Special Thanks to This Year’s Judges

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424 Beacon Street • Boston • MA 02115

OD Class of 2018

13th Annual
Public Health
Poster Presentation
Day

April 14th, 2015

Visionaries: A Celebration of Student Accomplishment
Mandates for Ocular Protection in Youth Sports

L. Bornstein, B. MacDonald, M. Procaccini, A. Savard, B. Strake, A. Tchao

Purpose: Ocular injuries related to sports is the leading cause of blindness among children. While the injuries are far too common they are easily preventable, it is estimated that 90% of these injuries could be avoided with the use of proper protective eyewear. The problem is that 84.6% of children do not currently wear eye protection when participating in recreational sports causing over 10,000 injuries per year in children age 0-14. Injuries range in severity from ocular abrasions, to sight threatening conditions such as lacerations, and retinal detachments. In 2006 the state of New Jersey passed a law mandating that all children, who normally wear glasses must wear proper protection while participating in sports. The goal of this poster is to analyze the effectiveness of pediatric eye protection and propose legislative change in Massachusetts.

Case Report(s): Analysis was conducted on the effects of three different mandates requiring protective eyewear during sports activities. US Lacrosse and The International Floor Ball Federation instituted these mandates and have studies illustrating the benefits of having such mandates. Another study compared the ocular health status of high school field hockey participants in the United States, who operate under the legislature of states that currently have mandates and states that do not. All three sports activities saw a reduction in the amount of ocular injuries after the mandate was instituted, while not decreasing the amount of contact to the head in these sports.

Conclusion: We propose that the institution of pediatric protective eyewear will drastically decrease the amount of ocular injuries in high risk sports and thus it should be written into law in the state of Massachusetts.

Posters on display in the Library, Clausen Room, and Atrium at 424 Beacon Street, Boston, MA 02110

Schedule of Events

7:30-9:30 AM Poster Presentations Begin
Uneven numbered posters will be on display with group presenters

9:30 –11:30 AM Poster Presentations Continue
Even numbered posters will be on display with group presenters

11:30 – 12:00 PM Lunch Reception for OD 1 Students
Lecture Hall 2
(Dinner pick up in Cafeteria)

12:00 - 1:00 PM Poster Day Awards Ceremony
Lecture Hall 2
(Projected to Lecture Hall 3)

Posters will remain on display until 1:00 PM
Athletes as an Ideal Target Population for Orthokeratology

T. Camarillo, K. Choi, G. Hamilton, M. Miles, K. Muller, K. Williams

Very little research has been conducted to show the increasing prevalence of myopia in Western countries. One study shows that the prevalence of myopia in the United States has increased from 25% in the 1970s to over 40% today.

In recent decades, the push for young people to attain higher education has likely increased myopia rates in the U.S. By reshaping the cornea overnight, orthokeratology has been successful in slowing and controlling the progression of myopia in young patients.

Based on the fact that many young patients participate in sports, our study aims to highlight young athletes as an excellent target population for use of Ortho-K. Ortho-K lenses would slow progression of myopia in athletes while also eliminating many of the problems they experience with other corrective methods.

In addition, data shows that there is a large amount of patients and optometrists that could benefit from the implementation of Ortho-K into more optometry practices.

Key Words: orthokeratology, corneal refractive therapy, myopia, myopia epidemic, myopia risk factors, contact lenses, athletes, sports vision, recreation
1. Scientific Soup (AODP 2016)
2. Protein Expression of Alzheimer’s Disease and Reduced Hippocampal Volume-Risk Loci in Human Hippocampus (Stephanie Adams, MS)
3. Is Google Glass an Efficient Teaching Tool for Indirect Ophthalmoscopy? (OD2018)
4. Does Reading on Electronic Media Have a Higher Correlation with Myopic Change than Reading on Print? (OD2018)
5. Light Toxicity During Eye Exams (OD2018)
6. Telemedicine: Bridging the Gap (OD2018)
7. The Tear Story Seen Through Contact Lenses (OD2018)
8. Using Video Games to Investigate Typical and Atypical Visual Development (Sathyasri Narasimhan)
9. Keratoconus: Improving Quality of Life Through Advancements in Detection and Treatment (OD2018)
10. Establishing a Gold Standard for Dry Eye Diagnosis (OD2018)
11. Evaluating Contact Lens Hygiene Compliance and Methods of Patient Education in Young Adults (OD2018)
12. The Role of Nutrition and Diet in Dry Eye Syndrome (OD2018)
13. UV Radiation: The Role of Contact Lenses in Ocular Protection (OD2018)
14. Scleral Contact Lenses for Visual Rehabilitation After Penetrating Keratoplasty: Long Term Outcomes (Boris Severinsky)
15. Spherical Aberration Control in Contact Lenses (Gerald Cairns)
16. A Tail of the AODP Class of 2017 (AODP 2017)
17. Effect of Angle of Incidence on Anterior Chamber Angle Metrics from Optical Coherence Tomography (Jyotsna Maram)

Library Poster Titles and Group Numbers

Poster #33

Sports Related Concussions in Adolescent Athletes: How Aware Are You?

Bolano, K., Hundle, J., Karlin, S., Lee, N., Minhas, P., & Telfer, M.

Background
A concussion is caused by traumatic biomechanical forces directed to the head, resulting in complex pathologies of the brain. Less than 10% of sports related concussions result in loss of consciousness; it is important to educate coaches and parents of other associated signs and symptoms. This will improve underreporting and increase the safety of adolescent athletes. Concussions are associated with visual disturbances such as saccades, smooth pursuit, vergence, accommodation, and photosensitivity. The King-Devick Test and the ImPACT Test are two reliable exams that should be performed in succession following head trauma and compared to a baseline value that coaches have previously obtained.

Report
The purpose was to determine if there is a need for coaches and parents to be educated in recognizing the signs and symptoms of a concussion, and the impact it has on oculomotor function. Coaches and parents (n=73) were surveyed anonymously about concussion signs, symptoms, treatment, and general awareness. The majority of responses (96%) indicated that concussion training needs to be improved as well as increasing awareness about the impacts of a concussion.

