could help improve compliance to follow up schedules and further improve visual outcome.

ADDITIONAL COMMENTS: This study is conducted as part of an optometry program co-founded by ICEE, OGS and Sightsavers at Mzuzu University, Malawi.

8. A PROFILE OF CATARACT PATIENTS: RESULTS OF A RAAB STUDY IN KWA-ZULU NATAL, SOUTH AFRICA (125553)

Kovin S. Naidoo, OD, PhD, FAAO, Brien Holden Vision Institute

RESULTS: Cataract was the major cause of bilateral blindness (55.2%) and severe visual impairment (53.3%). Of those patients diagnosed with bilateral cataract, 61.5% were unaware of treatment whilst 15.4% felt that nothing should be done about it as it was age-related. For those patients with previous cataract surgery, 73.5 % had their operations at a government hospital with 88% very satisfied with the results. The uptake of cataract surgical services is as reflected in the prevalence of aphakia and pseudophakia and cataract surgical coverage being 1.59 % and 37.3 % respectively.

PURPOSE: Age-related cataract is the leading cause of preventable blindness in the developing world. As such, there is an urgency to prevent or delay cataract formation, as well as treat those already identified. This study, using results of a Rapid Assessment of Blindness (RAAB) methodology, provides a profile of cataract patients in the northern eThekweni district of Kwa-Zulu Natal province, South Africa.

METHODS: Rapid Assessment of Avoidable Blindness (RAAB) is a methodology to conduct a population based survey of visual impairment among people aged 50 years and over. Thirty three clusters of 50 subjects, 50 years and older, in the Phoenix, Inanda, Ntuzuma and KwaMashu (PINK) area were randomly selected by compact segment sampling. 1542 consenting subjects underwent enumeration and a clinical examination. For those identified with cataracts and/or having previous cataract surgery, investigation into barriers to cataract surgery, visual outcome and patient satisfaction was conducted.

CONCLUSIONS: This study shows that cataracts are the leading cause of avoidable blindness in persons over 50 years of age for the PINK area. Poor patient awareness could be improved by health promotion activities Low cataract surgical coverage could be remediated through active case-finding within the community and enhanced screening by primary eye care human resources.

9. PREVALENCE OF REFRACTIVE ERROR AND VISUAL PROBLEMS IN ETHNIC MINORITIES SCHOOLCHILDREN IN XINJING, CHINA (125678)

Man Pan Chin, BSc (Hons) in Optometry, Kar Ho Siong, BSc (Hons) in Optometry, Ka Ho Chan, Wing Yan Becky Chan, Ho Yin Yau, Chi Wai Do, Henry H.L. Chan, PhD, FAAO, Allen M Y Cheong, The Hong Kong Polytechnic University School of Optometry

RESULTS: The ethnicity in this examined population was mainly Uyghur (59.4%), Han (27.3%) and Hui (11.3%). The prevalence of any one eye and both eyes having VA worse than 20/40 was 23% and 11.7% respectively. Higher prevalence of reduced vision was found in Han ethnic (17.4%), followed by Uyghur (10.1%) and Hui (8%), however it was not statistically significant ($p>0.05$). Uncorrected or undercorrected refractive errors were the major reasons for the visual impairment (86%), followed by 6% of amblyopia and 3.4% congenital cataract. Myopia, with spherical equivalent of $-0.5D$ or more in either eye was found to affect 12.3% of the subjects who failed the VA, yet the correlation of it with age was very weak ($r=-0.15$).

PURPOSE: Xinjiang is home to a number of different ethnic groups such as the Uyghur, Han, Hui, and Mongol. Limited data are available on the causes of visual problems in this population. We aimed to investigate the visual status in the minority school children in Turpan and determine the prevalence of visual problems.

METHODS: A total of 634 students in 5 Turpan schools aged 4 to 19 years completed the study (mean age: 11.9 SD 2.6 years). The examinations included visual acuity (VA), ocular motility, binocular vision, external and internal ocular health assessments. Participants with habitual or presenting VA worse than 20/40 in any eye underwent cycloplegic retinoscopy and subjective refraction after instilling Mydrin-P (0.5% phenylephrine and 0.5% tropicamide) for 30 minutes.

CONCLUSIONS: Visual problems in school-age children in Turpan were mainly due to uncorrected or under-corrected refractive errors. Regular visual assessment and eye health education is essential to raise the awareness of the need of refractive correction.

ADDITIONAL COMMENTS: Funding acknowledge: The Hong Kong Polytechnic University Internal Grant A-PJ39.

10. OCULAR HAZARDS FACED BY THE SURGEON IN THE OPERATING ROOM: A COMPREHENSIVE REVIEW AND META-ANALYSIS (125081)

Rehna Ismaily, Wendy W. Harrison, OD, PhD, FAAO, Midwestern University Arizona College of Optometry

RESULTS: Eye splash risk was highest in vascular surgeries. Projectile injuries were most commonly found in orthopedic surgeries, and radiation exposure was prevalent in neuro and orthopedic surgeries. Meta-analysis of 16 articles examining eye splash was conducted. It was found that in 2,644 procedures, 36% of them resulted in at least one splash of blood or bodily fluids to goggles, masks, or visors. Furthermore, although awareness of eye splash by the surgeon was not as frequently reported (5 studies total), it was always lower and ranged from 3-14%. Despite the high prevalence of eye splash we calculated that only 58% of surgeons routinely wear EPDs in an analysis of 8 articles.

Use of EPDs was found to range from 27-100 % depending on the study. It was also found that surgeons incorrectly believe that corrective spectacles provide adequate protection. The lack EPDs lead to ocular and systemic infections and injuries.

PURPOSE: Surgeons are exposed to ocular hazards in the operating room involving eye splash of body fluids and blood, radiation exposure and projectile injuries. The magnitude of these exposures, and the lack of eye protection device (EPDs) use by surgeons needs further investigation.

METHODS: Seventy five studies were identified in the search. Data was only obtained from Canada, USA, Europe, Australia and New Zealand, assuming similar health and safety standards. Similar studies were then collated together, and meta-analysis of studies involving eye splash in surgical situations was done. A meta-analysis on the use of EPDs by surgeons was also conducted. The other types of hazard exposures did not yield enough articles for a proper meta-analysis.

CONCLUSIONS: Education on ocular hazard risk and training of appropriate eye protection needs higher priority for surgeons. Optometrists should aid our medical colleagues by educating them on the risks. Face shields, goggles, or glasses with side shields made of polycarbonate or trivex lens material are recommended.

11. AWARENESS OF OPTOMETRIC EXPERT WITNESS RESPONSIBILITIES IN MICHIGAN (125155)

James R. Miller, OD, FAAO, Michigan College of Optometry, Keri Baker, OD, Tecumseh, Ontario, Canada, Laura Schindler, OD, Omaha, NE

RESULTS: 184 Michigan optometrists responded to the survey and 21 have reported being asked to serve as an expert witness. Only 6 of the 17 optometrists who accepted the invitation to become an expert witness knew of the duties required before becoming involved in the process. Of the responding optometrists who have never been asked to be an expert witness, 24 said they would be interested in the future, 70 had no interest, and 57 remained undecided.

PURPOSE: When an optometrist is accused of not meeting their professional standard of care, the complaint can lead to an investigation by the Bureau of Health Professions or a malpractice case. Expert witnesses are often selected to provide their opinion as a part of these investigations. The goal of this study was to research the awareness that optometrists have toward the responsibilities of optometric expert witnesses in the state of Michigan.

METHODS: An online survey was created and sent to 766 Michigan optometrists inquiring about their experiences as expert witnesses and their knowledge of expert witness duties. In addition, employees in the Enforcement Section of the Health Regulatory Division for the Michigan Bureau of Health Professions were interviewed for their insights on the responsibilities of optometric expert witnesses.

CONCLUSIONS: Expert witnesses play an important role in investigations of complaints against optometrists. It appears that most optometrists have little to no understanding of the process and their responsibilities as an expert witness. It would be helpful for the state of Michigan to provide this information to better prepare optometrists for these potential responsibilities and raise awareness of the process in general.

12. OPTOMETRY INTEGRATION INTO THE PATIENT-CENTERED MEDICAL HOME (125250)

Andrew M. Archila, OD, FAAO, Naval Branch Health Clinic Yuma

RESULTS: Three cases illustrate what occurred during the integration process. Case 1 showed how recognizing gaps in the PCMH follow up can be identified by Optometry and how the use of a patient registry can be employed. Case 2 proved that Optometry can play a role in identification of systemic disease. Case 3 showed active engagements in care coordination can lead to quicker and complete care.

PURPOSE: To describe the integration process noting actions, results and lessons learned illustrated by case report for others in the optometric profession and ultimately describe optometry's role in the Patient-Centered Medical Home (PCMH) model. The PCMH concept can be described as a new care model that reorganizes primary care to improve access, coordination, quality, satisfaction and comprehensive patient-centered care

METHODS: A spreadsheet of patients indentified with confirmed or suspected cases of systemic disease such as hyperlipidemia, diabetes and hypertension were kept as Optometry integrated into the PCMH. Ways our clinic integrated into the PCMH were: tracking annual dilated fundus examinations for the high-risk, diabetic population, conducting blood pressure screenings, using a patient registry to identify certain populations of patients needing examination, and tracking referrals to primary and specialty care.

CONCLUSIONS: Many lessons were learned from efforts to integrate Optometry and the PCMH. The biggest lesson was that integration is an arduous task. One must provide constant feedback and instruction to staff by tracing the care of patients. We found that by following a patient's care via record review made a great impact as a teaching tool. We also found that only by effectively marketing our services and capabilities to the PCMH staff did we achieve greater success. Practice process redesign was essential. Consistent with the American Optometric Association viewpoint, Optometry should position itself formally as the primary eye care provider for the PCMH.

13. OUTCOMES OF "SEE TO SUCCEED": A CITYWIDE PROJECT TO ADDRESS VISUAL NEEDS OF UNRESOLVED SCHOOL-AGED STUDENTS IN HOUSTON, TEXAS (125276)

Tara Vacharkulksemsuk, Padhmalatha Segu, OD, University of Houston, College of Optometry

RESULTS: A total of 1,259 charts were reviewed and classified by age--200 were 7 years old or younger, and 1,059 were at least 8 years old. <p> <p> Myopes were more frequent among the older age group, while hyperopes were more common in the younger age group. The difference in refractive error among the 2 age groups was statistically significant ($p<0.01$). <p> <p> Strabismus was found in 1.5% of 7 year-olds and younger, and in 1.1% of the older age group. This small difference was not statistically significant ($p=0.50$). <p> <p> 13.5% of the younger age group was referred for further evaluation, whereas 7.3% of the older age group was referred. This difference was statistically significant ($p<0.01$). <p> <p> There was no strong agreement between the

parents' and students' reports of glasses use. 9.5% of the younger and 6.5% of the older age group came to the event with their old glasses, while the parent failed to report any history of glasses use. There was no statistical significant in the difference between the 2 groups ($p=0.58$).

PURPOSE: To assess the outcomes of See to Succeed* events taking place in 2011, specifically: (a)prevalence of each type of refractive error (b)prevalence of strabismus (c)frequency of referrals (d)correlation of parent and patient's subjective report of history of glasses use. <p> <p> *See to Succeed is a joint effort among multiple entities within the Houston area to provide eye exams and glasses to school-aged students, who have failed a vision screening and have not pursued subsequent follow-up.

METHODS: A retrospective chart review of exams done through See to Succeed in 2011 was conducted. Approval was granted by the University of Houston Institutional Review Board for the Protection of Human Subjects.

CONCLUSIONS: See to Succeed serves a large population. Characterizing the population can help to improve efficiency and tailor services to meet the population's needs.

14. **MUMPS INDUCED CORNEAL ENDOTHELIITIS: A PUBLIC HEALTH ISSUE?** (125300)

Julia Appel, OD, FAAO, State University of New York (SUNY) College of Optometry

BACKGROUND: Corneal endotheliitis is a rarely encountered manifestation of viral eye disease, mostly associated with herpetic/cytomegalic infection. It is also associated with epidemic parotitis (mumps)and exposure in the general population is rising due to noncompliance with childhood vaccination recommendations with significant systemic and ocular impact. This case will serve to aid in review of the differential diagnosis of this rare disorder and will raise awareness of the Public Health issues and potential ocular manifestations associated with mumps vaccination non compliance.

CASE REPORT(S): A 38 yo male presented to the UEC with c/o an irritated R eye. BVA was 20/25- OD (OS was unaffected with 20/20 VA), PERRL-APD, trace fine KPs, trace/+ flare, mild corneal edema and subtle endothelial folds. IOP were 24 OD, 14 OS. The patient was with anterior uveitis and treated with Pred acetate 1% Q1h and homatropine HBr 5% q 4 hrs. Upon worsening of the edema and the development of additional systemic Sx (parotitis and testicular swelling), a Dx of corneal endotheliitis and secondary trabeculitis was made while consultation with the PCP led to confirmation of the Dx of epidemic parotitis with titer. The anterior uveitis was improved by the topical Tx but the corneal edema worsened over the next two visits resulting in acuity of 20/50 OD and a corneal thickness of 769 microns. Topical treatment was adjusted and careful monitoring and palliative Tx was instituted by the PCP. Near complete resolution of the endotheliitis and acuity occurred at 4 weeks.

CONCLUSIONS: Although this patient was vaccinated as a child both he and his vaccinated sister showed lack of immunity as adults. Significant systemic and ocular complications can arise when those not vaccinated or incompletely immune encounter those with active epidemic parotitis (mumps) due to non compliance with current CDC vaccination recommendations. The eyecare provider must be vigilant and inclusive in the

differential diagnosis of presenting corneal endotheliitis and work with the patients PCP to properly identify and treat the etiology.

15. ADHERENCE OF ONLINE OPTICAL SHOPS TO APPROPRIATE FITTING PARAMETERS FOR PRESCRIPTION SPECTACLES (125325)

Stacy Hu, Adam Grimm, Anna Lam, Samantha Mein, Adam Puia, New England College of Optometry

RESULTS: Nine websites did not collect sufficient information to dispense accurate single vision lenses or bifocals; the only website that did was Eyeglasses.com. All 10 online optical shops failed to assess all of the parameters for progressive lenses.

PURPOSE: In the past decade the availability of prescription eyewear from online sources has increased significantly. What was once available only through a dispensary is now being distributed to consumers through the Internet. These websites owe much of their success to low costs, convenience, and speed of delivery. Since this is a recent phenomenon, virtually no research has been conducted on the quality of these prescription spectacles.

METHODS: Our study examined 10 online optical businesses that were considered as having the "2012 best eyeglass services online" by toptenreviews.com. We surveyed the parameters each website requires from the patient before dispensing prescription single vision, bifocal, and progressive lenses. Some of the variables considered were binocular pupillary distance, monocular pupillary distance and segment heights, all of which are essential for accurate dispensing of these types of lenses. Since parameters such as fitting height and pantoscopic tilt are necessary for optimal vision with progressive lenses, we also took these more detailed measurements into consideration.

CONCLUSIONS: All 10 online optical shops did not properly assess the parameters necessary for preventing blurred vision, eye strain, headaches and nausea that can arise with poorly fit lenses. Therefore, it is imperative that eye care professionals educate patients in the quality of lenses online to ensure that patients experience the best vision with their lenses.

ADDITIONAL COMMENTS: We would like to thank Dr. Gary Chu, Dr. Clifford Scott, Timothy Wilson, and the Class of 2015 at NECO for all of their support.

16. EFFECTIVENESS OF THE VISUAL SIMULATION OVER THE CONVENTIONAL METHODS OF INTRODUCING PROGRESSIVE ADDITION LENSES TO A BIFOCAL WEARER (125368)

Gopi Suresh Vankudre, MOptom, Bharati Vidyapeeth Deemed University Medical College School of Optometry

RESULTS: There is a significant impact with the visual simulation method over conventional with a mean ranking in visual simulation for ease of adaptation, computer use, Cosmetic appearance, climbing stairs of 23.15, 22.29, 24.09, 24.03 whereas in conventional method the mean ranking were 11.85, 12.71, 10.94, 10.97 respectively.

PURPOSE: To evaluate the impact of the visual simulation over the conventional methods of introducing progressive addition lenses.

METHODS: In a randomised, population based comparative study; 34 subjects wearing

bifocal lenses were included in this study. The data analysis is done with the help of Wilcoxon Sign Rank Test for Comparison of Pre and Post results and Mann-Whitney u test was used to compare the results of post demonstration between both the methods. The age of the subjects was from 40 -50 years. 25 of them were males and 9 were females. The subjects are randomly divided in two groups. Pre demonstration Questionnaire form is graded by the subjects wearing bifocals from both the groups to understand the difficulties faced by them with their present bifocal spectacles. 17 Subjects were shown the demonstration with the conventional way and 17 subjects were shown demonstration using visual simulation. Post demonstration questionnaire form is filled up by the subjects from both the groups to assess the impact of the demonstration. The impact of the conventional demonstration is compared with the impact of the visual simulation with the help of post demonstration questionnaire form.

CONCLUSIONS: There is significant impact of visual demonstration over the conventional method of demonstration.

ADDITIONAL COMMENTS: I would like to thank all the Faculty from Bharati Vidyapeeth School of Optometry, Pune(India), All participants included in the study

17. REFERRALS FROM A SCHOOL-BASED VISION CLINIC., FINDING WAYS TO INCREASE FOLLOW UP CARE (125685)

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RESULTS: Of the 103 patients referred, 30 (29.1%) scheduled appointments at IEI for follow up care. Only 13 (12.6%) of these patients kept their follow up appointments. Four more have appointments scheduled.

PURPOSE: School-based vision clinics provide eye care to a large number of children who may not otherwise receive it. The primary role of these clinics is to provide glasses to students. However, a number of students also need secondary or tertiary care. Many children attend school-based clinics because their parents have no time, transportation, and/or means to ensure optical care. Given these obstacles, how do we make certain that children referred for further care receive it?

METHODS: The Illinois Eye Institute at the Chicago Public Schools (IEI at CPS) referred 103 patients for follow up care at IEI between April 25, 2011 and May 21, 2012. Reasons for referrals included vision therapy (20), strabismus (8), cornea (11), retina (25), and glaucoma evaluation (39). All students needing follow up care leave IEI at CPS with a note to their caregivers explaining the need for follow up as well as the phone number of IEI. Within a week, the caregivers receive a phone call directly from IEI to set up an appointment. A reminder note is sent home 8-12 weeks after the initial examination.

CONCLUSIONS: Many children seen at our clinic are lost to follow up. An excellent way to ensure complete eye care would be to provide secondary care at IEI at CPS. The addition of a fundus camera and OCT would enable us to eliminate many of our glaucoma and retinal referrals. These tests could be completed at their initial exam, reducing the need for multiple visits. Expanding our clinic hours would allow us to provide more appointments and offer vision therapy. A position is being added in conjunction with the Chicago Health Corps program to work with caregivers, helping

them overcome barriers preventing follow up care for their children. Also, in the future we hope to expand to other geographic areas of Chicago to limit the distance to our clinic for all CPS children.

18. RAPID QUANTIFICATION OF LOW CONTRAST VISION (125612)

Veronica Wong, OD, Jeff C. Rabin, OD, PhD, FAAO, Jonathan Boster, BS, Madison Ruelle, BS, Thien Tran, BS, Brandi Stewart, BS, University of Incarnate Word Rosenberg School of Optometry, John Gooch, MD, Steve Wright, OD, MS, USAF School of Aerospace Medicine

RESULTS: There was no significant difference ($F=0.02$, $p>0.89$) between low contrast VA with standard letter chart (mean logMAR+SD=0.22+0.13; 20/33+/-6 letters) vs. Netbook (mean+SD=0.20+0.10; 20/32+/-5 letters). Moreover there was no difference ($F=0.12$, $p>0.72$) between 20/50 letter CS with letter chart (mean logCS+/-SD=1.59+/-0.17) vs. Netbook (1.60+/-0.22). Binocular VA exceeded monocular by 30% for letter chart and by 20% for Netbook; binocular CS exceeded monocular by 50% for letter chart and 40% for Netbook; but these differences were not significant ($F=0.83$, $p>0.36$).

PURPOSE: High contrast visual acuity is the cornerstone of vision care, but symptoms occur and performance can be decreased despite normal VA. Refractive surgery, optical aberrometry/wavefront correction, and evolving structural imaging techniques demand sensitive metrics with low contrast testing at the forefront. Our purpose is to describe a new approach for rapid assessment of low contrast vision using a Netbook computer.

METHODS: Low contrast (5%) VA and small letter contrast sensitivity (CS; 20/50 letter size) were measured in 22 adults using translucent letter charts (PrecisionVision) back-lit in a fluorescent light box viewed at 4m. Measures were compared to VA&CS obtained with a computer-based, parameter estimation by sequential testing staircase program displayed on a Netbook (10.1 inch 1024x600 display; Innova Systems, Inc.) viewed at 91cm. On each trial a single letter appeared centered in the display and the subject used a mouse to select the letter seen from an adjacent matching display. Letter size (VA) or contrast (CS) changed based on the response-driven staircase to rapidly record VA & CS and response time.

CONCLUSIONS: Our results support use of a Netbook for rapid assessment of low contrast vision. Staircase-to-threshold & forced-choice letter recognition allows rapid VA & CS measurement with precision of ETDRS charts. Advantages include letter randomization, contrast control & reaction time measures. Future efforts include application to tablet and mobile systems to enhance portability and home medical monitoring.

19. DOES ABRUPT CHANGE IN IMAGE QUALITY IMPACT ACUITY IN A SIMILAR MANNER AS A FUNCTION OF AGE? (125978)

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RESULTS: All the three image quality metrics were highly correlated with change in logMAR acuity ($R^{2\text{sup}} = 0.80$). There is no statistically significant difference in the slopes and/or intercept between age groups ($p > 0.05$).

PURPOSE: To determine if the abrupt introduction of blur impacts acuity in a similar manner regardless of age.

METHODS: Nine different normal WFEs, selected randomly from Thibos et al.'s 2002 6mm best corrected data set, were scaled to yield log visual Strehl values from -0.3 to -1.5. Scaled WFEs were used to calculate three image quality metrics – log neural sharpness, log visual Strehl, and log light in the bucket. Three subjects in each decade of age from 20 to 70 years participated (n = 15). Residual WFE over a 3mm pupil was measured over subjects' habitual spectacle correction, and used to pre-compensate computationally blurred, 11-line logMAR acuity charts of 30% contrast (3 charts for each of the 9 scaled log visual Strehl values). Charts were viewed through a 3mm pupil and read up to the 5th letter missed. Acuities of each subject were normalized to their best corrected acuity, and regressed with change in each image quality metric to yield correlation coefficients, linear slopes, and intercepts. T-statistics were used to compare slopes and intercepts as a function of age.

