The following presentations and posters were presented during the 2010 COVD 40th Annual Meeting in Rio Grande, Puerto Rico.

Oral Research Presentations

VISUAL EVOKED POTENTIAL EVIDENCE THAT MAGNO-PARVOCELLULAR INTEGRATION TRAINING CAUSES - NEURAL REORGANIZATION IN READING DISABLED CHILDREN

John Shelley-Tremblay – Associate Professor of Psychology, The University of South Alabama

Background: This project evaluated effectiveness of a computer-administered visual training program (Perception Attention Therapy for Harmony; PATH©) designed to ameliorate deficits in the timing of interactions between the magno and parvocellular pathways of the brain of Reading Disabled (RD) students.

Methods: Secondary and middle-school students (n = 17, m = 10, f = 7) from the Alabama gulf coast were referred by school reading specialists due to below normal classroom reading performance. Participants were randomly assigned to received training first (Train 1st) or to a wait-list control (Train 2nd). Standardized tests of comprehension, vocabulary, attention, oral reading, non-word decoding, and dyslexia symptoms were administered along with VEPs, CM, and eye tracking measurements were made before (T1), immediately after (T2), and after 8 weeks (T3). PATH training consisted of 18, 30 minute sessions of dynamic motion discrimination training on reversing, isoluminant contrast gratings (see Figure 1), where students indicate the direction perceived motion of the center disk. Sessions were followed by 2 stories from the Guided Reading program from Reading Plus°.

Results: Results indicate significant improvements in CM threshold and significant changes in the VEPs (Figure 2) for both groups immediately following training, and the effect persists in the Train 1st group at T3. Positive gains in oral reading fluency and comprehension were found for the Train 1st group and the Train 2nd group, but not in the wait list control condition.

Conclusion: Results indicate that PATH therapy may be effective at ameliorating magno-parvocellular interaction deficits, and evince small effects on direct measures of reading performance. This is the first study to directly demonstrate that VEPs may be normalized in clinical RD populations.

OBJECTIVE MEASUREMENTS OF READING SPEED AND EFFICIENCY IMPROVE IN CHILDREN FOLLOWING VISION THERAPY: A RETROSPECTIVE ANALYSIS

Barry Tannen, OD, FCVO – SUNY/State College of Optometry; Noah Tannen – Pre-Optometry Student, Lafayette College; Kenneth J Ciuffreda, OD, PhD, FCVO-A – Distinguished Professor, SUNY/State College of Optometry

Purpose: A retrospective analysis was conducted to assess objectively reading speed and efficiency with the Visagraph II Eye Movement System (Visagraph) following vision therapy (VT) in children with signs and symptoms of oculomotor-based reading dysfunctions.

Methods: 46 children between the ages of 8-17 years from the primary author’s private practice met the following criterion: symptoms of oculomotor-based reading dysfunctions (e.g. loss of place when reading, skipping lines, etc), and Visagraph recordings where both reading speed and grade level equivalent were below their grade level. To be included in the analysis, VT had to both be recommended and completed during the years 2007-2009. All of these patients had Pre and Post VT Visagraph recordings using an amended protocol (Tannen and Ciuffreda, JBO, 2007) which calls for two recordings taken at the patient’s Independent Reading Level (aIRL) with the second one being used for analysis, and one recording
taken at least two grade levels below the patient’s Independent Reading Level (bIRL). VT consisted of standard optometric vision therapy procedures for remediation of accommodation, binocularity, and oculomotor function according to the patient’s individual status. The average course of treatment was 28 (forty minute) sessions performed twice weekly.

**Results:** Pre and Post VT Visagraph recordings were analyzed to determine if significant improvements in the various components of reading eye movements occurred after VT, and whether there was a difference in the Post VT Visagraph recordings of the aIRL group vs. the bIRL group. All Visagraph eye movement parameters improved significantly (p<.01) on a percentage basis following VT. Average aIRL improvement: Reading speed (51%), Grade level equivalent (134%), Fixations (34%), Regressions (45%), Span of Recognition (37%), Duration of Fixation (9%). Average bIRL improvement: Reading speed (54%), Grade level equivalent (138%), Fixations (42%), Regressions (63%), Span of Recognition (43%), Duration of Fixation (7%).

**Conclusions:** The results demonstrate significant improvements in all Visagraph parameters, both aIRL and bIRL. These improvements were similar in magnitude in both test conditions which suggests a primarily oculomotor basis for the gains. The improvements in Visagraph measurements correlated well with symptom reduction that occurred in 93% of the patients.

**VERGENCE STRESS SIGNIFICANTLY AFFECTS READING RATE**

Maureen Powers PhD, FCOVD-A, FAAO; Gary Miner and Yoshie Morita, MA – Gemstone Foundation

**Background:** Despite many years and many studies, doubt still exists about whether visual skills directly affect reading. We asked whether the reading performance of children with good vergence skills would be affected if they read through bilateral prisms that produced atypical vergence for them.

**Methods:** Methods were approved by an institutional review board. 15 children were recruited locally. Five were found to have neither symptoms (determined using the Convergence Insufficiency Symptom Survey - CISS) nor signs (determined by measuring vergence break and recovery, near points of convergence and accommodation, accommodative facility, and Developmental Eye Movement test ratios) of visual skill problems and thus entered the study. All were 20/30 or better at near, wearing habitual correction. Average age was 11.5 years. Subjects read Visagraph paragraphs at or below grade level while wearing bilateral, balanced prisms on both eyes. At least 80% comprehension was required for a trial to be counted. Prisms were 2, 4, 8, 16, or 20 dipoters (pd) either base in or base out. Reading rate was compared to baseline rate with no prisms and to monoculat rate with one eye covered. To control for distortions, control conditions were run with plano pieces of plastic of like thickness to each prism power base and with Fresnel prisms.

**Results:** Reading through prisms totaling 4 (2 +2) or 8 (4+4) pd reduced reading rate (p<.01). The effect was similar for base in and base out prisms. At these values subjects reported that images were single, but Visagraph traces from the two eyes showed more convergence (to counteract base in) or divergence (to counteract base out) while reading. At higher prism values (total 16 pd, base in or out) images were reported to be intermittently diplopic and reading rate slowed even more. At the largest values (32 and 40 pd) reading rate was not slowed as much; subjects reported reading “one image or the other.” The relationship between reading rate and the magnitude of vergence stress (compared to baseline) was strong (r=.75) and significant (p.<.001).

**Conclusion:** Reading rate slows when subjects exert extra effort to maintain single vision.

**INFANTSEE®: NEW INSIGHT INTO THE OVERALL VISION HEALTH OF INFANTS IN THE USA; CAUSES FOR CONCERN AND NEED FOR VISION DEVELOPMENT**

Mark Schwartz, MPH; Glen Steele, OD, FCOVD – Southern College of Optometry

**Background:** New data collected by Optometry’s Charity™. The AOA Foundation from the 2009 Centers for Disease Control and Prevention (CDC) InfantSEE® pilot project indicates an overall cause for concern (in need of follow up care) rate of one in six infants. The pilot project also identified significant economic disparities concerning socio-economic income levels and an increased rate of causes for concern in three specific vision categories.

