

AMY CATHERINE NAU

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EDUCATION AND TRAINING:

Undergraduate:

St. Michael's College, Winooski, VT
BA, History 1990

Graduate:

Harvard University, Cambridge MA
New England College of Optometry, Boston MA
Health Careers Program, 1995
O.D., 2000

Postgraduate:

Boston VA Health System, W. Roxbury MA, 2001
Residency, ocular disease

POSITIONS AND HONORS

10/2015-present Adjunct faculty, Assistant Clinical Professor, New England College of Optometry
7/2014- present Korb and Associates, Boston MA
7/2014-present Korb Research, Boston MA
7/2014- 7/2015 Adjunct faculty, Assistant Professor, University of Pittsburgh
Department of Ophthalmology
6/2012- 6/2014 Director, Telemedicine UPMC Eye Center
6/2011- 6/2014 Executive Committee, UPMC Eye Center
3/2004- 6/2014 Director, Optometric, Medical Contact Lens and Low Vision Services
Department of Ophthalmology, University of Pittsburgh
1/2010- 6/2014 Director and Founder, Sensory Substitution Laboratory, UPMC Eye Center/ Fox Center for Vision Restoration
6/2004-6/2014 Director, UPMC Eye Center Optical Shops (six locations)
6/2003-6/2014 Assistant Professor, UPMC Eye Center/Department of Ophthalmology, University of Pittsburgh, secondary appointment at the McGowan Center for Regenerative Medicine
6/2003 -7/2011 Course Director, Optics and Contact Lenses courses for University of Pittsburgh, Department of Ophthalmology
7/2001 -12/2003 Staff Optometrist, Department of Ophthalmology, Beth Israel Deaconess Medical Center, Boston, MA
2000 - 2003 Sub-Investigator, Ophthalmic Research Associates, Andover, MA
2000 - 2001 Per diem optometrist, For Eyes, Boston MA
1994 - 1998 Research Assistant, Ocular Research of Boston, Boston MA

LICENSURE

Commonwealth of Massachusetts 2000-2003, 2014 - present
State of Pennsylvania 2003-214

HONORS/AWARDS

- 2013 Honorable Mention, ocular photography contest *Boston Keratoprosthesis with contact lens and fungal infiltrate*. American Academy of Optometry meeting, Seattle WA, 2013.
- 2012 American Optometric Association Summer Research Retreat, invited participant
- 2008 Western Pennsylvania Optometric Society “Young OD of the Year”
- 2002-08 New England College of Optometry Alumni Board, *member*
- 2000 Bausch and Lomb Excellence in Contact Lens Award
- 1996-00 Beta Sigma Kappa (Optometric Honor Society), Co-president 1997, President 1998
- 1996-00 American Academy of Optometry Student Member, New England College of Optometry Student Representative, 1999
- 1999 Baeder Outstanding Student Scholarship Award
- 1999 Bausch and Lomb American Academy of Optometry Travel Grant Award
- 1996-99 New England College of Optometry Student Ethics Committee Representative, *President, 1999*
- 1996-99 Student Affairs Committee, student representative
- 1998 Vistakon American Academy of Optometry Travel Grant Award
- 1997 New England Chapter, American Academy of Optometry Travel Grant Award

PROFESSIONAL ACTIVITIES

- 2014-present Scleral Lens Research Group (Fellows Doing Research American Academy of Optometry Special Interest Group)- steering committee member
- 2013- 2014 Medical Contact Lens and Ocular Surface Association (MCLOSA)
- 2012- 2014
- University of Pittsburgh, First Experiences in Research Mentor
- 2012 – present American Academy of Optometry, Education Quality Assurance volunteer
- 2010 – 2014 National Association for University Based Optometry, Board Member
- 2010 – present Contact Lens Association of Ophthalmologists, member
- 2010 – 2014 Medical student Scholarly Research Project Mentor, University of Pittsburgh
- 2010 – present Scleral Lens Society, member
- 2010 – 2014 Ophthalmology resident Scholarly Research Project Mentor, UPMC Eye Center
- 2007 – 2011 Disabilities Resource Center Council Member, UPMC
- 1999 – present Association for Research in Vision and Ophthalmology, Member
- 2005 – 2009 American Academy of Optometry, Membership Committee
- 2005 – 2014 Pennsylvania Optometric Association, Member
- 2005 – present American Optometric Association, Member
- 2004 – 2008 Optometric Retina Society, Member
- 2001 – present American Academy of Optometry, Fellow
- 2001 – 2007 New England College of Optometry - Student Mentor

PEER REVIEWED MANUSCRIPTS

Matthew C. Murphy, Jasmine Kashkoush, Amy Nau, Kevin Chan. Top-down modulation in the visual cortex correlates with duration of blindness and speed of performance during sensory substitution. *Submitted, Neural Plasticity October 2016.*

Caitlin O'Connell, Arash Mahboobin, Scott Drexler, Mark Redfern, Amy Nau, Rakiie Cham. Effects of acute peripheral/central vision loss on standing balance. *Submitted, Experimental Brain Research, November 2016.*

Jennifer Harthan, OD, Cherie B. Nau, OD, Joseph Barr, OD, Amy Nau, OD, Ellen Shorter, OD, Nicolette T. Chimato, David O. Hodge, Muriel M. Schornack, OD. Scleral Lens Prescription and Management Practices: The SCOPE Study. *In Press: Eye & Contact Lens, October 2016*