Conclusion
Sports are risk factors for concussions and it is evident that there is a lack of awareness of their signs and symptoms. Sports clubs and school boards should be required to implement mandatory concussion training and policies.

KEY WORDS:
Sports related concussion, adolescent athlete, awareness, education, training
Motion Sharpening of Looming Vertical Bars

Shannon Moore, Glen McCormack

Purpose: Our lab previously showed, at ARVO ’14, that nonfixated blurred vertical bars moving in stereoscopic depth appear sharper than when stationary. This sharpening exceeded that of conjugate lateral motion having the same retinal image velocities. The purpose of this study was to determine whether nonfixated blurred vertical bars appearing to loom within a monocular optical flow field would also be sharpened more than bars appearing to move laterally.

Methods: 15 normally binocular young adults monocularly viewed four 30 minarc-wide vertical bars drawn on a monitor 40cm from the eyes. All bars appeared simultaneously for 0.5 sec about a 5 minarc white fixation spot. Two of the bars (above or below fixation) loomed toward (or away) from the subject with horizontal velocities of 1.75, 3.5, or 7Δ/sec, while the other two bars were static. The edges of the bars were blurred by cosine luminance profiles, which were fixed at 25 minarc for the moving bars and adjusted by an adaptive staircase procedure for the static bars to match the blur of the moving bars. Looming bars underwent horizontal separation, vertical size change, and vertical position change commensurate with looming. In the horizontal motion control condition the two moving bars laterally separated from each other, without vertical size or position change. In the vertical motion control condition the moving bars grew and moved vertically in a manner commensurate with looming, but without a horizontal position change.

Results: A mixed ANOVA evaluated the effects of motion type (looming, horizontal, or vertical), subject, and velocity (1.75, 3.5, or 7) on sharpening. Motion sharpening increased significantly with velocity (f=156, p≈0.0), and differed significantly between subjects (f=4.56, p≈0), like we found previously. At the highest velocity, the looming bar edges were subjectively sharpened by 13% of their base blur of 25 minarc. Motion sharpening differed between motion types (f=20.7, p≈0), but this difference was mostly between the vertical condition and the other two conditions. Sharpening during looming was only 3% greater than during lateral motion (insignificant).

Conclusions: While motion sharpening was clearly evident in the looming and lateral motion conditions, the trivial difference between them argues that the appearance of motion in depth by way of looming does not add to motion sharpening.

Clausen Room/Atrium Poster Titles and Group Numbers

18. The Prevalence of Ocular Health Myths Among Pharmacists (OD2018)
19. Improving Interprofessional Communications in Reference to Obese Patients’ Ocular Risks (OD2018)
20. E-cigarettes: Blind to the Consequences? (OD2018)
21. The Prevalence and Health Consequences of “Beezing” (OD 2018)
22. Overlooked Tanning Regulations in Massachusetts (OD 2018)
23. Cannabinoids for Glaucoma Therapy (OD 2018)
24. The Effects of Food Coloring on Contact Lenses and Ocular Health (OD 2018)
26. Implications of Expansion Services on Vision Care: Analysis of Community Health Center Expansion Services and Opinions (OD 2018)
27. Eyes Behind Bars: Analyzing the Current Eye Care Systems in Correctional Facilities (OD 2018)
28. Optometry in the United Kingdom (Fatima Hussain)
29. Myopes’ Ability to Accurately Accommodate to Blur Cues in Virtual 3D Images (Kristen Kerber)
30. Atropine Confers More Protection Against Myopia Progression with Luminance Flicker (Laura Goldberg)
31. Quality of Functional Vision Through Adjustable Spectacles [FocusSpecs] Phase II (Ran He)
32. Motion Sharpening of Looming Vertical Bars (Shannon Moore)
34. Athletes as an Ideal Target Population for Orthokeratology (OD 2018)
35. Mandates for Ocular Protection in Youth Sports (OD 2018)
Uncorrected refractive error is the leading cause of visual impairment worldwide. The use of adjustable spectacles can benefit populations lacking access to refractive eye care. The results of Phase I showed that functional vision was similar between AdSpecs adjustable spectacles and habitual correction. The AdSpecs design injects silicone fluid to change lens curvature and power.

In Phase II, we evaluate vision through FocusSpecs adjustable spectacles, which change lens power through two Alvarez-type lenses that move horizontally with respect to each other. Our study provides insight into the functional quality of FocusSpecs and their level of comfort when worn as corrective devices. Subjects were 30 adults 22-44 years of age.

We measured distance visual acuity (VA), near VA, contrast sensitivity as well as lateral and vertical phorias through both FocusSpecs and habitual correction. Subjects also completed a Convergence Insufficiency Symptom Survey (CISS). It was found that VA and contrast sensitivity were slightly reduced through FocusSpecs. These differences were not considered clinically significant and would not substantially impair functional vision. Means of phoria and CISS were similar between FocusSpecs and habitual correction.

The results suggest that FocusSpecs can serve as a screening tool as well as a potential corrective device in the developing world.
Atropine Confers More Protection Against Myopia Progression with Luminance Flicker

L. Goldberg & F. Rucker

In the chick model system, luminance flicker produces a hyperopic shift, while color flicker produces a myopic shift in refraction as a direct result of changes in eye length. This study investigated whether color and luminance pathways for emmetropization are blocked by atropine, a muscarinic antagonist used to prevent myopia progression in children. Chicks were binocularly exposed eight hours each day, for four days, to one of three illumination conditions: 2 Hz sinusoidal luminance flicker (LUM), 2 Hz sinusoidal color flicker (BY), or steady light. Luminance flicker was created with in-phase modulation of red, green and blue light, while color flicker was created with counter-phase modulation of red and green with blue light. Mean illuminance was 680 lux. Eyes received daily injections of 20 μl atropine (18 nmol), 20 μl phosphate-buffered saline, or no injection. Measurements of the axial dimensions of ocular components and refraction were performed before and after the experiment using A-scan ultrasonography and an infrared photorefractor.

