**A Comparison of the Matching Familiar Figures Test (MFFT) and the Test of Visual Perceptual Skills (TVPS) in children**

Karen A. Kehbein, OD,

Marc B. Taub, OD, MS

Southern College of Optometry

Deborah Wohl

**Background:**

Visual attention is an important skill in the academic setting. The MFFT is a test to evaluate a child’s impulsivity and accuracy when comparing pictures and takes less than 5 minutes to complete. The TVPS is a battery of tests to assess visual perceptual skills and takes roughly 30 minutes to complete. A child’s attention can affect the outcomes of a test based on the length that it takes to administer. Therefore, we wanted to compare the MFFT and the TVPS to see if there was any correlation between the scores.

**Methods:**

Seventy-five children between the ages of 7-12 years old were to be recruited to take the MFFT and the TVPS. The inclusion criteria included 20/20 acuity at distance and near and no history of strabismus or vision therapy. The children were randomly chosen to take either the MFFT or the TVPS first, and they were recruited from the Pediatrics and Teen Clinics at the Southern College of Optometry.

**Results:**

TVPS Discrimination, Spatial Relations, Figure Ground and Visual Closure show a significant negative correlation with MFFT Impulsivity while Form Constancy shows no correlation. TVPS Spatial Relations, and Visual Closure show a significant negative correlation with MFFT Efficiency while Discrimination, Figure Ground and Visual Closure show no correlation. As age increases, the scores of TVPS Discrimination, Spatial Relations, and Figure Ground are significantly negatively related with age. However, MFFT Impulsivity and MFFT Efficiency are not related with age.

**Conclusions:** The MFFT can serve as an entry screening to determine if there is a need to complete the entire TVPS. A higher MFFT Impulsivity score can be an indication of a decreased TVPS score. While the TVPS is negatively associated with age (most likely due to our convenience sample, which is comprised of patients who presented themselves to the clinic and consented to go through the tests), the MFFT is not impacted by age.

## **Retinal Mechanisms Involved in Myopia Progression in a Chick Model**

Koslowe KC. OD, MS 1,3, Rozentzvaig L. MS 2, Gantz L.PhD3,

Yinon U. PhD 2,Rosner M. MD 4

1 Bar Ilan University, Department of Optometry

2Physiology Lab. Goldschleger Eye Research Institute, Sackler Faculty of Medicine Tel-Aviv University, Sheba Medical Center

3Hadassah Academic College, Department of Optometry

4Department of Ophthalmology Sheba Medical Center Tel Hashomer, 52621 Israel

**Background**

Recent studies suggest that peripheral hyoperopic defocus causes a myopic shift in refraction. This study examined if partial absence of mid-peripheral nasal retinal tissue can affect the growth and function of the chick eye during development.

**Methods**

Twenty one domestic fowl chicks were treated by burning 10% of the nasal aster retinal area of one randomly determined eye with an Argon laser. After one month of 24 hours per day of 1200-3800 Lx lighting, the exposure was reduced to 12 hours of lighting per day. The optical components of the eye were examined by retinoscopy, the axial length was measured using ultrasonography, and retinal function was examined by standard flash electro-retinogram (ERG). The average results for the 90º meridian (vertical axis) of the retinoscopy, the axial length, and the ERG a-wave and b-wave peak and latency, were compared with Chi Square analysis and Student's t-test for independent samples, as appropriate.

**Results**

There were no significant differences in the refractive and axial length measurements between the two groups. However, there was a significant decrease in the amplitude of both the a- and b- wave ERG recordings (p<0.05), and in the latency of the a-wave of the treated and fellow-control eyes. The latency of the b-wave was not significantly different between the groups, but approaching a significant difference (p=0.08).

**Conclusion**

Although there were significant impairments in the retinal function in the treated chick eyes, the refractive error and axial length of the chicks was not significantly different between the control and treatment group. Based on these findings, burning only a small part of the peripheral retina does not significantly impair eye growth or refractive development notwithstanding the ensuing decrease in photoreceptor function.

**Sensitivity of the Traditional Randot vs. Paul Harris Randot Stereotests in Detecting Aniseikonic Stereoanomalies**

Ken Koslowe, OD, MS,1, 2 Einat Shneor, BOpt, PhD2, Yamit Levi, BOpt2, Sima Azulay, BOpt2, Dinah Paritzky, BA2, Liat Gantz, BSc, PhD2

1. Bar Ilan University, Ramat Gan, Israel
2. Hadassah College, Jerusalem, Israel

**Introduction/Purpose:** Stereopsis is a high form of binocular vision that requires equal visual acuities in the two eyes and coordination between the eyes that provides a useful clinical screening tool**.** Aniseikonia is an intraocular difference in the perceived retinal image size between the two eyes that is prevalent in 1%-3.5% of the population and is likely to grow as a result of the aging population and the increase in cataract and refractive surgery (Kramer et al., 1999; Rutstein et al., 2006). Aniseikonia deteriorates binocular visual performance by elevating the stereothreshold. We compared the sensitivity of the traditional Randot Stereotest and the Paul Harris (PH) version of the Randot Stereotest, which does not contain monocular cues in detecting aniseikonic stereoanomalies.