**Results:** Through InfantSEE®, optometrists provide a one-time, no-cost comprehensive eye and
vision assessment to infants in their first year of life, between the ages of 6 and 12 months, offering early detection of potential eye and vision problems regardless of income or access to insurance coverage.

Results of this pilot project indicate a strong relationship between lower household income levels and a higher rate of causes for concerns. In three identifiable vision categories, binocularity (p<0.0008), ocular motility (p<0.0019) and visual acuity (p<0.0023) infants from self-reported household income levels below $26,000 exhibit higher rates of causes of concern than infants from self-reported household income greater than $26,000.

Discussion: Further investigation is needed to examine the relationship between socio-economic disparities as it relates to infant visual health. As a result of this pilot project, specific guidelines that address the limitations of causes for concern have been developed. The new guidelines for defining a cause for concern within these three vision categories will help to identify the overall significance of infant vision health in the United States while at the same time help to provide available resources to ensure vision development of affected infants.

Poster Presentations

WOLD COPY TEST PERFORMANCE USING THREE DIFFERENT ADMINISTRATION PROTOCOLS
Hannu Laukkanen, OD; Suzanne Tsang, OD; John R Hayes, PhD – Pacific University College of Optometry

Background: The Wold Sentence Copy Test (WSCT) is a well known tool for assessing children’s copying speed and performance. A variation, the Wold-Pacific Copy Test (WPCT) was later introduced to compare word vs. number copy speed, and to measure the number of eye/head movements needed for copying. Although the WSCT and WPCT have different administration protocols, the norms derived for each are sometimes intermixed. The purpose of this study was to compare children’s performance on both. In addition, a third protocol with the copy template at 6m (WFtN) was added to the comparison.

Methods: 59 elementary schoolchildren grades 1-6, from 4 different schools were tested with all three protocols. In addition, the participants, their parents, and their teachers, completed questionnaires about the participant’s copying performance. Means were compared in a three way analysis of variance using age, stimulus type, and method as independent variables testing associations with copy speed in seconds, number of head movements, and number of errors.

Results: Age was significant in copying speed (F=14.4, p<.001); Letters vs. numbers was significant (F=110, p<.001); Letters vs. numbers by Age (F=3.15, p=0.022); Protocol Method (F=79.8, p<.001); Protocol Method*Age (4.76, p<.001); Letters vs. numbers by Protocol Method (F=12.7, p<.001); Letters vs. numbers by protocol method by age was not significant (F=.97, p=.46).

Conclusions: Copying words was faster than similarly grouped numbers with all three protocols for children 6-11 yrs old. Copying of words and numbers was faster with the lower grades with the WSCT protocol where the template was at the top of the page. Copy speed was not different between the WPCT (with the template on an eyelevel easel at 40cm) and the WFtN (size compensated copy template at 6m). Copy speed for words was not different between the three protocols after age-9, whereas differences in copy speed for numbers persisted even for the older age groups through age-11.

VISUAL SKILLS AND READING:
SYMPTOMS AND FLUENCY
Yoshie Morita, MA; Robert Hoffman, EdD; Maureen Powers, PhD, FCOVD-A, FAAO; – Gemstone Foundation

Background: We and others have shown that poor readers tend to have poor visual skills. Here we asked whether reading fluency as measured by schools correlates with symptoms of poor visual skills, and whether symptoms and/or skills are affected by a program of visual skills training via internet in school.

Methods: Methods were approved by an institutional review board and by the school district. Students (N=346) in grades 3-6 attending public school in Los Angeles responded to questions on the Convergence Insufficiency Symptom Survey (CISS). Distance acuity, vergence, accommodation, and tracking skill were measured in symptomatic students (CISS > 15), and a subset of them (N=32) participated in a visual skills training program via internet at school. The training program was 30 sessions of 20 minutes each, using anaglyph technology and red/blue glasses.
Results were compared to another symptomatic subset (N=30) who did not participate in training. **Results:** Oral fluency was significantly correlated with CISS score (p<.01). Over 50% were symptomatic for CI. Nearly all students who failed the CISS scored below “adequate” on one or more visual skill. Following visual skills training, CISS scores improved in 84% of students who participated in training, compared to 43% of those who did not. Reading fluency tests administered by the school before and after visual skill training demonstrated improvement in words read correctly per minute in 88% of participants (12 words per minute, on average; p<.001). Conclusions: Poorer reading rates are associated with symptoms as reported on the CISS. Practicing visual skills (accommodative facility, tracking, and vergence) improves symptom scores and reading fluency. The results imply that visual skills training carried out in a school setting can positively impact both symptoms and reading..

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**CASE REPORT: VISUAL BIOFEEDBACK IN THE TREATMENT OF CONGENITAL NYSTAGMUS**

Ira Strenger, OD; Barry Tannen, OD, FCOVD  
– Associate Clinical Professor, SUNY/State College of Optometry

**Background:** Auditory oculomotor biofeedback has been shown to be successful in reducing the amplitude and frequency of nystagmus in patients with congenital nystagmus. It’s use has been limited by the lack of a commercially available instrument. We present a case report where the Visagraph II Eye Movement Recording System is used to provide visual biofeedback to help a patient reduce the amplitude and frequency of his congenital nystagmus. Case Study: Patient ML was a 25 year old Caucasian male who presented to the UEC Biofeedback Clinic, for the evaluation and treatment of his congenital nystagmus. The chief complaints were reduced visual scanning, reduced focusing ability, and a right head turn, all of which he attributed to his congenital nystagmus. The patient showed moderate hyperopic astigmatism OU with best corrected distance visual acuity in primary gaze of 20/60 OD/OS/OU and 20/40 OU at near. Additionally, he had a constant alternating esotropia at distance and near with no measurable stereoacuity. The following describes how we used the Visagraph as a visual biofeedback therapy device: 1. the patient was seated 57 cm from the CRT screen where the Visagraph program was being run, with the infrared goggles adjusted in the standard manner. 2. The “measurement only” setting was used to record eye movements. 3. The patient viewed a clear plastic transparency film that was taped over the CRT screen with the letters “X” in primary gaze, “L” 5 cm left and “R” 5 cm right of the central fixation target. 4. The patient was able to view his recorded eye movements behind the “X” on the transparency film. The patient was then instructed to attempt to make the line “straight” with as little oscillations as possible. Conclusions: After two sessions, the patient was able to dampen his nystagmus to less than 1 degree in amplitude for 30 sec at a time in primary gaze. After 10 sessions, the patient was able to dampen his nystagmus for a five minute periods. Friends and family have noticed the reduced nystagmus and decreased head turn. The patient now notices less asthenopia while reading and his visual acuity has improved one line to 20/50 OD/OS/OU. This case report demonstrates the use of the Visagraph II Eye Movement Recording System as an effective tool for visual biofeedback in the case of congenital nystagmus.

