

# **A Common and Treatable Cause of Dizziness, Headache and Anxiety Refractory to Standard Treatments: Vertical Heterophoria**

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**Based on observation of more than 3500 cases, we describe a distinct medical syndrome that is characterized by dizziness, headache and anxiety. These symptoms are visually mediated and are caused by a form of binocular dysfunction characterized by vertical misalignment of the lines of site of the two eyes (*Vertical Heterophoria – (VH)*). The patients we describe can have VH based on vertical displacement of the orbits and eyes associated with facial asymmetry, secondary to Traumatic Brain Injury (TBI), or secondary to aging. While many patients are able to compensate for and adapt to this misalignment, these patients are unable to do so. Typically they have been diagnosed with a wide range of non-ocular conditions, and have uniformly had poor resolution of their symptoms with standard therapies. Preliminary evidence suggests that treatment with prismatic spectacle lenses markedly reduces or eliminates symptoms in this patient group. Recognition that dizziness, headache and anxiety can be precipitated by a binocular vision disorder, and that this disorder can be effectively treated using prismatic spectacle lenses represents a new paradigm and significant advancement in the assessment and management of this severely affected patient population.**

## **Introduction**

Dizziness, headaches and anxiety are three common symptoms that cause patients to seek medical attention. For many, diagnosis and treatment proceeds without difficulty. However, there is a subset of patients in whom the etiology of these symptoms and their effective treatment has remained elusive. Despite a full evaluation using standard diagnostic methods and techniques, and after multiple consultations and therapeutic interventions, it is not uncommon for these patients to remain symptomatic. These symptoms can be disabling, resulting in a reduced capacity to work, drive a car, or even leave the house<sup>1</sup>. Many of these patients ultimately have their symptoms ascribed to malingering or a psychiatric condition<sup>1,2</sup>. In this paper, we describe the association of vertical heterophoria with symptoms of dizziness, headache and anxiety, and how these symptoms can be ameliorated with prismatic spectacle lenses.

## **Case Report #1:**

### **Chief Complaint: Headache and Dizziness after Traumatic Brain Injury (TBI)**

**History of Present Illness:** A.P. is a 27 year old female administrator who suffered a TBI when she was struck in the left eyebrow by a golf ball that had just been hit off the tee. She had no loss of consciousness, but did suffer from a laceration of the left eyebrow, and traumatic iritis; a head CT demonstrated fracture of the orbital roof and a left frontal lobe contusion. This injury precipitated a number of symptoms, her most problematic being dizziness, headache, and neck pain. She described the dizziness as an unsteadiness, “like I’m on a rocking boat”, that is worsened by rolling over in bed or sitting upright too quickly. She describes the headache as a severe constant throbbing, in and around both eyes, that is worsened with eye movements and with reading but always present. The pain seemed worse in the left eye region. Acetaminophen only partially alleviated the headache; the patient refused to use narcotics due to previous side effects.

The patient was started on escitalopram after her injury to aid in healing from the TBI as well as for mood stabilization. She was evaluated by a Physical Medicine and Rehabilitation (PM&R) physician, who then referred the patient for Speech Therapy (ST), Occupational Therapy (OT) and cranio-sacral therapy (CST). She noticed some improvement in her neck ache with her CST sessions, but the relief would last only 1-2 days. The other therapies were not helpful, and she continued to remain symptomatic, particularly with her headache, dizziness and neck ache. The PM&R physician, who was familiar with Vertical Heterophoria Syndrome, recognized that the symptoms pointed to a visually mediated etiology, and referred the patient for vision evaluation.

**Associated Symptoms** include difficulty with concentrating, short term memory loss, difficulty processing multiple conversations simultaneously, difficulty reading (loses place while reading, can only read for 10 minutes due to eye fatigue / difficulty maintaining focus), motion sickness, difficulty with depth perception (resulting in an inability to drive) and anxiety in large crowds. All symptoms began after the TBI.

**Past Medical History** is positive for recurrent herpes infection, for which she takes daily oral suppressive therapy.

**Present Medications** include valacyclovir (Valtrex) and oral contraceptives.

**Family History** is negative for dizziness, headaches and anxiety.

**Social History** is negative for cigarettes and illicit. She occasionally drinks socially.

**Vision Evaluation** was performed. Abnormal findings include Von Graefe and Maddox Rod testing that demonstrated vertical heterophoria; a head tilt, eye pain with eye movements, and drifting to one side while walking. Dizziness was exacerbated with side-to-side head movements and bending over and straightening up. Initial VHS-Q score was 16. Symptoms were noted to diminish with trial-framing of the new prescription containing prismatic correction.