In chicks injected with atropine and exposed to luminance flicker, the experimental eye became 3.93 D more hyperopic, displaying an inter-ocular 0.7 D hyperopic shift in refraction compared to the -2.7 D inter-ocular shift observed in saline injected eyes. Conversely, color flicker induced no significant change in refraction with either atropine or saline. Favoring hyperopia, atropine-injected eyes showed significant reductions in eye length under all conditions compared to saline-injected eyes (p = 0.008). Eye length in atropine-injected eyes was nearly half the axial length of their fellow eyes at the end of the experimental period (LUM and Steady: p < 0.01, Color: p < 0.001). Counteracting the changes in eye length, choroidal thinning occurred with atropine-injected eyes, especially upon exposure to color flicker (97 ± 15 μm). Under luminance flicker, atropine injections led to significant thickening of the lens compared to fellow eyes (X-N: 94 μm; p = 0.02) and a corresponding decrease in anterior-chamber depth, further reducing hyperopia.

The substantial hyperopic shift in refraction observed when combining atropine injections with luminance flicker, and the lack of a myopic shift in refraction with color flicker, suggests a role for the parasympathetic system in the control of emmetropization via a luminance pathway. Maximizing exposure to luminance contrast changes during atropine treatment enhances the protective effect of atropine on myopia progression.
**Poster #1**

**Scientific Soup**

L. Guo, C. Lord, E. Moulton, C. Sun, J. Zhou, X. Zhou

In February 2014, a group of six scientists from varied fields and backgrounds embarked on a 27-month journey to become optometrists. United by this common goal, we hurl ourselves into what will become a transformative experience that we will never forget.

This poster is a sampling of the diversity of our training and scientific expertise that we bring with us as we find our niche in clinical eye care.

**Poster #2**

**Protein Expression of Alzheimer's Disease and Reduced Hippocampal Volume-Risk Loci in Human Hippocampus**

S. L. Adams¹, T. Norman¹, K. Tilton³, S. Seshadri², I. Delalle³

We examined the protein expression of novel genome-wide association studies (GWAS) identified risk alleles implicated in Alzheimer's disease (AD) and low hippocampal volume with postmortem hippocampi with no or mild-to-moderate AD-associated pathological changes. We found BIN1, the most significant late-onset AD susceptibility locus after APOE, expressed in glia of all the examined cases while the punctate signal in neuropil varied substantially. EPHA1, another confirmed AD risk locus, is an ephrin receptor implicated in neuronal apoptosis.

We found EphA1 in the neuronal cytoplasm, with a trend of decreasing signal intensity as AD progressed. Methionine sulfoxide reductase B3 (MSRB3) locus, critical for oxidative stress, was identified in GWAS on hippocampal volume. We found MSRB3 signal mostly as cytoplasmic puncta in pyramidal neurons from all of the examined cases, albeit in various amounts. Finally, LEMD3, a possible causal gene at the MSRB3 locus, was expressed in neurons as well as astrocytes. Neuronal expression of LEMD3 may increase with AD progression.

Our data provide first insight into the human hippocampal cell type- and cell compartment-specific protein expression of AD- and hippocampal volume reduction-risk alleles. We are currently examining the correlation of these proteins' expression with the cognitive status reflected in CDR (Clinical Dementia Rating) scores.

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**Post #29**

**Myopes’ Ability to Accurately Accommodate to Blur Cues in Virtual 3D Images**

Kerber, K.L.¹, Maiello, G.²,³,⁴, Thorn, F.¹, Bex, P.J.³, Vera-Diaz, F.A.¹

**Purpose:** Defocus blur affects refractive error development. Various human studies report decreased ability to accurately accommodate in myopic adults and children compared to emmetropes, however other studies have found no differences. We hypothesize that myopes have a decreased ability to accurately accommodate but only when certain 3D cues to accommodation are not available to them.

**Methods:** Binocular accommodative responses were measured using a PowerRefractor while subjects wore shutter glasses and viewed naturalistic images on a 3D display. Stimuli were “dead leaves” images that capture the spatial characteristics of real world images.

Subjects viewed five types of images, each randomly presented five times at 40cm for 5 sec, with various cues to accommodation: (1) flat [2D], (2) blur gradient, (3) disparity gradient, (4) size gradient, (5) all cues. Subjects were instructed to fixate on a central green dot at all times.

Thirty-eight young (22 to 31 years) healthy adults participated; reliable data was obtained for 21 (n=10 myopes). Refractive error was determined by binocular subjective refraction that followed a vision screening and objective refraction.

**Results:** Myopes show less stable accommodation responses than emmetropes, which are significantly more variable when viewing 2D flat images (Wilcoxon, p=0.01), but become as stable as emmetropes’ responses when 3D and blur cues are available. Accommodation response latencies appear larger in myopes for all conditions, particularly for the “size” and “disparity” conditions. A positive correlation was found between amount of myopia and accommodation response latency when size and/or disparity cues were available (R²>0.4).

The amplitude of accommodation was not significantly different between the refractive groups for any condition, although myopes appear to accommodate more (smaller lags) for all conditions.

**Conclusions:** Our results indicate larger variability in accommodation responses in myopes when viewing flat images. Only when additional cues are added (disparity, blur, size), do myopes’ accommodation responses stabilize. In addition, the time lag to achieve adequate accommodation is larger for myopes. Inaccuracies of accommodation when viewing 2D images (typical of indoor activities) may cause long-term blur on the retina, which may impede precise emmetropization.

**Key Words:** accommodation, myopia, binocular vision/stereopsis

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Eyes Behind Bars: Analyzing the Current Eye Care Systems in Correctional Facilities

C. George, J. Hahm, A. Hanley, J. Hinds, R. Taher

INTRODUCTION: According to case reports, lawsuits, and global statistics, current eye care standards for prisoners do not appear to be effective.