**AN INVESTIGATION INTO THE RELATIONSHIP BETWEEN THE COVD-QOL AND ATTENTION DISORDERS AS MEASURED BY THE TEST OF VARIABLE ATTENTION (TOVA): A PILOT STUDY**

Allison Lyerly; Stephanie McLin; Marc Taub OD, FCOVD – Southern College of Optometry

**Background:** Over the last two decades, there has been a significant rise in the number of school-aged children diagnosed with Attention Deficit Hyperactivity Disorder (ADHD). Equally as interesting, is that children with poorly developed binocular and accommodative efficiency show symptoms similar to those with an attention disorder. This study will investigate the relationship between visual symptoms and a standardized measure of attention.
Methods: Sixteen subjects between the ages of 6 and 13 were recruited for the study. The parent/guardian completed the College of Optometrists in Vision Development quality-of-life (COVD-QOL)-Short form. The children were administered the Test of Variable Attention (TOVA), a 21.8 minute fixed interval, continuous performance test, after a brief introduction to the stimuli and a practice simulation. The TOVA score was obtained for each subject. The score is a comparison of the child’s performance to those responses of a group diagnosed with ADHD.

Results: A statistical analysis of the COVD-QOL score vs. the TOVA score resulted in a correlation of -0.40347. As the COVD-QOL increased (an indication of increased visual symptoms), the TOVA score decreased (an indication of decreased attention ability).

Conclusions: The proliferation of children on some variety of medication for ADHD is staggering. Dr. David Damari showed us in an article discussing three case reports of children using medication to treat their supposed ADHD, that visual issues including refractive error and/or binocular vision dysfunction may in fact be part of the diagnostic picture. Currently, we are left with two thoughts: 1) The COVD checklist is actually screening for attention problems, not just visual ones, 2) The TOVA test requires a certain level of visual efficiency not accounted for by the program creators. These two questions will be further investigated as patient recruitment and testing occurs.

CRITICAL FLICKER FREQUENCY IS REDUCED IN PATIENTS WITH SELF-REPORTED READING DISABILITY

Barry Tannen, OD, FCOVD; Kenneth J Ciuffreda, OD, PhD, FCOVD-A – Distinguished Teaching Professor, SUNY/State College of Optometry

Purpose: To assess the critical flicker frequency threshold (CFF) in children with the chief presenting complaint of reading problems.

Methods: The CFF threshold of 40 children between the ages of 7-16 years with the chief complaint of reading problems was measured in the primary author’s private practice during the course of a comprehensive optometric evaluation. 23 age-matched controls without any history or complaint of reading problems were also tested. CFF threshold was assessed binocularly with the habitual near prescription in place at 40 cm. The test light consisted of 4 contiguous white light-emitting diodes (LEDs) with which were mounted within a handheld rectangular enclosure and provided diffuse illumination via a circular translucent plexiglass cover. The size of the test field was 3.5 degrees with a luminance of 100cd/m2 performed in a dimly illuminated room. The flicker rate was controlled by a calibrated dial, which allowed the experimenter to gradually increase or decrease the flicker frequency over a range of 30 to 60 Hz. Patients were instructed to fixate the center of the test field, while the rate of flicker was either increased (“stops flickering”) or decreased (“starts to flicker”) by at a rate of approximately 1 Hz per second. 3 ascending and 3 descending measurements were taken alternately. A single mean CFF threshold was obtained by averaging the 6 measurements.

Results: Mean CFF threshold was 45.48Hz +/-3.0Hz in the normal readers and 39.59 +/-1.4Hz in the patients with reading problems, which was significantly different (t-test, p<0.01). Only 3 of the 40 children (7.5%) with reading problems had a CFF threshold within 1 standard deviation of the mean CFF threshold of normal readers.

Discussion: Mean CFF threshold discriminated well between children with a chief complaint of reading problems and those with no history or report of reading problems. This agrees with earlier studies demonstrating reduced temporal processing reflecting visual magnocellular impairment in children and adults with reading disability/dyslexia. We suggest that the CFF threshold test, which is both simple and rapid, be considered for inclusion in the optometric armamentarium for children presenting with reading problems.

INTERACTION OF DYNAMIC ACCOMMODATION AND SUSTAINED VISUAL ATTENTION.

Dmitri V. Poltavski, PhD; David H. Biberdorf, OD, FCOVD – Valley Vision Clinic; Dr. Thomas V. Petros, PhD – University of North Dakota

Background: The ocular accommodation response is influenced by a number of visual and cognitive factors, including image blur, chromatic aberration, proximity, target size, workload and attention. Currently, the relationship between accommodation and attention is poorly understood. Methods: Using the WAM-5500 open-field autorefractor, we
attempted to measure the dynamic accommodative responses of 28 college students while they performed the Conners’ Continuous Performance Test (CPT), a clinically-validated measure of attention used in the diagnosis of a variety of attention-spectrum disorders. All participants had normal corrected vision of at least 20/20 at far and near. The study employed a counterbalanced within-subject design with two conditions: baseline and accommodative/binocular stress. In the latter condition the accommodative/binocular stimulus to the CPT task was manipulated by having the subjects wear -2.00 over-minus lenses. During both sessions the subjects’ brain wave activity was also monitored using an EEG set with the active electrode placed over the left frontal lobe. Results: The results showed that the accommodative response was significantly reduced in the visual stress condition than at baseline (-0.23D vs. -1.46D, p<.01) with no changes observed in EEG activity associated with visual attention. Behavioral performance on the CPT significantly deteriorated in the visual stress condition. In the visual stress condition participants were significantly more likely to be classified as belonging to the attention-challenged population than general population (mean probability 0.35 vs. 0.28, p=0.04). Most of the attentional problems were observed on the measures of Hit reaction time, response variability, stimulus detectability and the number of perseverations. Multiple regression modeling also demonstrated that dynamic accommodation in the stress condition was significantly predictive of the number of omissions on the CPT test explaining 64.4% of the cases. Conclusion: These results have implications for the testing and treatment of a variety of attention-spectrum disorders, which are traditionally managed pharmacologically to restore presumed dysfunctional neurotransmitter systems in the cortex.

OBJECTIVE MEASURES OF DYNAMIC ACCOMMODATION IN A CHILD WITH ACCOMMODATIVE INSUFFICIENCY - A CASE STUDY

Tomohito Okumura, MSOptom, MEd, FAAP, FCOVD-I – Osaka Medical College LD Center; Eiji Wakamiya MD, PhD – Osaka Medical College, Department of Pediatrics, Aino University, Faculty of Nursing and Rehabilitations; Hannu Laukkanen, OD, MEd, FAAO – Pacific University, College of Optometry; Hiroshi Tamai MD PhD – Osaka Medical College, LD Center & Department of Pediatrics

Background: Accommodative insufficiency (AI) has been reported to be one of the leading causes of asthenopia with near work in schoolchildren. Asthenopia related to AI may be a significant problem that interferes with near visual work performance, such as reading and writing. Previous research suggests that accommodative insufficiency should be defined by objective methods, because the prevalence of accommodative insufficiency defined by objective measures was much higher than that identified by subjective clinical measures. In addition, a great deal more accommodation information can be obtained by using an advanced autorefractor such as WAM-5500 (Grand Seiko, Hiroshima, Japan). However, few studies have reported accommodative characteristics of school children with AI using objective measures. This study examined monocular and binocular dynamic accommodative functions in an AI child using objective, infrared, open-field autorefracter, demonstrating advantages of its use in clinical practice.