**Course:** The patient received her first set of glasses with prismatic correction, and was seen in follow-up 5 weeks later. At that time she felt 90% better as compared to her baseline before prismatic lens treatment. Her final VHS-Q score was 11. The patient had complete resolution of her headache, dizziness and neck ache. Her associated symptoms also resolved, with the exception of short term memory loss (which has markedly improved) and night-time driving (which she still

finds difficult). Over the course of the last 12 months, the patient has retained her symptom improvement with only minor adjustments to her prismatic lens prescription.

### **Case Report - #2**

**Chief Complaint:** Dizziness and anxiety.

**History of Present Illness:** D.T. is a 54 year old male who is a supervisor at a roofing company. Four years ago, he began experiencing “dizzy spells”, which he described as feeling lightheaded, nauseated and very dizzy. These spells lasted 7-8 hours and occurred 3-4 times per year. There did not seem to be any precipitating events. Relief could only be obtained by lying down and sleeping. Over the course of the next 3 years, he was diagnosed with hypertension, vertigo, bacterial ear infection and hearing loss; yet treatment with antihypertensives, meclizine and antibiotics was unsuccessful in preventing the dizziness episodes or in diminishing the symptoms. Over the course of the next year, the dizziness episodes increased to 3 times a month. The patient then experienced a severe episode of dizziness accompanied by a panic attack, for which he sought care in an Emergency Department, and was diagnosed as having had an anxiety attack and vertigo. The patient was then referred to an otolaryngologist. Pertinent findings included a hearing test that revealed sensorineural hearing loss, and an electronystagmogram test that was negative. Additional symptoms included anxiety for 3 years (due to his fear of having another dizziness episode), sensitivity to bright lights, drifting to one side while walking, a tilted head posture, and upper back and neck discomfort. He had frontal sinus pain which he ascribed to allergies. The otolaryngologist, who was familiar with Vertical Heterophoria, noted that the symptom complex pointed to a visually mediated etiology, and the patient was referred for vision evaluation. During the 2 months prior to vision evaluation, the dizziness episodes increased to 3 times per week, and the anxiety markedly worsened.

**Past Medical History** included a diagnosis of seasonal allergies, hypertension, and hearing loss right ear.

**Present Medications** included Allegra, Hyzaar and Antivert.

**Family History** was negative for headaches, dizziness or anxiety.

**Social History** was negative for alcohol, smoking or illicit.

**Vision Evaluation** was performed. Abnormal findings included Von Graefe and Maddox Rod testing that demonstrated vertical heterophoria, a head tilt, and tension in the trapezius muscles. He noted diminution of his neck ache after 20 minutes of wearing the new prescription containing prismatic correction, which had been placed in a trial frame (trial-framing).

**Course:** The patient was prescribed spectacle lenses containing prismatic correction for vertical misalignment, and within 7 weeks experienced complete resolution of his symptoms; he noted no further dizziness episodes, his neck discomfort was gone, and he no longer had anxiety. Over the course of the last 12 months, the patient has remained asymptomatic.

### **Case Report #3:**

**Chief Complaint: Headache**

**History of Present Illness:** CB is a 40 year old female who has experienced headaches since high school. The headaches have grown steadily more frequent and intense, becoming a daily

occurrence by the time the patient reached 30 years of age. She describes her headaches as tight and achy, starting in the nuchal and occipital region and progressing to the crown and frontal regions. Typically these headaches were worse upon awakening, becoming somewhat less severe as the day progressed. Her headaches improved somewhat with NSAID's, and much more so (but not completely) with hydrocodone. Additional symptoms included dizziness with bending over, while watching action movies and while performing close-up activities; motion sickness since very early childhood, unsteadiness with gait, difficulty with depth perception, anxiety when in crowds, occasional diplopia, tilted head posture, problems with glare / sensitivity to bright lights, frequently closing one eye to help with reading, words running together while reading, and skipping lines or losing her place while reading. At age 37, she experienced a severe headache that did not respond to either NSAID's or hydrocodone, causing the patient to seek care in the Emergency Department. The patient's headache was relieved with parenteral narcotics. The Emergency Physician caring for the patient was familiar with VH and noted that the symptoms pointed to a visually mediated etiology, and the patient was referred for vision evaluation.

**Past Medical History** included a diagnosis migraine headaches and sinusitis.

**Present Medications** include NSAID's and Hydrocodone.

**Family History** is positive for her father having had severe nausea and agoraphobia; mother and sister having had frequent, severe headaches.