**Methods:** Thirty volunteer subjects, aged 18 – 32 (mean: 26 ± 3, 18 female, 12 male) with normal visual acuity and binocularity were included. Size lenses that lack optical power but magnify all meridians thereby increasing retinal image size with magnifications of 3.1%, 5%, 10%, and 19% were placed in front one eye while obtaining two measurements with the traditional Randot and PH Randot stereobooklets. The magnification, the tested eye, and the stereotest type were tested in a random order. The stereothreshold obtained with each stereobooklet was plotted as a function of the size lens magnification to determine the effect of the monocular magnification on stereopsis. A Bland Altmann analysis was conducted to examine if the two stereotests were interchangeable. In addition,

**Results:**

Only the PH Randot demonstrated a consistent deterioration in stereothreshold due to the induced aniseikonia. The Bland Altmann analysis demonstrated that the two tests are not interchangeable, and that there is a consistent bias between the traditional Randot and the PH Randot. The traditional Randot consistently yields lower stereothreshold measurements than the PH Randot.

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**Discussion**: It is probable that the monocular positional cues in the traditional Randot aided the subjects with the induced aniseikonia in detecting which figure contained depth. However, the random dot stereogram targets in the PH Randot require full binocularity to detect depth and were therefore not detected by the subjects with the induced aniseikonia.

**Conclusion:**

Because the traditional Randot did not demonstrate a deterioration in stereothreshold with the induced aniseikonia, we recommend that clinicians use the PH Randot test to detect aniseikonic stereoanomalies.

**Differences Between Eye-Hand and Eye-Foot Coordination in Normal Heterophoric and Esophoric Persons**

Ricardo Bernárdez, Consuelo Villena

Dpto. Optica II (Optometria y visión). UCM.

**Background:** Hand-eye and foot-eye coordination is used in sports, optometry and neuroscience to measure the coordinated control of eye movement with hand or foot movement and guide reaching and grasping. In this work we want to integrate this parameter in an optometric examination to establish differences in the evaluation. This will help us to verify the integration of vision at the parietal level in two particular case types: esophoric and normal heterophoric population. Our goal is to measure coordination to 40 cm at near and 6.56 feet to middle distance, looking for differences in the type of heterophoria in a young university population.

**Methods:** The materials used were a Wayne Saccadic Fixator (WSF) and basic equipment for a complete visual examination. Refractively, we corrected the correction using a philosophy of maximum plus for best visual acuity. We measured eye-hand and eye-foot coordination randomly with the patient standing and pressing light on the WSF to 40cm and with a remote control at 2m. The subjects were asked to push as many lights as posible in one minute using their preferred hand. The measures were made with and without auditory stimulus.

**Results:** This was a population of 100 college students mean age of 22.44 ± 2.10 years (19 to 27 years) with 0.54 standardized bias and standardized kurtosis of -1.53​​. The average refractive error was -1.49 ± 2.43 D in the spherical component for visual acuity 1.18 ± 0.21. In normal heterophoria (ortho and exophoric conditions) at 2m, the hand-eye coordination was: 82.78 ± 13.49 pulse per minute (ppm) with sound and 74.38 ± 15.24 ppm at 40cm (F = 23.28 for p = 0.00001) and without sound at 2m it was 82.24 ± 12.99 ppm versus 73.00 ± 15.23 ppm at 40cm (F = 28.98 p = 0.00001). In subjects with esophoria: ​​with sound was 81.39 ± 18.31 ppm at 2m and 73.42 ± 16.98 ppm at 40 cm (F = 6.89 p = 0.009) and without sound it was 80.78 ± 16.83 ppm vs 71.46 ± 18.11 ppm at 40cm (F = 9.68 p = 0.002). For eye-foot coordination, measured with WSF, and with sound in normal heterophoria it was: 63.01 ± 13.11 ppm at 2m and 57.13 ± 9.66 ppm at 40cm (F = 18.28 for p = 0.00001) and without sound 61.45 ± 11.35 ppm vs. 56.18 ± 9.58 ppm (F = 17.48 p = 0.00001). For esophoria with sound, it was 63.06 ± 13.25 ppm at 2m versus 57.16 ± 10.93 ppm at 40cm (F = 7.95 to p = 0.005) and without sound , 62.23 ± 12.79 ppm versus 56.06 ± 12.49 ppm (F = 8.08 to p = 0.005) .

**Conclusions:** The results obtained indicated that regardless of phoria a result of higher in pulses per minute was found for 2m vs. 40cm. We didn’t find meaningful differences with phoria because this visual condition needs to be measured in a bigger sample and perhaps more difficulty in task.

**A Neuro-Optometric Approach to Brain Injury as Part of the Multi-disciplinary Care Team**

Mark Menezes BSc (Hons) Optom

Aston University and Birmingham University

**Background**: Derby Head Injury team is a centre for treatment of traumatic brain injury in the UK. Currently, management of patients is via orthoptists when necessary, who then refer patients to physiotherapy and occupational therapy. Physiotherapists and occupational therapists at Derby have championed neuro-optometric intervention in conjunction to present orthoptic services. The following case is one of a series of case studies as a result of this collaboration.