Case Summary: A 11-year-old boy presented to our clinic with a chief complaint of difficulty keeping attention centered on near work and sleepiness while reading. The comprehensive visual functional evaluation revealed AI with convergence insufficiency, but normal visual acuity and good ocular health. In addition, dynamic accommodation measurements with the WAM-5500 clearly showed instability and a high lag of accommodation during both monocular and binocular conditions—even at the beginning of near testing, which substantiated the relationship between his asthenopia and his AI.

Discussion: The WAM-5500 with high-speed mode, is a very useful clinical tool for objective measurement of important accommodation elements, such as dynamic and sustained accommodative response under both binocular and monocular conditions.

ADVANCED OPTOMETRIC TREATMENT MODALITIES IN THE MANAGEMENT OF ACQUIRED CASE CYCLOROTARY NYSTAGMUS

M.H. Esther Han, OD, FCOVD; Allen Cohen, OD, FAAO, FCOVD; Barry Tannen, OD, FAAO, FCOVD – SUNY College of Optometry
**Background:** Patients with acquired brain injury (ABI) often have complex visual sequelae that significantly affect their ability to perform activities of daily living. This case report presents multiple and advanced optometric treatment modalities required to address the visually-related functional needs of the patient.

**Case Summary:** GM is a 46 year old white male who was initially referred to the Vision Therapy Service for a Biofeedback Evaluation on 3/5/09 with a history of cerebrovascular event in 2002 which resulted in the following vision symptoms: oscillopsia which worsens in right gaze, constant diagonal diplopia at all distances, balance difficulties, near vision blur, light sensitivity, and difficulty ambulating in a crowded environment.

Subjective refraction: OD: +0.75-0.50x080 20/30 OS: +0.75-0.25x085 20/20. With a near addition lens of +1.50D, OU acuities were 20/20. Objective assessment with cover test in primary gaze: 10 RET, 5 RHT for distance and 10 RET, 5 RHT at near. Near point of convergence: fusion (luster) at 4 inches. No restrictions in extraocular motilities. Rotary, seesaw, downbeat nystagmus with OD worse than OS and which worsens in right gaze. With dilation and visual field assessment was unremarkable. Pupils were normal without evidence of an afferent pupillary defect.

**DIAGNOSES:** 1) Cyclorotary nystagmus; 2) Oscillopsia; 3) RET, RHT at distance, RXT, RHT at near; 4) Photosensitivity.

**TREATMENT PLAN:** 1) Separate DV and NV spectacles with fusional and yoked prisms, indoor tint, and central opaque occlusion of OD 2) Auditory biofeedback with version training and 3) Visual-vestibular rehabilitation therapy.

**OUTCOMES:** Symptom improvement: Improved control of his nystagmus with decreased oscillopsia. Improved balance and no longer feels as though he is falling. Decreased diplopia.

**Discussion:** With any case, all optometric treatment modalities need to be considered. The use of spectacles can be expanded beyond the management of refractive error and photosensitivity by the use of prisms (fusional and yoked) and selective occlusion to include the management of ocular misalignment and fixation deficits related to the nystagmus. The vision rehabilitation program can require phases with varying approaches such as: visual feedback therapy using the Visagraph, auditory biofeedback, and visual-vestibular therapy. The sequence and types of therapy activities will be further discussed.

**TREATMENT OF HIGH ANISEIKONIA IN ADOLESCENTS WITH HIGH VISUAL DEMAND: A CASE SERIES**

**Kelly Meehan, OD; Erin Jenewein, OD – Nova Southeastern University**

**Background:** Anisometropic amblyopia is a common condition among adolescents. Proper detection and management is critical for a successful visual outcome. Correction of anisometropia can often result in disturbing aniseikonia so that the appropriate refractive correction should be determined so as to limit the amount of anisiekinia experienced by the patient. This case series reviews the management of two adolescent patients with anisometropia and aniseikonia. Clinical findings, the relation to Knapp’s law, use of the New Aniseikonia test (NAT) and treatment options as they relate to the cases presented will be discussed.

**Case 1:** A 16-year-old girl presented to our clinic for evaluation of decreased vision at both distance and near in both eyes. She also reported mild headaches towards the end of the day while trying to view the board at school. Uncorrected visual acuity was 20/50-1 OD and 20/400 OS. Ocular history was positive for an iris coloboma OS. Upon examination, refraction revealed -1.75-1.25X010 OD and -7.00-3.00X167 OS. With spectacle correction aniseikonia testing revealed 6% aniseikonia using the NAT. The diagnosis of anisometric amblyopia was made and the patient was fit with contact lenses. Corrected visual acuity with contact lenses was 20/20 OD and 20/25-3 OS. Aniseikonia testing with contact lenses and spectacles was 1-2% using the NAT.

**Case 2:** A 16-year-old female presented to our clinic for evaluation of blurry vision, OS>OD. She did not wear lenses, and upon examination her refraction revealed -2.00-0.50X180 OD (20/20) and -10.50-1.75X180 OS (20/40). Aniseikonia testing revealed 10% aniseikonia with spectacle correction. The patient was diagnosed with anisometropic amblyopia and was fit with contact lenses and spectacle correction over the contact lenses. Corrected visual acuity with contact lenses and spectacles over his lenses was 20/20 OD and 20/25-3 OS. Aniseikonia testing with contact lenses and spectrales was 1-2% using the NAT.

**Conclusions:** Patients with anisometropic amblyopia due to high anisometropia can be treated effectively and safely using contact lenses, spectacle correction and occlusion. The aniseikonia produced by spectacle correction of anisometropia may provide
an obstacle to the development of normal binocularity, thus making contact lenses a preferable choice. The NAT uses a direct comparison method and is easy for clinical use. Favorable visual outcome can result from proper treatment of these challenging cases.

LOW VISION, OCULAR DISEASE AND VISION THERAPY--OH MY!

Marc B. Taub, OD, MS, FAAO, FCVOI – Southern College of Optometry; Anna Taylor – 4th Year Optometry Student, Southern College of Optometry

Background: Low Vision, Ocular Disease and Vision Therapy are distinct areas of practice in many offices. Specialty care can be of benefit to many patients, improving quality of life, but it can also lead to practitioners not seeing the “big picture.” There is often significant overlap in visual problems that patients may face and present with. This case report will highlight such a patient.