METHODS AND ANALYSIS: Through examination of the current inmate eye care guidelines and implications of early preventative eye care measures, we are suggesting a two-fold reform to hopefully help improve inmate quality of life during and after serving a sentence at a correctional facility, including successful attainment and retention of jobs and education.

CONCLUSION: By exposing the current statistics on inmate eye care standards and criminal behavior linked to vision problems as well as amending the current eye care available to inmates, we hope to prevent criminal behavior that potentially stems from undiagnosed ocular problems and assist in successful assimilation back into society.

Poster #28

Optometry in the United Kingdom

Fatima Hussain, Ivan Jj. Liaw, Pritesh Patel, Alisha Rhemu

A brief discussion on the educational pathway and scope of practice of Optometry in the United Kingdom*

*Note: This is not a research article; simply an informative poster
Poster #4
Does Reading on Electronic Media Have a Higher Correlation with Myopic Change than Reading on Print?

Purpose: The purpose is to determine whether there is a correlation between the type of media used for near work and the incidence of myopic shifts.

Methods: A survey was conducted on a sample of 192 optometry students from schools in the U.S., Puerto Rico, and Canada to observe whether reading on an electronic device is associated with greater myopic shift than reading on printed paper.

Results: Our data shows a correlation between the amount of time spent reading on print and the incidence of myopic progression; longer times spent working with printed materials are associated with an increased number of myopic shifts.

Conclusions: However, contrary to our hypothesis, our other data found little correlation between the amount of time spent on electronic devices and incidence of myopic shifts. Various studies confirm these results. Additionally, the data gathered indicates a positive correlation between reading on print and the progression of myopia. A more comprehensive study with a larger sample size is required to extrapolate these findings to a more general population. This study also proposes some changes optometry schools can implement in order to potentially slow myopic progression in students.

Key Words: Near Work, Refractive Error, Myopic Shift, Electronics, Print

Poster #26
Implications of Expansion Services on Vision Care: Analysis of Community Health Center Expansion Services and Opinions
P. Dupuy, H. Frechette, B. Grynyk, R. Kormos, A. Szalkowski, R.H. White, MPH

PURPOSE: Vision care is identified by the U.S. government public health resource, HealthyPeople 20/20, as one of the chief objectives aiming to improve the quality and duration of the lives of Americans. Although the U.S. Office of Disease Prevention and Health Promotion have identified vision care as being instrumental in achieving the mission of seeking to promote healthy development with longer, high-quality, disease-free lives, while eradicating health care inequalities, vision care remains excluded from the definition of primary care. The purpose of this qualitative study is to highlight the need for vision care services within community health centers while gauging community health centers’ perception of the Expansion Services grants and how these grants relate to CHCs’ perceptions on the definition of vision care.

METHODS: Questionnaires were conducted with Community Health Centers that had received Expansion Services grants during 2014. CMOs, CEOs, and other qualified representatives commented on the benefit of Expansion Services grants, how funding is being put to use, and health center opinions for including vision services in the definition of primary care. Trends in the qualitative data were examined.

RESULTS: Quantitative and qualitative responses were obtained from 34 community health centers throughout the United States. Prior to receiving funding, the majority of CHCs did not offer vision services (64%). When determining how funding was being used, CHCs responded primarily by funding optometrists, purchasing equipment, and initiating vision care programs, expressing that further funding would be required to meet the needs of the community and increasing demand. When asked opinions on whether or not vision care should be included in the definition of primary care, 100% of respondents strongly supported the inclusion of vision care within primary care services.

CONCLUSION: The eyes and visual system do not exist in their own unrelated environment but affect and are affected by the total health and wellbeing of the patient. It is clear that vision care systems in a majority of these CHCs would not exist without the additional funding received through Expansion Services grants. With unanimous favor expressed by CHCs for including vision care as part of the definition of primary care, it is evident that CHCs are ready to embrace vision care as a fundamental service in health centers. Amending legislation to include vision care as part of the definition of primary care would greatly increase funding towards vision services, creating many opportunities for optometrists while providing necessary high-quality care to underserved communities and populations.
Poster #25  

Is Beauty Truly Timeless?  

A. Wiederoder, C. Davis, C. Cesar, D. Patel, M. Dulski, R. Gohel  

Unsafe use of eye cosmetics poses a serious threat to the eye health of patients of all ages, predominantly females. The origin of this threat can be traced to consumers who, misinformed by poorly labelled packages, continue to use long-since contaminated makeup on their eyes. This study looks at the prevalence of expiration dates and health-related warnings on the packaging of eye cosmetics and how the presentation of this information is regulated by governmental agencies.  

Research showed that the FDA has very limited control over the selling of cosmetic products and their safety. Investigation of the labels on many popular eye cosmetics demonstrated that expiration dates were only present on 20% of products for mascara on both the bottle and outer packaging. In regards to eyeliner, 0% had expiration dates on both the outer packaging and liner itself. If expiration information was present, they were easily missed or confusing.  

Results suggested that the lack of easily accessible information about the safe use of eye cosmetics are very likely to be an underlying cause of makeup-related eye diseases and infections. More regulation on the sale of cosmetics is required to solve this problem and get expiration dates in the minds and lines of sight of consumers.  

**Key words:** eye cosmetics, expiration dates, public health, FDA

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Poster #5  

Light Toxicity During Eye Exams  

V. Huynh, G. Lin, A. Magbanua, A. Quach, B. Umapathisivam, D. Veneziano  

Patients are exposed to a great amount of light during eye exams, which can lead to retinal damage. Previous studies reported safe maximum duration of light exposure for different optometric procedures. The purpose of this study is to quantify the total light exposure during an eye exam and to determine the potential of patients receiving light-induced retinal damage.  