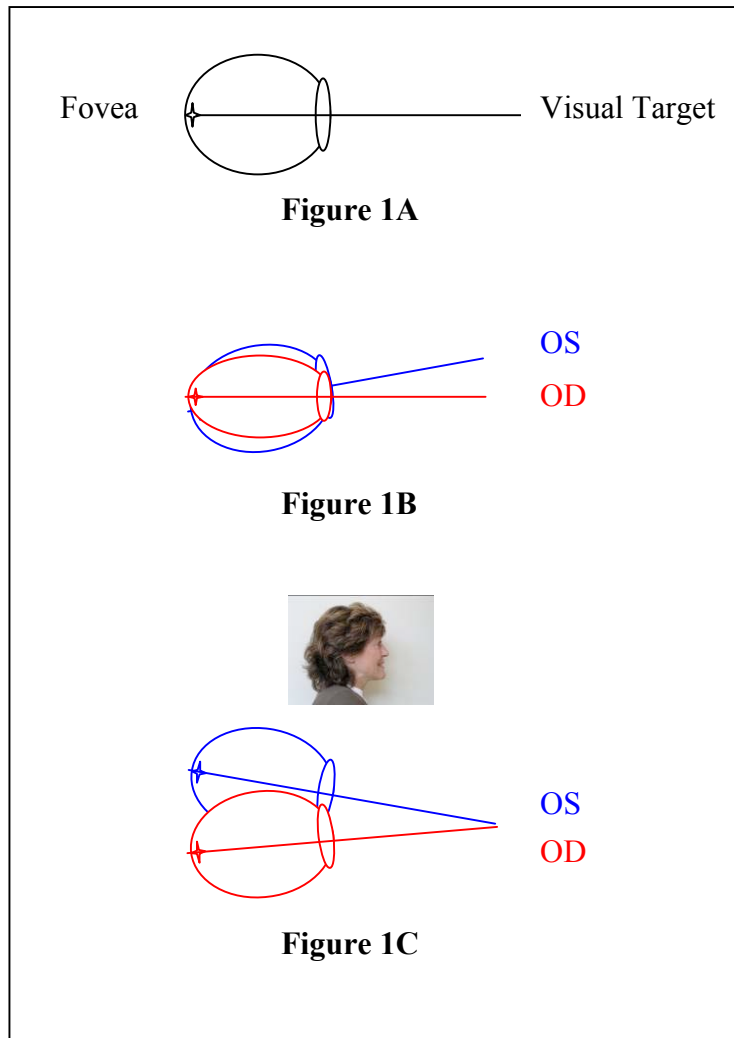
**Social History** is negative for alcohol, smoking, illicit drug use.

**Vision Evaluation** was performed. Abnormal findings included Von Graefe testing that demonstrated vertical heterophoria, a head tilt, facial asymmetry (with vertical orbital misalignment), eye pain with eye movements, and drifting to one side while walking. Dizziness was exacerbated with bending over and straightening back up. Symptoms were noted to diminish with trial-framing of the new prescription containing prismatic correction.

**Course:** The patient was prescribed spectacle lenses containing prismatic correction for vertical misalignment, and within 2 weeks noted marked improvement with all symptoms; she felt 95% improved as compared to her baseline before prismatic lens treatment. Over the course of the following 3 years, the patient has retained her symptom improvement, requiring only minor adjustments to her prismatic lens prescription.

## Definitions

In order to understand VH, one must first have an understanding of the concept of *fusion*. Fusion is the process by which a single cortical image is perceived from two separate ocular images. Difficulty with continuously maintaining fusion creates blurred vision or diplopia. Multiple correctional fusional reflexes exist to avoid this and to maintain a fused binocular image<sup>3</sup>. Vertical heterophoria describes a visual condition where the line of sight from one eye is higher than the line of site from the other eye when at physiologic rest (an ocular posture created by disrupting fusion utilizing a Maddox Rod or prism) (Figures 1a, 1b and 1c). Many people are able to compensate for this misalignment<sup>4</sup> and maintain fusion by constantly activating the appropriate elevator and depressor eye muscles. However, in some patients this process causes the extraocular muscles to become strained and fatigued, and the attempt to compensate is unsuccessful; fusion is not consistently maintained<sup>5</sup>.