Case Summary: A 7 year old male was referred to the Vision Therapy and Rehabilitation service due to, longstanding decreased vision OU and complaints of a head turn to the left and squinting/closing the right eye which were becoming more prevalent. He was in regular education classes and was underperforming according to his mother. To see the board at school, he had to sit in the front of the classroom and often had to walk up to the board. The patient denied having trouble seeing reading material in his textbooks. His mother indicated that he was having trouble with reading and was a clumsy child. His medical, birth and developmental histories were unremarkable. The entering corrected visual acuity was 20/80 at distance and .4/1.25 at near OS, OD, OU, with a mild hyperopic correction and flat-top bifocal. All chair skills were within normal limits, except for the presence of nystagmus noted while performing EOM testing. The NSUCO showed poor pursuits and poor saccades. No improvement was noted in visual acuity with a trial frame refraction. Anterior segment and undilated posterior segment evaluations were within normal limits. Based on the previous primary care and current vision therapy examinations, the patient was diagnosed with decreased vision secondary to congenital nystagmus and ocular motor dysfunction.

A three pronged approach to treat this patient was put into effect. The visual acuity decrease was managed with traditional low vision devices. 1) Max TV glasses, a 2X magnification system are to be worn during school and for other distance activities and a 2X bar magnifier will be used for near activities. 2) 4Δ Yoked prism based left was implemented to reduce the amount of the head turn, essentially driving the patient into their null point. 3) Ocular Motor based vision therapy will be implemented to improve eye movements.

Discussion: This report shows a case in which it is necessary to think outside of the box. In many traditional optometric offices, this child’s visual acuity and efficiency issues, along with the potential lifelong neck pain/discomfort might have been passed over or disregarded. This case shows the importance of blending several “optometric specialties,” allowing eye care practitioners to use all of the tools at their disposal to treat the patients’ visual and systemic signs and symptoms.

OCULAR SIGNS OF FETAL ALCOHOL SYNDROME

Angela Howell, OD – Pediatric Resident, Southern College of Optometry

Abstract: Fetal Alcohol Syndrome is an important finding in pediatric ocular evaluation. The manifestations of alcohol use during pregnancy are displayed in ocular and facial characteristics of affected patients. A case study of fetal alcohol syndrome in the pediatric patient is presented for review. Ocular and facial features observed for diagnosis are presented for the diagnosing physician.

Case Summary:

Subjective: Eighteen month old white male child presented to the office with his caregiver. The caregiver was concerned about his eyes appearing crossed. History revealed a low birth weight and developmental delays in speech and motor skills. No medications were taken. He was reported to be up to date on his immunizations. The child was in foster care due to undetermined abuse or neglect.

Objective: Patient’s estimated visual acuity was 20/60 in each eye based on preferential viewing testing. He could fixate and follow light or a moving target. He was equally agitated when right or left eyes were occluded. Hirschberg testing revealed centered reflexes with no strabismus present. Pupils were equal round and reactive to light with no afferent papillary defect. Retinoscopy revealed two diopters of hyperopia in the right eye and one and three quarter dipotor of...
hyperopia in the left eye with crisp approximately equal reflexes. Intraocular pressure was soft by digital tonometry in each eye. External examination revealed prominent epicanthal folds. The left eye had a two millimeter ptosis. Intrapalpebral distance was nineteen millimeters. Lateral canthus to nasal canthus measures twelve millimeters in each eye. Facial appearance showed a thin upper lip. Posterior pole evaluation with direct ophthalmoscope revealed bright foveal light reflexes and normal retinal structure.

**Assessment:** Epicanthal folds OU, ptosis OS, hyperopia OU

**Plan:** Reassure caregiver about absence of strabismus, monitor the ptosis in the left eye with digital photography, consult pediatrician about diagnosis of fetal alcohol syndrome, monitor at six months for ocular growth and development, no prescription at this time.

**Discussion:** Fetal alcohol syndrome is prevalent and often overlooked. As primary caregivers optometrists will encounter patients presenting with ocular and facial signs of the disorder. A team approach with primary care pediatricians, developmental psychologists, physical and occupational therapists is advised to maximize outcomes for these patients.

**USING VAN-ORDEN STARS TO MONITOR THE PROGRESS OF VISION THERAPY IN ADULT STRABISMIC PATIENTS**

Mary Bartuccio, OD, FAAO, FCOVD – Assistant Professor, NOVA Southeastern University

**Background:** Adults who present with long-standing strabismus can be effectively treated with vision therapy. One simple way to monitor their progress is by utilizing the Van-Orden Stars to document changes in spatial localization and posture.

**Case Summary:** AB was a 53 year old female who presented with consecutive Intermittent Alternating Exotropia (IAXT) at all distances. She complained of having “trouble focusing” at all distances. As a child, she had two strabismus surgeries to correct the esotropia. Her medical history was unremarkable. AB’s initial best corrected visual acuity was 20/25 in each eye at all distances with a mild hyperopic correction. Ocular alignment testing revealed a 14 pd IAXT at all distances with intermittent central suppression OS and inadequate stereopsis. At near, an add did not help improve her vergences and facility, nor her sensory fusion. Ocular health was unremarkable. She was diagnosed with IAXT with central suppression OS. She completed her 11-month VT program with strong emphasis on improving her spatial localization and sensory fusion. Throughout therapy, she completed a series of Van-Orden stars using the Cheiroscope to monitor her progress. As noted in the illustrations of her Van-Orden stars, when standing, she initially exhibited an eso posture with shifts towards the exo side. However, when sitting, she presented with central suppression of her left eye and progressed to a large eso posture. Over the course of therapy, the Van-Orden Stars demonstrated that the eso posture and suppression were eliminated. Upon completion of vision therapy, her ability to localize in space improved as her posture shifted to a slightly exo direction with good sensory fusion. Her most recent exam showed improved visual acuities in each eye, good sensory fusion and adequate vergences and facility.

**Discussion:** Van-Orden Stars are an effective method to illustrate the transitions in the patient’s spatial localization throughout the vision therapy program. In addition, these two-dimensional patterns can easily guide the therapist in making adjustments to the vision therapy program to maximize results.

**TWIN TROPIAS: THE SAME, YET DIFFERENT**

Jacqueline Rodena, OD; Erin Jenewein, OD, MS – Nova Southeastern University

**Background:** Although the definitive cause of strabismus is unknown, there has been evidence showing that some cases of strabismus may have a genetic correlation. Esotropia is more commonly seen in multiple members within a family than exotropia. Among set of twins, concordant strabismus is more common in monozygotic twins. This case highlights a pair of monozygotic twins diagnosed with different presentations of esotropia.

**Case Summary:** A pair of monozygotic 7-year-old twin girls presented with esotropia first noted by their father at age two. Twin A presented with a large angle concomitant constant alternating esotropia with no global stereopsis, some peripheral fusion and deep central suppression of the right eye. She presented with a moderate amount of hyperopia which did not improve sensory fusion. Twin B presented with an accommodative esotropia, 500 arc seconds of global stereopsis, and peripheral fusion with alternating central suppression with a bifocal hyperopic
prescription. Although this was not the first exam for the twins, vision therapy was never recommended in the past.