Eleven eye exams were observed and the duration of light exposure during different optometric procedures were timed. These exams included retinoscopy, direct ophthalmoscopy, pupils, and extraocular movements, slit lamp biomicroscopy, slit lamp with the 90D lens, and binocular indirect ophthalmoscopy (BIO). The retina can experience light damage if safe times are exceeded when using ophthalmic devices. Most experienced clinicians follow guidelines under maximum permissible exposure (MPE) values, but it is important to take extra precaution for inexperienced clinicians and patients with pre-existing retinal injury.  

**Key Words:** light toxicity, ophthalmic instruments, exposure time, light intensity, retinal damage

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Poster #6  

Telemedicine: Bridging the Gap  

C. Crowson, D. Folman, M. Gobeille, J. Les, K. Maloney, V. Yiannoulis  

Throughout the United States, ocular disease and visual impairment place a significant burden on society and impact patients’ abilities to achieve optimal quality of life. These conditions are predicted to increase in prevalence as the population ages. Despite the growing prevalence of both ocular disease and visual impairment, many patients are unable to access care. Financial barriers, such as insurance status and poverty, make care unaffordable to low-income patients.  

Non-financial barriers, such as lack of transportation, inadequate education, physical co-morbidity, and the necessity of frequent follow up also impact care utilization. Telemedicine, or the use of telecommunication and information technologies to provide clinical health care at a distance, presents a potential solution for populations with limited access to care.  

This project examines applications for telemedicine in the diagnosis and management of glaucoma, age-related macular degeneration, diabetes, and low vision. Based on a review of recent literature in the field, we have concluded that more research exploring possibilities for implementation of telemedicine is warranted. Developments in telemedicine have the potential to bridge the gap between providers and patients who have limited access care.  

**Keywords:** telemedicine, access to care, glaucoma, age-related macular degeneration, diabetes, low vision, rural medicine
Poster #7
The Tear Story Seen Through Contact Lenses

New technology has made it possible to monitor diseases and conditions using biomarkers. Researchers have identified specific biomarkers that are unique to certain diseases. This technology is being applied in contact lenses with the hopes eliminating present day monitoring techniques. These new techniques are less invasive, produce faster results, can be constantly monitored, and improve the care that providers can deliver to their patients. These future contact lenses will hopefully give providers the opportunity to monitor their patients closer and more effectively.

Specific diseases that researchers are hoping to improve treatment and management for include diabetes, glaucoma, cancer, heart disease and potentially other systemic diseases. This technology is not limited to the monitoring of diseases but also can be used to administer medications and help correct refractive error.

This shows promise to improve the way healthcare is delivered by using less invasive techniques and allowing for real time monitoring. We look forward to implementing these techniques as future health care providers.

Poster #24
DO OR DYE: The Effects of Food Coloring on Contacts Lense and Ocular Health

Purpose: Trending today amongst the teenage population are food-color stained contact lenses as an accessible and cheap alternative to prescription colored contacts. To understand the method to this madness, 15-year-old Youtuber, Jixi Jones, was interviewed about her video on how to make “Homemade Colored Contacts”. Her opinion strongly suggests that dyed lenses pose minimal threat to one’s eyes. In fact, a growing number of teens are applying acidic food coloring to their contact lenses without considering the consequences this practice has on their ocular health. The objective of our project is to examine the impact of food coloring on contact lenses and deduce the effect this has on one’s ocular structures.

Methods: McCormick food coloring was added to Acuvue 1-Day Moist contact lenses for a 2-day and 3-week time period to assess the absorption of color and the condition of the lenses.

Results: Over the 2-day and 3-week period, the dyed lenses were wrinkled at the edges and lost their convexity, thus compromising their structural integrity.

Conclusion: Dyed lenses ultimately result in conditions including corneal ulcers, infections and conjunctivitis. Intervention by optometrists, the AOA and the FDA is crucial in educating patients and inhibiting the further progression of this unsafe practice.

Keywords: Public Health, Teenagers, Dyed Contact Lenses
**Poster #23**

**Cannabinoids for Glaucoma Therapy**

R. Kolambekar, R. Ishrat, P. Liem, J. Patel, A. Uddin

**Background:** Primary open-angle glaucoma, normal-tension glaucoma, and angle-closure glaucoma result in blindness associated with optic nerve degeneration and often increased intraocular pressure. A G protein-coupled receptor, CB1 receptor, is found in ocular tissue and its activation by cannabinoids is related to aqueous humor production and outflow. Cannabinoids have also been found to have neuroprotective antioxidant properties.

**Report:** A research study on eight patients with bilateral glaucoma was treated with synthetic cannabinoid which resulted in decreased intraocular pressures. The results of the study demonstrated that cannabinoids act as vasodilators which increases aqueous humor efflux. Studies based on the impact of medical marijuana use on the community have shown insignificant correlation between the use of medical marijuana and the increase of marijuana for recreational purposes. However, drug abuse and dependence on marijuana has amplified in states that have legalized marijuana for medicinal purposes.

**Conclusion:** Separation of therapeutic actions from side-effects now seems possible through a diverse array of novel chemical, pharmacological, and formulation strategies. Currently, lipophilic drugs involving formation of microemulsions show the most promising advancements in glaucoma treatment with usage of Cannabinoids, due to its lack of euphoria and rapid decreases IOP. Methods alternative to smoking and the ideal dosage must be studied further to see the potential of medical marijuana for glaucoma therapy.

**Keywords:** Cannabinoids, Cannabis, intraocular pressure, Glaucoma, CB receptor

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**Poster #8**

**Using Video Games to Investigate Typical and Atypical Visual Development**

Sathyasri Narasimhan, Deborah Giaschi

During my tenure as a post-doctoral fellow, I worked primarily with children who had unilateral anisometropic and/or strabismic amblyopia. Study participants typically included children (3 - 16 years old) with amblyopia and age-matched control children with normal visual acuity.

Though the experiments were designed using psychophysical methods, the tasks were made child-friendly by using several disney and cartoon characters in a video game setting. Several studies were designed (1) to investigate the typical development of motion perception, (2) to examine the time course of development of stereo processing mechanisms and (3) to evaluate motion perception deficits and interocular suppression in amblyopia.