Muriel Schornack, Cherie B Nau, OD; Jennifer Harthan, OD; Ellen Shorter, OD; Joseph Barr, OD; Amy Nau, OD; Nicolette T Chimato; David O Hodge. Demographic Characteristics and Prescribing Patterns of Scleral Lens Fitters: The SCOPE Study. *In Press: Eye & Contact Lens, October 2016*

H. Christiaan Stronks, Ellen Mitchell, Amy Nau, Nick Barnes. Visual task performance in the blind with the BrainPort V100. *In press Expert Review of Medical Devices 2016.*

Matthew C Murphy, [Amy C Nau](#), Christopher Fisher, Seong-Gi Kim, Joel S Schuman, Chan KC. Top-down Influence on the Visual Cortex of the Blind during Sensory Substitution *Neuroimage. 2016 Jan 15;125:932-40. doi: 10.1016/j.neuroimage.2015.11.021. Epub 2015 Nov 14.*

Patricia Grant, Lindsey Spencer, Aimee Arnoldussen, Rich Hogle, [Amy Nau](#), Janet Szlyk, Jonathan Nussdorf, Don Fletcher, Keith Gordon, William Seiple, The Functional Performance of the BrainPort V100® Device in Persons Who Are Profoundly Blind. *Journal of Visual Impairment & Blindness, March-April, 2016, p. 77-88.*

[Nau AC](#), Murphy MC, Chan KC (2015) Use of sensory substitution devices as a model system for investigating cross-modal neuroplasticity in humans. *Neural Regen Res* 10(11):1717-1719. September 2015.

Zambelli AM, Brothers KM, Hunt KM, Romanowski EG, [Nau AC](#), Dhaliwal DK, and Shanks RM. Diffusion of Antimicrobials Across Silicone Hydrogel Contact Lenses. *Eye and Contact Lens. 2015 Sep;41(5):277-80.*

Yabiao Gao, Rahul Chandrawanshi, [Amy Nau](#), Zion Tsz Ho Tse. Wearable Virtual White Cane Network for navigating people with visual impairment. *Proc Inst Mech Eng H. 2015 Sep;229(9):681-8.*

Stronks HC, [Nau AC](#), Ibbotson MR, Barnes N. The role of visual deprivation and experience on the performance of sensory substitution devices. *Brain Res. 2015 Jul 14. pii: S0006-8993(15)00515-6. doi: 10.1016/j.brainres.2015.06.033.*

Nau AC, Pintar C, Arnoldussen A, Fisher C. Acquisition of Visual Perception in Blind Adults Using the BrainPort Artificial Vision Device. *Am J Occup Ther*. 2015 Jan-Feb;69(1):6901290010p1-8.

Murphy MC, Nau AC, Fisher C, Kim SG, Schuman JS, Chan KC. Top-down Influence on Visual Cortex of Blind during Sensory Substitution. *Proc. Intl. Soc. Mag. Reson. Med*. 2022, p 579. 2014.

Kimberly M Brothers; Amy C Nau; Eric G Romanowski; Robert Shanks . Dexamethasone diffusion across contact lenses is inhibited by Staphylococcus epidermidis biofilms in vitro. *Cornea*. 2014 Oct;33(10):1083-7.

Lee VK, Nau AC, Laymon C, Chan KC, Rosario BL, Fisher C. Successful visual sensory substitution use functions independently of visual pathway integrity. *Front Hum Neurosci*. 2014 May 13;8:291.

Nau A, Drexler S, Dhaliwal DK, Mah F, Raju L, Deschler E. Contact Lens Fitting and Long Term Management for the Boston Keratoprosthesis. *Eye Contact Lens*. 2014 May;40(3):185-9. doi: 10.1097/ICL.000000000000021.

Nau A, Pintar C, Fisher C, Jeong J-H, Jeong KH. A Standardized, Portable Obstacle Course for Assessment of Visual Function in ultra low vision and artificial vision. *J Vis Exp*. 2014 Feb 11;(84)

Kowalski RP, Abdel Aziz S, Romanowski EG, Shanks RM, Nau AC, Raju LV. Development of a practical complete-kill assay to evaluate anti-acanthamoeba drugs. *JAMA Ophthalmol*. 2013 Nov 1;131(11):1459-62.

Nau A, Bach M, Fisher C. Assessment of Visual Perceptions Enabled by Sensory Substitution (BrainPort). *Translational Vision Science and Technology*. Special Issue: Regenerative Medicine in Ophthalmology, <http://tvstjournal.org/doi/abs/10.1167/tvst.2.3.1> 2013.

Legarreta JE, Nau AC, Dhaliwal DK. Acanthamoeba keratitis associated with tap water use during contact lens cleaning: manufacturer guidelines need to change. *Eye Contact Lens*. 2013 Mar; 39(2):158-61.

Nau AC. A Contact Lens Model to Produce Reversible Visual Field Loss in Healthy Subjects. *Optometry Vol 83 (6)* p 278, June 2012

Nau AC, Hertle R, Yang D. Effect of tongue stimulation on nystagmus eye movements in blind patients. *Brain Struct Funct*. 2012 Jul;217(3):761-5.

Nau, AC. "A comparison of Synergeyes versus traditional rigid gas permeable lens designs for patients with irregular corneas" *Eye & Contact Lens: Science & Clinical Practice*. 34(4):198-200, July 2008.

Troilo D, Boisvert N, Nau A. How is accommodation related to refractive state? Evidence from experimental studies using animal models. In: Thorn F, Troilo D, Gwiazda J (Eds.)