**Conclusion:** Although this case report demonstrates that this pair of monozygotic twins with a concordant strabismus may have a genetic component in nature, it shows that twins can have different presentations secondary to environmental influences. Importance of early exams and treatments will be discussed. This case report will include differential diagnosis and management of different types of esotropia and will discuss the prevalence of concordant and disconcordant strabismic phenotypes in twins.

**FUNCTIONAL VISION EXAM RESULTS FROM A HIGH SCHOOL IN INNER-CITY MILWAUKEE**

**Kellye Knueppel, OD, FCOVD; Maureen Powers, PhD, FCOVD-A, FAAO – Gemstone Foundation**

**Background:** We were interested in helping economically challenged students at a high school in Milwaukee with their vision problems. The number of students in 9th grade seemed manageable, so we embarked on a systematic study to collect data from each of them with the goal of helping each one with his or her specific problem.

**Methods:** Dr. Knueppel and her associates performed complete functional vision exams on all 93 students in 9th grade (average age 15 yr) during the fall semester of 2004, at the school site. 59% of the students were male. Measures taken included acuities near and far, cover test, retinoscopy, saccade and pursuit ability, convergence and divergence ranges, visuomotor ability (VMI), Developmental Eye Movement test (DEM) and COVD Quality of Life (QOL). Values for functional variables were generally obtained using best correction. At the end of each exam Rx and/or treatment was prescribed. Teachers were informed of each student's visual status.

**Results:** Every student had some type of visual problem. Although only 13 would have failed standard school screening (DVA worse than 20/40), full vision examination revealed that 66% needed glasses and all had at least “mild” deficits in at least one basic visual skill (described to the teachers as eye movements, focus, and teaming). On a scale of 1 to 4 for priority of need for vision therapy, where 1 is “urgent,” 79% ranked 1 or 2. QOL was 26, on average, and was significantly correlated with the severity of binocular vision problems (p<.02). The average percentile rank of DEM scores was 67, but the distribution was bimodal suggesting 2 groups of students with regard to tracking. VMI age equivalent was 10 years; interestingly, the top 2 VMI age equivalent scores (15.8 and 14.0, respectively) were obtained by strabismics.

**Conclusion:** Every student in this cohort had vision difficulties, and all would have benefitted from vision therapy; over half were severe enough to require it. Although the data represent only one school, taken together with other work they imply that large numbers of students in disadvantaged schools may suffer from signs and symptoms that could be helped by vision therapy. The implications of this finding for both schools and optometry will be discussed.

**CASE OF SUCCESS USING VISION THERAPY IN THE INDUSTRY**

**CUEROS INDUSTRIALIZADOS DEL BAJIO, S.A. DE C.V. (CUINBA)**

**Guadalupe Funes; Naya Ma. Díaz; Luis Enrique Mongeloz**

**Background:** The demand of quality in the Car Industry is very high. The way of measuring this quality is in parts in parts per thousand (pieces without defects) called PPM’s. CUINBA was a supplier for the car industry and its main customers were Volkswagen and General Motors. The product was a set of leather pieces packed in a box, and afterwards another company assembled and mounted on the car seats. The quality survey of the leather pieces was made by workers whose only tool was their visual system. The process starts marking the leather defects, to be then cut with swages. Once cut, the pieces were visually inspected to be packed. After packing in boxes, these were audited once again (by sampling) to check the customers’ requirements (inner PPM’s). A Vision Therapy Program was applied to the workers responsible of the markings, inspection, cut and auditing, people whose work depended on their visual system. The process starts marking the leather defects, to be then cut with swages. Once cut, the pieces were visually inspected to be packed. After packing in boxes, these were audited once again (by sampling) to check the customers’ requirements (inner PPM’s). A Vision Therapy Program was applied to the workers responsible of the markings, inspection, cut and auditing, people whose work depended on their visual system. We evaluated the symptoms of visual stress and also compared the number of VT sessions versus the PPM's (factory control indicator).

**Methods:** We made a diagnosis using a list of Stress Visual Symptoms (OEP Pamphlet: A Plus For You), Keystone Telebinocular, Van Orden Star,
Cheiroschope drawing and the visual acuity was made by the optometrist of the factory. Based on this, we planned a program to develop the basic visual abilities (eye movements, near and far focusing, binocular coordination) and also included process therapy (Think Track Cards) and Posture Exercises (from Rossana Bardini’s book). We trained the chiefs of section in the program developed and the workers did the exercises daily in a special room. We measured graphically and compared the visual stress symptoms that affected directly the standards of quality required by the company (PPM’s).

Results: It was observed that during the vision therapy program the PPM’s diminished significantly. It is important to recall that when the VT exercises were suspended for 9 weeks, the PPM’s increased to the “normal” level and when workers resumed the program, the PPM’s diminished again. The same happened with the visual stress symptoms. (Graphics attached).

Conclusion: This work clearly shows the benefits of VT and its application in the industry. The company had savings of millions of pesos, but the most important is that the workers had a better quality of life at work.

EVALUATION OF THE DEVELOPMENTAL EYE MOVEMENT TEST IN PATIENTS WITH RIGHT-TO-LEFT READING PATTERNS
Tybee Eleff, OD; Daniella Rutner, OD; Rimma Kapatsinskaya – SUNY State University of New York

Background: The Developmental Eye Movement (DEM) test is a visual-verbal test used in the evaluation of oculomotor dysfunctions. The DEM is standardized for patients whose primary language is English, which is read in the left-to-right direction. The goal of this study was to compare DEM test results for the right-to-left reading direction versus the left-to-right direction in children and adults whose primary language is read from right-to-left. If the results were dissimilar this would indicate that this population may be overdiagnosed with oculomotor deficiencies.

Methods/Case Summary: Forty children and adults aged 7-32 completed the DEM test. Vertical scores were recorded for all subjects. All subjects then completed the horizontal test in both right-to-left and left-to-right directions. Horizontal scores, total errors on the horizontal test, and ratios were calculated for each reading direction.

Results: No statistically significant differences were found between the horizontal completion times, total number of errors, or calculated ratios of the two tested reading directions.

Discussion/Conclusion: This study shows that the DEM test yields similar results on all subtests for both directions in patients whose primary language has a right-to-left reading pattern. The DEM, with its standard left-to-right protocol is clinically useful in this subset of patients with right-to-left reading and writing patterns.

THE EFFECT OF LOW PLUS LENSES ON AN ASPERGER’S PATIENT WITH MILD GAZE AVOIDANCE
Janette D. Dumas, OD – Assistant Professor, Southern College of Optometry

Background: Aspergers Syndrome is part of the Autism Spectrum Disorder, ASD. It is thought to be a milder variant of autism. It is the result of neurological disorder that affects the functioning of the brain. Patients with Aspergers have trouble communicating and socializing with others because of delays in language development. There are also several visual dysfunctions associated with Aspergers including gaze aversion. Base up and base down prism have been known to reorganize the visual space of Aspergers patients which enable them to attend and process visual stimuli more effectively. This case gives an example of improved visual gaze with low plus lenses.