A brief summary of these studies and their results would be presented in this poster.

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**Poster #9**

**Keratoconus: Improving Quality of Life Through Advancements in Detection and Treatment**

C. Benn, R. Carr, L. Fields, S. Flynt, K. Nelson, P. Schrepel

There has been an obvious progression in the methods of detection and treatment of ocular conditions in recent years. With earlier detection, a shift toward preventative care has evolved. Such treatment can largely impact diseases like keratoconus because the patient demographic involves a critical age at which life decisions are made.

Through personal accounts, it was discovered that diagnostic and treatment methods were limited. Data collection, methods, and techniques have shown much advancement over time.

Recent treatments and preventative measures, such as collagen cross-linking and genetic testing for keratoconus, have been increasingly studied and show promise in improving the quality of life for the patient.

**Key words:** keratoconus, collagen cross-linking, genetics, quality of life
Poster #10
Establishing a Gold Standard for Dry Eye Diagnosis
N. Aneja, H. Garlick, K. Gregory, A. Lapaseotes, J. Lee

Dry eye syndrome is a common cause of eye irritation found in an increasing number of individuals in today’s society. There is no current gold standard for diagnosing dry eye, meaning that there is often discrepancy between doctors when evaluating dry eye, and treatment is extremely variable.

By developing a strategy for diagnosing dry eye that optometrists can routinely follow, it will be easier to treat uniformly. Based on optometrists’ experiences and methods combined with effectiveness and costs, a diagnostic flow was developed. The three layers of the tear film can be evaluated separately, and based on the patient’s symptoms and signs, a more efficient course of treatment can be implemented.

Starting with case history, the patient’s symptoms can guide the doctor to evaluate each layer of the tear film, starting with the outermost lipid layer and working toward the innermost mucin layer. Doing this will help determine the type of abnormality causing the dry eye symptoms.

Specific tests are administered depending on which layer of the tear film is suspected to be abnormal. Based on the proposed diagnostic flow, optometrists can provide standardized care that is cost and time efficient, while maintaining reliable and accurate treatment.

Key words: dry eye, diagnostic test, tear film, standardized

Poster #22
Overlooked Tanning Regulations in Massachusetts
K. Dorff, P. Frost, A. Mehwash, S. Miller, R. Shah, R. Servattalab

BACKGROUND: Exposure to UV radiation when using indoor tanning devices can cause irreversible damage to the eyes. There are several forms of protective eyewear available that can be worn while tanning to reduce the detrimental effects of UV radiation. The FDA regulates the labeling and manufacturing of sunlamp products. All other regulations vary by state. Massachusetts state law requires that protective eyewear is worn while tanning.

REPORT: This study investigated the compliance of tanning salons within the Boston area to public health regulations. An anonymous survey was administered to 32 different tanning facilities. Of the 32 tanning salons, 17 responded to the questions on the survey.

CONCLUSION: When asked if tanning facilities required that customers wear protective eyewear, 70.6% responded yes in compliance with Massachusetts’s regulations. In contrast, when asked if the tanning facilities would turn away a customer who refused to wear protective eyewear, only 29.4% responded yes. Therefore while some tanning facilities follow the regulations other do not. Intervention is needed to ensure that all salons are in full compliance with Massachusetts’s law in order to reduce the frequency of preventable ocular damage.

Key Words: Indoor Tanning, UV Radiation, Ocular damage, Massachusetts State Law, Noncompliance
Poster #20

E-cigarettes: Blind to the Consequences?

B. Brar, G. Coffin, A. Ianovski, C. Mariella, U. Sandhu, D. Shlosman

**Purpose:** To highlight the lack of awareness of the harmful effects of e-cigarettes. We will compare chemicals found in both cigarettes and e-cigarettes in order to assess the correlation between these chemicals and those that cause or increase the risk of certain ocular diseases.

**Methods:** This report utilized an anonymous online survey that addressed public awareness on topics including: safety of e-cigarettes and other nicotine delivery systems in comparison to cigarettes, and the correlation between smoking and increased risk of developing ocular diseases.

**Results:** 56.2% admitted to use of tobacco products (excluding e-cigarettes) and 36.6% stated that they had used e-cigarettes. 60.1% reported that these devices are less harmful than traditional tobacco products. Only 43.8% of responders were aware that nicotine, heavy metals, and other carcinogens in cigarettes have been identified in the vapor of e-cigarettes. 75.2% were unaware of the impacts of smoking on ocular health.

**Conclusions:** There is a lack of awareness of adverse health effects caused by e-cigarettes. We believe that FDA regulation of e-cigarettes in conjunction with increased public awareness of the potential health hazards will result in an environment conducive to further research on the possible benefits or consequences of these products.

Poster #11

Evaluating Contact Lens Hygiene Compliance and Methods of Patient Education in Young Adults

A. Ferreira, A. Muia, F. De Rubeis, H. Tennant, P. Yassa

**Purpose:** Young adults are identified as a problematic population when considering contact lens hygiene compliance as defined by the AOA, CDC, and FDA standards of care. Current patient education is inadequately reaching this demographic. Therefore, our research aimed to evaluate contact lens hygiene compliance in young adults and other methods of patient education to improve compliance.

**Methods:** We evaluated contact lens hygiene in young adults aged 18-29 and which patient education methods were best. We conducted an online survey targeted to young adults who currently wear contact lenses regarding demographics, contact lens hygiene, and patient education methods.

**Results:** Results demonstrated poor (<50%) compliance among young adults for contact lens hygiene, including hand-washing when inserting and removing lenses (38.3% and 20.8%, respectively), and replacement of contact lens cases (>3 months). Speaking with an eye care professional was the most effective method of patient education, followed by a hands-on method. The least effective form of patient education included the Internet, pamphlets, etc.

**Conclusion:** Despite declared knowledge of contact lens hygiene, many young adults do not display proper compliance. This disconnect suggests a need for a different method of patient education. In addition to talking to an eye care professional, a hands-on learning approach would provide a new, engaging, and potentially beneficial way to improve compliance in young adults.