Myopia 2000. Proceedings of the VIII International Conference on Myopia. Myopia 2000, Inc. Boston 254-258 (2000).

Krenzer, KL, Ousler GW, Slugg A, Nau AC. A comparison of the staining characteristics of rose bengal and lissamine green in the evaluation of the clinical signs of dry eye syndrome. IOVS,2000; 41(4). (ARVO supplement #4934).

Greiner JV, Glonek T, Korb DR, Whalen AC, Hebert E, Hearn SL, Esway JE, Leahy CD. Volume of the human and rabbit meibomian gland system. In: Sullivan DA, Dartt DA, Meneray M (eds). Lacrimal Gland, Tear Film and Dry Eye Syndromes: Basic Science and Clinical Relevance. Advances in Medicine and Biology, Plenum Press, 1998; p. 339-43.

Effect of meibomian gland occlusion on tear film lipid layer thickness.
Greiner JV, Glonek T, Korb DR, Hearn SL, Whalen AC, Esway JE, Leahy CD.
Adv Exp Med Biol. 1998;438:345-8.

Greiner JV, Glonek T, Hearn SL, Whalen AC, Esway JE, Leahy CD, Korb DR. The effect of meibomian gland occlusion on tear film lipid layer thickness. In: Sullivan DA, Dartt DA, Meneray M (eds). Lacrimal Gland, Tear Film and Dry Eye Syndromes: Basic Science and Clinical Relevance. Advances in Medicine and Biology, Plenum Press, 1998; p. 345-48.

Volume of the human and rabbit meibomian gland system.
Greiner JV, Glonek T, Korb DR, Whalen AC, Hebert E, Hearn SL, Esway JE, Leahy CD.
Adv Exp Med Biol. 1998;438:339-43.

Human and rabbit lipid layer and interference pattern observations.
Korb DR, Greiner JV, Glonek T, Whalen A, Hearn SL, Esway JE, Leahy CD.
Adv Exp Med Biol. 1998;

Korb DR, Greiner JV, Glonek T, Whalen AC, Esway JE, Hearn SL, Leahy CD. Human and rabbit lipid layer interference pattern observations. In: Sullivan DA, Dartt DA, Meneray M (eds). Lacrimal Gland, Tear Film and Dry Eye Syndromes: Basic Science and Clinical Relevance. Advances in Medicine and Biology, Plenum Press, 1998; p. 305-07.

Korb DR, Greiner JV, Glonek T, Esbah R, Finnemore VM, Whalen AC. The effect of periocular humidity on the tear film lipid layer. IOVS 1995; 3 (ARVO) supplement#4626).

Korb DR, Greiner JV, Glonek T, Esbah R, Finnemore VM, Whalen AC. The effect of periocular humidity on the tear film lipid layer of dry eye patients. Ophthalmology 1995: 100 (supplement).

Korb DR, Greiner JV, Glonek T, Esbah R. Finnemore VM, Whalen AC. The effect of periocular humidity on the tear film lipid layer. Cornea 1996 Mar; 15(2):129-34.

Korb DR, Greiner JV, Glonek T, Whalen AC, Esway JE, Hearn SH. Human and rabbit tear film lipid layer thickness and blink rate. Second International Conference on the Lacrimal Gland, Tear Film and Dry Eye Syndromes. Bermuda, November 1996.

Greiner JV, Glonek T, Korb DR, Whalen AC, Hebert E, Hearn SH, Esway JE, Leahy CDE. Humana and rabbit meibomian gland secretion volume. Second International Conference on the Lacrimal Gland, Tear Film and Dry Eye Syndromes. Bermuda, November 1996.

Greiner JV, Glonek T, Hearn SH, Whalen AC, Esway JE, Leahy CD, Korb DR. The effect of meibomian gland occlusion on the tear film lipid layer thickness. Second International Conference on the Lacrimal Gland, Tear Film and Dry Eye Syndromes. Bermuda, November 1996.

Korb DR, Greiner JV, Glonek T, Esbah R, Finnemore VM, Whalen AC. The effect of periocular humidity on the tear film lipid layer. American Academy of Ophthalmology, Atlanta GA 1995.

POSTERS/MEETING PRESENTATIONS:

Murphy M, Kashkoush J, Nau A, Chan K. "Top-down modulation in the visual cortex negatively correlates with duration of blindness and reaction time during sensory substitution". International Society of Magnetic Resonance in Medicine 2017 Annual Meeting, Honolulu Hawaii

Amy C. Nau, Christen Kenrick, Andrew McLeod, Caroline Blackie, Sabiha Alloo, Donald Korb. Prevalence of Meibomian Gland Disease in a Graduate School Population. American Academy of Optometry, Anaheim California, October 2016.

Amy C. Nau, Christen Kenrick, Andrew McLeod, Caroline Blackie, Sabiha Alloo, Donald Korb. Dry Eye Symptoms in a Graduate School Cohort as Measured by SPEED Questionnaire. American Academy of Optometry, Anaheim California, October 2016.

Donald R Korb, Caroline A Blackie, Amy C. Nau Evidence to support a "Meibomian Gland First Culture" and the role of Dynamic Meibomian Imaging . American Academy of Optometry, Anaheim California, October 2016.

Kenrick C, Nau A, McLeod A. Incomplete blinking and meibomian gland function in a graduate school cohort. Tear Film and Ocular Society Conference, Montpellier France, September 2016.