**Figure 1**

Phoric eye posture in Traditional VH (Figure 1B) and in VH due to vertical orbital misalignment (Figure 1C)

*The Line of Site is defined as the line from the visual target to the fovea (Figure 1A). Note the vertical eye displacement and converging lines of site in the vertical orbital misalignment model of Vertical Heterophoria (Figure 1C).*

### **Vertical Heterophoria Symptoms**

VH is composed of a constellation of diverse symptoms that occur due to the vertical misalignment of the visual lines of site, and the body's attempt to compensate. Symptoms include headache, dizziness and anxiety; as well as head tilt, neck ache, routine visual symptoms, reading symptoms, and binocular vision symptoms (see Table 1)<sup>6,7,8,9,10,11</sup>. Extraocular muscle strain occurs in an attempt to maintain eye alignment<sup>12</sup>. This can cause headache and eye pain symptoms (asthenopia), which are frequently worsened with eye movement. Fatigued extraocular muscles are unable to consistently maintain fusion, causing transient diplopia or blurring of the image<sup>5</sup>. The fluctuating, inconsistent visual input conflicts with the non-fluctuating and consistent inputs from the vestibular and proprioceptive systems. These mismatching inputs are perceived as dizziness. Anxiety is known to be associated with dizziness symptomatology<sup>1,2,13</sup>. Head tilt is a known compensatory mechanism that occurs in vertical heterophoria to minimize vertical misalignment and avoid

diplopia<sup>7,11</sup>. Routine visual symptoms, reading symptoms, and binocular vision symptoms are all known to be precipitated by heterophoria<sup>11</sup>.

VH manifests itself along a continuum of severity; some patients have few symptoms and are minimally affected, while others have many symptoms and are completely disabled<sup>4</sup>.

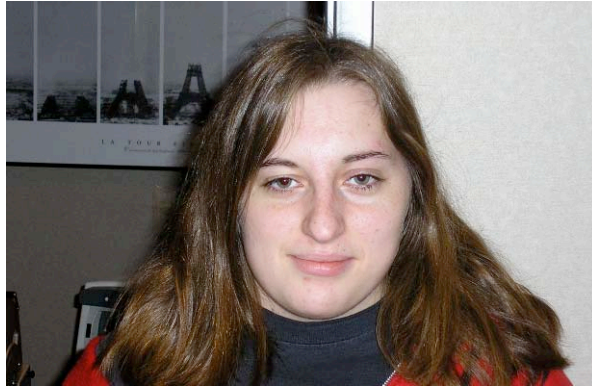
**Table 1:  
Symptoms of VH (by Symptom Category)**

<b>Pain Symptoms:</b>	<b>Reading Symptoms:</b>
Headache	Difficulty with concentration
Face ache / "sinus" pain	Fatigue with reading
Eye pain or pain with eye movements	Difficulty with reading and reading comprehension
	Skipping lines while reading
	Using a line guide (finger, ruler, envelope) to maintain one's place while reading
<b>Head Tilt Symptoms:</b>	Words running together while reading
Neck ache and upper back pain due to a head tilt	Losing one's place while reading
<b>Dizziness Symptoms:</b>	
Dizziness	<b>Routine Visual Symptoms:</b>
Lightheadedness	Blurred vision at near or far distances
Off-balanced	Difficulty with close up vision (i.e. – reading or computer use)
Motion sickness (is frequently the first symptom of VHS - can occur very early in childhood)	Difficulty with night vision
Nausea	Eye strain
Poor depth perception	Sore eyes
Lack of coordination	
Unsteadiness or drifting to one side while walking	<b>Binocular Vision Symptoms:</b>
Difficulty walking down grocery aisle	Double or overlapping vision
Disorientation	Shadowed vision
	Light sensitivity
	Difficulty with glare or reflection
	Closing / covering one eye while reading
	<b>Psychological Symptoms:</b>
	Feeling overwhelmed or anxious in crowds
	Agoraphobia
	Feeling overwhelmed or anxious when in large contained spaces like malls or big box stores

## Physical Exam

Physical exam findings can include facial asymmetry with one eye physically higher than the other eye (see Figure 2) and a compensatory head tilt<sup>7,11</sup> that is frequently associated with trapezius muscle tension. Reproduction of the headache and dizziness symptoms often occurs during testing of extraocular range of motion and with Near Point of Convergence (NPC) testing. Drifting to one side while walking is often seen in VH patients who have dizziness. There can be an exacerbation of dizziness symptoms by bending over and quickly becoming upright, or by rapid vertical and horizontal head movements. Ocular exam will often (but not consistently) reveal vertical image displacement via binocular vision tests such as Von Graefe, Maddox Rod and Vertical Vergence testing. These patients rarely demonstrate CN 4 lesions or SO palsies. Vertical Vergences amplitudes are small (unlike the very large Vertical Vergence amplitudes found in long-standing CN 4 lesions<sup>14,15</sup>). Otolaryngologic and neurologic evaluations of these patients are usually negative. Examination of the retina and anterior chamber does not reveal abnormalities, and intraocular

pressures are normal. Refractive error varies from patient to patient, and must be corrected prior to assessment and correction of the vertical misalignment.