Case Summary: KS is a 6 y.o. male that presented to The Eye Center at Southern College of Optometry for an eye examination. His birth history was normal. Developmentally, the mother stated that he has made improvements in his speech and language development since he was enrolled in speech therapy at school. His medical history was remarkable for Aspergers Syndrome. Entering Visual acuity was 20/15 OD, OS in the distance and 20/15 OD, 20/20 OS without correction. Randot Stereopsis was positive forms and 40 sec of arc with the Wirt circles. EOMs were full but jerky and NPC was to the nose. In further evaluation of his eye movements, Northeastern State University College of Optometry Eye Movement Test revealed a reduced ability to control head and body movement. Cover test was ortho in the distance and ortho at
near. Distance retinoscopy revealed +0.25DS OD 20/15 and +0.50 DS 20/15. Monocular Estimation Method, MEM was +0.75 DS OD, OS. During the examination, it was observed that KS attended to objects and people for short periods of time and seemed to lose interest quickly. However, once a trial lenses of +0.50 was placed on him, it was noted he brought the object of regard closer and attended to the target more intently. The mother noted the difference as well. His eye contact with the doctor improved with the trial lenses. Diagnosis: Low Hyperopia OU. He was prescribed +0.50 OU for full time and was return to the clinic in four weeks.

**Discussion:** It is known that plus lenses allow a person to localize objects as being further away while reducing physiological stress. This case report will discuss the visual evoked potential of the patient with and without glasses and review the literature on the possible mechanism of the improvement of gaze attention with low plus.

**OPTOMETRIC VISION THERAPY’S ROLE IN REFLEX SYMPATHETIC DYSTROPHY SYNDROME (RSDS)**

Mehrnaz Azimi Green, OD, FCVOVD

**Background:** RSDS is a chronic condition where patients experience continuous, intense pain that gets worse over time. Exact etiology is not clear, but believed to be a result of dysfunction in the central or peripheral nervous systems. Some patients report a triggering injury, but that is not always the case. Often the pain spreads to include the entire arm or leg, even if the initiating injury might have only been to a finger or toe. Pain can sometimes travel to the opposite extremity. It may be heightened by emotional stress. Common signs include changes in color, temperature, texture, nail and hair growth over the affected body part accompanied by intense burning pain, skin sensation, sweating and swelling. Spontaneous remission from symptoms occur in some cases, others have unremitting pain and crippling irreversible changes in spite of treatment. Treatment is aimed at relieving painful symptoms so that patients can continue their activities of daily living. The following therapies are frequently prescribed: physical therapy, psychotherapy, sympathetic nerve block, medications (topical analgesic, antiseizure, antidepressants, corticosteroids, and opioids).

**Case Summary:** RR is a 48 Y.O. male attorney referred to our office by a primary care optometrist for a binocular vision assessment after complaining of severe ocular asthenopia associated with reading and computer use. His medical history was remarkable for RSDS diagnosed 3 years earlier, which is poorly controlled with corticosteroids as needed and physical therapist recommended exercises every morning. He was corrected to 20/20 OD, OS, OU at distance with his current spectacle Rx: OD -6.00-1.00X107, OS -5.75-0.25X090. At near, his VA reduced to 20/30 OD, OS, OU addition of +1.00 lenses OU “blurred”. Static Retinoscopy revealed the following: -6.50-1.00X107 OD and -6.75-0.25X090. Bell retinoscopy revealed revealed poor release or relaxation of accommodation. Convergence near point was 5 inches for break and 20 inches for recovery. Pursuits testing revealed poor fixation and significantly jerky eye movements. Cover test revealed orthophoria at distance and 15 diopters of exophoria at near. No changes in spectacle Rx were given initially. A program of vision therapy was started that focused on fixation, pursuits, accommodative flexibility, and convergence. After approximately one month of therapy once a week, RR was able to accept a plus one add over his current Rx and reported more ocular control and awareness. He continues his home vision therapy program to develop ocular awareness and relaxation, which he feels also helps him with his body pain and awareness.

**Conclusion:** Developmental ocular evaluation is warrented in patients with RSDS. These patients may be experiencing ocular stress secondary to their condition and may greatly benefit from vision therapy.

**COMPARISON OF SYMPTOMS AND OBJECTIVE READING DATA AFTER TREATMENT BY TINTED LENSES**

Dustin Dixon, MS; Third Year Optometry Student, W.C. Maples, OD, FCVOVD – Professor of Optometry, SCO; Richard Hoenes, MS – Statistician, Northeastern State University; Marc Taub, OD, FCVOVD – Professor of Optometry, SCO

**Background:** The Irlen lens has been a method of treating reading problems for 30 or more years. One of the criticisms is the subjective nature of the testing procedures. An instrument has been developed (Intuitive Colorimeter) to more objectively measure the proper hue, tint and saturation.
Methods/Case Summary: Twenty normal adult subjects without eye pathology self-administered the COVD-Short Form Quality of Life instrument and was tested with the Intuitive Colorimeter to identify the ideal tinted lenses for the individual. They were then divided into three groups, each with their BVA distant Rx: one group was prescribed the best tint identified. The second group a the opposite tint to the one chosen and the last group continued was not Rxed a tint. A Readalyzer was performed on each subject at the beginning of the project. Each subject wore the prescribed lenses for at least 1 month and a Readalyzer was again performed with the lenses in place. The pre intervention reading data was compared to the post intervention reading data.

Results: There was no statistical difference in the symptoms nor any of the variables measured by the Readalyzer.

Discussion: the results of this data casts serious doubt on the value of the Intuitive Colorimeter data. It is possible since the subjects were adults and without identified reading problems that the data may have been different if we had recruited subjects with reading problems. The data may also have been different if the lenses had been worn for a longer period of time.

Conclusion: We conclude that the tints identified by the Intuitive Colorimeter does not improve variables of reading that are measured by the Readalyzer.

VISUAL STATUS OF CHILDREN WITH DOWN SYNDROME
Robert H. Duckman, OD, FCOVD – SUNY College of Optometry

Background: Down Syndrome is a developmental disorder caused by trisomy of chromosome #21. It is characterized by distinct physical and visual signs. There is a large body of literature on Down Syndrome much of it from before 2000. This poster will comprehensively look at visual function of 25 children with Down Syndrome.

Methods: The data presented in this poster are from 25 consecutive Down Syndrome children who were assessed at the Stepping Stone Day School (SSDS) and ranged in age from 2.5-5.17 years of age. The children were all enrolled in center-based programs at SSDS. There were 14 boys and 11 girls. All children were given comprehensive visual examinations including visual acuity, ocular-motor evaluation, retinoscopy and ocular health assessment.