**Case Report:** A 41 yr old male patient was involved in a motorbike accident resulting in orthopaedic damage, a subarachnoid bleed, bifrontal cerebral contusions, bilateral rib fractures, bilateral clavicular fractures, left scapula fracture, jaw fracture, bilateral pneumothorases and cardiac arrest at time of incident, and right brachial plexopathy. His ability to orientate to midline was noted to be markedly affected when seen by physiotherapy. A midline shift to the right was noted on neuro-optometric investigation and with the appropriate Rx in place, ambulation, balance, and gait were much improved. (He was noted to have extensive coordination problems, no sensation on his LHS, and coordination and strength problems on his right side.) Problems with concentration and short term memory were also noted. He initially had double vision which corrected itself following orthoptic intervention with Fresnels. However he still noted that he fatigues quickly in the afternoons. Fusional ranges were found to have markedly low recoveries and these were thought to contribute to his symptoms of fatigue. Concentration and stamina both improved markedly with neuro-optometric intervention. He had a peripheral BPPV which has been treated with the Epley manoevre successfully. The BPPV had reoccurred earlier this year and he still experienced vertigo when looking up or down. These symptoms were much reduced with the Rx in place. The physiotherapist had found that before neuro-optometric intervention current physiotherapy and occupational therapy interventions did not hold and the patient had not made any major gains in treatment over the previous eighteen months. Neuro-optometric intervention led to an improvement in balance, ambulation, gait and concentration. Also the patient was able to sustain performance more easily throughout the day. The patient was diagnosed with a visual midline shift, transient myopia, suppression of the RE. With glasses and directed orthoptic treatment patient's activities of daily living (ADL's) improved markedly. Patient retained gains made in physiotherapy and occupational therapy. Able to ambulate more easily and fatigue reduced.

**Discussion:** Success with such cases has led to an intervention strategy and plans for implementation of a screening protocol for patients with traumatic brain injury seen by the Derby Head Injury team and would be a model for treatment strategies for other brain injury units in other hospitals within the NHS.

**Relation between Prosopagnosia & Hemifield Loss of Contrast Perception following Traumatic Brain Injury (TBI)**

Samantha Slotnick1, Kenneth Ciuffreda2,3, Naveen Yadav2,3, Robert Byne4

1Private practice, Scarsdale, NY

2 SUNY College of Optometry, NY, NY

3 SUNY Eye Institute, State University of New York

4 Family Vision Care, Mt. Kisco, NY

**Background:** Patients who sustain Traumatic Brain Injury (TBI) may describe symptoms of a higher-order perceptual nature (i.e., prosopagnosia), which may require neuro-psychological testing for documentation. Electro-physiologic techniques may be modified to relate an objective measure to a subjective perception. The present study is a longitudinal evaluation of a 36 year old female who was symptomatic for prosopagnosia, right hemifield neglect, and right hemifield loss of contrast perception following TBI to the left pinna.

**Methods:** Visually Evoked Potential (VEP) measures were obtained with the Diopsys® NOVA-VEP (Diopsys, Inc., Pine Brook, NJ), binocular viewing at 1m for 20' arc (64x64 check size) at 85% contrast. Settings were modified to present the stimulus to one hemifield (central fixation), occluded hemifield presented as black. VEP measures were repeated at 8, 10, 11 and 17 months post-TBI. Neuro-psychological testing was conducted at 1 and 18 months post-TBI. During this period of time, the subject underwent an office-based Optometric Vision Therapy (OVT) program.

**Results:** Initial measures showed a 25% (3 μV) relative amplitude deficit for the right hemifield (9.2 μV) compared to the left (12.2 μV). Full field amplitude was 24.6 μV. More recent VEP measures show reduced amplitude asymmetry between hemifields (2.1 μV @ 11 mos; 0.0 μV @ 17 mos).

Neuropsychological testing at 1 month indicated visual processing deficits in tasks involving part/whole relationships. Language-based tasks in which visualization and working memory skills support performance were similarly depressed. Seven measures indicating a focal visual processing deficit were significantly improved at 18 months (scaled score increases of 3.6±1.4). Improvements matched subjective reduction of symptoms.

**Conclusions:** VEP with stimulus modification has the capacity to demonstrate objective hemifield asymmetries in processing which relate to subjective hemifield asymmetries in visual perception in TBI. Hemifield VEP presentation may provide data on visual processing in TBI patients, which is not available on full-field presentation. OVT may play a role in the time course and outcome of rehabilitation of visual symptoms following TBI.

**Prosopagnosia & Hemifield Loss of Contrast Perception following Traumatic Brain Injury (TBI)**

Samantha Slotnick1, Kenneth Ciuffreda2,3, Naveen Yadav2,3, Robert Byne4

1Private practice, Scarsdale, NY

2 SUNY College of Optometry, NY, NY

3 SUNY Eye Institute, State University of New York

4 Family Vision Care, Mt. Kisco, NY

**Patient’s Symptoms:** A 36 year-old white female presented with a primary complaint of problems with face recognition (prosopagnosia) following TBI (high speed impact to the left pinna). She described people as "looking like relatives of themselves." Short-term symptoms of vertigo and past-pointing (reaching for objects several inches left of target) resolved inside three months; right hemifield neglect and severe loss of working memory were still present 8 months post-TBI.

**Findings, Diagnosis:** Neuropsychological testing at 1 month post-TBI indicated visual processing deficits in tasks involving part/whole relationships, visualization, and working memory.

Probing of subjective perception of faces with controlled central fixation revealed an awareness of softened facial details confined to the right side of the face. Visually Evoked Potential (VEP) stimulus was modified to stimulate one hemifield with central fixation under binocular viewing at 1m for 20' arc (64x64 check size) at 85% contrast. Initial measures (8 months post-TBI) confirmed asymmetric contrast perception with a 25% (3 μV) relative amplitude deficit for the right hemifield (9.2 μV) compared to the left (12.2 μV).

**Treatments:** Patient was enrolled in an office-based optometric vision therapy and rehabilitation program (OVT). Procedures to enhance sensitivity to motion and space in the right hemifield included integrative techniques of the binocular, oculo-motor, gross and fine motor, visual, and vestibular processing systems. Visual spatial memory activities were conducted in the presence of non-related verbal and cognitive demands to reduce dependence on auditory memory cues.

