CURRICULUM VITAE

Claudio Busettini, Ph.D.

Tenure Associate Professor

WORK ADDRESS: Department of Optometry and Vision Science
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DATE/PLACE OF BIRTH: August 11th, 1959, Trieste, Italy.

EDUCATION AND TRAINING:

2017 Effort Reporting: Principles, Process and Certification.
By UAB – required training.

2016 Financial Conflict of Interest in Research – 4th year Refresher.
By UAB – required training.

2015 IRB Initial Training – CITI.
By UAB – required training.

2014 Understanding Investigator Responsibilities under the NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules OHS_BIO305
By UAB OH&S – beta tester for UAB IBC.

2014 Disability Support Services (DSS) Faculty and Staff Training
By UAB – required training.

2014 Medical Waste Management for Labs OHS_BIO301L
By UAB OH&S – required training.

2014 Hazard Communication OHS_CS245.
By UAB OH&S – required training.

2013 Use of Controlled Substances in Research, Teaching, and Veterinary Care at UAB OHS_CS245 .
By UAB OH&S – required training.

2012 QEP Phase II: Faculty Engagement.
Part of SACS accreditation. Quality Enhancement Program.

2012 Financial Conflict of Interests in Research CIRB_fCOI.
By UAB CIRB – required training.

2011 Disability Support Services.
By UAB Disability Support Services – required training.

2011 Alabama Ethics training.
By the State of Alabama – required training.

2010 Scientific Writing Seminar: Changes in the NIH Application/Review Process.
By UAB Center for Clinical and Translational Science – A series of seminars on the new NIH grant format.

2009 IRB training on Informed Consent.
By UAB IRB – required training.

2009 ARRA award reporting information and training.
By UAB Office of Grants and Contracts Administration – required training after I had an ARRA award associated with my R01 grant.

2009 UAB Bevill Neuroscience Symposium 2009 on Neuroimaging.
By UAB Comprehensive Neuroscience Center. A one day series of seminars on the latest imaging techniques.

2008 IRB Seminar on safe storage and management of clinical data.
By UAB IRB – required training.

2008 Excellence in Teaching Workshop Series (7 workshops of 2 hours).
By UAB Faculty Development Program. Continuation of my training to be an effective teacher.

2007 Scientific Writing Seminar Series (6 workshops of 2 hours).
By UAB Faculty Development Program. How to write successful grant applications.

2007 IRB Continuing Training.
By UAB IRB – required training.

2007 Using Animals for Teaching, Testing, and Research at UAB.
By UAB IACUC – required training.

2006 IRB Continuing Training.
By UAB IRB – required training.

2005 Master Teacher Program Workshop Series.
By UAB Faculty Development Program. Continuation of my training to be an effective teacher.

2005 Working with Nonhuman Primates in Research at UAB.
By UAB IACUC – required training.

2005 IRB initial training.
By UAB IACUC – required training.

2005 HIPAA Privacy/Security Training HPAS.
Required training.

2005 Effort Reporting Mandatory Training Course ERPT.
Required training.

2004 Diversity Awareness Education part I and II.
Required training.

2004 Research code of conduct part I and II.
Required training.

2004 Chemical Safety Training OHS_CS101.
By UAB OH&S – required training.

2002 MGH/MIT/HMS Functional MRI Visiting Fellowship Program. MGH Center for Biomedical Imaging. Charlestown, MA.
An intensive 1-week course on functional magnetic resonance.

2000 Department of Bioengineering, UAB. Advanced MRI (BME748). 3 credit hours.
Advanced MRI course in preparation for my own use and for the teaching of use of the 4.7 Tesla vertical MRI/fMRI system for non-human primates at what later became the UAB Center for the Development of Functional Imaging. See also the 2002 Visiting Fellowship at MIT.