Rocco Palumbo, Lauren N Ayton, Amy Nau, Russell L Woods: Using Rasch analysis with measures of visual ability of people with ultra-low vision. ARVO 2016 (accepted).

Cherie Nau, Jennifer Harthan, Ellen Shorter, Joseph Barr, Amy Nau, Muriel Schornack. SCOPE Study: Demographics of Scleral Lens Fitters - Global Specialty Lens Symposium, Las Vegas NV, January 2016.

Jennifer S. Harthan, Ellen Shorter, Joseph Barr, Amy Nau, Cherie Nau, Muriel Schornack. SCOPE Study: Scleral Lens Fitting Trends Among Practitioners - J Global Specialty Lens Symposium, Las Vegas NV, January 2016.

Amy Nau, Cherie Nau, Ellen Shorter, Jennifer Marathon, Joseph Barr, Muriel Schornack. The SCOPE Survey (Scleral lenses in Current Ophthalmic Practice: an Evaluation) Indications for Scleral Lens Wear. Global Specialty Lens Symposium, Las Vegas NV, January 2016.

Amy Nau, Jordan Davidner, Christen Kenrick, Esther Chung. The Influence of Contact Lens Modality of the Development of Meibomian Gland Dysfunction. American Academy of Optometry New Orleans LA, October 2015.

MC Murphy, AC Nau, C Fisher, SG Kim, JS Schuman, KC Chan. Relationship between visual functional connectivity and duration of blindness depends on onset of visual deprivation. 2015 Proceedings of International Society for Magnetic Resonance in Medicine, Toronto, May 30 – June 5, 2015.

MC Murphy, C Fisher, SG Kim, JS Schuman, AC Nau, KC Chan. Top down influence on the visual cortex of the blind during auditory sensory substitution. Proc. Intl'. Soc. Mag. Reson. Med. 22 (2014), 579. 2014 Proceedings of International Society for Magnetic Resonance in Medicine, Milan, May 10-16, 2014.

Nau A, Moffa D. Predicting Subject Candidacy for Artificial Vision use with Depression Screening Instruments. American Academy of Optometry Denver CO, November 15, 2014.

Nayak N, Dhaliwal D, Raju L, Kamyar R, Mammen A, Nau A, Bower T. accepted abstract submission (30039177/Sleep Position and Obstructive Sleep Apnea in Keratoconus) for AAO 2014 and Subspecialty Day in Chicago.

Kowalski RP, Abdel Aziz S, Romanowski EG, Shanks RM, Nau AC, Raju LV. abstract submission (30039934/Comparison of 10 Commercially Available Contact Lens Solutions in the Complete-Kill of Acanthamoeba Cysts) for AAO 2014 and Subspecialty Day in Chicago in October

Yabiao Gao, Ka-Wai Kwok, Rahul Chandrawanshi, Alex Squires, Amy C. Nau, Zion Tsz Ho Tse. Investigating Safety Issues Related to Electric Vehicle Wireless Charging Technology 2014 IEEE Transportation Electrification Conference and Expo Dearborn, Michigan, USA.

Nayak N, Dhaliwal D, Raju L, Kamyar R, Mammen A, Nau A, Bower T. Sleep Position and Obstructive Sleep Apnea in Keratoconus. Presentation Number: 1584 - C0223 Session Number: 223 Session Title: Cataract and anterior segment -2014 Meeting of the Association for Research in Vision and Ophthalmology(ARVO), Orlando, May 4-8, 2014.

Murphy M, Chan K, Nau A. Functional Plasticity of the Visual System in the Blind during Sensory Substitution Task and at Rest. Presentation Number: 2163 Session Number: 265 Session Title: Ocular Nanotechnology and Regenerative Medicine 2014 Meeting of the Association for Research in Vision and Ophthalmology(ARVO), Orlando, May 4-8, 2014.

MC Murphy, C Fisher, SG Kim, JS Schuman, AC Nau, KC Chan. Top down influence on the visual cortex of the blind during auditory sensory substitution. 2014 Proceedings of International Society for Magnetic Resonance in Medicine, Milan, May 10-16, 2014.

Tenley N Bower, Divya Narendra, Amy C Nau, Regis P Kowalski, Leela V Raju, MD. Contact Lens Surveillance Cultures in Patients wearing Bandage Contact Lenses. Ocular Microbiology and Immunology Group (OMIG) 2013.

V Lee, AC Nau, KC Chan. Microstructural visual brain reorganization in the congenitally blind and acquired blind. 2013 Proceedings of International Society for Magnetic Resonance in Medicine, Salt Lake City, Apr 20-26, 2013.

Zambelli A, Nau A, Shanks R, Brothers K, Dhaliwal D. Diffusion of Antimicrobials Across Silicone Hydrogel Soft Contact Lenses. Fall Educational Symposium on Nov. 15. Cornea Society 2013

Lee, VK, Nau A, Chan KC. Microstructural Visual Brain Reorganization in the Perinatal and Acquired Blind. Regenerative Ophthalmology Conference, Pittsburgh PA, June 2013.

Lee V, Nau AC, Chan KC. Microstructural Visual Brain Reorganization in the Congenitally Blind and Acquired Blind. Salt Lake City, UT International Society for Magnetic Resonance in Medicine 21st Annual Meeting 2013 (ISMRM 2013) April 2013.