**Outcomes:** After 9 months OVT, the patient's observation of prosopagnosia and contrast asymmetry became much less noticeable. Working memory skills were restored gradually. Reassessment of neuropsychological tests at 18 months post-TBI revealed a significant improvement in measures related to visual processing (scaled score increases of 3.6±1.4). More recent VEP measures show reduced amplitude asymmetry between hemifields (2.1 μV @ 11 mos; 0.0 μV @ 17 mos). OVT may play a role in the time course and outcome of rehabilitation of visual symptoms following TBI.

**Novel Use of Visually Evoked Potential (VEP) to Document Asymmetries between Hemifields following Traumatic Brain Injury (TBI)**

Samantha Slotnick1, Kenneth Ciuffreda2,3, Naveen Yadav2,3, Robert Byne4

1Private practice, Scarsdale, NY

2 SUNY College of Optometry, NY, NY

3 SUNY Eye Institute, State University of New York

4 Family Vision Care, Mt. Kisco, NY

**Procedure:** Visually Evoked Potential (VEP) measures were obtained in a patient who had sustained a traumatic brain injury (TBI) to the left pinna. Subjective complaints of a softening of details on the right side of faces directed a modification of the VEP settings to explore differences in brain activity with hemifield-stimulation.

The Diopsys® NOVA-VEP (Diopsys, Inc., Pine Brook, NJ) was employed with binocular viewing at 1m for 20' arc (64x64 check size) at 85% contrast. The stimulus was presented to one hemifield (central fixation). Occluded hemifield was presented as black. Initial measures showed a 25% (3 μV) relative amplitude deficit for the right hemifield (9.2 μV) compared to the left (12.2 μV). Full field amplitude was 24.6 μV. Longitudinally repeated VEP measures demonstrate hemifield differences while subjective symptoms of hemifield asymmetry are present.

**Applications:** Patients who sustain TBI, particularly with a lateralized impact, may experience asymmetric effects on visual perception. Patients’ ability to verbalize these effects may vary, particularly if expressive language is impacted following trauma.

Any finding or report of subjective hemifield differences, such as hemifield neglect, would be an indication to evaluate hemifield-stimulated VEPs.

Positive findings on hemifield-stimulated VEP may direct probing for differences in subjective perception between the two hemifields.

Re-evaluation of asymmetry over time may provide an objective indication of recovery post-TBI. Medical management is supported by the ability to document physiological changes as a result of the TBI. Furthermore, sudden onset of changes in perception following TBI may be particularly disconcerting to a patient. Identification of objective findings which correlate with subtle subjective symptoms may provide relief to a patient who is struggling to articulate perceptual effects of the trauma.

**Innovative Characteristics:** Hemifield-stimulated VEP provides objective functional data in patients whose symptoms cannot be documented by other traditional methods of anatomic or functional imaging. Patients with mild TBI frequently have unremarkable findings on magnetic resonance imaging (MRI), electroencephalogram (EEG), and full-field VEP. Objective hemifield differences on VEP may correlate with subjective complaints and with performance on higher-order assessments of visual processing, such as neuropsychological testing.

**Recovering Ego-center Post Blast Injury: “Did you really just compare me to a puppy learning to walk?”**

Melissa Zarn, OD

Southern College of Optometry

**Background:** Repetitive concussive injury can lead to a variety of systemic findings. Significant overlays have been found between Traumatic Brain Injury (TBI) and Post Traumatic Stress Disorder (PTSD). Treatment for TBI and post-concussive syndrome (PCS) may allow patients to more appropriately manage their PTSD.

**Case Report:** JB, a 26-y.o. U.S. Army enlisted soldier, reported for in the TBI Clinic at Landstuhl Regional Medical Center (LRMC) following a recent weight loss in 2011. He complained of persistent headaches with photo- and phonophobia, dizziness and imbalance, fatigue, poor memory and concentration, irritability, insomnia, tinnitus, and blurry vision. His weight loss was suspected to be from inflammatory bowel disease. His medical history was also significant for post-concussive syndrome, chronic post-traumatic stress disorder, vertigo, drug-induced accommodative dysfunction, anxiety, depression, and joint paint. He was taking multiple medications for migraines and mood stabilization as well as for pain. He had been evaluated and treated in 2010 for blast exposure incurred on a deployment during 2005-2006.

JB had poor oculomotor control; moving his eyes caused dizziness and swaying backwards when he was standing. He had to look at the floor to walk in a straight line. When tested for ego-center, he consistently indicated objects were centered when aligned approximately mid-pupil over his right eye.

JB was assigned yoked prism (4∆ base-left OU) to wear four hours per day. While wearing yoked-prism glasses, he was to execute oculomotor, eye-hand coordination, and balance and ambulation activities. After 2 weeks of therapy he had improved stability while wearing the yoked-prism glasses and noticed visual distortion through the prism. After 3 weeks of therapy, his midline testing showed consistent center over the right nasal canthus. He started weaning off yoked prism, decreasing by 1 hour per week with the intent to incorporate oppositional prism to challenge his balance.

JB was subsequently assigned to an in-patient TBI/PTSD rehabilitation program in Texas and not seen for further evaluation.

**Discussion:** Significant physical impairments can delay a patient’s ability to address psychological trauma. Providing physical rehabilitation to patients to help return automatic function may allow them to more appropriately address psychological trauma.