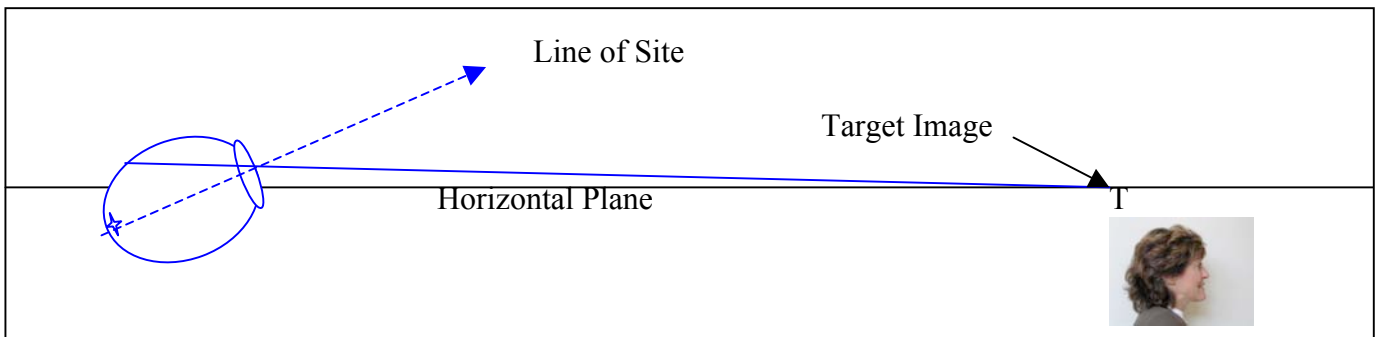


**Figure 2**

Facial Asymmetry in Vertical Heterophoria  
*Notice the left eye is vertically displaced upward.*