Results: Visual acuity was measured using Teller Acuity Cards on 23 children and Lea Picture Symbols on 2 of the children. Seven (28%) had normal visual acuity (20/40 or better) and 18 children (72%) had acuity ranging from 20/60 – 20/400. Ocular motor assessment found that 60% of the children had strabismus with 8 constant esotropes and 7 exotropes (5 intermittent and 2 constant). Ocular
motilities were full and concomitant, but of very poor quality in 100% of the children. Significant refractive errors were identified in 21 with hyperopia present in 48%, myopia in 36% and astigmatism in 44% of this population. There were 2 children (8%) who had a high anisometropic refraction. Four children (16%) had no significant refractive error. Ocular health was normal in most children with these exceptions: one child with optic atrophy (4%), one child with monocular cataract (4%) and one child with nystagmus (4%). There were three cases (12%) of blepharitis and one child (4%) with conjunctivitis.

**Discussion/Conclusion:** In the young Down syndrome child there is a high prevalence of strabismus, ocular motor dysfunction, refractive error and reduced uncorrected visual acuity.

**PRISM AND VISION REHABILITATION TO TREAT POST-OPERATIVE EPILEPTIC PATIENT**

**Melissa A Zarn, OD; Hannu Laukkanen, OD – Pacific University College of Optometry**

**Background:** SM, a 33yo male, presented to Pacific University Clinic for comprehensive exam in March 2008 complaining of double vision. His medical history was significant for epilepsy diagnosed at age 16 which was treated with multiple medications to control seizures and to relieve pain post-seizure. He underwent corpus callosum ablation in January 2003. SM was referred from the primary care clinic to the strabismus clinic and then to the vision therapy clinic. He started vision therapy in February 2009 but had difficulty following the therapy plans due to continued seizure activity. He underwent right temporal lobectomy in June 2009 and returned to vision therapy in July 2009.

**Case Summary:** Pre-therapy: cover test 45°RXT with 8-10°RHyperT, accommodative amplitudes 4.25 D OD/5.00 D OS, NPC single at 1 m, stereopsis (-) RDS and 140° Wirt Circles. During early visits patient displayed poor attention and reduced consciousness; his balance was poor and he stumbled frequently when attempting to walk. Post-Therapy cover test 2°EP, 3°RHyperT, accommodative amplitudes 10 D on push-up, NPC 10/12 cm, stereopsis (+) RDS and 30° Wirt Circles. Improved balance and gait, improved attention, increased awareness of surroundings, and increased independence.

**Discussion:** This case highlights the importance of whole patient care. The visual condition is affected by medication interactions and physical conditions. Prism was an effective method of controlling the vertical deviation to allow improvement of horizontal vergence ranges and increased accommodative function through vision therapy. Additional benefits to the patient were increased independence which led to significant decreases in medication load. In 10 months, the patient was seen to become progressively less dependent on parental care, even to the point of travelling to a different region independently and spending 7-days camping alone in an isolated wilderness area.

**PROVIDING PEDIATRIC VISION CARE IN OUR COMMUNITY: A REPORT ON THE UNIVERSITY OF WATERLOO, SCHOOL OF OPTOMETRY, EXTERNAL PEDIATRIC PROGRAM**

**Lisa W. Christian, BSc, OD – Professor, University of Waterloo, College of Optometry**

**Background:** Vision disorders are a common pediatric health problem in North America. It has been well documented that the earlier a vision problem is diagnosed and treated, the less negative impact it will have on a child’s development. According to the College of Optometrists in Vision Development (COVD), one in four school-age children have vision problems that can affect academic performance. However, despite studies and reports that indicate early vision detection is a key component in a child’s development, it is estimated that only 14% of children have received a comprehensive eye examination prior to entering school (Vision Council of America). In a recent study by Vision Service Plan, it was found that three-quarters of the parents surveyed did not take their child (age five and under) for a vision examination. Based on these results, the University of Waterloo, School of Optometry (UWSO) initiated an external pediatric program in 2004 to promote and provide pediatric vision care in the Kitchener-Waterloo (K-W) community.

**Program:** UWSO currently provides full vision examinations, round-table discussions and seminar presentations to three specific focus groups: elementary schools, public childhood educational centers, and under-serviced communities. Currently
the program services over a dozen different facilities, and has seen over a thousand children that have never previously received vision care. To date, our program has been able to support the COVD statistic, finding that of the 623 full eye exams performed at local elementary schools, 152 children (24.3%) were found to have vision, binocular vision and/or learning visual problems. While UWSO is making a difference in pediatric vision care within the K-W community, more programs are needed to promote vision exams (starting at age six months) throughout the province of Ontario; with the ultimate goal of expansion throughout Canada. The UWSO external paediatric program will hopefully serve as a model for other optometrists and optometry schools to encourage and provide pediatric vision care in their community.

A REVIEW OF OCULAR DOMINANCE AND ITS EFFECT ON SPORTS
Kelley Davis, OD – Pediatric Optometry Resident, Southern College of Optometry

Determining ocular dominance is often neglected during a typical, comprehensive eye exam. There are a multitude of testing procedures and instruments that can be used to determine ocular dominance, several of which will be discussed in this paper. The age old question of, "Does ocular dominance affect athletic performance?" seems to arise in nearly every sport. One could imagine the benefit of crossed dominance in hitting a baseball, but it may be a hindrance in riflery.

A literature review using PubMed and Visionet, an internal search system at SCO, found six articles that address sports and ocular dominance. Sports discussed ranged from golf to baseball to archery. In evaluating the studies, the data is inconclusive sometimes contradictory when it comes to crossed versus uncrossed hand-eye dominance in relation to athletics. With no strong correlating data, optometrists should neither encourage nor discourage patients from a particular career path based on ocular-hand dominance patterns. Ocular dominance in athletics may become an issue when prescribing monovision or multifocal optical correction and must be considered in certain situations, especially if the patient is symptomatic. However, it should not be emphasized as an important factor in athletic performance.

OPTOMETRIC VISION THERAPY AS A TREATMENT FOR ACQUIRED NON-COMITANT DEVIATIONS
Ann M. Nolan, OD; Debbie Luk, OD; M.H. Esther Han, OD; Allen Cohen, OD; Steven Shaby, OD – SUNY State College of Optometry

A non-comitant deviation (NCD) is defined as a change in the angle of deviation of at least 5° when looking in different positions of gaze. The variation in the deviation is due to a paresis, paralysis, or restriction of at least one extraocular muscle. A patient suffering with an acquired NCD will often experience diplopia which is disruptive to their daily life. Currently, there are few report describing a detailed approach to using vision therapy in treating these patients. A case reported is presented to describe how classical optometric vision therapy procedures can be modified and adapted to maximize the field of binocular single vision. Our patient presented with a chief complaint of oblique diplopia; onset of symptoms began immediately after undergoing neurosurgery. She was diagnosed with an acquired non-comitant intermittent exotropia at distance and near, right hyperphoria, and deficits of pursuits and saccades. After completing 30 sessions of in-office vision therapy with prescribed home vision therapy, our patient had a significantly larger field of binocular single vision, improved depth perception, and improved oculomotor skills. This shows that vision therapy can be a successful treatment for an acquired NCD.