Kowalski RP, Aziz SA, Shanks RMQ, Romanowski EG, Nau AC. Evaluation of a Complete-Kill Assay for Anti-Acanthamoeba Solutions. Ocular Microbiology and Immunology Group Meeting, New Orleans, Louisiana November 15, 2013

Steinbrink JM, Laymon JM, Rosario-Rivera C, Bedda L, Nau AC. The Relationship of Specific Categorical Variables with PET Scan White Matter Activation in Blind and Control Subjects Using BrainPort, In: ARVO Annual Meeting, Ft. Lauderdale, FL, 2013, E- Abstract

Nau AC, McCue M. Telerehabilitation for Artificial Vision (In: ARVO Annual Meeting, Ft. Lauderdale, FL, 2012; E-Abstract #333)

Arnoldussen A, Nau AC, Fisher C, Fisher J, Pintar C, Engleka G, Janosco K, Keifer A, Wolfe C. Perception of Depth Using the BrainPort Vision Device (In: ARVO Annual Meeting, Ft. Lauderdale, FL, 2012; E-Abstract #6327)

Nau, AC, Fisher C, Pintar C, Engleka G. Vision Based Psychophysical Tests Can be Used with Sensory Substitution Device (Brainport)- In: ARVO Annual Meeting, Ft. Lauderdale, FL 2011; E – Abstract #D1108

Friberg T, Nau AC, Pintar C, Fisher C, Chen C. “Seeing” With Your Tongue -- Sensory Substitution Using a Simple Alternative To The Retinal Chip, In: ARVO Annual Meeting, Ft. Lauderdale, FL 2011; E-Abstract #A244

Dongsheng Yang, Nau AC, Hertle RW. Effect of Tongue Stimulation On Nystagmus: Evidence Of Afferent Influence On Eye Movements In: ARVO Annual Meeting, Ft. Lauderdale, FL, 2011; E-Abstract #3020

Nau AC, Pintar C, Fisher CN. A Standardized Obstacle Course for Low Vision Mobility Assessment. In: ARVO Annual meeting, Ft. Lauderdale, FL 2011; E-Abstract t # 3623

Nau AC, Contact lens visual rehabilitation after implantation of the Alpha-Cor keratoprosthesis. ARVO, 2007.

Nau AC, Wildsoet CF, Troilo D. Hyperopic defocus from spectacle lenses alters the pattern of accommodative behavior in chicks. IOVS, 1999;40(4). (ARVO supplement #4457).

Nau AC, Troilo D, Wildsoet CF. Compensation to negative lenses in chicks is not affected by conditions which alter accommodation. IOVS, 1998; 39(4). (ARVO supplement #3238).

PRESENT RESEARCH ACTIVITIES

Evaluation of the Structure and Function of Meibomian Glands in Patients with Keratoconus and Patients Wearing Medically Necessary Contact Lenses.

Role: Principal Investigator

Sponsor: Korb Research

This multi-center study is the first to determine whether patients who wear medically necessary contact lenses are at greater risk for developing evaporative dry eye.

Pilot Study for the Evaluation of the Structure and Function of Meibomian Glands Among Young Adults Attending Graduate School

Role: Principal Investigator

Sponsor: Korb Research, Tear Science, Inc.

This cross sectional study examines the functional and structural characteristics of the meibomian glands in a graduate school cohort.

Pilot study for the evaluation of the structure and function of meibomian glands among a Pediatric cohort

Role: Principal Investigator

Sponsor: Korb Research

This cross sectional study examines the functional and structural characteristics of the meibomian glands in a pediatric cohort.

Treatment of Meibomian Gland Dysfunction Among Young Adults Attending Graduate School

Role: Principal Investigator

Sponsor: Korb Research, Tear Science, Inc.

This interventional study will examine the results of LipiFlow treatment over the course of one year in subjects attending graduate school.

Heat Tolerance of the Human Eyelid:

Role: Principal Investigator

Sponsor: Korb Research, New England College of Optometry

This study will determine the heat tolerance of the human eyelid, which is a critical issue for the appropriate treatment of meibomian gland dysfunction.

SCOPE (Scleral lenses in Current Ophthalmic Practice: an Evaluation) Research Group

Role: Executive Committee Member.

This research group was established in the spring of 2014, and received early mentorship from the Fellows Doing Research SIG of the American Academy of Optometry. Our mission is to engage in translational research in the area of scleral lenses. To date, we have administered four surveys globally which provide data on over 86,000 scleral lens fits. These surveys have explored management practices, demographics and prescribing patterns, satisfaction with scleral lenses in keratoconus and lens complications. Prospective, multi-center trials are in the planning stages.

Visual Information Restoration and Rehabilitation via Sensory Substitution Technology in Children-

Role: Consultant

This study explores use of sensory substitution and neuroplasticity in blind children

Blink patterns and lipid layer thickness as a function of type of contact lens wear.

Role: Principal Investigator

Correlation of lipid layer thickness and partial blink as a function of soft or rigid gas permeable contact lens use using the Lipiview.

PAST RESEARCH SUPPORT

NIH Loan Repayment Program Recipient 2012-2014

Assessing Feasibility of TeleRehabilitation in Low Vision Patients

Role: independent contractor 5/2013-5/2014

Sponsor: Faculty Innovation Fund Award Johns Hopkins

The overarching goal of this project is to demonstrate the feasibility of using tele-rehabilitation as a platform for delivering low vision rehabilitation services. Pilot data collected through this project will lay a foundation for a randomized controlled trial grant application to be submitted to the National Eye Institute, National Institutes of Health (NIH).