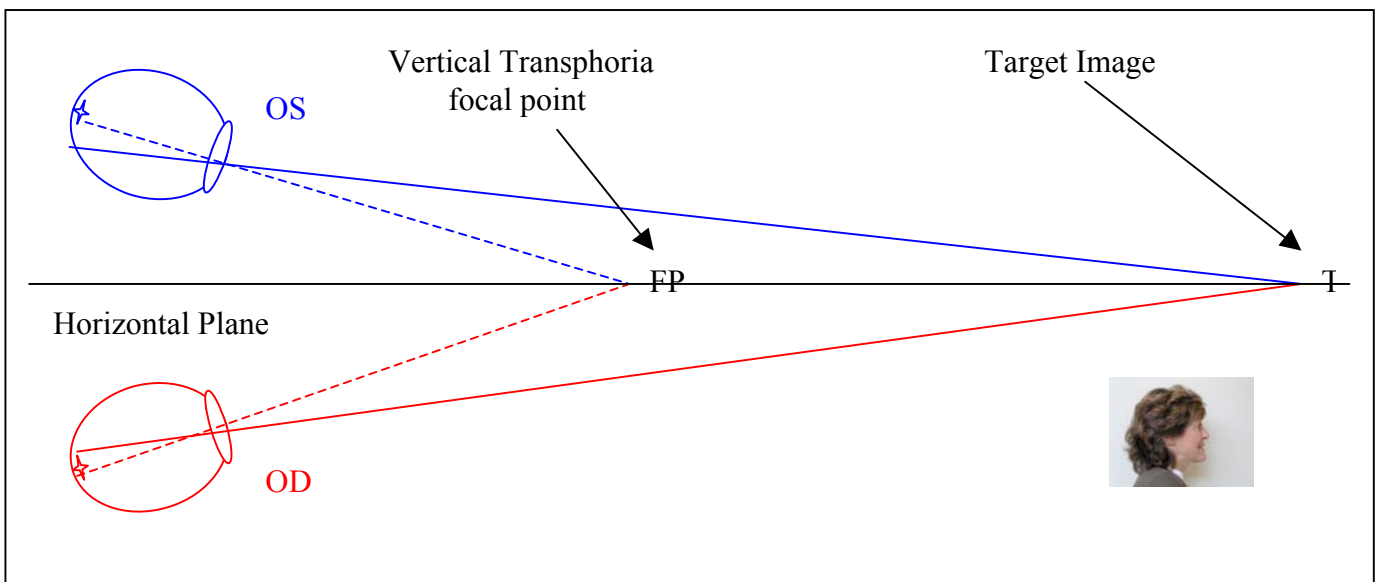
## Pathophysiology

We have observed that VH patients have a unique phoric posture of the eyes coupled with a compensatory divergence that is very similar in nature to the phoric posture and compensatory divergence that occurs with esophoria on a horizontal plane, except that in VH it is occurring on a vertical plane. In this new phoric posture, which we have named *Vertical Transphoria*, the eyes assume a vertically “cross-eyed” position (Figure 1c and 2b) which causes the higher eye to see the higher image; this is dissimilar to the phoric posture of those with a Cranial Nerve 4 (CN 4) lesion / Superior Oblique (SO) palsy, where the higher eye sees the lower image (see Figure 1b and Figure 2a).



**Figure 2a: Model of SO palsy and CN 4 lesion:**

*Elevated or “high” eye has the target image striking the retina above the fovea, which is interpreted by the brain as a low image (Line of Site = dotted line; Image from Target = solid line)*

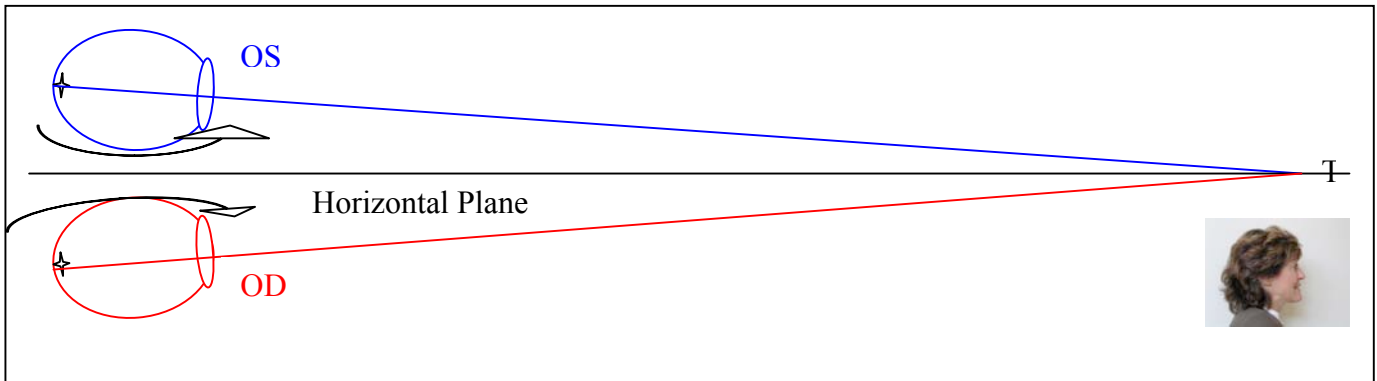


**Figure 2b: Phoric Position of the Eyes in Vertical Transphoria:**

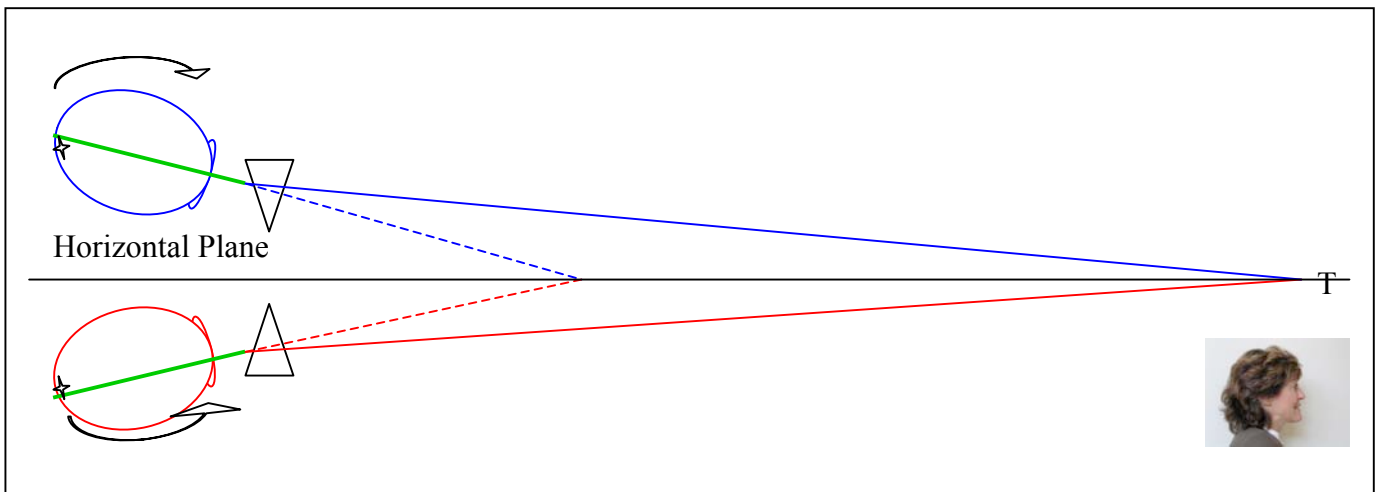
*Elevated or “high” eye has the target image striking the retina below the fovea, which is interpreted by the brain as a high image (Line of Site = dotted line; Image from Target = solid line)*