CONCLUSIONS: When subjects are adapted to their own aberrations, the impact of abrupt change in image quality on visual performance, as measured by logMAR acuity, is statistically same regardless of the age of the subject. This suggests the stability of complex blur interpretation mechanism with age although subjects are adapted to different habitual aberration levels .

ADDITIONAL COMMENTS: NIH/NEI R01 EY08520 (RAA), NIH/NEI R01 EY019105 (RAA), NIH/NEI P30 EY 07551 (Core Grant)

20. COMPARISON OF VISUAL ACUITY MEASUREMENTS FROM PEDIATRIC VISION TESTS (125169)

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RESULTS: The defocus induced changes in recognition threshold were not significantly different across all charts. The recognition thresholds of the HOTV, Keeler and Lea charts were not significantly different from the thresholds found with the ETDRS chart for focused and defocused conditions. The recognition thresholds of the Kay Pictures chart were statistically significantly different (better acuity, $p < 0.0001$) than other charts. The average difference between the Kay Pictures and ETDRS charts was 0.18 (+/- 0.07) logMAR for focused viewing and 0.16 (+/- 0.11) logMAR with defocus.

PURPOSE: Several visual acuity charts are available for paediatric use. As children develop cognitively, tests based on detection or resolution tasks are replaced with charts using recognition paradigms so that deficits in development are found earlier. It is desirable that charts using the same type of visual acuity task but different target designs should provide comparable results. This study provides data on the comparability of 4 pediatric charts with recognition tasks.

METHODS: The pediatric acuity charts chosen were: 4m multiple-line crowded HOTV Chart, crowded single line Keeler logMAR Chart, crowded single line Kay Pictures Chart, crowded single line Lea Symbols Chart. A standard ETDRS chart provided the reference standard against which the other charts were compared. Visual acuity measurements under focused and defocused (+1.00DS) conditions were obtained from the right eye of 25 adult participants with normal vision. Measurements used character-

by-character counting and termination when smaller targets were refused.

CONCLUSIONS: Visual acuity measurements during a child's vision examination are vital for assessment of development. For adults, Kay pictures produced significantly better visual acuity (by 1.5 to 2 lines) than all other charts. This difference is likely to occur in children and further research is needed. Care should be taken in pediatric practice to record the chart used to obtain VA so that valid comparisons can be made over time.

21. VALIDATION OF A NEW CHINESE READING-ACUITY CHART FOR CLINICAL RESEARCH (125172)

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RESULTS: Similar to the original MNREAD, the new chart captured the sharp rising part of the reading speed versus print size curve at small print and the asymptote at larger print sizes. MRS was moderately and significantly correlated with the passage reading speeds of different Chinese reading materials ($r > 0.60$, $p < 0.01$). An effect of age was found for MRS and CPS. Young adults read significantly faster than elderly participants and children. Interestingly, the elderly participants had similar RA as the other age groups, but they required significantly larger CPS values ($p < 0.001$).

PURPOSE: The aim of this study was to validate a new Chinese Reading-Acuity Chart, composed of traditional Chinese characters, with design specification similar to those of the English MNREAD chart.

METHODS: Thirty-three subjects with normal vision were recruited for 3 different age groups (children, young adults and elderly). Sentence reading performance as a function of print size was measured by this chart which comprised 19 single sentences at a range of print sizes from 1.5 logMAR to -0.3 logMAR in 0.1 log steps. Each sentence had similar complexity and word structure and consisted of 12 Traditional Chinese characters printed over three lines. Each participant was asked to read aloud individual sentences at their habitual reading speed. Reading speed in number of corrected words read per minute was measured for each print size and analyzed by nonlinear mixed-effects models to estimate maximum reading speed (MRS), critical print size (CPS) and reading acuity (RA). CPS was defined as the print size to achieve 80% of MRS, while RA was defined as the smallest print size resolvable by the participant. In addition to sentence reading, passage reading performance on three common Chinese texts was measured.

CONCLUSIONS: The new chart provides a reliable reading assessment for Traditional Chinese readers. This chart contains continuous and standardized Chinese sentences that closely resemble normal everyday reading materials for accurate reading measurement for clinical and research purposes.

ADDITIONAL COMMENTS: PolyU Grant A-PJ39

22. NORMATIVE DATA ON STANDARDIZED MESOPIC VISUAL ACUITY (125613)

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RESULTS: The photopic visual acuity (mean \pm SD) was -0.11 ± 0.08 logMAR while mesopic visual acuity was 0.04 ± 0.11 logMAR. There was a significant 0.15 logMAR difference in photopic and mesopic acuities ($p < 0.0001$).

PURPOSE: Investigations involving normative mesopic visual acuity are minimal. Additionally, the mesopic light levels chosen in these studies varying greatly and so visual acuities are not directly comparable. Recently, manufacturers have made mesopic visual acuity testing more accessible and have cited 3 cd/m² as the standard for mesopic visual acuity. In this study, we examined the normative photopic and mesopic visual acuity of young healthy subjects.

METHODS: Forty-nine subjects performed the tests of photopic and mesopic visual acuity. The subjects \pm age (mean \pm SD) was 24.6 ± 1.8 years. Subjects were free from ocular pathologies that would reduce best-corrected visual acuity and had been refracted within the past year. Standard retro-illuminated ETDRS charts were used at a distance of 3 meters with and without a commercial mesopic filter (Precision Vision, La Salle, IL) that was designed to reduce standard chart luminance from 170 cd/m² to 3 cd/m². The average luminance of the charts was 182.1 cd/m² when measured under standard conditions and 4.04 cd/m² with the mesopic filter in place. The different letter charts were randomly assigned to be used during photopic and mesopic measurements to eliminate memorization effects. Letter-by-letter scoring was used. Photopic and mesopic visual acuities were compared using a paired t-test.

CONCLUSIONS: Visual acuity at a mesopic light level of 3-4 cd/m² (by addition of the commercial mesopic filter used in this study) yields a significant 1.5 line decrease in standard best corrected visual acuity among healthy normal subjects. This normative data can be used as a basis for future studies that investigate mesopic visual acuity as a function of age and/or in the presence of ocular disease.

23. LIMITS OF AGREEMENT (LOA) BETWEEN THE CSV1000 AND THE PELLI-ROBSON (PR) CONTRAST SENSITIVITY, (CS) TEST (125640)

Susan A. Kelly, PhD, Yi Pang, Dana Richter, Calvin Vance, Becky Yeung, David M McIntosh, Illinois College of Optometry

RESULTS: The 95% LoA according to Bland-Altman were calculated by multiplying 1.96 times the standard deviation of the log CS differences between these two tests. The values calculated for 3, 6, 12 and 18 cpd are as follows, respectively: ± 0.34 , ± 0.44 , ± 0.72 and ± 0.65 log CS.

PURPOSE: The PR letter chart is a well-designed test that measures CS for spatial frequencies between 2 and 5 cycles per degree (cpd). However, the PR test has not been directly compared with non-letter CS charts comprised of sinewave gratings. In this study we measured the LoA between the PR test and CSV1000 which measures CS at 4 different spatial frequencies; 3, 6, 12 and 18 cpd. We have recently reported that a new scoring method for the CSV1000 significantly improved its test-retest reliability and used this new method when measuring the LoA.

METHODS: CS was measured for 38 subjects (mean age 28.2 yr) on both tests in randomized order. CSV1000 CS was defined as the reciprocal of the lowest contrast grating the subject correctly detected the location of twice. CS measurements for the PR

test were scored letter by letter. Testing was stopped when the subject missed 2 letters in a triplet. Mean luminance for both charts was 85 cd/m^2 . Data analyses were performed with SPSS on log CS data.

CONCLUSIONS: Due to the make-up of the letters that comprise the PR chart it was expected that the best agreement between these two tests would occur at 3 or possibly 6 cpd. Our data show that the average difference between the PR and CSV1000 was -0.15 log units at 3 cpd and twice that at 6 cpd. The CSV1000 produced lower contrast thresholds. The 95% LoA are lowest for 3 cpd and are increasingly higher with higher spatial frequencies. While the LoA of $+0.34$ is not as low as that observed between PR and the MARS test for example, which are less than $+0.25$, the agreement between the PR score and that obtained at 3 cpd on the CSV1000 seems reasonable given the difference in stimuli, methods and scoring procedures between these two CS tests.

24. **VISUAL GAIN: COMPENSATION FOR MACULAR PIGMENT MEDIATED BY TEMPORAL MECHANISMS (125754)**

Nicole Wood, PhD, James Stringham, University of Georgia Vision Sciences Laboratory

RESULTS: Subjects' MP optical density ranged from 0.1 to 0.95 at 30° eccentricity from the fovea. Preliminary data suggest relationship between CFF values and MP levels, such that subjects with higher MP levels exhibit lower S-cone CFF values for the foveal condition. The same subjects exhibit higher CFF values for the foveal L + M-cone condition.

PURPOSE: Macular pigment (MP) is yellowish, diet-derived pigment deposited in relatively high optical densities in foveal region of retina. For uniform visual perception to occur across the visual field, the visual system must "normalize" inputs. Visual perception across visual field appears to be unaffected by MP, despite the fact that spatial density profile of MP is non-uniform. This non-uniformity offers an opportunity to experimentally determine mechanisms responsible for normalizing visual inputs to yield uniform percept.

METHODS: Spatial profiles of MP optical density (MPOD) of 15 subjects, 18-45, determined using heterochromatic flicker photometry. To determine temporal sensitivities of short-wave sensitive (S) cones and middle (M)- and long (L)- wave sensitive cones, critical flicker fusion frequencies (CFF) were determined under conditions favoring each, for both fovea (where MP is most dense), and parafovea (where MP absorption is minimal). Two-channel Maxwellian-view optical system was employed. 1-degree target stimuli (440 nm for S-cone, 550 nm for L + M cone) presented on 10-degree, 3.3 log troland backgrounds (530 nm for the S-cone condition, and 442 nm for L + M cones). Rate of flicker for target fields slowly increased until subject no longer perceived flicker.

CONCLUSIONS: Results suggest that the visual system uses temporal processing speed to compensate for spatially non-uniform absorption of short-wave light by MP. Temporal summation would increase gain to S-cone system by virtue of decreasing temporal processing speed. Temporal summation would be decreased in L + M pathway by increasing temporal processing speed. We conclude: the visual system modulates temporal processing of visual pathways to compensate for MP.

25. A NOVEL DEVICE TO MEASURE SPATIAL DISTRIBUTION OF MACULAR PIGMENT (125149)

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RESULTS: Spatial mapping of MPOD across all subjects resulted in a first-order exponential function consistent with previous studies (Nolan et al., 2008). The MPOD measurements were highly reliable demonstrating a standard error of <0.010 log unit at the fovea to <0.025 log unit at 8 deg eccentricity. MPOD and contrast sensitivity were not significantly correlated for 3cpd, 6cpd, and 12cpd for all retinal eccentricities.

PURPOSE: Previous studies have shown a relationship between in vivo macular pigment optical density (MPOD) and visual function. Most of these studies have only measured MPOD in the central fovea (although see Stringham et al., 2008). The current study describes a device to: 1) provide a detailed spatial map of MPOD at 33 discrete positions across 16 deg of central retina, and 2) correlate the MPOD distribution with visual function.

METHODS: A novel device was constructed to measure MPOD using customized heterochromatic flicker photometry (cHFP). MPOD was measured at 0, 2, 4, 6, and 8 deg retinal eccentricities along superior, inferior, nasal, and temporal meridians using a 1 deg circular stimulus. Reliability was assessed by 5 repeat measurements in each area. Contrast sensitivity (generated using Psykinematix on a calibrated CRT monitor) was determined at 3, 6, and 12 cycles per degree (cpd) at the corresponding retinal locations using a grating pattern oriented +/-15 deg from vertical with a 2AFC method. Pearson correlations were used to determine the relationship between MPOD and contrast sensitivity. A total of 11,475 trials were analyzed across 9 subjects.

CONCLUSIONS: The new device reliably measures MPOD across the central 16 deg of the visual field. In addition, statistical analyses found a relatively symmetrical spatial distribution of macular pigment along measured meridians. Consistent with previous studies, MPOD is not significantly correlated with contrast sensitivity for spatial frequencies of 3cpd, 6cpd, or 12cpd. This device can be used to model other types of visual performance including measures of disability and discomfort glare.

26. MACULAR PIGMENT AND VISUAL RESOLUTION IN LOW LIGHT (125268)

Leon N. McLin, OD, MS, FAAO, Air Force Research Laboratory, James Stringham, PhD, Paul Garcia, BS, Peter A Smith, PhD, Paul Hiers, TASC Inc., Brian K. Foutch, OD, PhD, FAAO, University of the Incarnate Word Rosenberg School of Optometry

RESULTS: MPOD ranged from 0.025 to 0.866 at 30' eccentricity from the fovea. Subjects with higher MPOD required significantly lower contrast to detect the spatial resolution targets, and this effect became progressively stronger with increasing spatial frequency. For example, for a 5.5 cycle / degree target, $r = -0.24$; $p = 0.25$, while for an 18.33 cycle / degree target $r = -0.77$; $p < 0.001$.

PURPOSE: Macular pigment (MP) is a diet-derived pigment deposited in relatively high optical densities in the foveal region of the retina. By reducing rod intrusion and

increasing the efficiency of neural signaling throughout the visual system, MP could improve many aspects of foveal visual performance in mesopic- and scotopic-level conditions. Our study examined the effect of subjects' differing levels of MP optical density on mesopic-level contrast sensitivity for spatial resolution targets of relatively high spatial frequency.

METHODS: Twenty-five subjects aged 22-50 (mean = 30.1, SD = 6.9) participated in the study. Spatial profiles of MP optical density (MPOD) were determined using heterochromatic flicker photometry. To assess foveal spatial resolution, contrast thresholds were determined for small (1°) square-wave stimuli presented in Maxwellian view on a 0.1 cd/m^2 xenon-white background. Five spatial frequencies were tested: 5.5 cycles per degree (cpd), 7.33 cpd, 9.17 cpd, 11 cpd, and 18.33 cpd.

CONCLUSIONS: The results of this study appear to be consistent with the idea that MPOD leads to an enhanced ability to detect foveal targets of relatively high spatial frequency in low light conditions. Because the fovea maintains the highest density of photoreceptors, and is thereby capable of detecting the finest resolution, as a stimulus becomes increasingly more demanding in terms of resolution, it follows that it would be more dependent on foveal detection. With regard to the present study, preservation of cone function at mesopic light levels (presumably via rod suppression by MP) would therefore benefit those with higher levels of MPOD.

27. THE PERCEPTION OF HAIDINGER'S BRUSHES UNDER VARIOUS CONDITIONS (125333)

Joseph Zinkovich, OD, MS, MCPHS School of Optometry, John Gill, Elizabeth Luu, Midwestern University Arizona College of Optometry

RESULTS: For the NSB condition, 100% perceived, 87% clockwise, 13% counter-clockwise, 94% perceived 5 colors. For the BSB condition, 82% perceived, 96% clockwise, 4% counter-clockwise, 94% perceived 11 colors. LCD: 86% clockwise, 14% counterclockwise. LCVP: 22% clockwise, 78% counter-clockwise.

PURPOSE: The literature contains vague descriptions of the appearance, differences between individuals, and conditions that create Haidinger's brushes. The phenomenon is often described as being yellow when viewed against a blue sky, while not much information is available regarding the direction of rotation. Thus, the aim of this study is to document the attributes of this phenomenon.

METHODS: Forty subjects were asked to describe direction of rotation and color (from 16 samples) of Haidinger's brushes created under several situations: clockwise rotating polarizer is used in front of narrow spectrum blue (NSB) filter and broad spectrum blue (BSB) filter (similar to sky light); clockwise rotating computer screen (LCD) as reported anecdotally in literature; and liquid crystal variable polarizer (LCVP) producing nonlinear polarization.

CONCLUSIONS: Haidinger's brushes are more likely to be perceived using NSB light than BSB light (blue sky), although broader spectrum light creates a larger variation in perceived colors. The findings from the present study demonstrated that Haidinger's Brushes can be created using nonlinear polarization states and do not have to be physically rotating to elicit the perception of motion. In addition, this study also confirmed Shurcliff's (1955) findings.

28. **NECESSARY ILLUMINANCE FOR RICHMOND HRR SCREENING PLATES (125347)**

Taylor Chin, OD, Jason S. Ng, OD, PhD, FAAO, Brian Shih, Southern California College of Optometry

RESULTS: The mean \pm SEM minimum illuminance levels (lux) for plates 7, 8, 9, and 10 were 406.8 ± 136.3 , 142.3 ± 33.2 , 52.7 ± 6.7 , and 63.4 ± 9.7 , respectively. The average test plate illumination levels for the Macbeth lamp and Richmond Illuminator were 323 and 590 lux, respectively. CDG testing resulted in illuminance levels of 500, 270, and 100 lux for distances of ~40, 50, and 75cm, respectively. Only the Richmond Illuminator provided more than the average illumination level determined in order to successfully identify HRR test plate 7. Use of the CDG with a lamp-to-test distance of ~40cm or less should provide adequate illumination.

PURPOSE: The specificity of the Richmond HRR has proven to be very high in research studies. However, some find that the specificity of the test is lower in standard clinical use, especially due to the most desaturated screening plate (#7). This may be due to lower testing light levels than are necessary for a high specificity.

METHODS: The illuminance levels of several accepted light sources for color vision testing were analyzed (3 Macbeth easel lamps, 2 Richmond Illuminators, and a 100W tungsten bulb used with C Daylight glasses (CDG)). Multiple test distances were examined with regard to CDG testing (~40, 50, and 75cm). The other sources had standardized distances. The minimum illuminance levels needed to accurately identify the four red-green screening plates of the Richmond HRR test were determined by 10 subjects (5 males & 5 females / average age \pm SD of 48.69 ± 14.70). All subjects had normal color vision as determined by anomaloscope testing, had previously passed the HRR test, and had varying degrees of familiarity with the test.

CONCLUSIONS: The specificity of the Richmond HRR test may be improved in regular clinical use by assuring that the minimum illumination level is at least 400 lux, with increased illuminance levels likely increasing specificity even more. Use of the C Daylight glasses may necessitate a lamp-to-test distance closer than clinicians may realize.

29. **COLORIMETRIC EVALUATION OF COLOR VISION TEST IPHONE APPS (125083)**

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RESULTS: Two tests had disappearing plates. 'Color Blind' replicated the color differences of Ishihara's test closely while 'Blindness' contained color differences 2.5x greater. Like the Ishihara test, alignment is closer to the protan confusion line than the deutan line. The analysis of the alteration plates showed color differences up to 3x Ishihara's test. The two apps with diagnostic plates ('Color Test' and 'Color Blindness') replicated Ishihara's test well.

PURPOSE: Color vision tests lend themselves well to iPhone apps and their development is not surprising. Creating a valid color vision test is not simply a matter of

scanning a printed test and displaying the image since there are many color distortions in this process. This study was aimed at identification of those apps (available in late 2011) with a sound colorimetric construction.

METHODS: 5 free color vision test iPhone apps for available in 2011 were selected. All are based on Ishihara's test. The spectral radiances (380-780nm) of the colors of each app plate type were measured using a Photo Research Model 730 SpectraScan. The spectral reflectances of the equivalent Ishihara plates were also measured. The chromaticities were calculated. A set of criteria by which to compare the colorimetric construction were adapted from previous work. In the case of vanishing plates, these were alignment to the mean protan and deutan confusion lines and figure/background chromaticity difference. For alteration plates, the colour differences of the alternate figure were added. For the diagnostic plates, the alignment to the protan and deutan lines and the colour differences were calculated. Not all apps contained all types of plate. The metrics derived were compared with Ishihara's test itself.

CONCLUSIONS: Overall, the most faithful colorimetric replication of Ishihara's test was the 'Color Test'(Cassiopeia). Unfortunately, this also contains the other plate types (hidden and tracing), which are not routinely used. It is also constructed as a self-administered information exercise not particularly amenable to clinical application.

30. EVALUATION OF A NOVEL COMPUTER BASED ISHIHARA-LIKE TEST (125231)

Taylor Chin, OD, Jason S. Ng, OD, PhD, FAAO, James Bailey, OD, PhD, Christy Guenther, BS, Southern California College of Optometry

RESULTS: Among the subjects with CVDs, anomaloscope testing revealed 6 subjects had deutan defects and 2 had protan defects. The color normal subjects had a red-green midpoint of 41.9 ± 1.7 . Three subjects with CVD passed the new test, but only one subject with CVD passed the standard Ishihara test. Thus, using the anomaloscope as the gold standard reference test, the new test had 100% specificity ($p < 0.05$) and 62.5% sensitivity ($p > 0.05$); whereas the standard Ishihara book test had 100% specificity ($p < 0.05$) and 87.5% sensitivity ($p < 0.05$).

PURPOSE: The development of valid computer/online based color vision tests has been of interest to the clinical community for some time in order to screen for color vision deficiency (CVD). In this study we evaluated a novel computer based Ishihara-like color vision test that is intended for general clinical and occupational testing use on uncalibrated monitors.

METHODS: Twenty-five (14 males and 11 females) subjects (17 controls and 8 patients with red-green CVDs) were examined using the new test, the 24-plate Ishihara test, and the Nagel anomaloscope (in order to classify the subjects). All subjects were free from pathology, had average binocular acuities of 0.02 logMAR, and had a mean \pm SD age of 47.7 ± 14.0 . The test was given using a Dell 1908FPT LCD monitor at 1280x1024 resolution that was purposely set on factory default settings and not color calibrated. The test consisted of 1 demo plate and 29 plates designed to detect red-green color vision deficiencies. Missing more than 3 plates was deemed a failure of the test. Standard clinical color vision tests protocols were adhered to in performing the Nagel and Ishihara tests (e.g. proper lighting, test distance, test duration). Sensitivity, specificity, and p-

values were calculated with respect to chance performance.

CONCLUSIONS: The sensitivity of the new test was inadequate in its current form to be of use clinically, while the specificity was quite high. Revisions to the test may improve its performance in the future.

31. **EXPERIMENTAL STUDY ON COLOR RECOGNITION USING A HAND-EYE COORDINATION BOARD (125318)**

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RESULTS: The colors red (851-147ms), green (904-152ms) and yellow (960-164ms) have been deactivated significantly faster ($p < 0.05$) than rose (1103-184ms), pink (1119-167ms), blue (1225-204ms) and turquoise (1281-274ms). The mixing-up of blue and turquoise as well as rose and pink is the reason why mistakes only occurred in the target colors blue (49.0%), turquoise (40.2%), rose (8.8%) and pink (2.0%).