1999 UAB Graduate School Professional Program. Teaching at the College Level and Beyond (GRD705). 2 credit hours.
Coming from a completely different educational system, it helped me greatly in the understanding of what to expect from the UAB graduate and professional students and what the students expect from me. Additional courses were taken in 2005 and 2008.

1997 Use of animals in research at UAB. Initial training.
By UAB IACUC – required training.

1993-1994 University of Trieste. Post-doctorate Specialization School in Clinical Engineering. Degree: Clinical Engineer.
I was the only student with full scholarship, having obtained the highest grade on the entrance exam. This full-time 2-year program, open only to Doctor Engineers, included theoretical, applicative, and management courses, and an internship at the Clinical Engineering Department of the Cattinara Hospital, the largest hospital in Trieste. This is the only School in Italy for the preparation of managers of clinical engineering services and structures at the local, regional, and national levels.

1992 Italian Government Board of Engineers Certification.

1989-1992 University of Trieste. National Research Doctorate Program. Degree: PhD in Electronic Engineering (Bioengineering).
This is the equivalent of the PhD program in the Italian university system, called Research Doctorate. I had a full scholarship.

1986 Naval Academy of Livorno. Degree: Naval Weapon Systems Midshipman.
This was part of my 18 months of military service in the Italian Navy. As a Doctor Engineer in Electronics I was able to apply to the Naval Academy of Livorno of the Italian Navy and I was one of the 25 Electronic Engineers selected from the entire country. I did not realize how prestigious this admission was until I met my colleagues, several coming from the most famous and powerful families of Italy. At the end of the military service, I was graded the second best Complement Naval Weapon Systems Midshipman of that year for my work at the Naval Technical Office in Rome.

1978-1986. University of Trieste. Degree: Doctor Engineer in Electronics (Bioengineering).
This is the "long laurea" in Engineering, with minimum duration of 5 years, and the maximum educational level in the Italian university system unless, oriented towards research, one then applies to the National Research Doctorate Program or, for medical doctors, one applies to internships or specializations. I had a final grade of 110/110 cum laude, the highest possible.

1973-1978. Industrial Technical Institute "A. Volta" of Trieste. Degree: Industrial Specialist in Telecommunication Engineering.
High schools in Italy are divided in several categories. Already interested in electronics and telecom engineering, I selected a 5-year industrial-oriented school. As all 5-year high-schools, one could then apply to any University in any curriculum, from history to medicine without entrance exams, which were introduced only years later.

PROFESSIONAL AND ADMINISTRATIVE EXPERIENCE:

Member of the UAB Council of Center Directors, 2017-present

Member of the UAB Safety Committee, UAB, 2017-present

Member of the UAB Chemical Safety and Environmental Management Committee (CSEMC), UAB, 2015-present.

Member of the UAB School of Optometry Ethics, Equity and Diversity Committee, UAB, 2015-present.

Chair of the School of Optometry Faculty Advisory Committee, UAB, 2015-2016, helping writing the new SOO Faculty Handbook.

Co-director of the Vestibular and Oculomotor Research Clinic (VOR Clinic), UAB, 2014-present.

Member of the UAB Faculty Senate and Senate liaison for the UAB School of Optometry, UAB, 2014-present,

Member of the UAB Faculty Procedures and Policies Committee (FPPC), UAB, 2014-present. From Sept 2017 Vice-chair.

Member of the UAB Faculty Senate Executive Committee (FSEC) as senator-at-large, UAB, 2014-2016.

Member of the UAB Institutional Biosafety Committee (IBC), UAB, 2014-present.

As Senate, FSEC, and FPPC member, part of several committees, sub-committees, task forces, etc. UAB, 2014-present

Member of the UAB School of Optometry Academic Review Committee (renamed Professional Program Academic and Honor Council in 2015), UAB, 2013-present.

Member of the UAB Vision Science Graduate Program Admissions and Advisory Committee, UAB, 2012-2015.

Tenured Associate Professor, UAB, Oct 1st, 2012-present.

Member of the VSRC P30 Steering Committee, UAB, 2011–2013.