**Maximizing Functional Outcomes in Orbital Roof Fracture**

Melissa Zarn, OD

Southern College of Optometry

**Background:** Orbital fractures, while anatomically small, can have significant impact to the entire body.

**Case Report:** In this case, the patient had an orbital roof fracture which did not warrant surgical repair at the time of injury. As healing progressed, optometric examination of the patient showed diplopia, obvious deviation of vertical gaze, and restricted supraversion of the right eye. Physical therapy evaluation of the patient showed guarding of the upper trapezius muscles and neck muscles resulting from a compensatory head tilt to the left. Surgical correction of the fracture was considered but postponed and the patient desired short-term intervention. Vision therapy was utilized to prevent fibrosis of the superior orbital muscles should surgical correction be required. After 2 months of regular work by subject patient, eye alignment was orthophoric on cover test (a small hyperphoria was still present on Maddox rod testing) in all gazes and surgical correction was not necessary.

**Discussion:** Using therapeutic interventions helped prevent a patient with trauma-induced strabismus avoid surgery. Attention to subtle shifts in posture helped prevent life-long physical impairments which could have shortened this patient’s career.

**Research Summary for Brain Injury Vision Symptom Survey (BIVSS)**

Hannu Laukkanen, OD, MEd

Pacific University College of Optometry

**Background**: This poster will summarize research to date relating to the Brain Injury Vision Symptom Survey (BIVSS) questionnaire. The BIVSS is a 28-item questionnaire designed to survey vision symptoms following mild-to-moderate brain injury. It was initially used with brain-injured soldiers at Walter Reed National Military Medical Center (WRNMMC) in the spring of 2012.

**Methods**: The BIVSS is a 28-question survey has been anonymously administered to both brain injured and non-brain injured individuals with IRB approval. Validation research has included four groups of subjects: 1) soldiers who had sustained mild-to-moderate TBI, 2) non-military individuals with mild-to-moderate TBI, 3) non-TBI newly matriculated first-year optometry students, and 4) non-TBI third-year optometry students one week before National Board examination. Multiple analyses were applied to results, including factor analysis, Rasch, and Rasch Misfit Analysis.

**Results**: Whereas 100% of non-TBI subjects were able to complete all 28-BIVSS items, 93.5% of TBI subjects able to complete at least 27 questions. Factor analysis suggested up to 5-separate underlying factors in TBI responses. Rasch analysis identified a score of ≥ 45 on the 28-item BIVSS questionnaire as representing a significant visual problem. Mean scores were not different between military and non-military TBI groups but were significantly greater than for the non-TBI groups. Rasch Misfit Analysis indicated excellent coherence for 18 of the 28-questions. Analysis indicated the 18-item subset (BIVSS-18) had 96% sensitivity, 76% sensitivity, and 90% overall accuracy between TBI and non-TBI subjects. The critical score (indicating a significant visual problem) was ≥ 28 for the reduced 18-question version of the BIVSS. Given the clearly demarcated critical score, the BIVSS-18 could serve a valuable screening role in guiding allied health professionals in referring brain-injured patients for visual assessment.

**Conclusions**: Overall results indicate the BIVSS is a valid instrument for vision symptoms and potentially an aide in diagnosis of mild-to-moderate brain injury. The BIVSS-18 questionnaire demonstrated respectable sensitivity, excellent specificity, while both versions demonstrated good overall accuracy in discriminating vision symptoms between TBI and non-TBI groups. Both versions of the BIVSS were most likely to miss TBI’s with a low-level of symptoms. Because there was a clear trend for reduced symptoms as a function of years since the TBI, the BIVSS may prove to be a useful tool for monitoring rehabilitative progress and assessing improved quality of life. Ongoing research is underway to confirm these notions.

**Mirror as Stereoscope: Training in Virtual Free Space**

Vassilis Kokotas, Optometrist, Ioanna Valacha, Optometrist, Dionysia Soultanidi, Optometrist

**Procedure:** For this procedure a big mirror would be ideal. A small round sticker with a letter is placed on the mirror at subjects’ nose level. Subject is about to stand away of the mirror and look at the reflected nose image. Under these conditions eyes are fixating at the double distance from the mirror while accommodation is placed on the mirror plane. Each eye views image formatted in the mirror through a different angle and physiological diplopia is normally achieved by perceiving two stickers. Then, attention is placed on the sticker, so now person’s image is perceived as double according to physiological diplopia. In both cases, accommodation is not changing significant since it is fixed on mirror plane, so attention should be also paid on keeping the letter on sticker clear all the time.

**Application:** When subject looks from the sticker towards the image in the mirror is like working small amounts of Base In. Subjects can be asked to make jumps from their image to the sticker and back or change fixation slowly feeling the virtual space created by mirror and using physiological diplopia as a clue. This technique can be used especially when refining Base In flexibility and can be very useful in cases like sports vision training, when attention flows between different planes.

**Innovative characteristics:** This technique utilizes a simple mirror as a stereoscope for refining Base In flexibility in a virtual free-space environment. It can be used also for transferring skills from in-instrument to free-space environment. Simplicity of the technique and anti-suppression control allows to be prescribed as a home procedure also.