Effects of Visual Fields on Standing Balance

Co-Principal Investigator 8/1/13-9/1/14

\$120,000 NIH R-03

The goal of this proposed research is to determine the importance of central and peripheral visual field loss on standing balance in older adults.

Functional MRI of Sensory Substitution in the Blind

Co-Principal Investigator 1/2013-1/2014

\$70,000 OTERO fellow Fox Center for Vision Restoration

The main objective of this proposal is to identify the functional and structural connections that underlie the process of sensory substitution using advanced, non-invasive magnetic resonance imaging techniques and BrainPort. We will determine functional and structural changes in the brain before and after BrainPort training. This work will lay the foundation for the neurophysiological bases of sensory substitution. Our ultimate goal is to elucidate strategies for maximizing cross modal interactions for blind rehabilitation.

Visual Information Restoration and Rehabilitation via Sensory Substitution Technology

Co-Principal Investigator 10/2010-12/2013 30% effort
\$3.2M DMDRP

The aim of this proposal is to evaluate and improve a non-surgical visual prosthetic sensory substitution device called the Brainport. The advanced interfaces developed in this project will ultimately be broadly applicable to all artificial vision devices (i.e. retinal and cortical implants) that incorporate camera technology to capture a visual scene. We will initiate hardware and software algorithm upgrades to the BrainPort vision device through an iterative process using feedback and performance measures from users who are blind. This work will lead to a proven assistive technology ready for rapid deployment to wounded warriors, veterans and civilians who are blind.

Structural and Functional Brain Reorganization for Sensory Substitution in the Elderly and Blind

Co-Principal Investigator 8/1/12-1/1/14
\$20,000 University of Pittsburgh Institute on Aging

Explore how to exploit the effects of cross modal neuroplasticity in the elderly to improve their independence in living and to better connect with others, this project proposes to identify the structural and functional connections that underlie the mechanisms of cross modal brain reorganization in the aged and blind subjects at different onset ages of acquired blindness using advanced, non-invasive magnetic resonance imaging (MRI) techniques with the BrainPort device.

BrainPort FDA Safety Study

Role: Co-Investigator 10/2011-5/2013
\$35,000 Wicab, Inc.

The aim of this study is to conduct a one year efficacy and safety study for the BrainPort Vision Device.

Sensory Substitution for Enhanced Way finding in Blinded Veterans

Role: Principal Investigator 1/2009-12/2011
\$500,000 Fox Center for Vision Restoration

The BrainPort is a sensory substitution device which uses the tongue as a portal for creating a sense of vision in the blind. The aim of this study is to determine if the device represents a viable method for increasing independence of the blind outside a laboratory setting

Artificial Vision: Defining the Criteria for Ocular Cyber-Prosthetic Evaluation and Use:

Role: Principal Investigator 12/2008-6/2011
\$1M DCED State of Pennsylvania

The aim is to begin to create a standard body of knowledge regarding how to assess improvement in visual function, how to select appropriate patients, and how to measure the neuroplastic changes in the context of using the Brainport, a sensory substitution device for vision enhancement. Role: PI

Visual Rehabilitation with Artificial Devices:

Role: Principal Investigator 1/2011-1/2012
\$50,000 Fine Foundation

A major impediment to the adoption of artificial vision devices will be the lack of trained therapy professionals to work with blind patients. This project represents a collaboration with the Rehabilitation Engineering Research Center at the University of Pittsburgh to explore whether tele-rehabilitation portals will work with blind patients using artificial vision devices.

Epidemiology of Cardiovascular Risk Factors in Women (Healthy Women's Study); Lens Aging Substudy:

Role: Co- Investigator Substudy 8/2010-12/2011

This is an extension of a previous lens study (R21AG024177) to an additional epidemiological cohort with a rich data set of physiologic indices. We are seeking to determine whether certain cataractous changes can be used as a biomarker for healthy aging.

Ocular Development of the Ferret

Role: Co-Investigator
Departmental Support

The purpose of this research project is to determine the refractive errors and ocular biometry of developing ferrets, which are a commonly used animal model to study neuroplasticity. My role on the project was to take corneal measurements, perform A-scans and obtain refractive data on ferrets from birth to adulthood. We will publish our findings as well as the parameters of contact lenses that should be used on ferrets of various ages for work in neuroscience.

R21AG024177, The Genetic Basis of a Disease Free Model of Aging.

Role: Co-Investigator. 2006-2008.

The aim was to determine whether cataractous changes can be used as a biomarker for healthy aging.

Development of a Model of Reversible Visual Field Loss

Role: Principal Investigator 2008-2009
\$50,000 UPMC Health System Competitive Medical Research
Fund (CMRF)

To create reversible visual field defects in normal subjects using a contact lens model.

Ocular Residence Time of Artificial Tears Determined by Non-Invasive Imaging

Role: Principal Investigator 2006-2007
Departmental Support

The goal of this pilot project is to employ the Pentacam and Biotigen imaging technologies as non-invasive methods for determining the ocular residence times of artificial tear supplements.

Incidence of Ocular Abnormalities in Patients with Alzheimer Disease.

Role Co-Investigator
Merck 2005-2007

Specific Aims included evaluation of the crystalline lenses of individuals within three groups (those with varying degrees of AD, those without AD, and those at increased risk due to having a first degree relative with AD) and determine if there are any quantitative or qualitative changes in the lens that are potentially associated with AD or severity of AD. In addition, to quantify the retinal nerve fiber layer (RNFL) thickness of patients with the clinical diagnosis of AD and compare any retinal or optic nerve changes to the severity of Alzheimer's

Disease. And finally, using segregation analysis, assess the amyloid precursor protein gene to determine if this gene is associated with the quantitative or qualitative changes in the lens that are potentially associated with AD or extent of AD.