Member of the UAB Faculty Senate as School of Optometry Alternate Senator, UAB, 2009-2011.

Member of the Senate Faculty Affairs Sub-committee, UAB, 2009-2011.

Member of the Senate Sub-committee on Curriculum and Research, UAB, 2009-2011.

Member of the Vision Research Center National Eye Institute Core Grant Advisory Committee, UAB, 2009-2013.

Member of the Vision Science Research Center Advisory Committee, 2009-2013.

Member of CADRE (UAB School of Optometry IT Support), UAB, 2008-2011.

Director, Vision Science Research Center Computer Module, UAB, 2008-2013.

Member UAB Medical Scientist Training Program (UAB MSTP), 2007-Present.

Secondary appointment as Faculty of the Comprehensive Neuroscience Center, 2007-present.

Member of the School of Optometry Honor Council, 2007-2011.

Secondary appointment as Faculty of the UAB Graduate School, 2004-present.

Tenure-Track Assistant Professor, UAB, Oct 1st 2004-Sept 30th, 2012.

Assistant Director, Center for the Development of Functional Imaging, UAB, 2004-2007.

Scientist, Center for the Development of Functional Imaging, UAB, 2002-2016.

Associate Scientist, Vision Science Research Center, UAB, 2002-Present.

Research Assistant Professor, Department of Physiological Optics, UAB, 2000-2004.

Research Associate, Department of Physiological Optics, UAB, 1999-2000.

Post-doctoral Fellow, Department of Physiological Optics, UAB, 1997-1998.

Visiting Scientist at the Laboratory of Sensorimotor Research, National Eye Institute, National Institutes of Health, Bethesda, MD, 1994-1997.

Student of the Post-doctorate Specialization School in Clinical Engineering, University of Trieste, 1992-1994.

Post-doctoral Fellow, Laboratory of Sensorimotor Research, National Eye Institute, National Institutes of Health, Bethesda, MD, 1989-1992.

Research Collaborator, Unit of Trieste, National Group of Bioengineering, (National Research Council), Dipartimento di Elettrotecnica, Elettronica ed Informatica, University of Trieste, 1988.

Technical Naval Office of Rome, Italy. Naval Weapon Systems Midshipman. 1986-1988.

TEACHING:

Current:

School of Optometry professional course VS 132/VS 132L "Eye Movements and Principles of Binocular Vision" (32 contact hours class, 32 contact hours labs), course master, 2004-present.

Seminars (4 contact hours) on the anatomy and physiology of the extraocular muscles for the graduate course VIS 744 "Ocular anatomy, physiology, and biochemistry" with Dr. Srivastava course master, 2005-present

Seminars (4 hours) on the oculomotor systems for the graduate course VIS456/756 "Visual Neuroscience" with Dr. Sincich course master, 2013-present.

Past:

Seminars (6 class hours + 2 hours of laboratory demonstrations) on the oculomotor systems for the graduate course VIS747 "Central Visual Pathways" with Dr. Gawne course master, 2004-2012.

Annual BaSCO seminar series. 2-hour lecture with Dr. Rutstein on "Testing of ocular motility: Evaluation of the Extraocular Muscles", 2008-2012

VIS 753 MRI for Biologists and VS 754 MRI for Biologists Laboratory, 2004-2007.

UABSOM MSTP Grad Med Neuro Class (2 hours), 2007

OTHER ACADEMIC AND SCIENTIFIC ACTIVITIES

Ph. D. Mentoring:

Dr. Leah C. Corthell. Ph.D. in Vision Sciences. 2008-2011.
"Behavior of Midbrain Vergence Cells during Stepwise Transfers of Gaze and Oblique Tracking in Depth"

Dr. Kevin P. Schultz. Ph.D. in Vision Sciences. 2006-2010.
"Exploration of the Crosslinks Between Saccadic and Vergence Eye Movement Pathways Using Motor and Visual Perturbations"
Post-doctorate fellow in my laboratory from 2010 to 2012.