VH patients have symptoms that are relieved with base-up prism over the high image / high eye, and base-down prism over the low image / low eye. The fact that symptomatic relief is obtained with this prism configuration indicates that the eyes are in a vertically divergent posture, which is the posture one would expect the eyes to assume in order to compensate for their initial “cross-eyed” configuration (see Figure 2c-2d).

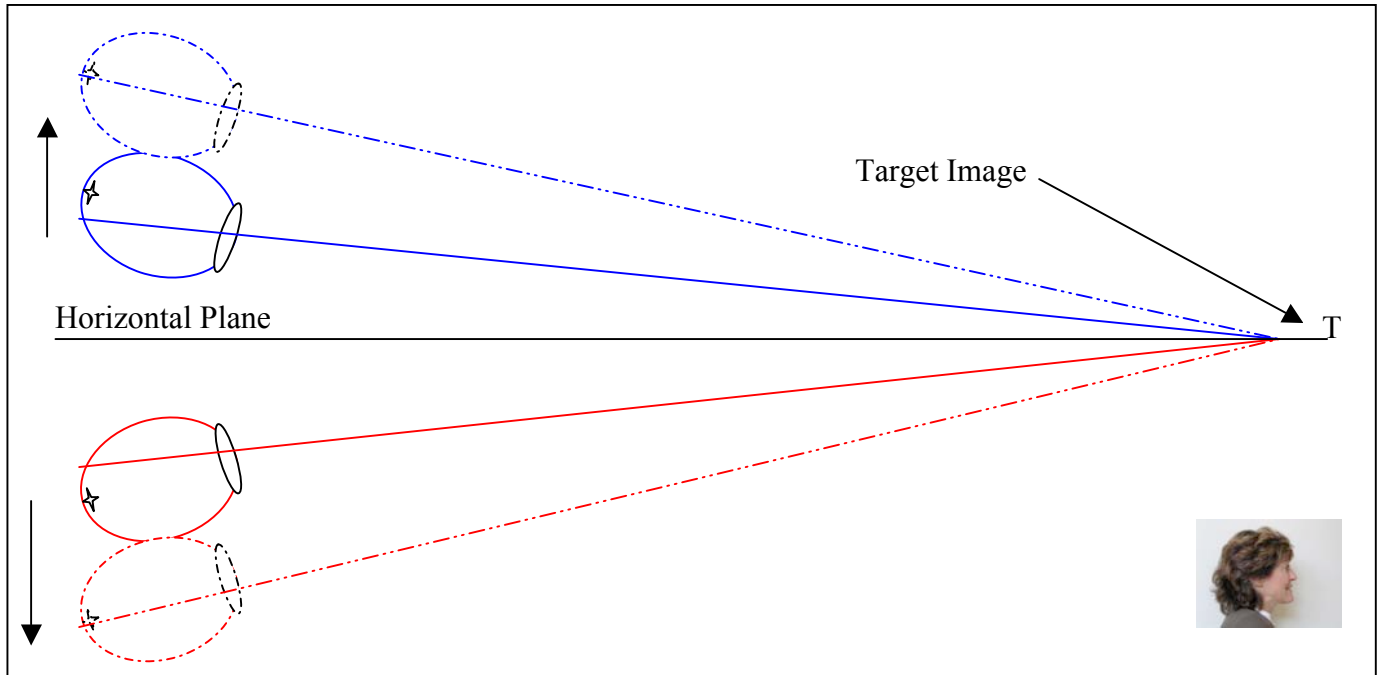


**Figure 2c: Compensatory Vertical Divergence:**  
*A newly described eye movement that is in response to Vertical Transphoria*