**Yoked Prism Effects on Body Posture and Spatial Perception in Normal Population**

Vassilis Kokotas, Optometrist, Dr. Frank Eperjesi, BSc, PhD, MBA, MCOptom,

(School of Life & Health Sciences, Aston University, Birmingham, UK)

**Background:** Yoked prisms have been proposed for modifying postural adaptation after cerebrovascular accidents and other neurological defects. Postural changes have been investigated also in a small group of normal individuals. In this case, the center of gravity shifted towards the base of the prisms under different conditions. However, research up today has not demonstrated which body parts are mostly affected. In addition, most researches have indicated yoked prism effects after adaptation without providing information on the immediate effects on posture.

**Methods:** Static posturography, photographic analysis and a 3-point spatial board have been used to analyze changes in weight shift, body posture and spatial perception respectively. Measurements were recorded with randomly chosen Plano lenses, 8 Δ Base Up yoked prisms and 8 Δ Base Left yoked prisms. All recordings took place within a time frame of one minute after applying the pairs in front of the subjects’ eyes.

**Results:** Posturography showed no statistically significant differences on percentages of maximal pressure distribution (p>.20). On photographic analysis base left yoked prisms had a significant effect on head shift (p<.001), head tilt (p=.002), shoulder tilt (p<.001), hips shift (p=.001) and angular midline shift (p<.001) on (x) axis towards to the right. Yoked prisms base up had a significant effect on head shift forward (p<.001). Angular relations were also effected in the head-neck area (p=.006) and ankles in relation to the floor (p=.038). Changes in body posture are supported by results of spatial board indicating that base up yoked prisms induced a tendency pointing further away from the subject. Yoked prisms base left showed that their main effect was on z axis by pushing visual space further away than the base up prisms on the left side (p<.001) equally further on the central fixation point and with no significant effect on the right side (p=0.782), indicating a clockwise space rotation.

**Conclusions:** Results suggest that although yoked prisms are affecting body posture they do not disturb weight distribution protecting homeostasis against gravity. Additionally, changes in body posture seem to relate to what is recorded on spatial board as an immediate and direct lens effect when preventing prism adaptation.

**Rehabiliatation and Vision Training Results in Acute Disseminated Encephalo-Myelitis (ADEM): A Case Report**

Vassilis Kokotas, Optometrist, Maria Tarasoudi, Optometrist, MSc, Georgia Gyftokosta, Optometrist

**Patient’s symptoms:** On May 2012, N.D. 26 year old male was transferred in emergency department after sudden fading and remaining unresponsive to the environment. During his recovery he reported upper and lower extremes’ left hemiplegia, loss of left visual field, diplopia and unstable visual acuity. He was hospitalized for 6 months followed by an intensive rehabilitation 6-months program in a special clinic.

**Diagnosis:** On July 2013, N.D. was referred for an optometric evaluation. Visual field testing showed a left homonymous hemianopsia, 60 Δ alternating exotropia at distance and 80 Δ alternating exotropia at near with right eye fixating 80% of time. Patient was unable to converge and could not perform a full range movement on the vertical axis. Visual acuities were measured 20/25 and 20/30 for the right and left eye respectively with small amounts of with the rule astigmatism in each eye. Accommodative insufficiency was also diagnosed. A visual midline shift to the right was also diagnosed without any indications of neglect.

**Treatments:** A weekly in-office vision training program was scheduled along with home-based activities for an initial 5 month period, aiming to improvements in ocular motility, convergence ability and peripheral awareness before referring for strabismus surgery.

**Outcomes:** By the end of the 5 month period N.D.’s alternating exotropia has been reduced to 45 Δ at distance and 60 Δ at near with almost equal alternation. He is able to perform full range eye movements and he is also able to converge up to orthophoria. Although no further improvements in visual fields are expected after a 12 month period, repetition of visual fields test indicated an improvement in the central and lower field. Visual acuities improved to 20/20 in both eyes and patient decided to continue vision training for an additional 5 month period. Surgeon’s opinion was to postpone surgical intervention until patient reaches his potential through training. Further improvements will be recorded up to the date of this posters’ publication. This case underlines the significant importance to deplete any possible mechanisms in recovery before surgical approach.

**Review of Prevalence of Vision Problems in Individuals with Intellectual Disability as Seen During The Opening Eyes Programs In 2012**

Sandra S. Block, OD, MEd, Professor, Illinois College of Optometry

**Background:** Vision is important to allow individuals with intellectual disability to function as independently as possible. Special Olympics (SO) Lions Clubs International Opening Eyes has been working to improve the quality and access of eye care to this vulnerable population since 1995 with effort emphasis on treating uncorrected refractive error. During the past 18 years, a vision assessment programs was created and offered at major SO events with the intention of providing corrections to athletes and exposing more eye care providers to the needs of these patients. The results from a standardized vision program that takes place all around the world has been entered into a central registry. A review of 2012 data is being reported.

**Methods:** Data from the screening forms that are completed as the athlete goes through the vision screening is entered into the HealthOne Global. If an athlete needs a correction, refractions are conducted and new glasses provided. Data includes history, current glasses, visual acuity, cover testing, stereopsis, color vision, autorefraction, eye health and IOPs. Recommendations including new glasses or referrals are recorded. The data was then extracted and reviewed.

**Results:** Athletes (17, 682) from 49 countries were screened (63.3% male). Of those with data and able to respond, 60.9% had far visual acuity better than 6/12. Strabismus was found in 10.4%. Athletes who were able to respond reported were asked to report on time of last eye exam, 31.1% of those >3 years or never. Refractive error showed a wide range (-35D to +30D) with a mean of -0.35D +/-3.55 sphere and -1.40D +/- 1.62 cylinder. Eye health problems were found in 14.5% of the athletes.