Memberships in PhD Dissertation Committees:

Anwar Almutairi	(School of Public Health)	Dec 2016-present
M. Ward	(Behavioral Neuroscience)	Graduated Apr 2008.
E. Gampher	(Cognitive Science)	Graduated Fall 2008.
R. Davison	(Behavioral Neuroscience)	Graduated Apr 2007.
H. Sean Lee	(BME Graduate Program)	Graduated Nov 2006.

Reviews of journal articles:

In preparation for becoming a member of study sections and editorial boards, I developed a very intense activity as reviewer for the major journals in the oculomotor and vestibular fields.

Psychopharmacology (1 paper in 2016 – second review in progress)

IOVS (2 papers in 2016 with two reviews)

Plos Computational Biology

Vision Research

Journal of Physiology London

Journal of Neuroscience

Journal of Vision

Nature Neuroscience

Biological Cybernetics

Journal of Neurophysiology

Cerebral Cortex

Inquiro (UAB Undergraduate Research Journal)

Reviews of grants:

UAB CAS Interdisciplinary Teams Applications (2016)

Human Frontier Science Program

National Science Foundation

City of Paris (France) Health System

UAB Faculty Development Program

Search committees:

Chair of the School of Optometry Faculty Search Committee, 2015-2016.

UAB Vice-Provost for Student and Faculty Success (substituting Dr. Ron Nowakowski, Dean of the School of Optometry), 2010.

As member of the School of Optometry Faculty Affairs Committee, I met with the representatives of Quick Leonard Kieffer, the company hired to coordinate the search for the new Dean of the School of Optometry, 2010.

Interviews of applicants to Graduate Programs, evaluations of student work, reviews of student travel grant applications and student scholarships:

Interviews of Neuroscience Graduate Program applicants

Interviews of Vision Sciences Graduate Program applicants

Judge at the UAB Graduate Student Research Day (Spring and Fall in 2016)

Judge of posters at the UAB Graduate Biomedical Sciences Presentations

Reviews of student travel grant applications to the Society for Neuroscience Meeting

Reviews of Vision Sciences student applications to UABSO scholarships

Participation in Journal Clubs:

Magnetic Resonance Imaging Journal Club

System Neuroscience Journal Club

VS700 Neuroscience Journal Club (Dr. Gross course master)

Organization of meetings:

Co-organizer, as part of the CDFI, of the international meeting "Functional Imaging Symposium" Nov 2006

Co-organizer, as part of the CDFI, of the international meeting "Functional Imaging Symposium" Oct 2002

Organization and hosting of visits to UAB:

Organized and hosted several visits to UAB. Among others,

Dr. John Leigh (Case Western Reserve University, Cleveland OH)
Dr. Elizabeth Engle (Harvard Medical School, Boston MA)
Dr. Richard Krauzlis (Salk Institute, San Diego CA)
Dr. Paul May (University of Mississippi, Jackson MS)
Dr. Bruce Cumming (NEI, NIH, Bethesda MD)

Always available to meet invited speakers and guests, in particular from the Vision Science Research Center Visiting Scholars series.

Participation in UAB and UABSO commencement ceremonies:

From the time I became faculty, I always participated in the UAB School of Optometry commencement ceremonies and in most of the UAB-wide commencement ceremonies as faculty spectator, or when asked, as marshal.