**Key words:** contact lenses, contact lens hygiene, compliance, patient education, young adults

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Students presenting their poster to the judges
**Poster #12**

**The Role of Nutrition and Diet in Dry Eye Syndrome**

Boemer, A., Hollenbach, B., Huebsch, K., Miller, M., O’Dowd, D., Stevens, S.

**Background:** The prevalence of dry eye syndrome has increased dramatically, becoming the most common ocular condition in the United States. This has prompted more research to find the cause of this now seemingly inevitable disease. This project recognizes the growing occurrence of dry eye syndrome and challenges the use of drugs, such as Restasis, as a primary treatment plan. Instead of expensive medications, this project looks at solutions within patients’ diets and the use of less expensive treatments.

**Case:** In a 2013 randomized, double blind study, half of the participants were given a placebo pill while the other half were given 500mg omega-3 supplements, taken twice daily for three months. The study concluded that there was a statistically significant improvement in dry eye symptoms, in the patients given 1000mg of omega-3 supplements daily over three months.

**Discussion:** The increase in dry eye syndrome has paralleled with an increase in the availability of processed foods. The average American’s intake of inflammatory agents, such as omega-6s, has amplified by up to 17 times the optimal amount. Studies have shown that many chronic diseases, such as dry eye syndrome, are triggered by inflammation. By reducing the intake of omega-6s, it is possible that dry eye syndrome prevalence could also decrease.

**Key Words:** dry eye syndrome, omega-3, omega-6, nutrition, prevention

**Poster #19**

**Improving Interprofessional Communication in Reference to Obese Patients’ Ocular Risks**

J. Brosof, J. Ferrucci, M. Hartnett, H. Le, K. Lundquist, S. Michalko

**Purpose:** This project seeks to examine the current state of interdisciplinary communication between primary care optometrists and other physicians with regards to their obese patients. We examined the current communication received and provided, as well as assessing ocular risk factors by surveying 20 optometrists, in regards to their obese patients.

**Background:** Given obesity’s prevalence and its many ocular manifestations, it is perhaps more imperative than ever for the condition to be managed in conjunction with patients’ eye health to reduce the risk of sight-threatening pathologies. The most challenging aspect of treating obesity is overcoming the social stigma that exists. All healthcare providers need to advocate for healthier lifestyles, but often don’t know how to approach the topic. Obesity is a major public health issue and early intervention is key to helping the patient prevent additional diseases and prolong life. More communication means more comprehensive care and prevention, which in turn means lower healthcare costs and better quality of life.

**Results:** The survey yielded varying results in terms of communication, however all of the optometrists recognized the risk factors regarding ocular manifestations for obese patients. There was however a distinguishable gap in interprofessional collaboration. For primary care providers who advocate for the best possible care is imperative that education and communication be mandated.

**Key words:** Obesity, interdisciplinary, collaborative care, advocate, education

Students answer faculty questions during poster day presentations
The Prevalence of Ocular Health Myths Among Pharmacists

M. Coward, J. Mockler, A. Opoku-Debrah, Y. Vuong, L. Walker, F. Zahir

This research project set out to explore if vision health myths and misconceptions affect the quality of pharmacists’ vision health advice to U.S. patients.

The idea stemmed from a 1997 Brazilian study on ocular health myths amongst hospital staff. Pharmacists licensed in 21 different states (n = 36) completed an online survey consisting of questions on demographics, eye/vision-related patient interactions, and true or false statements concerning popular eye care myths.

Participants were also asked if they have attended or are interested in attending a continuing education (CE) seminar on ocular health. Interestingly, approximately 75% of participants recommended vision products frequently, yet only 58% advised patients to see an optometrist. This is an important indicator as to where patients are getting their ocular health information.

It was also found that 8 out of the 17 true or false statements were answered correctly by greater than 80% of participants. Finally, although the majority (89%) have never attended a vision CE seminar, 92% of participants indicated interest in attending one.

Results from this survey indicate both demand and need for vision-based CE seminars targeted towards pharmacists.

Key Words: “Myth” “Misconceptions” “Vision Health” “Pharmacist” “Continuing Education”

UV Radiation: The Role of Contact Lenses in Ocular Protection

I. Chau, Z. Gao, T. Gill, J. Kaur, N. Khela, B. Sasan

BACKGROUND: Sunlight or ultraviolet radiation (UVR) is high energy light that can damage structures of the eye. In order to have complete protection with sunglasses, goggles or extreme wrap around styles must be used as other styles continue to allow light to enter the eye from the top, bottom and the sides of the lenses. As such, in comparison to spectacles, UVR blocking soft contact lens provide better absorption of ambient-diffuse and reflected UV radiation, which is often neglected by sunglasses.

REPORT: The aim of this group was to raise awareness for UVR protective contact lens use in conjunction with other protective measures. This was first achieved through conductance of a literature review. The literature indicated that UVR blocking contact lenses are classified into two distinct categories by the U.S. Food and Drug Association (FDA): Class I blockers and Class II blockers. Class I contact lenses block up to 90% of UVA and 99% of UVB, while Class II contact lenses block up to 70% of UVA and 90% of UVB and are recommended for general use. Additionally, lenses composed of polymers senofilcon A and galyfilcon A provided the greatest degree of UVB protection and UVA protection in lower regions of the spectrum, as such classifying them as Class I UVR Blockers. The gathered knowledge was synthesized into a patient oriented manner, and used to create a short video, aimed at increasing awareness and/or further educating patients on the use of ocular protection.

CONCLUSION: There is an apparent gap in knowledge when it comes to public awareness regarding ocular UVR protection. Future outlooks regarding this area include promoting the use of UVR blocking contact lenses, in conjunction with other protective measures. Currently there are no legal standards for the protection against UVR damage through contact lenses - only recommendations by A.N.S.I. - in turn pushing for a legal standard to be established.