PURPOSE: The interaction of visual and motoric component is known as hand-eye or hand-foot coordination and demands high of the perception system. This ability can be practiced with a novel coordination board (twall, IMM Holding GmbH) by deactivating flashing fields. The aim of this study was to determine one preference color out of the seven emitted light colors using a combination of a hand-eye coordination test and a visual selective task.

METHODS: In this prospective study 44 participants (25.0 ± 1.9 years; 64% female, 36% male) were included. They had to select a target color from distracting colors in a visual search task. The target color was presented in randomized orders and positions. The average reaction times of each color as well as the number of mistakes were recorded. Differences between the non-normally distributed reaction times for each color have been statistically tested with Friedman.

CONCLUSIONS: The selection of all seven colors showed preferences for red, green and yellow. A color optimization is necessary to design training for selective attention.

ADDITIONAL COMMENTS: This study was accomplished without any financial support.

32. **AUTOMATED AMSLER GRID TESTING (125565)**

Brandi Stewart, OD, Jeff C. Rabin, OD, PhD, FAAO, Jonathan Boster, BS, Madison Ruelle, BS, Thien Tran, BS, Veronica Wong, BM, University of Incarnate Word Rosenberg School of Optometry, John Gooch, MD, Steve Wright, OD, MS, USAF School of Aerospace Medicine

RESULTS: There was no difference in H ($p > 0.44$) or V ($p > 0.24$) blind spot size between right and left eyes of each subject. The red-on-black and white-on-black grids were most precise showing mean H BS=5.85 deg; mean V BS=6.43 deg; V/H ratio=1.13. The BS was slightly larger when measured with the low luminance grid (H: $p < 0.04$; V: $p < 0.07$).

PURPOSE: The US prevalence of age-related macular degeneration is projected to increase from 1.75 to 3 million by 2020 (Friedman, 2004) making accurate detection and monitoring of macular disease critical. The Amsler grid remains an invaluable in-office and home tool to assess central vision but depends on accurate patient responses and

accessibility, and the supra-threshold, black/white Amsler grid may not detect subtle decreases which signify vision threatening disease. Our purpose is to improve sensitivity and specificity of Amsler grid testing by using a computer-based grid with selectable color and luminance, interactive computer display, and compatibility with rapidly evolving mobile and tablet devices for home use.

METHODS: To assess efficacy of the automated Amsler grid (AAG), the physiological blind spots (BS) of 40 healthy eyes were mapped using the AAG. Testing was conducted monocularly with white-on-black, red-on-black, and low luminance gray-on-black grids. The subject fixated a cursor positioned 11 deg left or right of grid center; the clinician marked points of last seen and first reappearance of a dot moving horizontally away from fixation, then moving up/down away from the BS to quantify horizontal (H) and vertical (V) BS dimensions.

CONCLUSIONS: The AAG detects absolute & relative scotomas exemplifying potential for monitoring macular function on computer, tablet and mobile devices. While the BS is not typically measured with the Amsler, fixation on the edge allows accurate BS measurement critical for detection and monitoring of ocular and neurological disease. Low luminance, low contrast and pathway specific AAGs (e.g., Parvo vs. Magno; L, M or S cone) can disclose early changes in visual function to complement rapidly advancing optical, imaging and genetic techniques.

34. **OBJECTIVE ASSESSMENT OF VISUAL-ATTENTIONAL STATE USING THE ALPHA-BAND COMPONENT OF THE VISUAL-EVOKED POTENTIAL (VEP)** (125142)

Naveen Kumar Yadav, BSc(H) Oph Tech, MS, Diana Ludlam, BS, Kevin Willeford, BS, Kenneth J. Ciuffreda, OD, PhD, FAAO, State University of New York College of Optometry

RESULTS: All subjects exhibited an AR greater than 1.00, which reflected some degree of alpha damping ability. However, the mean AR was only greater than 2.00 at 10Hz (2.17) and 11Hz (2.93). The AR at 10Hz was significantly correlated with the clinical VSAT percentile score ($r=+0.69$, $p=0.001$).

PURPOSE: To develop an objective and quantitative approach to assess visual attention using the alpha band (8-13Hz) component of the VEP in visually-normal (VN) young adults with self-reported normal visual attention.

METHODS: 18 VN adult subjects (ages 21-28, mean 24 years) with self-reported normal visual attention were tested. Two conditions were used to modulate attentional state at the primary visual cortex (V1), and in turn alpha (8-13Hz) responsivity, as quantified by power spectrum analysis. (1) Normal, full-field VEP, eyes-open (Diopsys NOVA-TR, 85% contrast, 2Hz temporal frequency, 64x64 check size, 17°Hx15°V test field, 64 candelas/meter square, binocular viewing with distance refractive correction), and (2) eye-closed, alpha "relaxed" attentional state - subjects closed their eyes and were asked to relax for 60 seconds before testing during this "resting condition". For each condition, there were 3 trials, each 20 sec duration, averaged within and across subjects for each condition. The alpha damping parameter of "attenuation ratio" (AR; eye-closed

to eyes-open alpha power) was calculated for each alpha band frequency. An AR of ≥ 2.0 was deemed to reflect a high level of visual attentional damping. In addition, the subjective clinical Visual Search and Attention Test (VSAT) percentile score was compared to the alpha band power at each frequency.

CONCLUSIONS: This is the first study to assess objectively the cortical attentional state in VN young adults, with a significant subjective clinical correlate uncovered. These findings support the role of alpha in assessing visual attention objectively, for example in the diagnosis and treatment of visual-attentional disorders as found in traumatic brain injury, autism, and ADHD.

35. **ELECTRORETINAL RESPONSE TO SPATIAL FREQUENCIES IN HUMAN EYE** (125285)

Man Pan Chin, BSc (Hons) in Optometry, Patrick Ho-Wai Chu, BSc, FAAO, Allen M Y Cheong, Henry H.L. Chan, PhD, FAAO, The Hong Kong Polytechnic University School of Optometry

RESULTS: The DC amplitude was gradually increased from 0.24cpd to 4.8cpd. The trend was similar from ring 1 to ring 4. Significant differences were found between 0.24cpd and 2.4/4.8cpd ($p < 0.05$) in ring 1, ring 2 and ring 4; and between 0.24cpd and all other spatial frequencies in ring 3. There was no statistical significant difference in ring 5 and ring 6 across all spatial frequencies. The IC amplitude was significantly decreased with increasing spatial frequencies from 0.24 to 4.8cpd in ring 1 ($p < 0.05$). The decreasing trend was similar in ring 2, though it was statistical insignificant. From ring 3 to ring 6, the amplitudes remained nearly constant till 1.2cpd, and then increased, but all were not statistically significant, except those between 2.4cpd and 4.8cpd in ring 5 ($p < 0.05$).

PURPOSE: This study is to investigate the localized retinal responses to global flash mfERG stimulation with different spatial frequencies. It provides more understanding about the regional sensitivity in terms of spatial detection at retinal level with different eccentricities.

METHODS: Seventeen normal adults (mean age 22.6 SD 1.3 years) were recruited. The global flash mfERG stimulation pattern ($33.7^\circ(V) \times 38.4^\circ(H)$) contained 4 video frames: a multifocal flashes frame with 103 non-scaled hexagons, followed by a dark frame, a global flash frame and a second dark frame. Gratings of different spatial frequencies (0.24, 1.2, 2.4, 4.8cpd) were used as the stimuli. Presentation of the spatial frequencies was randomized. The peak to peak response amplitudes of direct component (DC) and induced component (IC) were evaluated and grouped into 6 concentric rings for analysis.

CONCLUSIONS: Our finding showed that there are regional variations of spatial sensitivity across the human retina. The outer and inner retinal levels present totally different characteristics towards spatial sensitivity at central region.

ADDITIONAL COMMENTS: This study was supported by the Associated Fund (Research Postgraduate) and the Internal research funding (GU-585; GU-858) from The Hong Kong Polytechnic University.

36. **COMPARISONS OF THE SPATIAL MATRIX OF FACILIATORY SUBFIELDS BETWEEN MULTIPLE V2 NEURONS IN INFANT MONKEYS** (125980)

Bin Zhang, PhD, Nova Southeastern University College of Optometry, Xiaofeng Tao, PhD, Guofu Shen, PhD, Earl L. Smith, OD, PhD, FAAO, Yuzo M. Chino, PhD, University of Houston College of Optometry

RESULTS: We found the following. 1) In 4-week-old infants, the preferred orientation of a neuron determined by the weighted sum of the preferred orientations of all facilitatory subfields within the spatial matrix substantially differed between units at a given recording site, but the differences become less in 8-week-old infants. The comparable data from 16-week-old infants were indistinguishable from those in adults. 2) The homogeneity of subfields between the units at a give recording sites showed similar developmental changes; the maximal orientation difference between a pair of facilitatory subfields in different units at a given recording site was largest in 4-week-old infants and became progressively less with age.

PURPOSE: Our anatomical study with a tracer injection method showed that the projection fibers from V1 to V2 and the intrinsic connections of V2 in macaque monkeys are relatively immature during the first 4 postnatal weeks, but become qualitatively adult-like by 8 weeks of age. In this study we explored the physiological correlates of these immature connections by comparing the spatial organization of subunits within the receptive fields of several V2 neurons that were recorded simultaneously with a single microelectrode.

METHODS: Recordings were made in anesthetized and paralyzed macaque monkeys ranging in age between 4 and 16 weeks. The responses of each unit were isolated using the unit sorting software. We employed dynamic two dimensional noise stimuli and a reverse correlation method to reveal subfields within the receptive field of each neuron and the spatial matrix of these subfields were compared between multiple neurons with respect to their preferred orientations, spatial frequencies, maximal strengths (Z_{max}) of responses.

CONCLUSIONS: The present results dovetail with the anatomical study showing that the feed forward connections from V1 to V2 and the intrinsic connections of V2 are relatively diffuse during the first 4 weeks of monkey's life and that this immaturity becomes far less obvious in 8-week-old infants.

37. **PATH ANALYSIS OF DIRECT AND INDIRECT EFFECTS OF DURATION OF FIXATION TO WORD READING SKILLS (125273)**

Aaron S. Franzel, OD, Erin Brooks, OD, University of Missouri-St. Louis School of Optometry

RESULTS: Of the four factors explored (DOF2, RAN, orthographic and phonological processing), only phonological processing failed to hold a significant direct effect on word reading. RAN and DOF2 also held significant indirect effects mediated through phonetic and/or orthographic processes. The model was strongest when all four factors were incorporated (.45). In all models, orthographic processing and duration of fixation held the strongest relationship to word reading.

PURPOSE: Early visual processing integrity is correlated with word reading. In previous reports, we established duration of fixation when reading sight-words as an early sensory correlate of single word decoding ability in reading delayed children referred to the Pupil

Project. In attempts to model the direct and indirect predictive value between duration of fixation at 2 grades below level (DOF2), orthographic processing, phonological processing and rapid automatized naming (RAN) to word decoding ability, we compared Visagraph duration of fixation data to results of the Processing and Learning Test-Reading and Writing (PAL-RW) in a path analysis.

METHODS: Records from 104 students with reading difficulties (age range 8-12 years) were used in the analyses. A theoretical model outlining the proposed relationship between factors was established, then direct and indirect effects between factors were calculated. Model fit was evaluated with structural equation modeling.

CONCLUSIONS: These results suggest that in a clinical population with visually related reading difficulties, duration of fixation (DOF2) and orthographic processing held a higher path coefficient than phonological processing or RAN in predicting single word reading. Further, RAN was a good predictor for both phonological and orthographic processing. Duration of fixation held the strongest predictive value of any single factor to word reading (-.31). This should be considered when analyzing risk factors for dyslexia. Results suggest modification to the double deficit hypothesis for dyslexia to incorporate visual/orthographic processing.

38. THE QUIET EYE IS NOT A TRUE FIXATION (125257)

Kristine N. Dalton, OD, MCOptom, FAAO, Aston University, Michel Guillon, FAAO, Optometric Technology Group, Shehzad A. Naroo, MSc, PhD, MCOptom, FAAO, Aston University

RESULTS: MD increased 10x from 0.5° to 3°, but TN and TD of fixations only increased by 3x from 0.5° to 3°. (ii) All three parameters measured for 0.5° and 3° were highly different and poorly correlated (0.5° vs. 3°; TN: 11.9 ±3.7 vs. 4.0 ±2.0, $r = -0.037$; MD(ms): 57.7 ±48.3 vs. 611.6 ±559.4, $r = 0.498$; TD(s): 0.62 ±0.31 vs. 1.83 ±0.96, $r = 0.385$).

PURPOSE: Previous research in golf putting has reported that the Quiet Eye (QE) was the only gaze associated with both higher skill and increased success. The QE in golf is defined as the final fixation on the ball prior the initiation of the backswing. The offset of the QE occurs when the gaze deviates off the ball by more than 3° visual angle for a minimum of 100ms. The authors propose that the QE definition is not consistent with fixation definitions in the current literature and does not provide accurate measurement of the vision strategy of golf putting; for reference a golf ball subtends an angle of 1.6° in the putting stance.

METHODS: Golf putting eye tracking data was recorded with a binocular eye tracker and analysed using novel bespoke software. The total number (TN), mean duration (MD) and total duration (TD) of fixations made to the ball during swing phase of putts (corresponds with the QE) were measured using visual angle fixation criteria from 0.5°(True fixation) to 3°(QE). 482 putts from 27 golfers of various skill levels were included in this study.

CONCLUSIONS: 0.5° represents a true fixation but 3° includes fixation, pursuit and

saccade gaze behaviours. Rather than measuring pure fixation, 3° only measures attention to a region of interest around the ball; true fixation and attention are not correlated in golf. The current sport vision literature based upon the current QE concept (Fixation = 3°) needs to be re-assessed.

ADDITIONAL COMMENTS: This study was funded by the Optometric Technology Group.

39. THE EFFECT OF STRUCTURED BACKGROUND ON SMOOTH PURSUIT WITH SIMULATED CENTRAL SCOTOMA (125200)

Thomas A. Keith, BSc, MSc, OD, Lei Liu, PhD, FAAO, Patti W. Fuhr, OD, PhD, FAAO, University of Alabama at Birmingham School of Optometry

RESULTS: The largest background effect (the difference between smooth gains on the uniform and the structured backgrounds) was in CS patients. This background effect was much smaller when NS pursued with a simulated scotoma, and was even smaller when NS pursued with the fovea. Horizontal pursuit of a slower (0.15 Hz) target produced the largest background effect differences between CS (1.907), NS with simulated scotoma (0.479), and NS with fovea (0.074).

PURPOSE: To better understand the role of the fovea in smooth pursuit eye movements in humans. Most smooth pursuit studies use uniform backgrounds that do not represent realistic conditions. On structured backgrounds, smooth pursuit gains tend to only decrease modestly (10%) in normals with fovea. In monkeys with a central scotoma, however, smooth gains for pursuing a target on a structured background are dramatically reduced compared to those on a uniform background. The current research entailed a systematic study of a previously unstudied condition where the foveal inputs of both the background and the pursuit target were eliminated through simulation but the anatomical fovea was intact.

METHODS: Ten normal subjects (NS) pursued a yellow dot moving along a horizontal or a vertical trajectory against a uniform or structured background; with fovea and with a 6.3-deg diameter simulated central scotoma. Three patients with central scotoma (CS) also performed the same tasks. The target waveform was a sinewave with a 10-deg amplitude and a frequency of 0.15 or 0.40 Hz. An EyeLink eye tracker was used to track eye movements and to provide gaze-contingent display for simulating a central scotoma. Composite and smooth pursuit gains were obtained using standard procedures.

CONCLUSIONS: Our results demonstrate that simply cutting off foveal input to the pursuit stimulus with a simulated scotoma in NS could not account for the strong background effect observed in CS. This suggests that an anatomically intact fovea is required to perform quality smooth pursuit on a structured background even if it receives no visual input.

40. EVALUATION VALIDITY OF US VISUAL PROCESSING TESTS ON ENGLISH SPEAKING TRINIDADIAN CHILDREN (125261)

Sandra S. Block, OD, MEd, FAAO, Illinois College of Optometry, Sandra E. Wang-Harris, OD, FAAO, Camelia Powdhar, Madelynn Applewhite- Waldron, University of the West Indies

RESULTS: A general comparison with one sample t-test revealed a statistically significant difference between the subjects and the US data for the TVPS and VMI. The mean standard score for 6 TVPS subtests and the VMI were below a scaled score of 10 (range 6.7-9.7) with the Spatial Relationships mean at 11.1. Data from all subjects revealed that the scaled scores from only 3 of 7 subtests of the TVPS were normally distributed. The Execution subtest of RFT was not valid since the students wrote cursively and the Recognition subtest reflected 27 subjects would have been diagnosed mild to severe reversal deficits which did not correlate with teachers academic performance reporting. Comparison of teachers' reporting of reading skills to individual DEM results, showed the DEM had a sensitivity of 0.4 and specificity of 0.8.

PURPOSE: This study investigated the validity of applying commonly used US visual information processing (VIP) tests to Trinidadian children. The subjects spoke English and attended one of two typical elementary schools which represent the general ethnic make up of the island.

METHODS: 52 nine year old subjects from 2 primary schools in Trinidad were administered 4 VIP tests (Test of Visual Perception - 3 (TVPS), Gardner Reversal Frequency Test (RFT), Beery-Buktenica Developmental Test of Visual-Motor Integration (VMI), and Developmental Eye Movement Test (DEM)). The subjects represented 3 ethnicities: Afro-Trinidadian, Indo-Trinidadian, and mixed race. The teachers identified students with difficulty in primary courses. The schools follow the British mode of education.

CONCLUSIONS: US standardized VIP tests are not appropriate for Trinidadian children. Additional studies need to be done to expand the subject pool within and outside of Trinidad and potentially to foreign born and educated US students. Caution is suggested in applying the current data to any student outside the US or even to foreign trained students until further studies are conducted.

41. **INFLUENCE ANALYSIS OF STROBOSCOPIC TRAINING ON ANTICIPATIVE SKILLS AND TEMPORAL RESOLUTION USING COMPUTER-BASED AND ELECTROPHYSIOLOGICAL TESTS (125320)**

Claudia Holzhey, BSc, University of Applied Sciences Jena, Wolfgang Sickenberger, MS Optom, Dipl Ing (FH) AO, Ernst Abbe University of Applied Sciences, Ralph Huonker

RESULTS: The data evaluation is based on a Mixed Factorial ANOVA as well as variance analyses within each experimental group. The flicker frequency, as a parameter of temporal resolution, significantly decreased within the test group by 2.3% ($p=0.00$) whereas it increased in the control group. There was no evidence in the EEG measurements due to the fact that electrophysiological signals are still detectable although the flicker fusion threshold is subjectively achieved. A subjective improvement in reaction time could not confirmed by the objective psycho-physiologically measured values. Concerning the anticipation of two-dimensional motions no changes were found.

PURPOSE: In addition to sport-motoric fitness, the performance of athletes is decisively destined by visual perception, especially in fast ball sports. Innovative training tools - such as the MJ Impulse shutter goggles - shall improve visual parameters. By using the MJ Impulse, the present pilot study helps to describe the effectiveness of a single stroboscopic training on anticipative skills such as reaction time and decision making as

well as on temporal resolution.

METHODS: In a controlled study design, 27 subjects participated in a thirty-minute MJ Impulse training. Starting with a frequency of 5 Hz and a light/dark ratio of 45 to 55%, test persons did simple passing and reaction exercises. Every ten minutes, the duration of the dark period was increased by 5%. The evaluation of the perception training was carried out by a pre- and post-test using three self-programmed computer scenarios and a flicker fusion test based on the Vienna Test System. Five of the 27 subjects additionally took part in EEG-measurements to validate the outcome of the flicker fusion test.

CONCLUSIONS: A single training using the MJ Impulse seems to have a negative impact on the flicker frequency. Further studies are required to detect a long-term effect and to validate the results ascertained.

ADDITIONAL COMMENTS: No conflict of interest to disclose.

42. **NORMATIVE VALUES FOR DYNAMIC VISUAL ACUITY USING THE BERNELL ROTATION TRAINER (125154)**

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RESULTS: As the RPM decreases the subject's time decreased and their accuracy increased. For the whole group of subjects mean % correct responses for the high, medium, and low RPM were 59.65%, 65.23%, and 70.49% respectively. The mean times to read all letters for the whole group were 2:12, 1:46, and 1:25 for the high, medium, and low RPM, respectively. The same trends were seen when males and females were compared; however, the accuracy was lower and the time was greater in females than males.

PURPOSE: Optometrists who specialize in Sports Vision often suggest that Dynamic Visual Acuity (DVA) is an important visual skill for athletes; however, there are no standard methods of assessing DVA or published normative values for any population. This study is designed to suggest a procedure for measuring DVA and provide normative values for DVA using a Bernell Rotation Trainer (BRT) with this procedure.

METHODS: BRT was used to test DVA in 22 subjects, 10 females and 12 males, between the ages of 23 and 30. Only subjects with a refractive error between +1.00D and -7.00D (spherical equivalent) were used. DVA was recorded at 3 different rotation speeds (High 29 RPM, Medium 24 RPM, and Low 16 RPM) at a distance of 20 ft. At each speed starting with the fastest RPM values were recorded for accuracy and time to complete the 9 lines of text. The subjects were asked to fill out a questionnaire in an effort to identify factors that may influence DVA.

CONCLUSIONS: This study is the first to use the BRT to quantitatively measure DVA. Further study is needed to determine if this procedure could become a standard assessment method. Our results show that our procedure was able to produce a general trend in both the males and females. It also provides a foundation for future comparison tests, like measuring the difference between a normal population and a sports population. To achieve this, data must be collected using organized athletes at the high school and college level.

43. **VISUAL SEQUENTIAL MEMORY AND LUMINANCE CONTRAST**
(125604)

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Southern California College of Optometry

RESULTS: The scores (mean \pm SD) were 11.6 ± 1.9 and 12.9 ± 2.3 for the negative and positive contrast, respectively. Subjects performed significantly ($p < 0.05$) better (8.3% improvement) when the test was presented in positive luminance contrast versus negative contrast.

PURPOSE: Positive contrast (white on black) visual acuity has been shown to be slightly, but significantly, better than standard visual acuity using negative contrast (black on white). We examined whether differences in luminance contrast would have any effect on a visual sequential memory task.