RESEARCH INTERESTS:

Primates have frontal eyes and highly-advanced binocular vision. While the primate moves inside natural three-dimensional environments, the oculomotor mechanisms that stabilize the images of the surroundings on the two retinas face a complex combination of rotational and translational optic flows. These patterns of motion of the different elements of the scene on the two retinas have to be quickly processed, taking into account their specific rotational and translational geometrical properties, to generate the appropriate compensatory movements of the two eyes. Together with Dr. Miles, we demonstrated, in both humans and monkeys, that the short-latency cortical ocular following system extracts from the visual optic flow key translational and in-depth cues that help optimize the retinal stabilization of visual disturbances associated with linear translation of the observer. The subcortical visual stabilization mechanism better responds to en-masse optic flows, typical of rotation of the observer. We also confirmed that, like monkeys, humans have a fully functional linear vestibulo-ocular reflex, which response modulates, as required by the geometry of motion parallax, with the inverse of viewing distance. On the basis of these results, it was proposed that the subcortical optokinetic system evolved

as the visual stabilization backup of the rotational vestibulo-ocular system, and the short-latency cortical optokinetic system as the visual stabilization backup of the translational vestibulo-ocular system. The new discovery of a short-latency locking vergence system was confirmed in both humans and monkeys.

When I moved to Birmingham, my focus shifted from the visual processes driving eye stabilization responses and gaze transfers in natural three-dimensional environments to the subcortical interactions among the primate eye movement systems occurring during these responses. Are these interactions unmasking a monocular organization of these systems, with the rotation of each eye controlled independently? Are they consistent with a binocular organization of the oculomotor pathways and, therefore, following Hering's law of equal innervation? Along this line, we recently studied, in monkeys, the adaptive oculomotor responses to an artificially altered binocular coordination. The strictly binocular adaptive responses we observed require a radical rethinking of these interactions and of strabismus, which will be the main focus of our future work, in both monkeys and normal and strabismic humans. We recently started to further explore this adaptation mechanism shifting the adaptive stimuli from small targets to large correlated and anticorrelated patterns. A poster was presented at the Society for Neuroscience meeting Nov 2015 and the data acquisition was completed in May 2016 on a second animal. The final data analysis is in process.

During what was supposed to be a simple control experiment, we discovered that the textbook assumption that, for both saccadic eye movements and eye blinks, the brainstem omnipause neurons act as their trigger was wrong. Blink onset was found to precede the response in the omnipause neurons. This was also confirmed by direct recordings in the orbicularis oculi motoneurons, responsible for the blinking action. We plan to further explore the organization of the blink circuitry, with particular focus on the co-contraction mechanism of the extraocular muscles that cause the globe to retract into the eye socket during the blink. We discovered near the oculomotor nucleus a group of cell that may drive this mechanism.

We also have an active program of eye movement recordings in humans. Together with Dr. Frölich, from the Department of Anesthesiology, we tested if saccadic dynamics could be used as an objective measure of the level of pre-surgical sedation. The final report was published in Behavioral Brain Research in 2014. As part of the Infant Aphakia Treatment Study (PI: Dr. Scott Lambert, Emory University, GA, web page: http://www.sph.emory.edu/IATS) I evaluated the fixational eye movements in a group of 112 children that had unilateral congenital cataract surgery in infancy. For this purpose, I built a complete oculomotor system that could be placed inside two large boxes for air travel to the recording sites. The final report was published in IOVS in 2014.

Major effort is associated with the human vestibular, oculomotor, and postural unit (VOR Clinic), started in collaboration with Children's Concussion Clinic. I was the co-PI of the initial grant that allowed the purchase of the main system, and I am the co-director and technical manager of the new facility. Currently I am analyzing a large number of datasets from control subjects to establish a rigorous analysis protocol and the baseline values in order to apply for a R01 grant, while we are developing together with the UAB Athletic Department and the Ophthalmology Department a UAB-wide baseline monitoring and concussion plan for UAB athletes. This agreement is the recruitment

basis for the R01 project. The initial focus will be the evaluation of children with suspected mild traumatic brain injury and comparing pre-season and post-season data from UAB students playing contact and non-contact sport. The facility is open to the entire UAB community, and beyond, with interests in human and oculomotor research. I am collaborating and part of a thesis committee on a project analyzing oculomotor, vestibular and postural responses in children with cerebral palsy.

