INTRODUCTION
Headache, dizziness and anxiety are common medical problems with significant impact on individual patients as well as society as a whole.

• Active general headache disorders impact 46% of the population
• Dizziness impacts 20%
• Anxiety disorders impact between 7-16%

The cost of care for these three problems in the US alone exceeds 70 billion dollars annually.2-6 The diagnosis and treatment of headache, dizziness and anxiety is usually approached individually since no single entity is routinely associated with all of these symptoms. However, many patients are refractory to or fail standard treatment and/or therapeutic modalities that target symptoms individually.

Vertical heterophoria (VH), a form of binocular vision dysfunction (BVD), can trigger all three problems. However, this is not known by the majority of practitioners in the medical and vision communities, and VH is only considered as a possible etiology for many reasons including:

• The VH/BVD symptom set is expansive and diverse, and the individual symptoms are common to many medical conditions.1-3,5-7 (Figure 1)
• Traditional BVD symptoms like dizziness/overlapping images are not present in the majority of these patients.5,22
• Lack of the current diagnostic tests (associated and dissociated phoria tests) in identifying VH patients.13-18,20
• Lack of a screening questionnaire that incorporates all of the symptom domains that are associated with VH/BVD.

Our investigation into VH/BVD began in 1995 and to date over 8000 patients have been evaluated and treated with our techniques, and anecdotally patients have experienced marked reduction in their headache, dizziness and anxiety symptoms. The purpose of this study is to document the efficacy of neutralizing prismatic lenses for reduction of headache, dizziness and anxiety in patients diagnosed with vertical heterophoria (VH) using our techniques.

RESULTS

• Using the Prism Challenge technique, prism application to neutralize VH markedly reduced all measures of headache, dizziness and anxiety (22.5%-60.8%) and an overall 78.0% subjective reduction of VH symptoms (Figure 3).
• Ophthalmology evaluation occurred in 42.9%, optometry evaluation occurred in 30.2%, and both occurred in 56.3% of patients, yet no patients were diagnosed with or treated for VH (Figure 4).
• The three most common presenting complaints in this group of VH patients was headache (32.5%), dizziness (32.5%) and neck pain (31%). Blurred/double vision was the presenting complaint in 1.6%.
• Vertical alignment tests predicted the direction of the misalignment between 25.0%-53.7% of the time, while the observed direction of the head tilt predicted the direction of the misalignment 74.6% of the time (Figure 5).
• Mean / median cumulative vertical prism prescription was 1.66 and 1.5 diopters respectively.

Figure 1. Prevalence of BVD Symptoms (% of patients) in 126 Patients (**indicates traditional BVD symptoms)

Figure 2. Baseline demographics

Figure 3. Overall Symptom Reduction, and % Reduction of Headache, Dizziness and Anxiety Metrics With Neutralizing Prism Lenses

Figure 4. Specialists Seen Prior To VH Diagnosis (% of patients)

Figure 5. Vertical Alignment Testing Accuracy (# correct tests / # of patients tested)

METHODS
This retrospective analysis followed 126 patients who were assessed by an optometric binocular vision subspecialist for symptoms consistent with VH, who went onto be diagnosed with VH, who completed both phases of treatment, and who had complete data sets. VH was diagnosed utilizing Prism Challenge, a new technique that consists of the incremental addition of small units of neutralizing vertical prism (0.250) to a trial frame containing the patient’s refractive prescription, with the goal of reducing the patients’ VH/BVD symptoms. Prism Challenge allows the patient and the doctor is diagnosed with VH when the vertical prism prescription results in a 23% reduction of the sum of seven common BVD symptoms (as measured individually on a subjective rating (0-10) scale) both before and after prism administration.

The examination phase consisted of a complete ocular and refraction exam coupled with a detailed binocular vision examination, which included vertical testing, Von Graefe phoria testing near and far, ductions, prisms (with and without dissociated phoria tests) and Prism Challenge. Also, the presence and direction of a head tilt was noted.

The treatment phase entailed the patient wearing the initial refraction and prism prescription (as determined by Prism Challenge) for 2-4 weeks, allowing their visual system to progressively relax. As this occurred, patients most often required one or two adjustments (usually minor) to their prescription. Data was collected before and after prism application and included validated survey instruments for headache (Headache Disability Index (HDI)), dizziness (Dizziness Handicap Inventory (DHI)), anxiety (Zung Self-Rating Anxiety Scale (Zung SAS)) and BVD (Binocular Vision Dysfunction Questionnaire (BVDQ)); and subjective rating (0-10 scale) of headache, dizziness and anxiety severity. Upon conclusion of treatment subjective overall improvement of heterophoria symptoms was measured utilizing a 10 cm visual analog scale.