METHODS: Forty-two subjects (23 males, 19 females) were randomly assigned to perform one of two tests of visual sequential memory specifically designed for this study. Each test had a total of 16 questions. Half of the subjects performed the positive contrast test and the other half performed the negative contrast test. The subjects \pm age (mean \pm SD) was 26.0 ± 3.2 yrs. Subjects were free from ocular pathologies, had visual acuities of 0.1 logMAR or better, and the majority (81%) were completely naive to the standard clinical test of visual sequential memory; which is given in negative contrast. The raw scores (number correct) of each test were compared using unpaired t-tests.

CONCLUSIONS: Positive contrast presentation of stimuli yields a statistically significant improvement in visual sequential memory; which could play an important clinical role in the determination of optimal print contrast for some patients.

44. **A COMPARISON OF TWO TESTS OF VISUAL-MOTOR INTEGRATION**
(125924)

Marc B. Taub, OD, MS, FAAO, Paul Harris, OD, Southern College of Optometry,
Sukriti Mohan, Memphis, TN

RESULTS: The mean scaled score was for the DTVP II and VMI were -83.7, SD 12.5 and 96.3, SD 15.9, respectively. These results were significantly different ($p=0.0048$). A medium to strong positive correlation was documented ($r=+0.513$).

PURPOSE: Vision is the dominant process for the interpretation of the world around us. To ensure success in the learning process, the visual signal must be efficiently collected, interpreted and integrated with the inputs from the other sensory processes. For proprioception or touch, the muscles need to be activated to perform the task smoothly and efficiently. Visual-Motor Integration is the term used for this process. Examples include catching a ball and copying from the board in school. This study investigated the relationship between two validated tests for visual-motor performance.

METHODS: Twenty-three children (ages 7 to 11 years, 11 months) were evaluated using the Eye-Hand Coordination and Copying subtests of the Developmental Test of Visual Perception (DTVP II) and Developmental Test of Visual-Motor Integration (VMI). All subjects had a comprehensive examination, 20/20 visual acuity at distance and near and had no physical limitation that would prevent participation. Test order was alternated to eliminate fatigue as a bias.

CONCLUSIONS: This study shows that performance on the Eye-Hand Coordination and Copying subtests of the DTVP II and VMI do in fact show a medium to strong correlation but cannot be used interchangeably. It is theorized that DVPT II scores are lower as it is a pure visual-motor activity in contrast to the VMI which calls for the use of learned perceptual skills.

45. OVER GLASSES FOR OLDER ADULTS RESTRICT THE PERIPHERAL VISUAL FIELD (125082)

Robert A. Strath, OD, PhD, FAAO, Alexander Hoffer, Daniel Marigold, PhD, Simon Fraser University

RESULTS: The over-glasses significantly decreased the visual field compared to the control condition, but had no effect on either visual acuity or contrast letters. This was more evident for the over-glasses with the side windows blocked. Specifically, temporal visual field was reduced to 57.6 degrees compared to 77.2 degrees without wearing the over-glasses. The over-glasses also significantly reduced Esterman field scores, where the loss was observed in the temporal fields. The visual fields of other quadrants were also significantly reduced, albeit to a lesser extent.

PURPOSE: Older adults commonly wear over-glasses to reduce glare and protect their eyes from solar damage. These large spectacles may compromise visual functioning and this may impact driving performance given the known associations between visual field loss and vehicle crashes. This study determined if over-glasses restricted the visual field in older adults.

METHODS: Twenty community living older adults, mean age 70 years old, participated in this study. Visual acuity (ETDRS chart), contrast letters, monocular kinetic field testing (Goldmann III4e target) and binocular visual field testing (Esterman) were performed with and without over-glasses. Two over-glasses were utilized; one with side windows and the other with the windows blocked.

CONCLUSIONS: Wearing over-glasses, especially those without side windows, restrict the peripheral visual field below the limits recommended for driving both private and commercial vehicles. Further research into these protective glasses, which reduce the visual fields during driving, is warranted.

46. EFFECTS OF CANNABIS INTOXICATION ON EYE MOVEMENTS AND OTHER PHYSIOLOGICAL INDICATORS (125097)

Karl Citek, OD, PhD, FAAO, Pacific University College of Optometry, Mike Iwai, Sgt, Oregon State Police, Bill Roberts, Cst, Victoria (CAN) Police Department

RESULTS: Consistent with prior research, subjects demonstrated reduced performance on motor skills tasks, convergence; increased pulse rate, systolic BP, pupil sizes; rebound dilation; but little or no ptosis or nystagmus, nor reduction in smooth pursuits or optokinetic responses.

PURPOSE: Previous research demonstrated changes in physiological responses and motor skills in individuals under the influence of cannabis (THC), but no changes in eye movements. In these studies, subjects were dosed with specific amounts of THC, often below the dosages that would have been self-administered. We investigated if there

would be any consistent differences in findings, as often reported by officers evaluating impaired drivers, in habitual users who were allowed to use as much of the drug as typical for recreational purposes.

METHODS: Subjects were recruited for Drug Recognition Expert Certification Trainings by word of mouth. All subjects signed informed consent and model release forms. 7 subjects admitted to being "medical marijuana" users, but neither they nor any other subject presented with any condition that would have made it difficult or harmful for them to participate. From all evaluations conducted, we isolated those where THC was the only intoxicant, evidenced by urinalysis; data from 11 females and 14 males, average age 34.3 years, range 18.7-68.2 years, qualified for the study. Each subject admitted using THC at a typical dosage and in the preferred delivery mode at least 30 minutes prior to testing. Most did not know the potency of THC they were using; we could not collect samples for independent laboratory assessment.

CONCLUSIONS: Compared to laboratory studies, Certification Trainings allow for testing of subjects under conditions more similar to those in the field. While we could not determine the precise nature of the drugs ingested by subjects in this study at the time of evaluation, post-hoc UA confirmed THC as the only intoxicant. Our results confirm many of the traditional findings for THC intoxication, including the lack of findings for changes in eye movements.

47. **RETINAL DEFOCUS AND EYE-HAND REACTION TIME IN MILD TRAUMATIC BRAIN INJURY (125126)**

Kenneth J. Ciuffreda, OD, PhD, FAAO, Jennifer Gould, MS, OD, Naveen Kumar Yadav, BSc(H) Oph Tech, MS, Preethi Thiagarajan, BSOptom, MS, FAAO, State University of New York College of Optometry

RESULTS: Retinal defocus did not significantly ($p > 0.05$) affect mean EHRT in either the mTBI (range 299-321 ms) or VN (range 275-281 ms) group. However, it was significantly longer (by 28ms) and significantly more variable (by 15ms) in the mTBI vs. the VN group ($p < 0.05$).

PURPOSE: To assess the effect of various amounts and types of retinal defocus on eye-hand reaction time (EHRT) in young-adults with mild traumatic brain injury (mTBI).

METHODS: Simple EHRT was assessed in 11 young-adult (ages 22-34, mean 28 years) subjects with mTBI to different amounts of spherical (plano, +1-4D, +10D) and astigmatic (+2D axis 90) retinal defocus. These lenses were introduced binocularly over the distance prescription in the spectacle plane. The RT-2S Simple Reaction Time Tester (Applied Therapy Products) was used at a distance of 1 meter. The red and green test target lights were partially masked to simulate the size of a traffic signal as would be viewed at 120 feet. Sixteen age/gender-matched, visually-normal individuals (VN) were tested and compared with the mTBI group.

CONCLUSIONS: The robustness of simple EHRT to retinal defocus in both groups suggests central neural insensitivity to blur for this simple performance task. Performance might be adversely affected for more complex and dynamic tasks, such as signage recognition during driving. The increased reaction time and related increased variability for this simple reaction time task in the mTBI group would compromise time-optimality of motor performance, and possibly safety, for many activities of daily living, such as

ambulation, sports, and driving. The slowed and variable responses may reflect diffuse axonal injury due to the pervasive coup-contrecoup nature of the brain injury.

ADDITIONAL COMMENTS: Supported by NIH/NEI grant 5T35EY020481.

48. COMPARISON OF CHANGE IN ACCOMMODATIVE LAG AND ACCOMMODATIVE MICROFLUCTUATIONS WITH VISUAL FATIGUE (125515)

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RESULTS: Subjective measurement of visual fatigue showed significant increase after task (Wilcoxon signed rank test; $p < 0.05$). Middle and last fixations were compared to first fixation using ANOVA. Accommodative lag did not show any significant change for either eye with time (OD: $p = 0.28$; OS: $p = 0.22$) whereas LFC, MFC, HFC of accommodative microfluctuations increased significantly at last fixation ($p < 0.05$) except LFC ($p = 0.14$) and HFC ($p = 0.17$) for right eyes.

PURPOSE: Both accommodative lag and accommodative microfluctuations are shown as promising indicators to assess visual fatigue. Therefore, this study was aimed to identify the most reliable indicator among accommodative lag and accommodative microfluctuations, when measured simultaneously.

METHODS: 12 emmetropes and 2 myopes (corrected by contact lenses) (age 23-40 years) performed 60 min of visual search task displayed on a LCD monitor placed 40 cm away from the eye. During the task, fixation target for 20 sec was displayed at the beginning, after 30 min and at end of the task. Subjects were made stable on head and chin rest. Real-time recording of refraction was done throughout the task using PowerRef II aligned to both eyes via hot mirror. Subjective measurement of visual fatigue was done using questionnaire before and after the task. Accommodative microfluctuations (Low frequency component (LFC) 0.29-0.9Hz, Middle frequency component (MFC) 1.0-1.6Hz and High frequency component (HFC) 1.7-2.5Hz) were acquired using FFT.

Accommodative lag and microfluctuations were analyzed from refraction recorded during fixations only.

CONCLUSIONS: Visual search task was successful in inducing visual fatigue subjectively. No change in accommodative lag but significant increase in accommodative microfluctuations was observed after 60 min of performing task. This suggests that accommodative microfluctuations are apparently more sensitive to fatigue than accommodative lag and therefore, a reliable indicator.

49. VISUALLY INDUCED MOTION SICKNESS DEPENDS ON VELOCITY, NOT TEMPORAL FREQUENCY (125203)

Jean-Marie Hanssens, OD, PhD(c), Guillaume Giraudet, PhD, Remy Allard, PHD, Jocelyn Faubert, PhD, FAAO, University of Montreal School of Optometry

RESULTS: The results show that MS depends on the velocity of the stimulus and not its frequency. Correlations between subjective discomfort, velocity of the virtual floor and postural stability suggest that the moving visual stimulus may induce discomfort regardless of posture. However, intrinsic instability of an individual under static conditions is correlated to MS and can be considered as a good predictor of visually

induced MS.

PURPOSE: According to the Postural Instability Theory (Ricco, Stoffregen, 1991), visually induced motion sickness (MS) would be related to visually induced postural instability. The purpose of this study was to determine whether MS increases with temporal frequency or velocity of the visual stimulation and by the same time to determine whether MS may occur without changing postural behavior.

METHODS: Twelve participants were asked to stand on a virtual floor in an immersive virtual reality environment, which simulated a black and white checkerboard floor. This virtual floor oscillated similarly to the rolling motion of a boat for three amplitudes (2°, 4° and 8°) and seven frequencies (0.03 to 2.0 Hz) corresponding to nine velocities (0, 125 to 32°/sec). We calculated the Velocity Root Mean Square (VRMS) based on data from electromagnetic sensors positioned on the head and lower back. VRMS represented a measure of postural instability induced by the visual stimulus. MS was evaluated for all conditions using the Subjective Unit Discomfort measure.

CONCLUSIONS: Visually induced MS depends on visual stimulus velocity. The postural theory cannot be used alone to explain the MS in our experimental conditions.

50. **EXPLORATIVE STUDY OF A REACTIONTIME COMPARISON BETWEEN PROFESSIONAL ATHLETES AND NOVICES USING A HAND-EYE COORDINATION BOARD (125677)**

Ulrike Rattunde, BSc, Wolfgang Sickenberger, Prof MS Optom (USA), Dipl Ing (FH) AO, Ernst Abbe University of Applied Sciences

RESULTS: Differences between the non-normally distributed data of each group were tested statistically by means of Mann-Whitney-U test. In comparison to the novices (98.053 ± 7.699 s), the professional athletes (91.706 ± 6.049 s) achieved significantly better results in the testing period times ($p=0.007$). Furthermore, the average error rate of the athletes with 1.7-2.1 mistakes was significantly lower ($p=0.011$) than this of the novices (4.2-3.4 mistakes).

PURPOSE: A proficient hand-eye coordination has great influence on the success of athletes in many sport disciplines and can be practiced with a novel coordination board (twall®, IMM Holding GmbH). A comparison was made between professional athletes and novices to determine differences in the hand-eye coordination performance.

METHODS: Nineteen female novices (24.7 ± 2.1 years) were included in this study and data were collected by one observer. These prospective results were compared to the retrospective results (multi observers at Vision@Sports, January 10-11, 2011) of 17 female athletes of the German women's national soccer team (24.1 ± 4.6 years). During the test the coordination board was divided into two fields. Two participants, each participant at one field, were doing a challenge at the same time, deactivating only one color (blue or yellow). The testing period time as well as the number of mistakes was analyzed.

CONCLUSIONS: The athlete-novice comparison suggests that female professional athletes have better hand-eye coordination. To evaluate the performance parameter, the coordination board twall is a useful device.

ADDITIONAL COMMENTS: The twall® was provided by IMM Holding GmbH. This

study was accomplished without any financial support.

51. PRIOR KNOWLEDGE HELPED TO SPEED UP SEARCH, BUT ONLY FOR SMALL SET SIZES (125679)

Lei Liu, PhD, FAAO, David Walsh, OD, University of Alabama at Birmingham School of Optometry, The Medical Center

RESULTS: Positive trials: Search reaction time (RT) was about 100 ms slower with than without scotoma. SS and prior knowledge of it had no effect on RT. Negative trials: overall RTs were 961 and 555 ms with and without scotoma. When there was no scotoma, SS and prior knowledge of it had only minor effect on RT. When there was a scotoma, RT stayed at ~1000 ms for all SS when SS was unknown, but was much faster at 1, 2 and 4 SS when SS were known (700 ms) and jumped to 1000 ms at larger SS. There was a significant difference between the first and last three SS under this condition.

PURPOSE: The parallel feature search is impaired in the presence of field defect because there is uncertain if all items are visible at the same time. Prior knowledge of the search task may reduce this uncertainty and speed up search. Four experiments were conducted to investigate this possibility.

METHODS: The task was to find a large, 2x2 deg black square target among smaller 1x1 deg black square distracters on a white background. The set sizes (SS) were 1, 2, 4, 8, 16 and 32 items. A trial could be positive (target present) or negative (target absent). The SS of a session either was fixed and known to the subject or varied trial-by-trial and thus precluded prior knowledge. The search was done with and without a simulated scotoma, which was a blank 10x10 deg square centered at gaze direction, updated every video frame based on eye position data from an eye tracker. Four search experiments were conducted on 6 young normal subjects: SS known/no scotoma, SS unknown/no scotoma, SS known/scotoma and SS unknown/scotoma.

CONCLUSIONS: Positive trials terminated promptly once the target became visible. Negative trials could be terminated only when the subject was confident that all items had been seen. Prior knowledge did help, but only at small SS (<8), where instant enumeration () could be used. At larger SS, or when prior knowledge was not available, some types of inter-saccade integration had to be performed, slowing down the search.

52. IS THE 3X RULE APPROPRIATE FOR COMPUTER USERS? (125213)

Olga Kochurova, Joan K. Portello, OD, MS, FAAO, Mark Rosenfield, OD, PhD, FAAO, State University of New York College of Optometry

RESULTS: Mean threshold distance was 131.4cm. Mean reading speed at viewing distances of 1.0, 0.5, 0.33 and 0.25 times threshold were 63.4, 117.6, 128.5 and 131.1 words per minute, respectively. While the latter 3 values were significantly different from the threshold distance ($p < 0.0001$), they were not significantly different from each other. The mean number of reading errors made during the 10 min task at distances of 1.0, 0.5, 0.33 and 0.25 times threshold were 11.3, 1.6, 1.3 and 0.8, respectively. Again, the latter 3 values were significantly different from the threshold distance ($p < 0.001$) but not from each other.

PURPOSE: When reading from an electronic display, many patients report symptoms

such as tired eyes or eye strain. To minimize symptoms, it has been suggested that a 3x acuity reserve should be adopted, i.e., the visual acuity (VA) should be 3 times better than that required to read the text on the display. Therefore, prolonged viewing of a 6/18 letter would require VA of at least 6/6. However, there is little objective evidence to support the 3x rule in normal subjects. While it is reasonable to assume that many patients will not be comfortable reading text which is close to their acuity limit for a sustained period of time, this study evaluated whether the 3x rule is appropriate, or if an alternative relationship between threshold VA and letter size for sustained reading would be superior.

METHODS: The study was performed on 25 asymptomatic young subjects who viewed a series of random words on a laptop computer. The furthest distance at which the subject could just resolve the text was determined. Both reading speed and accuracy were measured during a 10 min period performed at both the threshold distance and at 0.5, 0.33 and 0.25 times this threshold distance.

CONCLUSIONS: The results indicate that for visually-normal subjects, a 2x rule is appropriate, i.e., for sustained comfortable reading, the text size should be at least twice the individual VA. However, higher values may be necessary for more prolonged or demanding tasks, or in the case of individuals with visual abnormalities.

53. **NOVEL LOW VISION APPROACH TO BILATERAL SUPERIOR ALTITUDINAL FIELD LOSS** (125908)

Molly Sue Cardenal, BS, OD, FAAO, Keely Hoban, OD, Kim Toffel, VA Medical Center

BACKGROUND: Non-arteritic ischemic optic neuropathy (NAION) is a common cause of altitudinal visual field defects. There are many potential etiologies for NAION. Exercise Anaphylaxis (EA) is an uncommon condition precipitated by physical exertion. It ultimately causes vasodilation and hypotension. NAION secondary to EA and the resulting functional deficits experienced from bilateral superior altitudinal visual field defects are discussed as well as the efficacy of bilateral sectoral base up prism in improving ambulation.

CASE REPORT(S): A 22 year old male presented for evaluation of visual field loss. He had been diagnosed with NAION due to EA. His medical and ocular history included NAION, EA, and sleep apnea. His medications included Vicodin, Epinephrine, and Methocarbamol. The anaphylactic events began in September 2009 with a second episode in 2010. He underwent allergy testing which was negative except for allergy to fire ants. Evaluation revealed 20/20 vision uncorrected in each eye, normal color vision, pupils, and extraocular motilities. He had superior field loss in each eye which was quantified with both Humphrey and Goldman visual fields corresponding to inferior temporal pallor of both optic nerves. He was referred to the low vision department to assist in mobility as he reported running into overhead items. He had previously tried yoked base up prism which was ineffective due to the shifted inferior field. He reported he had frequent headaches and neck strain from trying to avoid overhead obstacles. Fresnel prism was applied to the upper half of both lenses. A training "obstacle course" was set up in the low vision office to help him practice scanning into the prism for awareness of overhead obstacles. After several weeks of wearing the prism, he reported a decrease in running

into obstacles as well as improvement in his headaches and neck pain.

CONCLUSIONS: EA is a potential etiology for NAION. For bilateral superior visual field loss, Fresnel prism is a better option for improving ambulation than full field prism because it targets only the affected visual field.

54. TWO DISTINCT PREFERRED RETINAL LOCI (PRL):, TWO CASE STUDIES (125215)

Kathryn A. Recker, BA, Eli Peli, MSc, OD, FAAO, Russell L. Woods, MCOptom, PhD, FAAO, Schepens Eye Research Institute

BACKGROUND: PURPOSE: PRLs are defined as a discrete, well-defined retinal region where fixations are made; relate to a specific task, and are repeatable within and between trials (Crossland et al., 2011). We report two people exhibiting control of spatially-distinct, non-adjacent PRLs to perform the same task within and between visits.

CASE REPORT(S): METHODS: Patient 1 (56yo-F) was seen in our lab for 8 years and patient 2 (61yo-M) came for 3 visits over the course of a year. Both patients have juvenile macular degeneration causing bilateral macular lesions. Perimetry, retinal fixation exams and retinal imaging were performed. Patients fixated with a region of spared fovea or para-fovea retina (central-PRL) and another region located outside their lesion (peripheral-PRL) during the exams. Data was collected only after the patient indicated they were looking at the fixation-target.

RESULTS: Patient 1 exhibited both peripheral and central PRLs upon request within and between visits over 8 years. She reported using the central PRL for reading in the early years and was highly aware of which PRL she used. Patient 2 was unaware of utilizing two distinct PRLs that were found by chance. After being asked to pay attention to his ocular orientation when using his central and peripheral PRL, he was able to switch location when asked. Both patients more commonly used the peripheral-PRL.

CONCLUSIONS: Conclusion: Both patients repeatedly and reliably switched between these spatially-distinct PRLs but varied in their awareness of doing so. Incongruent measurements could result from different PRLs being used during exams, particularly if the patient or clinician is unaware of two PRLs being used. Efforts should be made to explore viewing strategies and distinct PRL use.

ADDITIONAL COMMENTS: Supported by NIH R01EY019100

55. VISION REHABILITATION IN PROGRESSIVE SUPRANUCLEAR PALSY: A CASE REPORT (125219)

Nyssa Connell, OD, Boston VA Healthcare System, Maritza Grey, Martinsburg WV VA Medical Center

BACKGROUND: Progressive supranuclear palsy (PSP) is a rare neurodegenerative disease affecting gait, cognition, speech, and vision. Blurred vision, diplopia, and dry eye symptoms occur early; later symptoms involve eye movements, fixation, and convergence. We present a case of PSP and discuss the optometrist's role in rehabilitative care.

CASE REPORT(S): An 83-year-old Caucasian male was referred to the low vision clinic for difficulty telling time and reading. His last eye exam was 8 days ago, and near

vision glasses with base down prism had been prescribed. Ocular history included cataracts, choroidal nevi, presbyopia, and seborrheic blepharitis in both eyes (OU). Medical history included sleep apnea, deep vein thrombosis, pulmonary embolism, ischemic heart disease, hearing loss, and progressive supranuclear palsy. Exam findings included steady fixation in primary gaze with mild pendular nystagmus OU in right gaze, and reduced near point of convergence with poor recovery. He could not depress either eye, had no elevation in the right eye (OD), and had minimal elevation in the left eye (OS). Adduction OD was impaired to 80%. Horizontal saccades and pursuits were slow with slow initiation, and he demonstrated blepharospasm of the left upper lid. He had good use of his hands and was able to hold low vision devices. Visual acuity with best correction was OD 20/30 and OS 20/30 at distance, and 0.33/0.8M at near with +3.00 add OU, but he was unable to read the newspaper. We prescribed a closed circuit television and intermediate vision glasses with base in prism, and he read the newspaper fluently with these. We educated the patient and his wife on the importance of keeping his clock, food, and other items at eye level.