A first paper proposing a radically different method of measuring saccadic dynamics is in review. The results will be the basis for a complete rewriting of the saccadic analysis in our clinic and a radically different experimental design than the standard used in similar facilities. Currently I am working on a similar review of prosaccades combined with a manual task, predictive saccades and antisaccades, which, in the traditional clinical protocols of analysis have severe limitations, albeit there is strong evidence they are the most affected by concussion. No rigorous baseline data were ever published. It may well be that these protocols are actually not the best protocols for concussion and I am exploring other alternatives. The feasibility of these alternatives will depend on the future, in terms of location and space, of my human labs after moving out of the Worrell building, for their specific optical requirements.

Analyzing the possibility of recording eye movements (specifically VOR responses) in tree shrews for a R01 with Dr. Rafael Grytz.

PROFESSIONAL SOCIETIES:

Society for Neuroscience (SfN)
The American Physiological Society (APS)
Association for Research in Vision and Ophthalmology (ARVO)

ACTIVE GRANTS (AS PI or CO-PI):

Title & agency & grant period:

Passive eye response as a surrogate for brain response to head acceleration
1 R21 NS093256-01
Period: 06/01/2015 to 05/31/2017 Role: Co-PI with Dr. Mark Bolding and Dr. Lei Liu
Total direct cost $ 250,000 Total cost $ 367,500
Development of an instrumented eye insert for an improved detection of mTBI-inducing events on the game field. The physical design and construction of the prototype eye sensor and the tagged MRI imaging is a collaboration with Auburn University.

ACTIVE GRANTS (AS CO-INVESTIGATOR):

Title & agency & grant period:

Balance, Eye, And Mild traumatic brain injury (BEAM) facility
UAB HSF-GEF
Period: 10/2013 to 09/2015 Co-PI together with James Johnston, MD, UAB Pediatric Neurosurgery
Total direct cost (including ad-hoc contributions from UAB cores and departments): $ 210,000.
The maker of the vestibular chair I selected (Neuro Kinetics) agreed to offer a $ 45,000 discount with the agreement for us to acquire baseline data on specific subject populations using their advanced mTBI protocol, which can be seen as an additional grant. These baseline data we can freely publish and further analyze beyond their baseline reference values. Acquisitions completed early 2016.

Funding for a new human vestibular, oculomotor, postural, and retinal OCT clinic in collaboration with the Children Hospital. The initial focus will be the evaluation of children with mild traumatic brain injury, but the facility will be open to the entire UAB community and beyond interested in human and oculomotor research. I am the co-PI of the initial grant, and co-director and technical manager of the new facility.

Infant Aphakia Treatment Study Phase II
NIH/NEI U10 EY0313272
Period: 6/1/2009 to 5/31/2014 PI: Scott Lambert, Emory University
Total direct cost of project $ 1,012,181
Financial coverage: 10% effort of my salary, 10% effort of the salary of our senior computer programmer, and all expenses (travel, data backup material, equipment maintenance and repairs).

My contribution to this multi-site project was to evaluate the ability of the children of this study to fixate visual targets when they reached 4 ½ years of age. Together with Dr. Eugenie Hartmann, also from UAB, and responsible for the determination of the visual acuity of these children, we used the eye movement data to estimate how much of their loss in visual acuity in the treated eye might be due to abnormal eye movements (nystagmus, saccadic intrusions) during fixation. A "travelling oculomotor laboratory" was developed for this project.

Core Grant for Vision Research (P30 EY03039)
NEI/NIH P30
Period: 8/1/2009 to 7/31/2014 PI: Kent T Kayser
Role: Associate Scientist and Director of the Computer Module.

Support for shared computer, electronics, molecular/cellular, machine shop, outreach, and administrative modules. As director of the computer module and member of the Vision Research Center National Eye Institute Core Grant Advisory Committee, I was directly involved in its renewals and annual progress reports.