**Conclusions:** The data represents the results of vision screening for athletes with intellectual disability around the world. The percentages of problems are significant however are reduced from previous studies of this population (Block, et al, Woodhouse, et al). While the Opening Eyes program only gathers data from our events, the fact that the numbers of athletes who have not accessed eye care has decreased, it is hoped that the program is having a positive impact on access to care.

**Pallister-Killian Mosaic Syndrome**

Dominick M. Maino, OD, MEd, Illinois College of Optometry

Jennier Cussion, OD

**Introduction:** Pallister-Killian Mosaic Syndrome (PKMS) is a very rare, multiple congenital developmental disorder of unknown prevalence that is characterized by hypotonia, intellectual disability, seizures, distinctive facial features, meagre hair, unusual skin pigmentation, and other birth defects. Incidence is around 1/25,000. They often have difficulty breathing, feeding, sitting, standing, walking, and speech. The facial features include a high, round forehead, broad nose bridge, telecanthus, a wide mouth and a large tongue. Hearing loss, vision impairment, genital abnormalities, and heart defects are frequently noted.

**Case Report:** SS is a 4 year 4 month old female with PKMS who presents for an evaluation of eye rubbing in both eyes. Her parents are interested in determining if glasses and/or vision rehabilitative therapy are needed. She is currently receiving OT, PT, speech and vision services. SS was taking no systemic medications and denied any allergy to medication. Her last evaluation noted a moderate amount of hyperopia and astigmatism. She has been wearing this prescription for about 2 months. Her father reports that she wears them without difficulty, but does not notice any improvement in her visual abilities.

Her visual acuities were variable (fix and follow). Pupils were equal, round and sluggishly reactive to light. The Bruckner test showed OD slightly whiter and brighter, Hirschberg: >40 AXT and Kappa: central, unsteady fixation. EOMs appear full. Her cycloplegic refraction noted OD+4.50 -1.00 X180 and OS+4.50 -1.00 X 090. The external health assessment noted a petechial heme OD and was otherwise unremarkable. The DFE was unremarkable. SS fell asleep early into this examination. The assessment included pediatric cortical visual impairment, exotropia, and allergic conjunctivitis as well as hyperopia and astigmatism. The plan included full time wear of the Rx, Pataday for any ocular allergy present, VEP and vision rehabilitation.

**Conclusion:** Those with pediatric cortical visual impairment have been shown to improve in vision function once an appropriate diagnosis has been made and intervention given. Since Pallister-Killian Mosaic Syndrome is rare we do not know if this is also true for PKMS. This presentation will discuss all additional assessments and the outcomes of a vision rehabilitation program.

**Enhancing balance with visual training, a study on elderly**

Alessio Facchin Ph.D1 2 , Sandro Pederzolli3 , Roberto Pregliasco4

1 School of Optics and Optometry I.R.S.O.O., Vinci, Italy

2 Department of Behavioral and Brain Sciences, Univerisity of Pavia, Italy

3 Private study of physiotherapy, Genova, Italy

4 Optomaster training center, Genova, Italy

**Background:** Postural control, in particularly balance requires the integration of multisensory inputs such as: visual, vestibular, somatosensory and proprioceptive (Sundermier et al., 1996). Even the single contribution of these inputs are clear, specific influences of vision was available only for open and closed eyes (Owen et al., 1998), neurological patients with hemianopia (Paysse, Coats, 1997) or unilateral spatial neglect (Van Nes et al., 2009). Compared to these patients, no specific functional visual factor in healthy subjects where found. Neither evidence if the improvement of visual skills results in better balance was also available. In order to find these specific visual skill, the aim of this study is to verify the relationship between visual and balance measures on a group of elderly and if there are an improvement of balance after a visual training program.

**Methods:** Thirty healthy subjects from 57 to 82 years old participated in the study. They were subdivided in two groups, the first performed a visual training program and were compared to the second which were only tested two times and were considered as a control group. Before treatment were performed an optometric and balance examination that comprise for the optometric part: ocular dominance, visual acuity, stereopsis, far phoria and NSUCO Saccades. For balance part the evaluation comprise: standard and modified Tandem Walking Test, Tinetti’s balance scale and stability on balance board with open and closed eyes. After treatment were performed only balance examination.

**Results:** A correlation analysis between visual and balance skill shows a medium and significant relationship between stereopsis and Tinetti’s balance test (<0.01) and between stereopsis and balance board (p<0.05). After visual training there are a significant improvement only for VT group for tandem walking test (p<0.05) and stability on balance board (p<0.001).

**Conclusions:** Firstly we have found a significant relationship between balance control and one visual skill: the stereopsis. Secondly, after visual training only VT group showed specific improvement, in walking and in a balance board test. These results support the role of specific visual skill on a control of balance and show the indirect efficacy of visual training on balance control.

**Optometry and Visual Performance**

Pamela Schnell, OD

Marc B. Taub, OD, MS

Southern College of Optometry

*Optometry & Visual Performance (OVP)* is an international, peer reviewed journal dedicated to the advancement of the role of optometry in enhancing and rehabilitating visual performance. The mission of *OVP* is to increase the awareness and availability of clinically relevant information in functional, developmental, behavioral, and vision therapy aspects of optometry through an internet-based, open-access format. *OVP*, a collaborative effort of the Australasian College of Behavioural Optometry and the Optometric Extension Program Foundation, has an international circulation of more than 6000, including the membership of the representative organizations, optometry students, and residents. OVP covers a wide variety of topics, including clinical and scientific research, case reports and studies, reviews of new or adapted diagnostic or therapeutic methods, and editorials. Enhanced content such as author interviews, video demonstrations, and links to further resources can be found in the digital version.