CONCLUSIONS: For patients with PSP, the optometrist plays a crucial role in a multidisciplinary approach to care. Earlier intervention can optimize quality of life and includes an understanding of the ocular signs, symptoms, and natural history of the condition.

56. IS VERNIER ACUITY MORE SENSITIVE THAN GRATING ACUITY TO VISUAL IMPAIRMENT (VI) IN ADOLESCENTS? (125057)

Huizi Yin, OD, Barry S. Kran, OD, FAAO, Darick Wright, MA, COMS/ CLVT, Donna Bent, CAES, New England Eye Institute, Li Deng, PhD, FAAO, Dale Mayer, PhD, New England College of Optometry

RESULTS: Adult mean (SD) acuities (RE, session 1) were: RA -0.11 (0.05) (20/16); VeA: -0.24 (0.15); GA: -0.09 (0.05). Test-retest analyses of the adolescent data showed minimal bias and similar LOAs: RA LOA = 0.5 logMAR; VeA LOA = 0.8 logMAR, GA LOA = 0.6 logMAR. For adults, test-retest LOA for RA was smaller. Correlations of adolescents' δN for VeA and GA with RA (session 1) were significant and similar (VeA with RA, $r=0.80$; GA with RA, $r=0.84$). Mean δN s were also similar and not significantly different: Mean (SD) RA was -0.79 (0.34), VeA was -0.89 (0.04), and GA was -0.76 (0.31).

PURPOSE: To compare vernier acuity (VeA) and grating acuity (GA) tests to a recognition acuity (RA) test in adolescents with VI, hearing loss, and cognitive disabilities.

METHODS: 24 optometry students and 10 adolescents (16 eyes) attending Perkins School for the Blind were tested in each eye for RA (crowded letters), VeA (Drover et al OVS 2010) and GA (Teller Acuity Cards) in 2 sessions. Acuities were analyzed in logMAR. Test-retest reliabilities were examined with Bland-Altman method (bias, 95% Limits of Agreement, LOA). Because adults detected the highest spatial frequencies in both VeA and GA tests, only test-retest RA data were analyzed. To directly compare VeA and GA to RA in adolescents, their raw data were normalized taking the difference from the normal value for age (Delta-Normal, δN). δN s were analyzed with correlations and means.

CONCLUSIONS: Test retest reliabilities are similar for RA, VeA and GA tests in a small sample of adolescents with visual impairment and other disabilities. Normalized VeA and GA acuities have a similar relationship to normalized RA and are not significantly different on average. Thus, vernier acuity may not have an advantage over grating acuity in children with visual impairments due to ocular and neurological causes who have other disabilities. However, for other causes of visual deficits, for example, amblyopia, vernier acuity may be more sensitive than grating acuity.

57. MAPPING PATHWAYS TO VISUAL REHABILITATION: A STUDY OF OLDER ADULTS WITH AGE-RELATED VISION LOSS (125243)

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RESULTS: Three potentially constraining themes were identified in the ways seniors with ARVL navigated vision rehabilitation. *Lacking agency:* participants described passive experiences of vision rehabilitation in which they believed their understanding of their condition and their voice were unheard. *Negotiating uncertainty:* participants depicted an overly complex healthcare system coupled with a nebulous or frightening visual future. *Resisting acceptance:* participants viewed prescribed assistive devices as giving up on other more reasonable solutions or succumbing to the only remaining option.

PURPOSE: Age-related vision loss (ARVL) is increasingly prevalent. It significantly impacts quality of life, in part, by limiting occupational performance, which encompasses engagement in self-care, leisure and productive activities. This 2011 qualitative study of 21 Canadian seniors extends our understanding of seniors experiences with and attitudes toward vision rehabilitation and the potential impact of these resulting perspectives on occupational performance.

METHODS: Purposeful and snowball sampling methods were employed, leading to observations of, interviews with, and audio-diaries by 21 urban-dwelling Ontario seniors (69-91 year range; 16 women). Audio-recorded interviews and diaries as well as field notes of observations were transcribed. Data analysis was iterative, involving marking and interpreting meaning units among research team members.

CONCLUSIONS: We found this group of seniors with ARVL maintained three types of beliefs about vision rehabilitation that constrained therapeutic success: lacking agency, negotiating uncertainty, and resisting acceptance. Optometrists should be aware of the perspectives of seniors with ARVL that can limit vision rehabilitation engagement and occupational performance.

58. FACTORS INFLUENCING IMPROVEMENT IN LOGMAR VISUAL ACUITY (VA) IN PATIENTS WITH ALBINISM (125323)

Faheemah Saeed, BSc, OD, FAAO, Darrell G. Schlange, OD, FAAO, Illinois College of Optometry

RESULTS: The Pearson's correlation coefficients calculated are all insignificant indicating that there is no significant relationship between refractive error, amount of cylinder, or spherical equivalent and the magnitude of logMAR improvement [$r=-0.16$, $p(\text{two-tailed})=0.51$]; [$r=0.10$, $p(\text{two-tailed})=0.67$]; and [$r=-0.15$, $p(\text{two-tailed})=0.54$] respectively. However, there is a significant relationship between the VA obtained with best corrected spectacle prescription and the improvement in logMAR VA with tinted CL ($r=0.50$, $p(\text{two-tailed})=0.02$). The data indicate that those patients with the lowest best-corrected spectacle VA achieved the greatest improvement in logMAR VA with the tinted CLs.

PURPOSE: Therapeutic tinted CLs have been shown to improve various aspects of vision in patients with albinism including reduction in nystagmus intensity, reduced symptoms of glare and light sensitivity as well as improved VA and contrast sensitivity (Saeed & Schlange, 2011; 2012). In the current study, we report the extent to which refractive error affected the magnitude of improvement in logMAR VA with tinted CL correction. The impact of VA with best corrected spectacle prescription on the improvement in logMAR VA with tinted CLs is also reported here.

METHODS: The EDTRS chart was used to measure LogMAR VA in 20 subjects with Albinism while wearing their best corrected spectacle prescription. The subjects were then fitted with custom tinted CLs with an opaque tint and clear pupil at a follow-up visit where LogMAR VA was again measured after a 30 min adaptation period. The relationship between refractive error and improvement in logMAR VA was analyzed with Pearson's correlation coefficient (SPSS, Version 17.0, Chicago, IL).

CONCLUSIONS: Patients' refractive error is not significantly correlated with the amount of improvement in logMAR acuity that is obtained with tinted CLs. VAs obtained with best corrected spherical prescription are, however, significantly correlated with the improvement in logMAR VA; patients with worse VA achieved greater gains in LogMAR acuity with tinted CLs.

59. THE EFFECTIVENESS OF LOW-VISION REHABILITATION IN TWO COHORTS DERIVED FROM THE VA LOVIT STUDY (125335)

Joan A. Stelmack, OD, FAAO, Edward Hines VA Hospital, Robert Massof, PhD, Johns Hopkins University Wilmer Eye Institute

RESULTS: At baseline, differences in mean visual ability scores between groups were not significant. From baseline to 4 months, treatment effects increased in the treatment group ($p<0.001$), while mean scores except visual motor skills decreased in the control group ($p<0.01$). From 4 months to 1 year, the treatment group lost visual ability only in reading and visual information processing while the control group gained in all visual ability measures. Interactions of treatment and follow-up time in the mixed models showed treatment effects significantly changed from baseline to 1 year ($p<0.0001$) for all visual ability domains and overall visual ability. Both groups demonstrated improvement in visual ability from baseline to one-year ($p<0.0001$) except for mobility in the control group. Overall visual ability, but not other visual ability domains, improved more in the treatment group ($p=0.01$).

PURPOSE: To evaluate the effectiveness of low vision rehabilitation

METHODS: One hundred patients randomized to low vision treatment or waiting-list

control and thereafter to standard therapy were observed. Outcome measures included visual ability domains and overall visual ability estimated from difficulty ratings using the VA LV VFQ-48. A mixed-effects model was used to test treatment effects between groups at baseline, 4 months and one year. Differences in mean scores from baseline to one year and within-group changes from baseline to one year, baseline to 4 months, and 4 months to one year were compared.

CONCLUSIONS: Visual ability improved significantly in both groups from baseline to one year. The LOVIT treatment effect is robust and well maintained.

ADDITIONAL COMMENTS: Funding: VA Rehabilitation Research and Development Service Grant #C3457

60. A PILOT STUDY OF CLOSED CIRCUIT TV (CCTV) VERSUS ECCENTRIC VIEWING (EV) TRAINING FOR VISUAL REHABILITATION IN AGE-RELATED MACULAR DEGENERATION (AMD) (125378)

Susan J. Leat, PhD, FCOptom, FAAO, University of Waterloo School of Optometry and Vision Science, Francie Si, MD, MSc, William Hodge, MD, PhD, FRCSC, The University of Western Ontario, Deborah Gold, PhD, Keith Gordon, PhD, Canadian National Institute for the Blind, Dawn Pickering, OC(C), COMT CLVT, Canadian Association of Rehabilitation Professionals

RESULTS: Recruitment was more difficult than expected in this older population. Of 145 patients referred during a 2 year time period, 35 met the inclusion-exclusion criteria, 14 were willing to enroll and 10 finally completed the trial. However, for the main outcome variable (reading speed for 1.3M print), there was a significant improvement between baseline and outcome for the CCTV group ($p=0.005$), but not for the EV group ($p=0.28$) and the CCTV group showed significantly greater change than the EV group ($p=0.04$). There was also a borderline improvement in reading speed for 1M text and a significant decrease in the time taken to read utility bill information in the CCTV group. The other measures did not reach significance.

PURPOSE: In addition to optical devices, CCTV and EV training are both recognized interventions to improve reading performance in people with AMD. However, both are relatively expensive either in cost of the device or in the time of personnel. Our objective in this pilot randomized trial was to compare the effectiveness of these two interventions with 30 participants.

METHODS: Participants with AMD and visual acuity between 6/48 and 6/120 first received basic low vision care, including optical devices. After a period of at least 2 weeks, they took part in a battery of baseline measures including logMAR VA, reading speed and accuracy for 1.3M and 1M text, reading information on medicine bottles, utility bills and food packages, the NEI-VFQ, Geriatric Depression Scale and a reading inventory questionnaire. Then they were randomized to either obtaining a CCTV for home use or receiving EV training over the following 6 weeks.

CONCLUSIONS: Randomised clinical trials for LV rehabilitation, particularly in the elderly population, are challenging, but such trials are important for allocation of resources. This pilot trial did show early indications of more impact from CCTV than EV training.

ADDITIONAL COMMENTS: Supported by Lawson Health Research Institute IRF and

61. COMPARATIVE STUDY OF NEAR VISUAL ACUITIES OBTAINED BY MNREAD AND COLENBRANDER CHARTS IN FRENCH (125442)

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RESULTS: Regarding the best near visual acuity, strong Pearson correlations were found between all three charts; between MNRead and Colenbrander ($r=0,885$, $p\leq 0,01$), between MNRead and Lighthouse ($r=0,763$, $p\leq 0,01$) and between Colenbrander and Lighthouse ($r=0,822$, $p\leq 0,01$). As far as intraclass correlations (ICC) are concerned, Colenbrander compared to MNRead yielded an ICC of 0,873, MNRead and LightHouse an ICC of 0,734 and Colenbrander and LightHouse an ICC of 0,817, all with a significance of $p=0,000$.

PURPOSE: To determine if the visual acuities obtained with the MNRead and Colenbrander reading charts in French were similar or if there is a trend in the difference between the results. Results for minimal visual acuity obtained with Lighthouse decoding chart were also compared to see if this chart can be used as a predictor for reading acuity.

METHODS: 30 subjects with low vision, between the ages of 38 and 93 year old, were recruited. Each subject was recorded reading in a randomized order for the three charts (MNRead, Colenbrander and Lighthouse). Best visual acuities were then converted to LogMar using appropriate formulas, considering reading mistakes and actual reading distance. Reading speeds were also calculated for each paragraph completed by each subject. Pearson correlations were used to determine if there were significant differences between acuities for each chart. Intraclass correlations were also used to see if patients were consistent throughout the testing.

CONCLUSIONS: The recent French Colenbrander reading chart can be a very interesting tool to evaluate the reading abilities of low vision patients, since it is presenting similar results with the French MNRead chart. Lighthouse decoding chart can be used as a predictor of reading acuity with appropriate distance control.

ADDITIONAL COMMENTS: This research was done for my Masters thesis.

62. ACCIDENT AND NEAR MISS TRENDS IN OLDER PEOPLE WITH VISUAL IMPAIRMENT (125513)

Mei Ying Boon, PhD, BOptom (Hons), Byoung-Sun Chu, PhD, MOptom, FAAO, Catherine Bridge, PhD, Pei-Chu Lee, Te-Ju Chiang, MOptom, Nasser Alshamli, MOptom, Waleed Alghamdi, MOptom, University of New South Wales School of Optometry and Vision Science

RESULTS: There were significant differences in near miss rates between subgroups ((28% (4/14) control, 8% (1/12) cataract, 40% (6/15) glaucoma and 52% (17/33) AMD, $p=0.05$, Fisher exact test), but not accident rates ((5/14) control, (5/12) cataract, (5/15) glaucoma, (12/33) AMD, $p=0.97$, Fisher exact test). Median near miss rates were different between groups ($H=8.73$, $df=3$, $p=0.03$), but not accident rates. Near miss rate was correlated with accident rate ($R=0.38$, $p=0.001$). The ratio of fall to non-fall accidents experienced in the VI group was 3:35. None of the control participants fell.

Different baseline vision measures were associated with near miss rate for each VI subgroup.

PURPOSE: Deficits in vision are known to raise falls risk however little is known about whether non-fall accidents are also an issue for older people with visual impairment (VI). Therefore the purpose of this study was to investigate whether non-fall accidents are a problem for older people with VI and to explore if aetiology of VI, with associated visual deficits, impacts on accident pattern (frequency and type).

METHODS: A case-control prospective study of accident and near miss occurrence and type over 2 months comparing a sample of older people (>65 years) with normal and impaired vision. Baseline measures of vision and physical health were recorded then accident and near miss characteristics, as recorded by participants in a diary, were analysed. Subgroups based on aetiology of VI were also analysed.

CONCLUSIONS: Non-fall accidents were a problem for this sample of older people with VI, in addition to falls. Aetiology of VI was associated with different types and frequencies of near miss and accident events and should be further investigated.

63. **CONCEPT MAPS OF ACCIDENT CAUSATION AND PREVENTION AS PERCEIVED BY OLDER PEOPLE WITH VISUAL IMPAIRMENT (125527)**

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RESULTS: Participants with VI due to glaucoma and macular degeneration classified 74-81% of incidents as being vision-related while those with cataract classified only 36% of incidents as being vision-related. Four optometrists reviewed the diary entries and all incidents reported by participants with VI could be vision-related. Controls classified 50% of incidents as being vision-related which agreed with optometrist classifications. Participants usually identified impairments in light adaptation, contrast, refraction and central visual fields as contributing factors for accidents but not deficits in peripheral visual fields or depth perception

PURPOSE: To understand the mechanisms of accident causation and prevention as perceived by older adults with visual impairment (VI)

METHODS: Older adults (age>65 years) with normal (n=14) and impaired (n=70) vision participated in a 2 month prospective study of accident and near miss occurrence. Participants recorded details about any accidents or near misses in a diary including whether the incident was vision-related, the location and circumstances of the incident, what could have been done to prevent the incident from occurring or having a worse outcome, whether they sustained an injury. Concept mapping, a technique which illustrates how people explain relationships between various concepts, was used to analyse the diary data to determine participant understanding of how their vision is involved in accident causation

CONCLUSIONS: Older people with visual impairment may not be fully aware of the contribution of the subtler forms of impairment, such as deficits in peripheral vision and depth perception, to accident occurrence and avoidance.

64. AUSTRALIAN OPTOMETRISTS' ATTITUDES TO RECOMMENDING A PRIVATE CONDITIONAL DRIVER'S LICENCE (125532)

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RESULTS: 281 responses were received (response rate=14%). 82% of optometrists stated that patients with central VI should stop driving, although they would discuss conditional licensing (86%). While 90% said they would consider supporting a conditional licence, only 58% have done this previously. 7% of optometrists were familiar with prescribing bioptic telescopic spectacles, 30% are interested in prescribing them. Most optometrists felt confident to apply discretion when applying the visual standard however 30% prefer not to have this responsibility. Most optometrists (75%) believed that these individuals with VI should be given the opportunity to learn to drive and be tested on road. Optometrists reported that driving during daylight (91%), within their local area (85%), restricted speed (72%) should be imposed by driving licensing authorities.

PURPOSE: In Australia, private conditional driver's licences may be issued for individuals with visual acuity (VA) worse than 6/12 to 6/24. This study aimed to determine optometrists' management of patients, attitudes and understanding of the possibilities for driving with central visual impairment (VI). (VA<6/12 and normal visual fields, cognitive and physical health)

METHODS: 2439 optometrists were invited to participate in an online survey which evaluated whether they recommended conditional licences and the strategies or interventions they employed. Items were first piloted; consequently closed- and open-ended questions were used to explore optometrists' perceptions.

CONCLUSIONS: Australian optometrists are cautious when recommending conditional licences, however will consider discussing this with their patients with central VI. Strategies and restrictions require further research in Australia to clarify their safety and usefulness.

65. FACTORS AFFECTING PREFERRED RETINAL LOCUS (PRL) MEASUREMENT REPEATABILITY (125555)

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RESULTS: ONH position for the same exam was repeatable within 0.250 at the 95% confidence interval (CI), so data processing did not substantially contribute to the errors. The 95% CI of PRL position for repeated exams was 2.6 and 8.6 degrees for NV and CFL subjects, respectively. For NV subjects, foveal position repeatability was worse when the fixation target was further from the image center ($p=0.005$). For CFL subjects, PRL position repeatability was worse with larger BCEA ($p=0.03$) and larger changes in fixation-target location ($p=0.007$). For NV subjects, BCEA repeatability varied with fixation-target location ($p=0.02$), but there were no explanatory variables for CFL subjects.

PURPOSE: The position and size of the preferred retinal locus (PRL) are commonly used to evaluate retinal health and visual function of people with central scotomas that include the fovea. PRL measurements are typically taken once and seldom repeated for the same condition. Repeatability estimates the measurement noise. We investigated processing methods, human and instrumental factors that influence PRL repeatability.

METHODS: A retrospective evaluation of 132 retinal fixation examinations with a Nidek MP-1 of 40 normal-vision (NV) and 34 central field loss (CFL) subjects. For each subject, two matched tests with the optic nerve head (ONH) clearly defined were available, most from the same day. PRL or foveal eccentricity was relative to the population-average fovea location calculated from the ONH center. Factors were explored in multiple regressions that included averages and changes in: position of eye in image, tracking difficulty (time tracked to total time), fixation stability (bivariate contour ellipse area: BCEA), and PRL eccentricity.

CONCLUSIONS: Both instrument (image distortion and retinal tracking) and patient (PRL eccentricity, BCEA) measurement errors contributing to PRL repeatability. Studies of the PRL should consider poor PRL repeatability.

ADDITIONAL COMMENTS: Supported by NIH R01EY019100

66. AN ASSESSMENT OF A UNIVERSAL READING ACUITY CHART (125570)

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RESULTS: All participants were able to read all 50 lines. The average visual acuity was 0.034 (STD 0.045) LogMAR. The critical print size was calculated from a plot of the patient's reading speed vs. print size

PURPOSE: The purpose of this study was to examine the visual efficiency of normal subjects using ODOM-ROBIN CHART.

METHODS: Most reading charts are text reading charts; they have linguistic content and are inappropriate for persons who cannot read the language in which they are prepared. The ODOM-ROBIN CHARTS are number charts, independent of the language of the reader, which are designed to assess visual efficiency and thus reading comprehension of normal and low vision. It consists of 10 blocks of numbers whose size range from 0.9 LogMAR to 0 LogMAR in 0.1 LogMAR steps. Five lines and two columns of the same print size are grouped into a block. Participants are asked to read each line of numbers at 40cm and to state if the two numbers on the line are the same or different. The Odom-Robin Charts can be scored using either a modified version of ETDRS scoring in which a line corresponds to a letter or using scoring analogous to the MNREAD charts. Seventy six visually normal undergraduate students (mean age 22.83 STD 1.67 years; range 20 to 29 years) at the School of Optometry, University of Waterloo participated in this study. The participants were emmetropic and/or corrected; the mean spherical equivalent was -2.16(STD 3.08D) (range +4.87D to -10.87D). The time required to read each block and the number of errors made per block were recorded. The measurements were made under

normal photopic light levels.

CONCLUSIONS: The ODOM-ROBIN CHARTS works well for the normal and can be used with persons who are proficient in any language which uses Arabic numerals as found in all European and most non-european languages. The study needs to be further extended to patients with eye disorders.

67. COMPARISON OF MOTION SICKNESS SYMPTOMS: VISUALLY IMPAIRED AND NON-VISUALLY IMPAIRED (125583)

Tracy Matchinski, OD, FAAO, Janis E. Winters, Illinois College of Optometry

RESULTS: 373 subjects (155 VI and 218 NVI) were surveyed for history of MS. Of those, 137 (37 VI and 100 NVI) reported experiencing MS. The MSAQ was completed by 34 VI and 96 NVI subjects. MS symptoms as assessed by total score and sopite-related subscale, were rated statistically significant more severe by VI subjects compared to NVI (49.9 vs. 44.5 and 42.8 vs. 40.0 respectively). No statistically significant difference between was found for gastrointestinal, central or peripheral MS symptom subscales although VI subjects did rate symptoms in these subscales more severely than NVI subjects.

PURPOSE: Motion Sickness (MS) has been classified as a multidimensional construct with gastrointestinal, central, peripheral and sopite-related components. The Motion Sickness Assessment Questionnaire (MSAQ) was developed to quantify these symptoms.

METHODS: The MSAQ was administered to both visually impaired (VI) and non-visually impaired (NVI) subjects who subjectively complained of MS. T-test was performed to assess statistical significance ($p < 0.05$).

CONCLUSIONS: VI may have an effect on patients' perception of severity of MS symptoms. Clinicians should be aware of these differences to better care for the VI patients they serve.