PLANNED GRANTS:

To be submitted Oct 5th, 2016 to NINDS

Title: *Search for visual, vestibular and oculomotor cumulative alterations associated with participation in contact sports in high-school students: a pilot study.*
Type of grant: 2-years R21

We will determine: 1) What is the inter-subject variability of the pre-season measures for similar history of contact exposure and sport played by the athlete? 2) Are the pre-season data influenced by the sport played by the athlete and by the historical contact exposure? 3) What is the repeatability of the tests, in each subject, between pre- and post-season? 4) Is some of the pre/post season variability correlated with the senior-season contact exposure?

The goal is a 5-years R01 where we will follow high school athletes from when they enter high school to when they graduate. Similar arrangements are in the working with UAB Athletics and other Universities.

The VOR Clinic members are also developing other grants in which I am the "oculomotor" expert.

PAST GRANTS (AS PI):

Role of the vergence system in eye movements in depth and during binocular adaptive tasks. Bridge grant.
EyeSight Foundation of Alabama FY2011-12-274
Period: 7/1/2011 to 30/6/2012 Role: PI
Total cost (no indirect) $ 60,000

The goal of this bridge grant was to further explore, with preliminary new experiments, the monocular or binocular nature of the saccadic adaptive mechanisms in primates, which will be the focus of the competitive renewal of my R01.

Neural Organization of Eye Movements in Depth (1 R01 EY017283)
NEI/NIH R01
Period: 9/30/2006 to 8/31/2009. Two unfunded extensions to 8/31/2011. Role: PI
Total direct costs: $ 412,371 (Total costs: $ 600,000)
ARRA Administrative Supplement for total direct costs of $ 78,466 (Total costs $ 114,953) for the period 9/30/2009 to 11/29/2010.

Human and non-human primates have binocular vision. This requires not only the ability to drive both eyes in the direction of the object of interest (conjugate eye movements), but also to have a dedicated oculomotor system controlling the relative alignment of the two eyes (vergence eye movements). The aim of this project was to explore how conjugate and vergence oculomotor systems interact during eye movements in depth. Perturbations of ongoing vergence responses by puff-elicited trigeminal blinks were also used to test a specific hypothesis on the nature of these interactions known as the OPN Multiply Model. Control experiments on the blink circuitry brought major changes in the thinking of how blinks are triggered. The competitive renewal of this grant will propose the study of the monocular and binocular neural properties of the short-term adaptive responses to artificial binocular misalignments of the two eyes, which behavioral quantification was the focus of the 2006-2009 and 2010-2011 EyeSight of Alabama grants.

Plasticity of Primate Binocular Coordination
EyeSight Foundation of Alabama FY2006-2007-42

Period: 7/1/2006 to 6/30/2009 Role: PI
Total direct costs: $ 150,813

Optical challenges to binocular coordination elicit short-term and long-term adaptive processes, which nature and neural substrates are unknown. This was a pilot project to optimize the adaptive experimental protocols and obtain quantitative behavioral data of the adaptive responses during short-term optical alterations of binocular alignment in alert macaque monkeys. The results, which will play a major role in the renewal of the R01 grant, showed that vergence plays a major role in short-term saccadic adaptation, contrary to what is assumed in the current literature.

Functional Magnetic Resonance Imaging of Subcortical Oculomotor Areas in Primates
UAB Faculty Development Grant
Period: 8/15/2006 to 8/14/2008 Role: PI
Total direct costs: $ 10,000

Functional magnetic resonance of subcortical oculomotor areas in alert non-human primates is extremely challenging due to licking and breathing motion artifacts and the presence of massive vascularization. This pilot project attempted to use simultaneous slice-selective saturation pulses and cardiac gating to improve the quality of fMRI of these areas. The preliminary results showed that high-quality subcortical imaging is possible with the 4.7 T NHP system of the Center for the Development of Functional Imaging.