INVITED LECTURES

Doctor, My Eyes Turn Red When I Wear My Contacts; Therapeutic Options for Contact Lenses. Contact Lens Association for Ophthalmology (CLAO) meeting, January 2017, Naples FL.

Dry Eye: Focusing on the Sequelae Leads to Long Term Failure. Rapid Fire Lecture Series, American Academy of Optometry, November 2016. Anaheim, CA.

The Promise of Sensory Substitution. Lions Club, June 2106. Quincy MA.

The Tongue as Visual Surrogate: Experiences with Sensory Substitution for Blindness. Schepen's Eye Research Institute. February 11, 2016. Boston, MA

Expanding New Dry Eye Metrics- Implications for Clinical Research. New England College of Optometry Research Lecture Series. Boston, MA December 2, 2015.

The BrainPort in Adults: Psychophysical and Neuroanatomic Findings. World Society of Pediatric Ophthalmology and Strabismus, Barcelona Spain, October 2015. Section Chair-regenerative ophthalmology section.

Aspheric and Multifocal GP Lenses. The Contact Lens Educational Summit: Exploring New Heights in Contact Lens Management CLAO/CLSA Denver, CO May 2, 2015.

Hybrids: What is the Sweet Spot for this Modality? The Contact Lens Educational Summit: Exploring New Heights in Contact Lens Management CLAO/CLSA Denver, CO May 2, 2015.

Dry eye is the Wrong Diagnosis for Millions, Trumbull CT, March 29, 2105

Sensory Substitution for Vision: TLC Continuing Education Event, Babson College, Wellesley MA, March 29, 2105

The Tongue as Visual Surrogate: Experiences with Sensory Substitution for Blindness. VIVO Lecture Series, Schepen's Eye Research Institute, Boston MA Feb 11, 2014.

Emerging Trends in the Management of Dry Eye. New England College of Optometry Boston, MA December 7, 2014.

A Review of Contact Lens Fitting Considerations for the Boston Keratoprosthesis. American Academy of Optometry, Denver CO. November 16, 2014.

Sensory Substitution for Vision Restoration Twenty Ninth Symposium of the Center for Visual Science Engineering the Eye IV: Restoring Vision University of Rochester August 22-24, 2014

Contact Lens Fitting Considerations After Intrastromal Ring Placement for Keratoconus. CLAO meeting, Toronto CA June 13, 2014

Predicting Appropriate Candidates for Artificial Vision Use. McGowan Institute Retreat, Nemacon Woodlands PA March 12, 2014

Is Seeing with Alternative Senses Realistic? University of Pittsburgh Eye and Ear Foundation Spring Fundraising Event, Naples FL, February 20, 2014

Keynote Speaker: The Tongue as Visual Surrogate: Experiences with Sensory Substitution for Vision. VisionServe Alliance Annual Meeting, Pittsburgh PA, November 6, 2013

Keynote Speaker: Gaps in Assistive Technology for the Blind: Understanding the Needs of the Disabled IEEE Workshop on Multimodal and Alternative Perception for Visually Impaired People (MAP4VIP), San Jose California July 15, 2013

A Comparison of Normal Versus Visually Deprived Brains When Using Sensory Substitution. 3rd Annual Vision Restoration: Regenerative Medicine in Ophthalmology Conference, Pittsburgh PA June 11, 2013

The Tongue as Visual Surrogate: Experiences with Sensory Substitution for Blindness A Neurobehavioral Comparison of Normal Versus Visually Deprived Brains when Using Sensory Substitution. City University of New York, Department of Psychology, April 30 2013

How the Blind Brain Reacts to Visual Input: A neurobehavioral comparison of normal versus visually deprived brains when using sensory substitution McGowan Institute Retreat, Nemacon Woodlands Resort, PA March 9, 2013

A Taste of Vision LV Prasad Eye Institute, Hyderabad, India December 2012

A Taste of Vision. The World Through A Child's Eyes Symposium. Children's Hospital of Pittsburgh, Pittsburgh PA Nov 8, 2012

Telerehabilitation for Low Vision- Envision Conference, St. Louis MI, September 14, 2012

Artificial Vision. SILK Elsemay Bjorn Symposium, University of Tampere, Tampere Finland, August 13, 2012

A Taste of Vision. SUNY College of Optometry, New York NY February 16, 2012

Use of Anterior Segment OCT (Visante) for Fitting Scleral Lenses. Contact Lens Association of Ophthalmologist (CLAO) meeting, Las Vegas NV, January 28, 2012.

Clinical Neurology and Orthopedics Course OT2108, "Common Vision Disorders" ", University of Pittsburgh, Pittsburgh PA, February 3, 2012

Restoring Sight Through Non-Visual Pathways. First Annual Symposium Regenerative Rehabilitation, Pittsburgh, PA November 4, 2011.