Key Words: Protection, Ultra-Violet Radiation, Contact Lenses, Ocular Damage, Sunglasses
Purpose: To evaluate the success rate of highly gas permeable scleral contact lenses (SCL) for visual rehabilitation after penetrating keratoplasty (PK), over a period of up to 9 years.

Methods: A total database of 31 consecutive patient fitted with SCL between January 2004 and December 2009 was retrospectively reviewed. Demographic data, etiology prior to lens fitting, visual outcomes, follow up time and complications were analyzed.

Results: All eyes were fitted due to inadequate spectacle-corrected vision after successful penetrating keratoplasty or failure of other contact lens modalities. Out of 31 patients fitted, 28 (33 eyes) continue to wear SCL for periods between 0.5 and 8.8 years. The mean duration of follow-up after contact lens fitting was 5.2 ± 2.2 years. The mean age of corneal graft was 17.6 ± 11.4 years (range 4.3-42), and the mean interval between PK and initial contact lens fitting was 12.2 ± 10.7 years (range 0.7-36.0). The average steepest keratometry of our cohort was 55.0 ± 7.5 diopter (D) and the refractive astigmatism was 8.0 ± 4.4 D. The mean contact lens corrected visual acuity (BCVAc) was 0.78 ± 0.25 (range 0.3-1.2). Twenty-three (82%) patients achieved a functional vision of 0.5 or more. During the studied period, ten (30.0%) eyes presented at least one graft rejection episode and two eyes (6%) had an episode of microbial keratitis. Corneal transplants of 20 years or more show a higher rate of refits due to ectasia recurrence.

Conclusions: Scleral lenses should be considered as lens of choice in eyes with complex corneal geometry, as besides visual rehabilitation, their use may delay or prevent further surgical involvement.
Spherical Aberration Control in Contact Lenses

Gerard Cairns, Gary Mosehauer

Purpose: Aspheric optics in contact lenses are designed to reduce inherent spherical aberration in the eye. Four studies were conducted to evaluate spherical aberration and visual acuity of two marketed silicone hydrogel lenses (Test - balafilcon A with aspheric optics; Control – senofilcon A with conventional spherical optics) across a range of powers.

Methods: A single power was assessed in each study (+3.00D, -1.00D, -5.00D, and -9.00D). Cohorts of 22 - 25 subjects were dilated with 1% Tropicamide to achieve 6mm pupils. Baseline spherical aberration readings and high contrast logMAR visual acuities using a 6mm artificial aperture were recorded and then repeated with lenses in situ. A linear mixed model was employed to analyze data across all studies and paired comparisons were conducted within each study.

Results: The results showed that, over all studies, the Test lenses reduced the mean spherical aberration by 0.136um, significantly more than the Control lens which reduced the spherical aberration by only 0.054um (p<0.05). On average the Test lenses were 0.07 logMAR better (p<0.05). For the -9.00D, -5.00D and +3.00D powers individually, the Test lenses provided significantly better visual acuity (0.09 logMAR, 0.07 logMAR and 0.13 logMAR, respectively; p<0.05 in each case) compared to the control lenses.

Conclusions: Incorporating aspheric optics into contact lens designs can reduce the spherical aberration of the eyes’ optical system. These studies show that for contact lens patients, the balafilcon A lenses with aspheric optics can provide a clinically significant enhancement to vision over conventional spherical optics.
**Poster #16**

*A Tail of the AODP Class of 2017*

J. Ding, X. Guo, E. Wiecek, Z. Wu, H. Xu

The AODP Class of 2017 tells a story of two friends, Mickey Mouse and Walt Disney, as their vision changes throughout their lifetime. Each of the AODPs previously conducted research on the visual system in either mouse models or humans to better understand how our visual system develops, functions, and ages over time.

Hongping’s research provided information on how the mouse retina develops at early stages in life. Both Juan and Ziwei worked on dry eye disease, which tends to occur at old age.

Emily developed new methods to detect retinal changes and macular degeneration in older eyes in humans and Xiuyang worked on several things related to aging including immunology.

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**Poster #17**

*Effect of Angle of Incidence on Anterior Chamber Angle Metrics from Optical Coherence Tomography*

Jyotsna Maram, Ph.D.¹, Xiaojing Pan, M.D.¹,², Ken Marion, M.S., M.B.A.³, Zhou Yuan Zhang¹,Maria Fernanda Velasco, M.D.¹, Srinivas R. Sadda, M.D.¹, Vikas Chopra, M.D.¹

**PURPOSE:** To evaluate the local variability of anterior chamber angle (ACA) metrics obtained by time domain (TD) and spectral domain (SD) optical coherence tomography (OCT).

**METHODS:** Anterior segment OCT imaging was performed on 30 normal eyes using Visante TD-OCT and on 40 normal eyes using Cirrus SD-OCT. For Visante OCT, a single 16-mm line scan of the inferior angle with three slightly different rotations of 265°, 270° and 275° was performed. For Cirrus OCT, a 5-line raster of the inferior angle was performed, centering the third scan line at the 6 o’clock position, with 0.25 mm between lines. ACA measurements were taken for angle opening distance (AOD) and trabecular iris space area (TISA) at 500/750 µm from the scleral spur for Visante OCT and at Schwalbe’s line (SL) for Cirrus OCT. Measurements between line scans for each device were compared and quantified.

**RESULTS:** For the Visante OCT at three different scan orientations, the mean difference in ACA metrics was 0.41±0.15 mm for AOD-500, 0.59±0.22 mm for AOD-750, 0.14±0.06 mm² for TISA-500, and 0.27±0.1 mm² for TISA-750. For three different scan positions with Cirrus OCT, the AOD-SL and TISA-SL showed mean differences of 0.85±0.32 mm and 0.33±0.15 mm², respectively.

**CONCLUSIONS:** These findings suggest that small local changes in the position of the OCT line scan did not significantly alter ACA metrics in achieving reliable measurements. Given the absence of tracking and registration for current anterior segment OCT instruments, this observation is of relevance for longitudinal and dynamic studies of angle geometry.

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