FMR Imaging of Eye Stabilization Processes (1 R03 EY013753)
NIH/NEI R03
Period: 7/1/2002 to 6/30/2007 Role: PI
Total direct costs: $ 300,000 (Total costs: $ 378,005)

The major goal of this project was to develop techniques and protocols for MRI and fMRI imaging in alert macaque monkeys while performing oculomotor tasks in the, at the time just installed, 4.7 Tesla NHP MRI/fMRI system of the Center for the Development of Functional Imaging. A major issue which remained unresolved at the closing of the pilot grant was how to deliver high-quality wide-angle binocular stimuli, like the ones we used for our ocular following and short-latency vergence studies, inside the narrow bore of our system. A custom-made optical system that combined ultra-wide field oculars from astronomical telescopes used for comet searches with video-camera micro zooms, modified to be compatible with the MRI magnetic field and the animal intraocular separation, provided the needed +/-50° wide and high-contrast binocular stimuli, but at the cost of unacceptable distortion of the images of the eyes, extracted using semi-transparent mirrors placed in the optical path. This made video eye tracking using remote video cameras coupled with fiber optics as optical relays, the current standard, unfeasible. Recent evidence, from the laboratory of Dr. Logothetis in Germany and our own initial prototype, that search coil eye tracking systems can be safely used inside MRI systems, will eliminate the need of seeing the eyes of the animal for eye tracking, making our stimulus delivery system optimal for studies of the short-latency eye stabilization mechanisms. These stimuli are very short, and it may be possible to have them synchronized with the heart rate of the animal.

Development of an Acoustic and Vibration Monitor for High-Field fMRI

UAB Faculty Development Program
Period: 5/31/2002 to 4/30/2003 Role: PI
Total costs: $18,787

The major goal of this project was to develop a system to record the level of acoustic noise and mechanical vibrations delivered to the animal inside the magnet bore of our CDFI 4.7 Tesla NHP MRI system. The anatomical and functional sequences used routinely with our system are well tolerated by the animals, which wear sound-absorbent ear pads. Some experimental sequences, developed by the UAB Bioengineering Department, are much louder. Although none of these sequences are mature enough to be tested on live animals, we can now objectively estimate if they are safe by measuring the level of acoustic noise present in the bore and the level of mechanical vibrations that may be transmitted through the head post.

Laboratory start-up funds
Department of Physiological Optics B&E Account
Period: 10/1/2004 to end 2010.
Total direct costs: $ 85,000

Departmental start-up funds assigned at the start of the tenure-track.

PAST GRANTS (AS CO-INVESTIGATOR):

The Effect of Sedation on Pain Perception
(NIH-NCRR K23 RR021874 and GCRC M01RR-00032)
Sub-project: The Effect of Sedation on Eye Movements
Period: 8/1/2006 to 7/31/2011 PI: Michael A Frölich
Total costs: $ 152,899

One of the major issues of pre-surgical sedation, particularly during delivery, is to have an objective measure of the level of sedation of the subject. This project evaluated the feasibility of using, in humans, the changes in latency and dynamics of visually-driven saccadic eye movements during sedation as a clinical tool for a better dosage control of the sedative.

Functional MRI Facility
W.M. Keck Foundation
Period: 07/01/2000 to 06/30/2004
Total costs: $ 1,500,000

and

Acquisition of a high-field Magnetic Resonance Imaging System for Neuroscience Research
National Science Foundation

Period: 09/01/2001 to 08/31/2004
Total costs: $ 451,000

I actively participated in the development of these two applications, which allowed the purchase of the $ 2.2 M 4.7 Tesla vertical bore non-human primate MRI/fMRI system.

PUBLICATIONS:

C. Busettini, "Coordinazione occhi-testa: Progetto e realizzazione di un dispositivo per il rilievo contemporaneo dei movimenti degli occhi e della testa, con compensazione dello scorrimento cutaneo e del disassamento della testa." *Doctor in Electronic Engineering dissertation*, Trieste: Dipartimento di Elettrotecnica, Elettronica ed Informatica, University of Trieste, pp. 1-205, 1986.

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