68. ARE AGE AND DURATION OF VISION IMPAIRMENT FACTORS IN THE ABILITY TO COPE WITH LOW VISION? (125667)

Caitlin E. Murphy, MSc, Nathalie Duponsel, Tanja Gninka, BSc, Olga Overbury, PhD, University of Montreal School of Optometry

RESULTS: Older adults experience more denial, $r = 0.187^2$, and find it more difficult to adapt to their vision loss, $r = -0.549$. Irrespective of age, the longer individuals live with visual impairment, the more they accept and learn to live with it, $r = 0.233$, $r = 0.265$. Finally, older individuals report blaming themselves less for their loss of vision compared to younger people, $r = 0.176$.

PURPOSE: The majority of visual disorders such as Age-Related Macular Degeneration (AMD) and Glaucoma affect older adults. However, certain retinal disorders such as Retinitis Pigmentosa (RP) and Diabetic Retinopathy (DR) begin earlier in life. The purpose of this study was to compare the coping mechanisms of those with early onset visual disorders to those affected later in life.

METHODS: Participants with AMD, Glaucoma or DR, drawn from the Montreal Barriers Study database, were matched on age, gender and duration of impairment. Participants with RP and DR were recruited from two rehabilitation agencies. There were

135 participants in total (78 M, 76 F) between 23 and 95 years of age. All were eligible for low vision services according to the Quebec Ministry of Health. Three questionnaires were utilized: the Visual Functioning Index 14 - a 14-item measurement of self-assessed functional vision, the Brief COPE Inventory - a 28-item questionnaire measuring coping quality and the Center for Epidemiology Studies Depression Scale - a 10-item measure of depressive symptomatology.

CONCLUSIONS: Rehabilitation specialists should be aware that denial is a frequent coping mechanism used by older visually impaired people. On the other hand, older individuals do not blame themselves for their visual loss as much as younger people do. They accept it as part of the natural ageing process. It may be useful for professionals to provide low-vision patients with more information regarding the causes of certain visual disorders in order to avoid resignation to perceived inevitable changes.

ADDITIONAL COMMENTS: Supported by Réseau Vision of the FRSQ, INLB, and MMRC. Graduate Fellowship to ND

69. **IS VISUAL ACUITY ASSOCIATED TO QUALITY OF LIFE OF VISUALLY IMPAIRED OLDER ADULTS? IT DEPENDS! (125680)**

Judith Renaud, OD, MSc, Olga Overbury, PhD, University of Montreal School of Optometry, Marie-Josée Durand, OT, PhD, Université de Sherbrooke

RESULTS: There were significant correlations between HRQOL and VA of the better eye ($r = -0.38$, $p < .001$), of the worse eye ($r = -0.26$, $p = .003$) and binocular VA ($r = -.34$, $p < .001$). There were no significant correlations between SQOL and better ($r = -0.09$, $p = .32$), worse ($r = -0.04$, $p = .66$) or binocular ($r = -.06$, $p = .49$) VA.

PURPOSE: Quality of life (QOL) is a key outcome measure in health and rehabilitation interventions. In the literature, there are many definitions for QOL. According to Haas, there are two main approaches to define and measure this concept: objective and subjective. The objective approach, often referred as health-related QOL (HRQOL), considers objective indicators focusing mainly on the information quantifying the functional status of a person. The subjective approach, frequently called subjective QOL (SQOL), considers subjective indicators describing a person's well-being and satisfaction with life. The purpose of this study was to examine the association between visual acuity (VA) and QOL, both HRQOL and SQOL, in a visually impaired older adult population.

METHODS: This cross-sectional study involved 135 visually impaired older adults, aged 69 and older [mean = 83 years (SD 6.2)] who were recruited at a low vision rehabilitation center in Quebec, Canada. HRQOL was measured with the National Eye Institute Visual Function Questionnaire-25 and SQOL was estimated with the Quality of Life Index. VAs were measured with the Ferris-Bailey ETDRS chart. Correlations were performed.

CONCLUSIONS: Distance acuity of older adults with visual impairment is associated with HRQOL, but not with SQOL. This disparity supports the idea that QOL's objective and subjective approaches are somewhat different. Research in vision has mainly examined the objective component of QOL. Future research on visually impaired older adults' QOL should consider both approaches since this can provide additional information that can help clinicians' interventions.

ADDITIONAL COMMENTS: This study was supported by FRSQ and CNIB graduate fellowships to JR and, RRSV and INLB operating grant to JR.

70. VISUAL ACUITY PERFORMANCE 10 MINUTES POST OPTI-K LASER TREATMENT FOR HYPEROPIA/PRESBYOPIA (125295)

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RESULTS: 14 hyperopic patients with presbyopia, age 42-73 YO, mean age 58.6 YO, had monocular and binocular visual acuity measured before and after Opti-K refractive laser treatment. Pretreatment uncorrected distance monocular visual acuity(UCDVA)using the EDTS visual acuity chart ranged from 20/20 to 20/320. Mean UCDVA was 20/55. Pretreatment uncorrected monocular near visual acuity(UCNVA) ranged from 20/40-20/400. Mean UCNVA was 20/138. UCDVA was measured immediately post treatment (within 10 minutes) range was 20/20-20/80, mean 20/35. Five eyes had immediate re-treatment. Bilateral UCDVA ranged from 20/20-20/60. (mean 20/25); 7 patents were 20/20, 5 pts were 20/25, 1 pt 20/32, 1 pt was 20/60. (this pt was over-treated). Immediate post treatment uncorrected binocular near visual acuity ranged from 20/25-20/63. (mean 20/47). Bilateral UCNVA was 20/25 in 3 pts, 20/32 in 6 pts, 20/40 in 4 pts, 20/63 in 1 pt.

PURPOSE: The purpose of this study is to measure the distance and near visual acuity immediately s/p Opti-K laser treatment. The noninvasive, fast, repeatable refractive laser treatment reshapes the cornea without significant healing time. This study reports how quickly visual acuity is restored after treatment.

METHODS: This is a single arm, nonrandomized, unmasked clinical investigation. 14 hyperopic patients with presbyopia (SE between pl-+4.50) received NTK optimal keratoplasty (opti-K) bilaterally. Uncorrected distance and near visual acuity was measured immediately before treatment, and 5-10 minutes immediately after treatment. The results were compared.

CONCLUSIONS: Uncorrected distance visual acuity was improved in 13 of 14 hyperopic patients within 10 minutes of Opti-K refractive laser treatment. Uncorrected near visual acuity improved to 20/40 or better in 13 of 14 patients, and improved better than pretreatment UCNVA in all 14 patients. This is a safe, noninvasive, repeatable treatment option for hyperopia/presbyopia giving patients immediate uncorrected distance and near visual acuity improvement.

71. FACTORS THAT INFLUENCE SATISFACTION AFTER LASIK IN 38,520 CONSECUTIVE PATIENTS (125587)

Mitchell C. Brown, OD, FAAO, Coronado, CA

RESULTS: Overall, 95% of patients were satisfied after LASIK. Satisfaction responses were highest in patients with 20/12 or better UCVA, less than one line of UCVA disparity between the right and left eyes and in patients who were very satisfied with the care provided by their optometrist. Satisfaction responses were lowest in patients with 20/40 or worse UCVA, three lines or more of UCVA disparity between the right and left eyes and in patients who were very dissatisfied with the care provided by their optometrist. Satisfaction was not affected by the amount of treated preoperative

hyperopia or astigmatism, or by mesopic pupil size.

PURPOSE: To analyze factors that influence patient satisfaction after LASIK.

METHODS: This is a retrospective analysis of 75,396 LASIK procedures in 38,520 consecutive patients. The analysis evaluates questionnaire responses to determine the influence of postoperative uncorrected visual acuity (UCVA), UCVA disparity between right and left eyes, patient perception of care provided, preoperative (treated) hyperopia and astigmatism, and mesopic pupil size on patient satisfaction with the outcome of their procedure at one month after surgery.

CONCLUSIONS: Patient satisfaction after LASIK is multifactorial. In this study, overall satisfaction with procedure outcome was high (95%) and consistent with other published studies. Satisfaction was related to postoperative UCVA, inter-eye UCVA disparity, and patient perception of care provided by the optometrist. Satisfaction was not related to the level of preoperative (treated) hyperopia, preoperative astigmatism, or mesopic pupil size.

72. VALIDATION OF A NEW OPTOMETER FOR PERIPHERAL OBJECTIVE REFRACTION (125315)

Frank Spors, MSc, PhD, FAAO, Jie Shen, OD, PhD, FAAO, Donald J. Egan, OD, FAAO, Lance E. McNaughton, PHD, OD, Shivani Ram, Neil Patel, PhD, Western University of Health Sciences College of Optometry

RESULTS: The Wilcoxon signed ranks test showed that the mean refractive power values were not significantly different for all directions of gaze. The mean refractive power RMS values were: Mean differences for the different directions were as follows. Central MD -0.07D, p 0.08, 10° temporal MD -0.04D, p 0.26, 20° temporal MD -0.03D, p 0.42, 10° nasal MD -0.01D, p 0.68, 20° nasal MD -0.03D, p 0.39. The Hypothesis for the research project was supported. There was no clinically relevant difference between measurements of the two instruments.

PURPOSE: Western University's research group developed an optometer (ARPO) based on the Badal principle. The purpose of this study was to determine whether this instrument attached to a Nidek RT 5100 closed field autorefractor provides central and peripheral refractive results comparable to a Grand Seiko WAM 5500 open field autorefractor.

METHODS: The right eyes of 35 second year optometry students were measured with the 2 instruments. Refractive errors were limited to a range of -6.00D up to +1.00D of sphere, and no greater than -2.00D of cylinder. Each objective refraction reading was converted into power vector components M, J0 and J45 via astigmatic decomposition. For the purpose of statistical evaluation M, J0 and J45 were further converted to the refractive power RMS value P. The range of P for the initial central refraction was a mean of 2.29D with a standard deviation of 1.78D. Statistical analyses were performed using SPSS software version 16.0. A mean RMS difference ≥ 0.12 D between results of the 2 instruments was set as the limit for clinical relevance. Larger differences indicated a clinically meaningful difference. Refractive power RMS data were analyzed with the Wilcoxon signed rank test of paired measurements.

CONCLUSIONS: The newly developed ARPO optometer used in conjunction with a Nidek RT 5100 closed field autorefractor gave comparable refractive results to a Grand

Seiko WAM 5500 open field autorefractor for central and peripheral refraction along the horizontal meridian.

73. **PERIPHERAL REFRACTION AND REFRACTIVE ERROR CHANGES OVER ONE YEAR IN YOUNG ADULTS (125373)**

Andreas Hartwig, Dipl Ing (FH), Neil Charman, Hema Radhakrishnan, University of Manchester

RESULTS: The group means and standard deviations of the changes in AL and subjective refraction were respectively 0.01 ± 0.07 mm and 0.04 ± 0.29 D in myopes, and 0.02 ± 0.07 mm and -0.12 ± 0.38 D in emmetropes: none of these group changes were significantly different from zero ($p > 0.05$). No significant correlations were found between individual AL change or refractive error progression and peripheral refraction parameters. Significant correlations were found between subjective M and B1 fitting coefficient for M and between subjective M and relative peripheral M at 30 degrees temporal retina. The first significant correlation indicates a temporal shift of the polynomial fitting with increasing myopia and the second significant correlation indicates increasing relative hyperopia at 30° temporal retina with increasing central myopia.

PURPOSE: To evaluate a possible link between initial peripheral refraction along the horizontal meridian and refractive error progression in young adults during a period of one year.

METHODS: Peripheral refractions in 22 emmetropic (spherical equivalent from -0.50 to 0.50D; mean -0.03 ± 0.36 D) and 32 myopic (spherical equivalent from -9.63 to -0.63D; mean -3.46 ± 2.35 D) subjects were measured at 5° intervals along the horizontal meridian up to 30°, using an open-field autorefractor. The mean age \pm SD was 24.9 ± 5.1 years, ranging from 19 to 38 years. The peripheral refraction data, expressed in terms of M, J180 and J45, were fitted with quadratic polynomial curves of the form $f(x) = B_2x^2 + B_1x + \text{Intercept}$. Axial length (AL) and subjective refractions were also determined. A year later the measurements of AL and subjective refractions were repeated. Progression rates and their relation to peripheral refraction parameters were analysed.

CONCLUSIONS: The present study fails to show any link between peripheral refraction and refractive error progression. This is possibly due both to the short duration of the study and to the low overall refractive error progression rate in the subject population. There is some further evidence for relative peripheral hyperopia in myopes.

74. **EFFECT OF ACCOMMODATION ON PERIPHERAL REFRACTION (125263)**

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RESULTS: Emmetropic eyes did have about 1.0 D myopic shift in 30° periphery. Increasing Against-The-Rule astigmatism was presented in the horizontal periphery. These results are in alignment with previous literature. With stimulated accommodation, there were no statistically significant differences of the peripheral spherical equivalents M and J₀ astigmatism. Right eyes showed a positive linear slope of J₄₅ profile across the horizontal visual field which was

negative for left eyes. But with increasing accommodative demands, the slope of J_{45} profiles changed signs. J_{45} values varied within a range of 0.6 D.

PURPOSE: Both animal and human studies show that peripheral refraction has an impact on the development of central refractive error. Furthermore, there is evidence indicating the link between near work and myopia progression. The purpose of this study is to investigate the effect of accommodation during near work on peripheral refraction.

METHODS: Twenty six eyes (thirteen young subjects, 8 females and 5 males) with a narrow range of uncorrected refractive errors ranging from -0.50 to +1.00 diopters, and astigmatism less than -1.00 diopters were measured by an Grand Seiko WAM 5500 open field autorefractor. The refractive error was measured in 10 steps up to 30 across both the temporal and the nasal horizontal visual fields. The measurements were repeated with Maltese cross visual targets displayed at 20 ft distance, 40 cm and 25 cm. The near targets were arranged in an arc which allowed to maintain the same accommodative demand throughout the different directions of gaze. Central and peripheral refraction data were converted to power vectors M , J_0 , and J_{45} with astigmatic decomposition.

CONCLUSIONS: Near accommodation to 25 cm and 40 cm did not show significant effects on M and J_0 components of peripheral refraction in emmetropic subjects. But near accommodation had major effects on the J_{45} component. It remains unclear why J_{45} changed significantly. Further studies are needed to investigate the relationships between J_{45} and the states of accommodation.

75. REFRACTIVE SCREENING USING THE BRÜCKNER TEST: VALIDITY AND INTER-OBSERVER RELIABILITY IN A PEDIATRIC POPULATION (125389)

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RESULTS: For overall ametropia detection using the Brückner test, interns achieved 67.6% sensitivity, 78.1% specificity, 76.7% positive predictive value and 69.4% negative predictive value. Experienced optometrists obtained 82.4% sensitivity, 84.4% specificity, 84.8% positive predictive value and 81.8% negative predictive value. Inter-observer reliability for matching refractive crescents according to magnitude, classification and Pass/Fail judgments was 87.8%, 89.4% and 78% respectively.

PURPOSE: To evaluate the validity of the Brückner test as a refractive screening tool when performed by optometric interns versus experienced pediatric optometrists.

METHODS: Sixty-six children ranging in age from 1 to 12 years were refracted independently by optometric interns and optometrists using non-cycloplegic Brückner method, with subsequent cycloplegic retinoscopy as the comparative standard. Validity data was obtained for interns and doctors with respect to significant refractive error (> 2.50 diopter hyperopia, 1.50 diopter myopia, 1.00 diopter astigmatism and 1.25 diopter anisometropia).

CONCLUSIONS: The Brückner test appears to be a valid procedure for detecting

significant refractive error in young children. Further investigation of this method for refractive screening is warranted.

76. COMPARISON OF A NOVEL CELL PHONE-BASED REFRACTION TECHNIQUE (NETRA-G) WITH SUBJECTIVE REFRACTION (125394)

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RESULTS: For all 13 subjects, the average difference between NET and SR is 0.56 +/- 0.64. The refraction determined by NET is well correlated with that of SR $r=0.98$ and the two measures were not statistically significantly different from each other ($p>0.05$). Orthogonal linear regression fit presented a slope of 0.92 and a y-intercept of -0.19D. 61% of the subjects had an error smaller than 0.5D and 23% smaller than 1D. The average difference between NET and AR is 0.56 +/- 0.61 (correlated $r=0.99$).

PURPOSE: To assess the performance of a cell phone based refracting device (NETRA-G). This study determines the accuracy of this prototype in determining refractive error in comparison to non-cycloplegic autorefraction (AR) and subjective refraction (SR).

METHODS: NETRA-G (NET) retrofits a high-resolution mobile phone (Samsung Galaxy S) by adding a pinhole mask, a film and a lens onto the display. The device is bi-ocular with the fellow eye viewing an object at infinity. The subject aligns red and green lines with the translation on screen proportional to refractive error. 13 subjects (mean + SD age 29.79 +/- 11.32) underwent AR, SR, and NET refraction. Subjects refractive error ranged from plano to -7.5D (mean + SD refraction -3.00 +/- 2.21D). Exclusion criteria included amblyopia and any ocular pathology.

CONCLUSIONS: When compared to SR, NET slightly overestimated the myopic refractive errors and had a small myopic offset of 0.19D. The results shows that NET has potential to be used as an effective tool for rapidly estimating refractive errors by non-eyecare professionals. Accuracy of this novel technique is expected to increase as technology evolves.

77. MYOPIA AND THE WATER DRINKING TEST (125489)

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RESULTS: As expected, axial length was significantly longer ($p<0.01$) in myopic eyes. Water loading caused a significant increase in IOP by T=20 compared with controls, and for both refractive subgroups the increase in IOP (3.9 ± 0.6 mmHg) was similar. However, IOP had returned to within normal range by T=40 for non-myopes whereas myopes still ($p<0.001$) maintained these increase levels of IOP at T=40. No significant associations were observed between water loading and refractive error, central corneal thickness, axial length, anterior chamber depth or salivary cortisol.

PURPOSE: The rapidly increasing prevalence of myopia worldwide has been linked to increasing complexity of modern lifestyles. Animal and pilot human studies have also

suggested that physiological stress-induced dysregulation of transretinal fluid outflow may play a role. Thus, this study aimed to investigate differences in fluid regulation and cortisol levels between myopes and non-myopes during the rapid ingestion of water.

METHODS: Forty-one healthy adults with mean age 22.6 ± 1.6 yrs were assigned randomly to control or experimental groups where the latter drank 1 liter of water over 10mins. Refractive error (Shin Nippon open-field autorefractor), IOP (Tonopen), central corneal thickness (Sonogage), axial length, anterior chamber depth (IOL Master) and salivary cortisol (Salivettes) were measured at baseline, T=20 and 40mins. Twenty-five subjects were myopes (mean -3.50 ± 2.00 DS).

CONCLUSIONS: The Water Drinking Test itself was not sufficiently stressful to show significant change in cortisol levels though indirectly affecting ocular fluid dynamics in myopes. This suggests that myopic eyes may have reduced ocular fluid regulation that could indirectly influence axial length and volumetric enlargement of the globe.

78. **PREDICTING REFRACTIVE CHANGE AND STABILITY (125725)**

Mitchell C. Brown, OD, FAAO, Coronado, CA

RESULTS: At the initial assessment of refractive stability, 85.7% of eyes were determined to be stable and 14.3% were determined to be unstable. Of eyes determined to be stable at any exam, approximately 90% continued to be stable whereas approximately 10% became unstable at the next sequential exam. Of eyes determined to be unstable at any exam, approximately 27% continued to be unstable whereas approximately 73% became stable at the next sequential exam. Using ± 0.50 D and ± 1.00 D of past change as the stability criteria correctly predicted future change or stability 81.0% and 82.0% of the time respectively. Using no criteria for past stability and using the hypothetical assumption that all patients will be stable correctly predicted future stability 88.4% of the time.

PURPOSE: To evaluate the predictive value of past refractive change or stability.

METHODS: This is a retrospective time series analysis of refractive change in 29,231 eyes of 15,864 patients. Inclusion criteria required four consecutive manifest refractions, each separated by 365 \pm 30 days. Exclusion criteria were previous eye surgery and previous contact lens wear. The refractive change over time of manifest sphere and cylinder was analyzed to determine the predictability of future change. Predictive values were determined using several different criteria for past stability, and using no stability criteria with the hypothetical assumption that all patients will be refractively stable.

CONCLUSIONS: Past refractive stability is approximately 90% predictive of future stability. Past refractive instability is approximately 27% predictive of future instability. There is no significant difference in predictability whether the criteria for past stability is defined as being “no greater than 0.50D” or “no greater than 1.00D” of past change. Using the assumption that all patients will be stable is more predictive of actual stability than using arbitrary benchmarks of past stability to attempt to predict future stability.

79. **LONG DURATION MYOPIC SHIFT AFTER HYPERBARIC OXYGEN THERAPY (125687)**

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BACKGROUND: Hyperbaric Oxygen Therapy (HBOT) is indicated as a treatment of decompression sickness in SCUBA divers and also to improve wound healing, for carbon monoxide poisoning and for compartment syndrome, among a variety of other medical conditions. HBOT consists of exposing patients to high levels of oxygen, which increases healing with only minimal side effects. One key side effect is that HBOT can lead to myopic shifts, which have been previously documented as temporary changes.

CASE REPORT(S): A 49 year old Asian male presented to the Johns Hopkins Vision Rehabilitation Service with complaints of reduced distance vision. He had a history of multiple sessions of HBOT for treatment of non-healing digital ulcers secondary to scleroderma associated with Kimura disease and Raynaud's phenomenon. Treatment was completed seven months prior to presentation. The patient was aware that temporary changes to his glasses prescription were possible in association with HBOT, but became concerned when no improvement in clarity was noted after discontinuing treatment. Visual acuity through his presenting prescription of -15.50-0.50x105 was 20/70-2 in the right eye and -14.25-1.00x070 was 20/80+1 in the left eye. The patient pushed his glasses closer to his eyes during visual acuity testing. Monocular manifest refraction in the right eye was -20.00-0.50x105 and the left eye was -19.00-0.50x045. Trial frame refraction with binocular balance yielded -18.50-0.50x105 with visual acuity OD 20/20-1 and -17.50-0.50x045 with visual acuity 20/20-1 OS.

CONCLUSIONS: HBOT has become more prevalent with increased indications such as for poor wound healing. Optometrists should be aware of the indications of this treatment especially when shifts in refractive error are noted with the indicated comorbid conditions. Patients undergoing HBOT should be educated about potential changes in vision, which are usually temporary, but can be long-standing as in this case report.