In addition to the scientific journal, *OVP* also publishes a regular blog, *Visual Performance Today*, which highlights current topics in behavioral vision, practice management topics, member news for the sponsoring organizations, book reviews, and much more!

**Low Tech, High Touch Enabling the Brain to Communicate with Its Environment Through Lenses, Syntonics, and Tooties**

Mary Wong VanHoy, OD, FCOVD, FCSO

**Background:** Children with physical and cognitive challenges often present with significant visual deficiencies as well. This child presented with microcephaly (undersized head), strabismus, and uncompensated hyperopia. This poster will illustrate how compensatory lenses, Syntonic Phototherapy treatments, and the use of Tooties (specially designed and weighted bean bags) significantly improved his quality of life and ability to better respond to other rehabilitation services from a multi-disciplinary team of providers.

**Case Summary: A** five year old boy with microcephaly, diagnosed with optic atrophy and cortical visual impairment, as well as, significant physical challenges and non-verbal was referred to my office by his occupational therapist for a second opinion regarding visual rehabilitation to improve head posture and visual attention. No previous lens compensation or visual rehabilitation had been attempted.

**Clinical Procedures:** 1) Static retinoscopy revealed +5.00 sph each eye

1. Ocular health assessment revealed moderate pallor to optic nerves with small optic disks but retinal color seemed adequate and pupil responses present without APD but Alpha Omega Pupil present (premature dilation of pupils in presence of direct light stimulation)
2. Trial lenses of +3.50 sph OU resulted in immediate righting of head and visual arousal—slowly looked around room and initially eyes drawn to small beam of light coming from crevices of venetian blinds on window but alternating exotropia still present. Rx of +3.50 sph written for full-time wear.
3. One month follow-up: significant improvement in head posture and visual attention. Home syntonic phototherapy unit dispensed with hopes of expanding functional visual fields, eliminating alpha omega pupils, and enhancing binocular function
4. Six weeks follow-up: Continued improvement in visual attention and head posture with eyes aligned about 75% of the time. Tooties, a specially weighted bean bag, dispensed to try to gain voluntary movement of head and motor response on command
5. Second six weeks follow-up: Able to voluntarily move head in anticipation of a Tootie being placed on top of head. Now able to cause the Tootie to fall to one side of head voluntarily. Able to verbalize with sounds to express displeasure or happiness. Able to make eye contact with eyes aligned although eyes still assume intermittent alternating exotropic posture when relaxed.
6. Currently continuing home-based syntonic phototherapy and additional procedures with Tooties on his head to prepare for possible ability to control a head switch for communication device. Wearing current lens Rx of + 3.50 sph OU full-time.

**Discussion:** Dr. John Streff wrote, “*When vision is working well, it guides and leads, when not, it interferes*.” Clearly, this case study illustrates how vision, when enhanced, can significantly improve the patient’s ability to gain meaning, direct action, and more effectively “touch” and explore its environment. As behavioral optometrists, our obligation should be to explore all possible treatment modalities and judiciously incorporate them into our armamentarium for the patient’s optimum benefit.

**Improved School Performance in an Optometry Student with Divergence Excess Exophoria Through Vision Therapy: A Case Report**

Stefania Paniccia, OD, MS, Nicholai Perez, BS

The Inter American University of Puerto Rico [School of Optometry](http://www.optonet.inter.edu/)

**Background:**Divergence excess exophoria is a binocular vision abnormality characterized by a greater amount of exophoria at distance than at near, a high AC/A ratio, and an absence of amblyopia. Presented is a patient whose visual symptoms and school performance have improved with consistent in-office and home vision therapy.

**Case Summary:** A 27-year-old Caucasian male presents to the IAUPR School of Optometry Clinic with complaints of diplopia at near in the biomicroscope. The patient reported he was an optometry student who had been performing poorly scholastically.Ocular history was remarkable for low hyperopic correction. His medical history was unremarkable. Ocular examination resulted in VA sc 20/20 OD and OS with 40 secs of arc stereo. Cover test was 11Δ XP and 4Δ XP’. NRA and PRA were +1.75D and -1.50D respectively. NPC was 6cm/8cm. BAF testing was 6 cpm and MAF was 7 cpm. Vergences at near were BI X/14/10 and BO X/8/6. Vergences at distance were BI X/12/10 and BO X/6/4. Gross observation of the eyes revealed an exo posture without tropia. The patient was subsequently diagnosed with divergence excess exophoria.

**Treatment and Management:** The patient was scheduled for 45 min of in-office VT weekly with 3 days of home therapy based activities. Therapeutic goals were centered on improvement of fusional vergence skills at distance and near, to normalize accommodation, and to increase vergence values. Vergence activities included (but were not limited to) Brock string (stressing antisuppression), aperture rule (convergence and divergence) and vectograms (convergence and divergence). Accommodative activities included (but were not limited to) lens sorting, computer-based training, and red rock. Home based therapy included lifesaver cards, Brock string, and video game play using BO prism.

**Conclusion:** The patient completed 32 VT sessions with consistent home therapy in the span of 8 months. Reassessment showed improvement of BI and BO vergences at distance and near, as well as improvement of MAF, BAF, stereoacuity, NRA/PRA, and cover test. The patient reported subjective improvement in ability to fuse images and improvement in school performance.