Seeing Without Eyes: Sensory Substitution for the Blind. University of Pittsburgh School of Medicine Center for Continuing Education in the Health Sciences on-line CE series UPMCPPhysicianResources.com/ophthalmology

Low Vision Intervention- a Glimpse into the Future, GRECC Conference Series, Veteran's Administration Hospital, Pittsburgh PA September 30, 2011

A Survey of Demographic Traits and Assistive Device Use in a Blind Cohort, Envision Conference, St. Louis MI September 23, 2011

The BrainPort Vision Device: A Visual Information Prosthetic for the Blind Envision Conference, St. Louis MI September 23, 2011

No Barriers Summit: "Update on Clinical Experience with BrainPort Vision Device", Winter Park CO, July 3, 2011.

Promises and Pitfalls for Restoring Vision Through Non-visual Pathways, Pittsburgh PA, May 27, 2011.

Soffer Memorial Lecture: Seeing Without Eyes Sensory Substitution for the Blind, Pittsburgh, PA, May 25, 2011

Military Surgery Conference, "The BrainPort; Alternative to Retinal Chip for Vision Restoration", Bournemouth, England May 12, 2011

NEI/FDA Endpoints Symposium: Use of Functional Vision Endpoints in Visual Prostheses Product Development, Outcomes Assessments with BrainPort: What Worked and What Didn't: Wish List for Additional Outcomes May 6, 2011, Bethesda, Maryland

McGowan Institute for Regenerative Medicine, "Seeing Without Eyes: Sensory Substitution for the Blind. University of Pittsburgh, August 2011

Medical and Health Science Foundation, Seeing Without Eyes: Sensory Substitution for the Blind Pittsburgh 10/26/11 University of Pittsburgh Alumni Association "Strength through Partnership: Our Military and Beyond" series, "Sensory Substitution for the Blind" Pittsburgh PA 1/9/11

Advances in Contact Lenses. Pittsburgh Ophthalmological Society Annual Meeting Pittsburgh PA. May, 2011

American Academy of Optometry, "Seeing Without Eyes; Sensory Substitution for the Blind", San Francisco CA, 11/10

Clinical Neurology and Orthopedics Course OT2108, "Common Vision Disorders ", University of Pittsburgh, Pittsburgh PA, 2/11/11

New England College of Optometry, A Taste of Vision for Those Without Sight, Boston MA
2/22/11

Louis J. Fox Center for Vision Restoration, Innovations in Vision Restoration Lecture
Series: "A Taste of Vision for Those Without Sight" Pittsburgh PA 3/2/11

Pittsburgh Ophthalmology Society, Advances in Contact Lens Fitting. Pittsburgh PA
3/18/11

UPMC Eye Center Ophthalmology Residency Program Optics Lecture Series:

Astigmatic Lenses 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014

Contact Lenses: Clinical Function and Practical Optics 2004, 2005, 2006, 2007, 2008,
2009, 2010, 2011, 2012, 2013

Accommodation, Fusion and Binocularity 2005, 2006, 2007, 2008

Fusion and Binocularity 2010

Magnification 2004, 2005, 2007, 2009, 2010

Contact Lenses and Thick Lens systems 2012

Mirrors 2004, 2005, 2006, 2007

Optical Aberrations 2004, 2005, 2006, 2007, 2008, 2009

Introduction to Contact Lenses 2013

Optical Considerations for Contact Lenses 2005

Optical Prescribing 2007, 2008

Optical Prescriptions 2005

Optics of Ophthalmic Instruments 2007, 2008, 2009

Optics of Refractive Procedures 2006, 2007, 2008, 2010

Prisms 2008, 2009

Optical Aberrations 2007, 2010,

Properties of Light and Visual Function 2004, 2005, 2006, 2007, 2008, 2009

Reflection and Refraction of Light 2005, 2006, 2007, 2008, 2009, 2010

Reflection of Light 2013

Refraction at Curved Surfaces 2006

Refraction by the Eye 2005, 2008

Refraction 2004

Clinical Pearls of Refraction 2005

Troubleshooting the Subjective Refraction 2005

Spherical Lenses 2004

Refraction at Curved Surfaces and Prism 2008, 2012

Reflection and Mirrors 2007

Thick lenses and Refraction by the Eye 2010

OTHER RESEARCH RELATED ACTIVITIES

Ad hoc journal reviewer

Investigative Ophthalmology and Visual Science
Translational Vision Science and Technology
Cornea

Mentorship and Training Activities

OTERO Fellow

Matthew Murphy- neurobiological effects of sensory substitution use

Ophthalmology Resident Scholarly Project Mentor

Wendy Chen- Visual evoked potentials in blind subjects using artificial vision devices

Allison Zambelli- penetration of topical ophthalmic drugs through contact lenses

Interns First Experience in Research Mentor

Courtney Elvin- diffusion tensor imaging analysis of brain activation with sensory substitution use

David Moffa III- analysis of depression screens to determine candidacy for BrainPort use

Myles Nightingale- multisensory integration of artificial vision inputs for obstacle avoidance

Research Scholarly Project (medical students)

Julie Steinbrink- Correlation of PET derived activation of visual cortex with behavioral outcomes

Daniel Chen- diffusion tensor imaging analysis of brain activation with sensory substitution use

Summer Reserch Interns

Tobin Vijayin

Jenna Sembrat

Alex Keifer

Cody Wolfe

Kathleen Janesco

Myles Nightingale

Other (graduate level mentoring (M.S. / Ph.D.)

Kimberly Brothers- effect of biofilms on drug penetration through contact lenses

Justin Kaiser- Orientation and mobility training in outdoor environments using artificial vision.

Graham Stetson- heat tolerance of the human eyelid, ability of eyelid warming devices to attain therapeutic temperature at the inner eyelid surface.