DISCUSSION
Identification of VH (a form of BVD) in this patient cohort and treatment of the misalignment with neutralizing prismatic lenses led to marked reduction in all metrics for symptoms of headache, dizziness and anxiety, as well as for subjective metrics for overall symptom reduction (Figure 3). Approximately 30-50% reduction of symptoms occurred within 20 minutes of the initial application of neutralizing prism.

This study demonstrates the ability of the Prism Challenge technique to diagnose and initiate treatment of VH/BVD in patients with headache, dizziness, and anxiety, and the combination of the Prism Challenge technique and the BVDQ to assess treatment efficacy. Utilizing the BVDQ and the Prism Challenge technique might not be identified or treated. This prompted the development of the Binocular Vision Dysfunction Questionnaire (BVDQ). This validated instrument documents symptoms that occur when patients with VH/BVD symptoms might not be identified or treated. This prompted the development of the Binocular Vision Dysfunction Questionnaire (BVDQ).

Symptoms traditionally associated with BVD - diplopia, shadowed / overlapping vision and closing / covering an eye to ease visual tasks - were individually experienced by only approximately 25% of this cohort (Figure 1). Limiting the inquiry of VH to just traditional symptoms like these is likely to result in most patients with VH not being identified.

Current questionnaires used to assess binocular vision symptoms do not query all symptoms domains, potentially causing an under-identification of VH/BVD patients. One common validated survey instrument that addresses some VH/BVD symptoms (but only with near tasks) is the Convergence Insufficiency Symptom Survey (CISS).23-25 Symptoms queried include challenges with reading, headache, asthenopic discomfort, difficulty concentrating, reduced reading, and motion sickness. The VH/BVD symptom set is expansive and diverse, and the individual symptoms are common to many medical conditions.

The ability to treat medical symptoms that can cause significant morbidity, disability and expense (like headache, dizziness and anxiety) with an optometric treatment (i.e. - prismatic lenses) has significant ramifications for medical economics. Almost 90% of the patients in this study had a past history of evaluation and treatment for headache, dizziness and anxiety, and yet were still symptomatic at the time of presentation to this study. This new approach has the potential to significantly reduce medical expenses, as headache, dizziness and anxiety are quite common and expensive to treat, and the cost of episodic episodic optometric evaluation and treatment with neutralizing prismatic lenses is much less than continued care with treatment modalities (including medications) that are in many instances inadequately relieving the patient’s symptoms.

There are also significant implications for the field of optometry. This new diagnostic and treatment approach has the potential to significantly increase the size of the pool of patients that would benefit from an optometric intervention, one that would provide significant symptom relief for a very uncomfortable patient cohort that has been unable to obtain adequate symptom relief from any other treatment modality. To be able to service this large influx of patients, the number of practicing optometrists would need to be increased. Optometrists providing this care would be functioning as medical subspecialists, as they would be providing care for patients referred to them by primary care physicians or specialty physicians for treatment of medical symptomatology (like headache, dizziness and anxiety) that was not adequately managed by standard medical treatment modalities. Lastly, as the treatment is low-risk, this represents a return to the foundation of optometry – caring for patients and reducing their symptoms using lenses.

CONCLUSIONS

• The set of symptoms associated with VH and BVD is much broader than is traditionally understood
• The most common presenting symptoms of VH are headache, dizziness and neck pain. Blurred / double vision is rarely the reason why the patient sought care
• Current phoria tests lack adequate sensitivity to reliably identify the presence and direction of vertical misalignment
• Utilization of a new approach to identify the presence, the direction and the amount of vertical misalignment (Prism Challenge technique) allowed for the identification of VH patients that were previously missed when using standard assessment techniques
• Use of the resultant vertical prism prescription led to a rapid and marked reduction of headache, dizziness, and anxiety symptoms in these VH patients
• VH/BVD symptoms are commonly experienced by patients with headache, dizziness, and anxiety, particularly those patients who have experienced less than desirable outcomes with standard treatment modalities
• The effectiveness of this treatment approach highlights the need for further prospective and multicenter studies