ADDITIONAL COMMENTS: NIH/NEI EY12045 NIH/NEI EY018696 Readers Digest Partners for Sight Foundation

80. PRESBYOPIC STRATIFICATION DIFFERENCES WHEN USING AN AGE CRITERION VERSUS MEASURED THRU-FOCUS VISUAL ACUITY (125163)

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RESULTS: Hofstetter's age-amplitude calculation, with a vergence demand of 2.50D (40cm), was used for determining add power as a function of age. Measured thru-focus VA was also used to stratify each subject into an appropriate presbyopic group. The two stratification techniques were compared for the amount of variance and overlap between the three presbyopic groups: (1) Non-presbyope, (2) Low Add, and (3) High Add. When using age to determine the degree of presbyopia, the variance was significantly higher for the Low Add population at vergences from 1.0D - 4.0D ($p < 0.01$) than when utilizing the VA criteria. For the Non-presbyope population, the variability was significantly higher from 3.0D - 4.0D ($p < 0.01$) when using age compared to VA. High add subjects showed no significant difference in variance between the two stratification methods, but with age stratification there was a large overlap in average thru-focus VA between the Low and High add groups.

PURPOSE: To determine the differences in presbyopic stratification when using age compared to measured visual acuity (VA) as a metric.

METHODS: Ninety subjects, 180 eyes, (age range, 24-63yrs) were enrolled in a non-randomized, bilateral, unmasked evaluation of ocular aberrations, pupil diameter, VA and accommodation response. HCHI VA was assessed at 6m, 2m, 1m, 67cm, 50cm, 40cm, 33cm, 28cm, and 25cm. As the subject fixated on the lowest readable line, total ocular aberrations and pupil diameter were measured using the Complete Ophthalmic Analysis System (COAS). Each eye was tested monocularly, with the fellow eye occluded.

CONCLUSIONS: These results show that there is not a direct relationship between age of an individual and degree of presbyopia. Although there is still a trend between the three presbyopic groups when stratifying by age, there is an increase in the variance of measured visual acuity data along with a higher degree of overlap between the Low and High add groups. This study suggests that just using age to determine if a person is presbyopic is not a sufficient metric.

81. **EVALUATING PATIENT OUTCOMES AFTER CATARACT SURGERY WITH MULTIFOCAL AND ACCOMMODATING IOLS (125161)**

Josh K. Johnston, OD, Georgia Eye Partners, Dwayne Logan, MD, Ehsan Sadri, MD

RESULTS: Sixty-eight patients (C=17, R=18, T=33) were recruited for this study. Mean age: (C:71, R: 71, T: 74). Percentage of patients satisfied or very satisfied with overall vision without correction: (C:69%, R: 93%, T:90%). Percentage of patients not needing glasses after surgery: (C: 23%, R: 78%, T: 72%). Percentage of patients able to read easily: (C: 29%, R: 59%, T: 76%). Percentage of patients with moderately bothersome dysphotopsias: halos: (C: 10%, R: 31%, T: 30%), glare: (C: 10%, R: 31%, T: 17%). Percentage of patients that will most likely have surgery again: (C: 75%, R: 76%, T: 94%).

PURPOSE: To assess subjective outcomes in patients that have undergone cataract extraction and received different presbyopia correcting IOLs: ZMA00/ZMB00, SN6AD1, and AT50SE IOLs.

METHODS: Single-center, open-label, retrospective/prospective comparison study on patients that have undergone cataract surgery and have been implanted with either a ZMA00/ZMB00 (T), SN6AD1 (R), or AT50SE/AT52SE (C) IOL. Quality of life questionnaires were obtained on all patients with at least 3 months post cataract extraction.

CONCLUSIONS: All three presbyopia correction IOLs showed good overall visual satisfaction without correction. The multifocal platforms showed higher spectacle independence and dysphotopsias when compared to accommodative IOL. Aspheric diffractive multifocal patients showed the highest likelihood of having surgery again.

82. **ON HAPTICALLY-INDUCED OCULAR ACCOMMODATION (125590)**

Lawrence R. Stark, PhD, FAAO, Kimberly Shiraishi, Tyler Sommerfeld, OD, Southern California College of Optometry

RESULTS: Sensory modality had a significant effect on the slope of the accommodative stimulus-response function. The accommodation response in the Haptic condition was

significantly poorer than in the Visual condition ($p < 0.0001$). There was no significant difference between Visual and Visual and Haptic conditions ($p = 0.87$). Accommodation gain in the Haptic condition was not significantly different from zero (mean gain of 0.05, $p = 0.117$), despite accurate tactile space perception (mean gain of 1.03).

PURPOSE: To determine if touch can provide cues to ocular accommodation.

METHODS: The accommodation responses of 15 visually-normal, young adults were measured with an objective infrared optometer under binocular viewing conditions while they read a series of cards containing sets of standard Braille letters. Cards were placed within the manipulatory space of the hand (20-50 cm). (1) In the Haptic condition, subjects read by touch with the dominant hand in a completely dark room. They also made an estimate of card distance with the non-dominant hand. (2) In the Visual condition, they read by sight without touch in a lighted room. (3) In the Visual and Haptic condition, they read by sight and touch in a lighted room.

CONCLUSIONS: In this group, and for steady targets, touch does not provide a stimulus to accommodation, despite providing an accurate cue to space perception. Touch also has no significant effect on accommodation when vision is already present.

83. **REPEATABILITY OF OCULAR BIOMETRY MEASUREMENTS USING THE LENSTAR (125222)**

Krystal L Schulle, BS, David A. Berntsen, OD, PhD, FAAO, University of Houston College of Optometry

RESULTS: The mean \pm SD age and spherical equivalent refractive error were 24.1 ± 1.5 years and -3.28 ± 2.71 D, respectively. The between-visit 95% LoA were $\pm 9 \mu\text{m}$ for central corneal thickness, ± 0.14 mm for anterior chamber depth, ± 0.15 mm for lens thickness, and ± 0.05 mm for axial length. There was no between-visit bias for any of the ocular components measured (all $p > 0.18$). The inter-examiner 95% LoA were $\pm 6 \mu\text{m}$ for central corneal thickness, ± 0.06 mm for anterior chamber depth, ± 0.10 mm for lens thickness, and ± 0.03 mm for axial length. There was no inter-examiner bias for central corneal thickness, lens thickness, and axial length (all $p > 0.10$). There was a statistically significant, but clinically small, inter-examiner difference of 0.02 mm for anterior chamber depth ($p = 0.01$).

PURPOSE: To determine the between-visit and inter-examiner repeatability of ocular biometry measurements using a low-coherence interferometer.

METHODS: Central corneal thickness, anterior chamber depth, lens thickness, and axial length were measured (OS) in 24 adults with a Haag-Streit Lenstar. Five consecutive measurements were made by the same examiner at two visits (separated by 1 to 20 days). Measurements were also made by two examiners at one visit with examiner order randomized. To assess between-visit and inter-examiner repeatability, the difference versus the mean of each pair of measurements was plotted. The mean of the differences was compared to zero using a t-test (bias) and the 95% limits of agreement (LoA) were calculated.

CONCLUSIONS: Between-visit and inter-examiner repeatability were good for all ocular components. Lenstar axial length measurement repeatability is comparable to the reported repeatability of the IOLMaster, but the Lenstar has the advantage of simultaneously measuring all optical components using interferometry. The repeatability

of these measurements indicates that the Lenstar is a good choice for biometry in longitudinal studies.

ADDITIONAL COMMENTS: Support: NIH T35-EY007088 (KLS) and University of Houston New Faculty Research Program (DAB)

84. OCULAR DIMENSIONS OF ADULTS WITH DIFFERENT REFRACTIVE STATES (125648)

Amy Lam, OD, MS, David Troilo, PhD, FAAO, Kathryn Richdale, OD, PhD, FAAO, State University of New York (SUNY) College of Optometry

RESULTS: The axial dimensions of the eye as measured by MRI and US were well correlated and did not differ significantly, however PCI tended to overestimate axial length. Dimensions (mean mm) by refractive group were: AL(M=24.45,E=22.86,H=23.07), SH(M:23.83, E:23.33,H:23.29), VCD(M=17.39,E=16.03,H=16.14),CMRD(M=12.24,E=11.84,H=11.41),LT(M=3.95,E=3.93 H=4.16), LED(M=9.60,E=9.42,H=9.46). Several anatomical parameters were significantly related to refractive state (slope mm/D): AL (0.37, $p<0.001$), SH (0.09, $p=0.04$) VCD (0.34, $p<0.001$) and CMRD (0.10, $p<0.01$). MRI measures of LT, LED, and the LT/LED ratio were not related to refractive state.

PURPOSE: The dimensions of the eye are related to refractive state. Prior research has shown significant differences in anatomical characteristics between myopes and emmetropes, but there is relatively less work comparing myopes, emmetropes, and hyperopes in adults. This study examines anatomical differences among the three groups using different biometric techniques to examine several anatomical parameters in a single data set.

METHODS: MRI, IOLMaster (PCI) and A-scan US measurements were performed on the right eyes of 82 patients (ages 30-50, 11 hyperopes (H), 26 emmetropes (E), and 45 myopes (M)). Measurements of axial length (AL), sagittal height (SH), vitreous chamber depth (VCD), ciliary muscle ring diameter (CMRD), lens equatorial diameter (LED), and lens thickness (LT) were made on the central slice of MR images with a digital caliper. A mean of 6 MRI, 5 PCI, and 5US measures were used for each subject. MRI measures of axial length (AL) were compared to US&PCI using Bland-Altman plots. Linear regression was used to assess the relationship of the dimensions with refractive error.

CONCLUSIONS: These measures confirm that overall globe dimensions are different among refractive groups. AL changes were the best predictors of refractive state. Sagittal height and CMRD were weaker, but significant predictors. These measures may be useful in future studies relating eye shape to the development of refractive state.

ADDITIONAL COMMENTS: Grant support: K23-EY019097

85. CALCULATION OF THE THIRD-ORDER ABERRATIONS OF A SPECTACLE LENS USING ANALYTICAL WAVEFRONT TRACING (125141)

Gregor Esser, MSc, Dipl-Ing(FH), Wolfgang Becken, Werner Mueller, Dietmar Uttenweiler, Rodenstock GmbH Munich, Josep Arasa, Universidad Politecnica de Catalonia -- EUOOT, Peter Baumbach, University of Applied Sciences Aalen

RESULTS: It was possible to calculate analytically, also for oblique incidence, the third-order aberrations of a spectacle lens by analytical wavefront tracing. It could be shown

that progressive addition lenses introduce third-order aberrations like Coma and trefoil because of the inherent change of power to correct presbyopia.

PURPOSE: It is known from literature how to calculate the second-order aberrations (power and astigmatism) of a spectacle lens by analytical wavefront tracing using the Generalized Coddington-Equation and Propagation Equation. The authors succeeded to derive analytical refraction and propagation equations also for higher-order aberrations. It is the purpose of this study to calculate the third-order aberrations of a spectacle lens (especially a progressive addition lens) using analytical wavefront tracing.

METHODS: The chief ray was calculated by numerical ray tracing. The second- and third-order aberrations of the progressive addition lens were then calculated by analytical wavefront tracing using the equations derived by the authors 1,2. This was done for several gaze directions, so that the aberrations over the entire field of view through the progressive addition lens could be calculated and shown. 1. G. Esser, W. Becken, W. Mueller, P. Baumbach, J. Arasa, D. Uttenweiler, Derivation of the refraction equations for higher order aberrations of local wavefronts by oblique incidence, J. Opt. Soc. Am. A 27, 218-237 (2010). 2. G. Esser, W. Becken, W. Mueller, P. Baumbach, J. Arasa, D. Uttenweiler, Derivation of the propagation equations for higher order aberrations of local wavefronts J. Opt. Soc. Am. A 28, 2442-2553 (2011).

CONCLUSIONS: With the derived formulas, it is now possible to calculate the third-order Aberrations of a spectacle lens directly in a very fast analytical way.

86. THE IMPACT OF HIGHER ORDER ABERRATIONS ON MONOCHROMATIC AND POLYCHROMATIC BEST FOCUS: IS THERE A UNIVERSAL REFERENCE WAVELENGTH? (125205)

Allicia Kellogg, BS, OD, Darren E Koenig, BS, OD, Heidi Hofer, PhD, University of Houston College of Optometry

RESULTS: The RIW varied significantly across subjects from 535nm to 625nm. Additionally, our data indicate that the RIW is consistent across time, and not influenced by the specific visual target. The wide range of in-focus wavelengths indicates that a universal RIW for objective metrics will result in noticeable blur for many subjects. Cone energy predictions (with SCE) were significantly correlated with RIWs of the subjects, however not all variability was explained by subjects' HOAs.

PURPOSE: Objective refractions based on monochromatic calculations of ocular higher order aberrations (HOAs) are typically calculated at one reference in-focus wavelength (RIW), which is assumed to reflect polychromatic optical quality of the eye. We aim to determine if a single RIW can accurately reflect polychromatic optical quality of all individuals; if not, we aim to accurately predict the RIW for each individual.

METHODS: Nine color normal subjects focused targets (white, 490, 532, 550, 580, 600 nm) through an adaptive optics system with 2 and 6 mm pupil sizes. Focusing tasks were performed six times with natural aberrations and with HOAs corrected ($RMS < 0.12$). We predicted in-focus wavelengths using three image quality metrics: pointspread function (PSF) peak height, energy integrated over the cone aperture and PSF entropy. The metrics were computed from ocular longitudinal chromatic aberration (LCA) and each subject's HOAs with and without the Stiles-Crawford Effect (SCE).

CONCLUSIONS: A portion of the RIW variance is due to the interactions of LCA and

HOAs. However, other factors such as neural sensitivity, transverse chromatic aberration, visual processing, macular pigment, and spectral sensitivity are likely to play a role. The metrics with more predictive power included the SCE, which is typically ignored. The wide range of monochromatic in-focus wavelengths in our study suggests it is inappropriate to use a single RIW when calculating a refractive correction based on HOAs.

ADDITIONAL COMMENTS: NEI T35 EY07088, ROI EY019069, P30 EY07551

87. READING FROM AN I-POD VERSUS HARDCOPY TEXT (125088)

Mark Rosenfield, OD, PhD, FAAO, Gianinna Saa, State University of New York (SUNY) College of Optometry

RESULTS: When comparing the I-pod with printed text, no significant differences in total symptom score or reading accuracy were found. However, the reading rate with the I-pod (95.9 words per min) was significantly slower than for hardcopy (mean = 109.4 words per min; $p=0.001$). Further, the mean lag of accommodation was significantly larger for the I-pod compared with the printed material (1.08D v 0.88D; $p=0.002$). No significant difference in OSDI score between hardcopy and the electronic device was observed.

PURPOSE: The use of electronic reading devices has become more prevalent. Previous work in our laboratory has demonstrated that symptoms when reading from a computer screen are significantly greater than those experienced when reading printed text. The aim of the present study was to examine symptoms and task performance when reading from an Apple I-Pod device.

METHODS: 20 young, visually-normal subjects read a series of random words aloud at a viewing distance of 33 cm for a continuous 9 minute period either from an Apple I-Pod or printed text. Both reading rate and accuracy were monitored. In addition, the accommodative response was measured objectively during the course of the reading task using an open-field, infra-red optometer (Grand Seiko WAM 5500). Immediately after each session, subjects completed a written questionnaire concerning the level of ocular discomfort experienced during the task, as well as the Ocular Surface Disease Index (OSDI) questionnaire.

CONCLUSIONS: A larger lag of accommodation and reduced reading rate was seen with the I-pod. Thus reading from modern electronic devices is not equivalent to hardcopy printed materials.

89. SUBJECTIVE CLARITY, VISUAL ACUITY, AND IMAGE QUALITY (125605)

Andrew J. Toole, OD, PhD, FAAO, Nicklaus F. Fogt, OD, PhD, FAAO, Thomas W. Raasch, OD, PhD, FAAO, The Ohio State University College of Optometry, Tyson J. Brunstetter, OD, PhD, FAAO, Navy Refractive Surgery Center

RESULTS: One measure of subjective clarity is produced by the pairwise comparisons. The condition producing the highest number of "wins" is considered the condition of best subjective clarity. The mean difference between this most preferred power and subjective refraction endpoint was 0.22D (SD = 0.27D). Eyes with relatively low levels

of aberration tended to produce IQM peaks within a narrow (0.1D) range of each other. Eyes with high levels of aberration produced IQM peaks spanning up to a 0.7D range with some metrics being asymmetric and multimodal. Correlations between visual acuity and preference ranking were non-significant.

PURPOSE: To investigate the relationships among subjective image clarity, visual acuity, subjective refraction, and metrics of image quality.

METHODS: Seven subjects with normal vision were recruited for participation. Aberrations were measured with a Shack-Hartmann sensor. Subjects viewed through an optical systems consisting of relay lenses, a pupil-conjugate aperture, a deformable mirror (DM), and a video display at an optical distance of 9.3 m. Two versions of a method of adjustment were performed to find the cylindrical subjective endpoint. Three versions of objective refraction were derived based upon 2nd, 2nd and 4th, and 2nd, 4th, and 6th-order Zernike coefficients. The DM was used to control 2nd-order cylinder power over a continuous 1.25D range that included the those 5 measures of cylindrical correction. Visual clarity was evaluated by visual acuity measurement, and by pairwise comparison of every pair of the five different cylindrical corrections. Six image quality metrics (IQM) were calculated over this range, representing predicted image clarity through this cylindrical range.

CONCLUSIONS: These results are consistent with what is implicitly assumed of subject refraction: that it results in the clearest subjective retinal image. This does not necessarily mean this also produces the best visual acuity, suggesting that best acuity is not always a good proxy for best subjective visual clarity.

ADDITIONAL COMMENTS: Supported by the Navy Refractive Surgery Center, San Diego

90. **OBJECTIVE DETERMINATION OF REFRACTION AND VISUAL ACUITY IN PEOPLE IN PERSISTENT VEGETATIVE STATE AND MODERATE DEMENTIA PATIENTS (125544)**

Eva Hemkepler, Stephan Degle, Ernst Abbe University of Applied Sciences

RESULTS: Slight statistic correlations between the changes of the questionnaire points and the patient's age, duration of illness and improvement of visual acuity was found (Spearman: $r = 0.242$, $p = 0.449$; $r = -0.148$, $p = 0.684$; $r = -0.093$, $p = 0.774$). It was also possible to show an increase in the questionnaire points and an improvement of visual acuity by a probability of 95% ([2.1; 4.4], [0.2; 0.4]). Ten in twelve patients showed positive changes in behavior to external stimuli, which were noticed by the nursing staff after four to six weeks. For example, one change was a longer eye fixation. These changes are particularly meaningful in patients in persistent vegetative state, because of the lack of knowledge about their visual perception.

PURPOSE: To improve, by means of optometric care, the visual perception and the communication with the environment of patients in persistent vegetative state and of people suffering from relatively severe dementia.

METHODS: The refraction deficit of 33 people's eyes was measured using objective refraction methods, mobile eye refraction and retinoscopy. Twelve participants were included in this study. Visual acuity was determined by means of the Cardiff Acuity Cards. When the visual acuity improved by 0.2logMAR-steps, the patient received a pair

of glasses. In the first medical examination and four to six weeks later, the nursing staff filled out a questionnaire on the patient's visual perception. This questionnaire was analyzed using a point system especially created for this purpose.

CONCLUSIONS: Optometric care of these patients is necessary, especially because of the positive subjective changes in behavior which were recognized. Furthermore, the visual perception has improved. This improvement helps the patients to communicate with their environment or allows for more independence in everyday life and consequently enhances the quality of life.

ADDITIONAL COMMENTS: This study was accomplished without any financial support.

91. **NETBOOK CONE CONTRAST TEST (125801)**

Jeff C. Rabin, OD, PhD, FAAO, Jeff C. Boster, Madison Ruelle, Thien Tran, Brandi Stewart, OD, Veronica Wong, University of Incarnate Word Rosenberg School of Optometry, John Gooch, Steve Wright, USAF School of Aerospace Medicine

RESULTS: Both Netbook staircase & standard CCT showed 100% sensitivity for diagnosis of CVD & 100% specificity to confirm CVN with no difference between methods ($F=0.11$, $P>0.74$). Average & threshold CCT response times were 1.3X to 4X longer in CVD vs. CVN ($p<0.001$). Netbook CCT showed 100% agreement with Ishihara for CVD detection in 500 employees & quantified type & severity of CVD. Binocular CCT was equal to monocular to diagnose CVD.

PURPOSE: Color vision depends on three cones sensitive to long (L), middle (M) or short (S) wavelength light. Hereditary color deficiency (CVD; 8% males, 0.5% females) is due to a sensitivity shift or lack of L or M cones. S cone CVD is rare but acquired S CVD signifies disease making S cone tests needed. The cone contrast test (CCT) reveals type (L,M,S) & severity of CVD. We describe sensitivity, specificity & application of a Netbook CCT to quantify color vision.

METHODS: The CCT presents colored letters visible only to L, M or S cones in decreasing steps of cone contrast (13 to 1.4%) on a 10.1 inch Netbook viewed at 91cm (Innova Systems, Inc). A colorimeter auto-calibrates to ensure accurate contrast. The standard CCT had subjects read each letter aloud from highest to lowest contrast; Netbook presents randomized single letters & subject uses a mouse to select letters seen from a matching display. A response-driven parameter estimation by sequential testing staircase adjusts cone contrast to rapidly reach L, M & S thresholds in _ the time of the standard. We compared Netbook to standard CCT in 20 normals (CVN) & 10 CVD & evaluated the Netbook in 500 chemical company employees.

CONCLUSIONS: The Netbook CCT uses a rapid staircase & forced choice letter recognition to diagnose type & severity of CVD in <3 minutes. Reaction time serves as an added metric of color vision. Binocular testing can be used for screening but monocular testing is preferred for acquired CVD; often asymmetrical between eyes. Touch-screen CCT for mobile devices are in development.

93. **COMPARISON OF TEAR OSMOLARITY TO OTHER OCULAR SURFACE DISEASE INDICATORS (125712)**

Tammy P. Than, MS, OD, FAAO, Roderick J. Fullard, OD, PhD, Jenene Sims, OD, PhD, FAAO, University of Alabama at Birmingham School of Optometry, Keshia S. Elder, OD, MS, FAAO, University of Missouri-St. Louis College of Optometry

RESULTS: Fourteen subjects (twenty-eight eyes) completed the study (mean age 44.0 +/- 13.9). At baseline, the mean tear osmolarity was 295.8 +/- 11.6 mOsm/L. Only three eyes were found to have a reading greater than 308 mOsm/L which is indicative of dry eye according to the TearLab product information. Tear osmolarity did not correlate with Schirmer I tear test or fluorescein staining. While osmolarity is expected to have a positive correlation with OSDI scores and lissamine green staining, a small negative relationship was found in this study. Conversely, the correlation between osmolarity and NITBUT was a positive 0.2060 but expected to be negative. There was no correlation between tear osmolarity and 27 different cytokines and immune-regulatory proteins including IL-1 β , IL-2, IL-6, IL-8, IL-10, IP-10, TNF- α , IFN- γ , and VEGF.

PURPOSE: The correlation of tear osmolarity in non-Sjogren syndrome dry eye patients with other assessments of ocular surface disease was evaluated.

METHODS: Patients with mild to moderate dry eye were recruited to participate in a six-month study to evaluate the effectiveness of various dry eye therapies. After a two-week washout of dry eye formulations, Ocular Surface Disease Index (OSDI), tear osmolarity (TearLab osmolarity system), Schirmer I tear test, noninvasive tear break up time (NITBUT), fluorescein staining, and lissamine green staining were measured. Non-stimulated tears were collected atraumatically with sterile flame-polished glass micropipettes. Tear samples were assayed for tear cytokines using a Bio-Rad 27-Plex Cytokine Assay Kit.

CONCLUSIONS: Increased osmolarity of the tear film is known to be an important factor in the diagnosis of ocular surface disease. Measurements obtained using the TearLab osmolarity system did not correlate with the other objective and subjective measurements obtained. Therefore, it appears that additional investigation of the TearLab device be undertaken before including it in the standard battery of tests for diagnosing ocular surface disease.

ADDITIONAL COMMENTS: Research funded in part by a grant from VSP

Academy Information Posters

1. THE MASTER OF SCIENCE IN VISION SCIENCE PROGRAM AT THE SOUTHERN CALIFORNIA COLLEGE OF OPTOMETRY (125881)

William H. Ridder, OD, PhD, FAAO, Southern California College of Optometry

ABSTRACT: The Southern California College of Optometry has a fully accredited Master of Science in Vision Science (MS) program. The MS is a research-based graduate degree. Research is a vital part of the ongoing development of the profession and is incorporated into the mission statement of the College. The MS program emphasizes

hypothesis-driven research and the development of analytical skills in experimental optometry and vision science. The MS degree incorporates the design and conduct of an original research project, a written thesis, and defense of the thesis before a graduate committee. The MS prepares students to embark on a career in teaching and/or research in the basic or clinical science of vision. Students accepted into the program must be 1) enrolled at SCCO in the professional optometry program or 2) hold a Doctor of Optometry degree (OD) from an accredited school or college of Optometry in North America. The MS tracks require the equivalent of two years full-time study, including 20 quarter credits for core and elective didactic course work, and a minimum of 40 credit hours of research, culminating in a written thesis. Additional information and an application are available on the Southern California College of Optometry website.

2. AN ALL ON-LINE MASTER OF SCIENCE PROGRAM IN CLINICAL VISION RESEARCH (125906)

Bin Zhang, PhD, Josephine Shallo-Hoffmann, PhD, FAAO, Nova Southeastern University College of Optometry

ABSTRACT: Background: Nova Southeastern University College of Optometry has a fully accredited Master of Science in Clinical Vision Research (MSCVR) program designed to assist optometrists, optometric educators, optometric students, as well as other health-care professionals to extend their career opportunities by developing and enhancing their ability to perform clinical vision research. Report: This is a two-year program, 45 credit program, consisting of 24 credits of required core courses. A term runs 12 weeks and there are four terms each year. Core course topics include: Clinical Research Ethics, Fundamentals of Biostatistics; Principles of Statistical Inference; Clinical Research Design; Information Science for Clinical Research; Government and Private Funding Proposal Development; Presentation, Evaluation, & Publication of Clinical Vision Research; Ethical & Legal Issues in Human Subject Research, Epidemiology and Visual Health and International Development. A certificate is granted for candidates who successfully fulfill 24 credits of core course requirements. Specialty track courses are designed for each student individually, to reflect the student's interest and expertise and consist of 21 credits. A MSCVR degree is granted for candidates who successfully complete the specialty track and a thesis. WebCt technology consists of a secure platform, facilitating learning of subject matter in addition to an active exchange of information with instructors and fellow students. Our master's students are presenting papers and poster at this meeting for the past seven years. We are actively serving the needs of the military and have been listed as an AMEDD approved program.

CONCLUSION: The MSCVR program is the only ALL online graduate program in a college of optometry. The program is achieving the goal of advancing knowledge to pursue research and scholarship through effective online teaching, learning strategies and dedication on the part of the instructors, thesis advisors and especially the students.

3. RESIDENCY IN PEDIATRIC OPTOMETRY AND VISION THERAPY AT THE SOUTHERN CALIFORNIA COLLEGE OF OPTOMETRY (125440)

Kristine Huang, OD, MPH, FAAO, Southern California College of Optometry

ABSTRACT: The Pediatric Optometry and Vision Therapy (POVT) Residency is based at the Eye Care Center, a fully-equipped patient care facility owned and operated by the Southern California College of Optometry (SCCO). The residency is a full-time, formal, supervised program combining patient care, didactic education, teaching experience, and clinical research. The mission of the POVT residency is to develop the residents' clinical expertise in pediatric primary care and the assessment and management of binocular vision and visual processing anomalies, using comprehensive optometric procedures and treatment options.

APPLICATION REQUIREMENTS: The applicant must have or will earn an O.D. degree, furnish complete optometric transcripts, and have passed the Basic and Clinical Science parts of the NBEO and furnish official copies of the results. An essay stating the applicant's reasons for applying to the residency program should be submitted along with 3 letters of reference. Applicants must apply through the optometric Residency Matching Services, Inc. (ORMS) and follow application guidelines by February 1. A personal interview is required. For further information, please contact: Dr. Kristine Huang, Residency Coordinator, Southern California College of Optometry, 2575 Yorba Linda Blvd Fullerton, CA 92831-1699, 714.449.7435 • Fax: 714.992.7846 • e-mail: khuang@scco.edu

4. DEPARTMENT OF VETERANS AFFAIRS OPTOMETRIC RESEARCH FELLOWSHIP PROGRAM (125950)

Baharak Asefzadeh, OD, MS, FAAO, Gerald J. Selvin, Boston VA Healthcare System, Gregory L. Goodrich, Jennine E. Kirby, VA Palo Alto Healthcare System, Lyman C. Norden, FAAO, Patti W. Fuhr, University of Alabama at Birmingham School of Optometry, Bethany S. Martinez, Bessemer Community Based Outpatient Clinic Birmingham VA, John C. Townsend, Veterans Health Administration

ABSTRACT: The VA Optometric Research Fellowship Program was established in 2004 by the Department of Veterans Affairs. The goals of the fellowship are to ensure the continuation and future development of VA optometric research, to stimulate research in age-related eye diseases and vision disorders, to promote improvement of visual rehabilitation capabilities, and to enhance visual outcomes. The fellowship is a two-year program for residency-trained optometrists. The program involves clinical research and a variety of complementary opportunities, such as clinical precepting, teaching, and master's level coursework. This poster will review and discuss the experiences and achievements of the most recent research fellows matriculating through the programs located at VA Boston Healthcare System, Birmingham Department of Veterans Affairs Medical Center and VA Palo Alto Health Care System. The Department of Veteran Affairs has created exciting opportunities for residency trained optometrists to concentrate on clinically focused research. The VA fellowship aims to ensure the continuation and future development of VA optometric research, to enhance visual outcomes for veterans, and to develop the foundation for clinical research careers relevant to VA optometry.

5. THE ASCO OPTOMETRIC EDUCATION DIVERSITY MINI-GRANT PROGRAM (125019)

Barbara A. Fink, OD, PhD, FAAO, The Ohio State University College of Optometry

ABSTRACT: Since 2000, the Association for Schools and Colleges of Optometry (ASCO) has provided funding for the Optometric Education Diversity Mini-Grant Program. The goal of this program is to develop and implement activities/programs that are designed to recruit and/or retain underrepresented minority students, financially disadvantaged students, and first-generation college students. A variety of programs have been supported at the schools and colleges of optometry, including summer bridge programs for undergraduate students, mentoring and guidance programs for first-year optometry students, summer camps for high school and undergraduate college students, production of videos and instructive programming, and partnerships among various organizations. This poster summarizes those programs.

7. **HOW TO BECOME A DIPLOMATE IN THE SECTION ON LOW VISION (125655)**

Roanne E. Flom, OD, FAAO, The Ohio State University College of Optometry

ABSTRACT: The Diplomate in Low Vision is designed to recognize leaders among Academy Fellows with advanced knowledge of low vision rehabilitation and who maintain an active involvement in its practice and study. Diplomates in Low Vision are dedicated to advancing the field of low vision rehabilitation and are prepared to serve as resources to the Academy, the profession, and the public. This poster describes both the Clinical Diplomate Program and the Research Diplomate Program, with information on how to become a candidate and how to fulfill each of the steps in becoming a Diplomate.

8. **AMERICAN ACADEMY OF OPTOMETRY
BINOCULAR VISION, PERCEPTION & PEDIATRIC OPTOMETRY SECTION
DIPLOMATE PROGRAM (125343)**

Carmen N. Barnhardt, OD, MS, FAAO, Southern California College of Optometry

ABSTRACT: Becoming a Diplomate in the BVPPPO section will not only enhance your clinical and academic competence, it will create personal satisfaction of professional growth and achievement and give you peer recognition of excellence.

REQUIREMENTS FOR CLINICAL DIPLOMATE include: Current Academy Fellow in good standing, application and application fee. Once your application is accepted, one must choose an area of emphasis, either Binocular Vision & Perception OR Pediatric Optometry and then complete the following: submit and have five written clinical case reports accepted, pass the comprehensive written examination, pass the practical clinical examination, and lastly, pass the oral examination.

CASE REPORT TOPICS with an emphasis in Binocular Vision & Perception includes each of the following conditions: exotropia, esotropia, amblyopia, learning-related vision problem, and vision efficiency or general skills. Case report topics with an emphasis in Pediatric Optometry include each of the following conditions: significant refractive error in a patient <4 years of age; strabismus; amblyopia; developmental disability, mental handicap OR visual impairment; and pediatric ocular disease.

RESEARCH DIPLOMATE: The purpose of the Research Diplomate is to permit Diplomate status for individuals who contribute significantly to the field of binocular vision, perception, and/or pediatric optometry in the area of research. An application and curriculum vitae review by the Research Diplomate Committee will determine if the criteria of significant contributions to the field of binocular vision, perception and pediatric optometry have been met. Then one must complete the following: Submit a lengthy scientific paper on a topic to be agreed upon by the examining committee and the candidate and pass an oral examination focused on the candidate's expertise and general knowledge of topics within his/her scope of interest.

9. OPTOMETRIC EDUCATION DIPLOMATE (125750)

Aurora Denial, OD, FAAO, New England College of Optometry

ABSTRACT: The Optometric Education Section of the Academy is a leader in optometric education. The granting of the Diplomate status in Optometric Education is recognition of a focus and expertise in education beyond the level of teaching responsibilities that are commonly held by most faculty. The Diplomate status recognizes advancement in the areas of scholarly activity, educational research, advanced education and the delivery and transfer of knowledge. The purpose of this presentation is to provide information on how to become a candidate and how to fulfill the necessary steps involved in becoming a Diplomate in Optometric Education.

10. DIPLOMATE IN PUBLIC HEALTH AND ENVIRONMENTAL VISION (125184)

Gregory W. Good, OD, PhD, FAAO, The Ohio State University College of Optometry

ABSTRACT: Throughout the foreseeable future, the organization, administration, and delivery of health services will continue to change in a rapid and perhaps unpredictable manner. The Diplomate Program in Public Health and Environmental Vision is designed to encourage and facilitate the recognition of leaders essential to the future of our profession. This program will help the academy, and the optometric profession, assume a role of leadership in the design of our country's future health care agenda. The Diplomate Program is a two year process to recognize those Fellows of the Academy who are dedicated to advancing the field of Public Health and Environmental Vision.

11. PRIMARY CARE SECTION, AMERICAN ACADEMY OF OPTOMETRY (125433)

Michael W. Ohlson, OD, FAAO, West Union, IA

ABSTRACT: Primary care optometry is a focus of practice activity that emphasizes the development and maintenance of a high level of knowledge and clinical ability over the entire area of eye/vision care and associated areas of eye-related health care. The primary care optometrist is a practitioner with ongoing responsibility for the visual, ocular and related care of a population of patients. The origin of the Primary Care Section (PCS) of the American Academy of Optometry was the Aniseikonia Section (1949). The Section currently boasts over 1200 Fellows. Drs. Felix Barker and Linda Casser developed the PCS Diplomate program and it was

approved by the Academy Board of Directors in 1990. The first Diplomate awards were granted in 1996. Requirements for Diplomate status include completion of ten case reports, written examination, oral interview, and practical examination covering the breadth of comprehensive optometry.

12. AMERICAN ACADEMY OF OPTOMETRY SECTION ON CORNEA, CONTACT LENSES AND REFRACTIVE TECHNOLOGIES (125441)

Timothy B. Edrington, OD, MS, FAAO, Southern California College of Optometry

ABSTRACT: The Cornea, Contact Lenses and Refractive Technologies Section invite you to join our group of practitioners, educators and researchers to become a Diplomate.

13. MEMBERSHIP IN THE AMERICAN ACADEMY OF OPTOMETRY (125194)

Helen M. Viksnins, MEd, FAAO, American Academy of Optometry

ABSTRACT: The American Academy of Optometry promotes the art and science of vision care through lifelong learning. Membership in the Academy is open to all optometrists in professional practice, and to scientists, educators, librarians, administrators, and editors who have accredited themselves and optometry by their service. In addition, membership is available to students, to full time graduate students in the vision sciences and related sciences, and to residents in optometric residency programs. The Academy is the organization that exists to promote the intellectual and scholarly advancement of the optometric profession, a vehicle for fellowship amongst optometry's leaders from private practice, from educational institutions and from the research community. You will receive the Academy's monthly journal *Optometry and Vision Science*, be eligible for reduced registration fees at Academy meetings and can select a specialty section. What are the benefits in becoming a Fellow of the Academy? Academy Fellowship provides you with a means of staying abreast of the advancement in optometric and related vision science fields. It gives you opportunities to interrelate with the professional and academic leaders and the very best of the world's clinical optometrists -- and you become part of this community of optometric leaders. For those who take the step, Academy Fellowship becomes a rewarding part of professional life. The letters "FAAO" (Fellow of the American Academy of Optometry) after your name signify to colleagues and patients that you have attained a major achievement in your continued professional development and dedication to improved patient care. Please stop by the Membership Booth in the Exhibit Hall for Fellowship or student member applications. This information is also available directly from the Academy's website: <http://www.aaopt.org/becoming/efellowship/>

14. NEW YORK ACADEMY OF OPTOMETRY (125550)

Jennifer Colavito, FAAO, New York Academy of Optometry

ABSTRACT: The New York Academy of Optometry was founded in 1912! Therefore, this marks our 100th anniversary this year. The purpose of our informational poster is to present our mission statement to Academy attendees as well recruit new members to our meetings. Our group meets once per month for a stimulating, intimate dinner-lecture

format of continuing education. We mentor our new members through the process of becoming fellows of the American Academy of Optometry.</P>

15. CALIFORNIA CHAPTER OF THE AMERICAN ACADEMY OF OPTOMETRY (125932)

Raymond H. Chu, OD, MS, FAAO, Southern California College of Optometry, George Lee, OD, FAAO, Debora M. Lee, OD, FAAO, University of California Berkeley, Raymond R. Maeda, OD, FAAO, Western University of Health Sciences College of Optometry

ABSTRACT: The mission of the California Chapter of the American Academy of Optometry is to promote the Academy and to stimulate education, research, and interaction among students, vision scientists, and clinicians. The California Chapter annually commits 100% of its efforts to supporting student involvement in the Academy from all three California-based schools: UC Berkeley School of Optometry, Southern California College of Optometry, and Western University of Health Sciences College of Optometry. We would encourage any of our colleagues who have not yet joined the California Chapter to help us in our mission.

16. THE NORTH CAROLINA CHAPTER OF THE AMERICAN ACADEMY OF OPTOMETRY (125198)

Roger W. Cummings, OD, FAAO, W. G. Bill Hefner VA Medical Center, Philip Roels, Department of Veteran's Affairs Winston-Salem Outpatient Clinic

ABSTRACT: There are two primary missions of the North Carolina Chapter of the American Academy of Optometry. The first is to support residency, practitioner and student education through quality educational programs. The second is to increase the number of Fellows of the Academy from the North Carolina. The Chapter was formed through a nucleus of Academy Fellows and Fellowship candidates located at the W. G. (Bill) Hefner Veterans Affairs Medical Center in Salisbury, NC. Each year, the current Hefner optometry residents have an opportunity to present clinical case reports at a meeting to which optometrists from the area are invited. This year we've added the Primary Eye Care resident from Womack Army Medical Center located at Fort Bragg, NC to the program. Meetings have been held in Salisbury, Charlotte, Chapel Hill and Winston-Salem, with future meetings contemplated for other metropolitan areas of the state. The Chapter has been very successful in increasing the number of Fellows from North Carolina. Since its founding in 2005, 24 new fellows from the state have had ties to the chapter. At the 2010 AAO meeting in San Francisco, three new NC fellows were supported by Chapter members and activities. We invite all North Carolina fellows to join the Chapter.

17. VA OPTOMETRIC SERVICE OPPORTUNITIES (125945)

Loren W. Bennett, OD, MPH, FAAO, James H. Quillen, VAMC Mountain Home, John C. Townsend, Veterans Health Administration

ABSTRACT: The Department of Veterans Affairs (VA) has the largest integrated health care system in the world. For over 30 years, VA Optometric Service has been a national leader for provision of optometric patient care, clinical education, and research. The Department of Veterans Affairs also serves as the back-up health care system for the Department of Defense in times of national emergency. Over 600 optometrists at 180 facilities across the country provide eye care services within the Veterans Health Administration. About 60% of VA optometrists have faculty appointments at affiliated schools and colleges of optometry and train future optometrists, post-graduate residents, and post-residency research fellows for national practice. Approximately 10% of VA optometrists have faculty appointments at schools and colleges of medicine. During the fourth year of optometry school, there are over 1025 externship positions available for Doctor of Optometry degree candidates to obtain clinical training at VA medical facilities. About 135 post-graduate ACOE accredited VA optometry residency positions are available annually for development of advanced clinical competence. There are three post-residency VA Optometric Research Fellowship Program sites to train the next generation of optometric eye and vision care researchers. Research projects occur at many VA medical facilities, e.g., studies of low vision devices/rehabilitation strategies, multi-center clinical trials, telemedicine, outcomes assessment, etc. VA Optometric Service provides the majority of primary eye care and low vision rehabilitation services for our Nation's veterans. VA optometrists work with other health care providers as part of an interdisciplinary health care team. The role of VA Optometric Service for optometric patient care, clinical education, and research will continue to develop during the 21st century.

18. VISION SCIENCE LIBRARIANS - WHERE ARE WE NOW? (125420)

Nancy A. Henderson, MA, MLS, Pacific University College of Optometry, Suzanne Ferimer, MSLS, MEd, University of Houston College of Optometry

ABSTRACT: This poster will describe the activities of vision science librarians within two frameworks. First, we will provide a comparison of what vision science librarians did 25 years ago and what they do now this will highlight the breadth of current responsibilities. Second, we will identify AVSL member institutions active 25 years ago and those institutions newly added (and deleted) in the intervening 25 years.

19. IACLE, INTERNATIONAL ASSOCIATION OF CONTACT LENS EDUCATORS (125239)

Bonnie Boshart, Luigina Sorbara, OD, MSc, FAAO, University of Waterloo School of Optometry and Vision Science, Lakshmi Shinde, OD, Deborah F. Sweeney, BOptom, PhD, FAAO, International Association of Contact Lens Educators (IACLE), Shehzad A. Naroo, MSc, PhD, FAAO, Philip B. Morgan, BSc(Hons), PhD, FAAO, Janice M. Jurkus, Illinois College of Optometry, Etty Bitton, OD, MSc, FAAO, University of Montreal School of Optometry, Percy Lazon de la Jara, BOptom, PhD, FIACLE, Brien Holden Vision Institute

ABSTRACT: Background: IACLE is dedicated to raising the standard of contact lens (CL) education and promoting the safe use of CLs worldwide. Our mission is to increase the number of qualified CL educators and improve the quality of CL teaching, thereby increasing the number of skilled CL practitioners throughout the world and facilitating the use of CLs worldwide, in partnership with Industry. Discussion: IACLE developed a 10-module IACLE Contact Lens Course (ICLC). The course is available in English, Chinese (simplified and traditional), Spanish and Indonesian. Selected slides are also available in Korean, Portuguese, Russian, German and Italian. The ICLC, adopted by many teaching institutions around the world, is supplemented by interactive case studies, image collections and video libraries. The Distance Learning Program was developed to aid educators in systematically studying the modules of the ICLC and helping them to prepare for the Accreditation Examination - the only internationally accredited means of measuring contact lens knowledge. Successful completion of the exam qualifies members for Fellow of IACLE (FIACLE) status. Student Trial Exams are held prior to final qualifying exams to identify areas where knowledge is deficient and further study is required. Results help educators and institutions identify areas where changes in the curriculum are required. Using results from both the Accreditation Examinations and the STEs, IACLE tailors educational meetings at the national and regional levels. As well as addressing the issue of “what to teach,” IACLE now offers intensive Train-the-Trainer programs that address “how to teach,” with the aim of improving the presentation skills of FIACLES. Conclusions: IACLE currently works with 688 active members at 353 institutions in 69 countries reaching approximately 12,350 students each year. IACLE, in collaboration with our Industry partners, works to build a strong educational foundation that ensures our future practitioners are skilled and confident in fitting CLs and managing their patients.

20. **OPTOMETRIC EDUCATION (125749)**

Aurora Denial, OD, FAAO, New England College of Optometry

ABSTRACT: Optometric Education, a peer reviewed, national and international publication of the Association of Schools and Colleges of Optometry, is published on line three times during the academic year. Its circulation includes all of the accredited optometric educational institutions in the United States, as well as students, practitioners, government leaders, and others in the health sciences and education. Its readership also extends to numerous optometry schools outside the United States. Established in 1975, as the Journal of Optometric Education, it is the forum for communication and exchange of information pertinent to optometric education. It is the only publication devoted entirely to optometric education. The goal of the journal is to embrace and support scholarly achievements for the advancement of optometric education and the profession. The journal supports a broad interpretation of scholarship based on the scholarship of discovery, integration, application and teaching. The purpose of this presentation is to provide information about the journal, types of articles accepted for publication and provide information on the process of submitting a manuscript.