**Figure 2d: Prismatic Correction of Compensatory Vertical Divergence:**  
*Prism aligns Line of Site with Image from Target (Line of Site = dotted lines; Image from Target = solid lines; merging of Image from Target with Line of Site using prism = green line)*

A compensatory head tilt is observed in most VH patients. This effectively increases the vertical distance between the two eyes (see Figure 2e - dotted eye images), which causes the image to be projected higher on the retina (and closer to the fovea) of the high eye, which would be perceived by the brain as a lowering of the image; the opposite would occur with the image of the lower eye. Indeed, this model correlates exactly with the perception by VH patients of how the image moves in relation to tilting of the head.



**Figure 2e: Effects of Head Tilt on the Projection of an Image onto the Retina in VH:**

*Increasing the vertical separation of the eyes moves the Image from Target closer to the foveas (Position of eyes (with associated Image from Target) with head tilted = dotted image and dotted line; position of eyes (with associated Image from Target) with head upright = solid image and solid line)*

### Prevalence and Precipitants of Vertical Heterophoria

It is difficult to estimate the percentage of the population requiring treatment for this condition since the tests utilized to delineate vertical deviations do not consistently identify who is symptomatic. Some patients have measurable vertical deviations, yet are asymptomatic and don't require treatment; while others have no measurable vertical deviations yet are symptomatic and do require treatment<sup>4</sup>. It has been our experience that VH is common among those patients whose symptoms did not respond well to the standard treatment modalities for dizziness, headache and / or anxiety. A rough estimate places prevalence of symptomatic VH at between 5-10% of the population, which would make this condition quite common.

The onset of VH occurs most frequently in people who are in their mid-fifties, and while the exact etiology is uncertain, it appears to correlate with a diminution of elasticity in the muscles and ligaments of the eyes associated with aging<sup>16</sup>. It is important to note, however, that VH can first appear at any age and has been known to occur in very young children as well as in the elderly.

There are a number of anatomical and situational factors that predispose the patient to, or precipitate the onset of VH (see Table 2). While the most common causes of VH in our patients appear to be vertical orbital misalignment, TBI and aging, there apparently are multiple pathways to becoming symptomatic with VH.

**Table 2:  
Anatomical and Situational Precipitants of VH**

Hereditary / congenital facial and orbital asymmetry
Failure of compensatory fusional mechanisms due to aging
Demanding near visual tasks (reading, computer work)
Driving, particularly at high speeds and around curves
Viewing action movies
Complex disorienting visual stimuli – grocery aisle, crowds, high ceiling buildings (e.g.-malls)
Traumatic Brain Injury
High esophoria / high exophoria
Strabismus / Heterotropia

### Diagnosis and Treatment of Vertical Heterophoria

In our experience, the symptoms of VH are common to many other disease entities (see Table 3). Affected patients should undergo otolaryngologic and neurologic evaluations to rule out other disease entities. Reduction and / or elimination of symptoms with prismatic lenses is diagnostic of VH, as well as therapeutic. It is interesting to note that VH symptoms can be exacerbated in those with VH (or can be produced in people without VH) with the application of inappropriate prism<sup>17</sup>.

**Table 3:  
Differential Diagnosis of VH (by Symptom Category)**

<b>Pain Symptoms:</b>	<b>Reading Symptoms:</b>
Migraine Headache	Reading or learning disabled
Sinusitis	ADD / ADHD
TMJ	Convergence insufficiency
Chronic Daily Headache	Binocular vision abnormality
TBI / Post Concussion Syndrome	Astigmatism
	Hyperopia
<b>Head Tilt Symptoms:</b>	TBI / Post Concussion Syndrome
CN 4 lesion / SO palsy	
Scoliosis	<b>Routine Visual Symptoms:</b>
Torticollis	Myopia
	Hyperopia
<b>Dizziness Symptoms:</b>	Astigmatism
Benign Positional Vertigo	
Meniere's Disease	<b>Binocular Vision Symptoms:</b>
Visual Vertigo	CVA
Psychogenic Dizziness	Neuromuscular weakness
Chronic Subjective Dizziness	Brain tumor
CVA	TBI / Post Concussion Syndrome
Neuromuscular weakness	
Brain tumor	<b>Psychological Symptoms:</b>
TBI / Post Concussion Syndrome	Anxiety
Migraine Associated Vertigo	Psychogenic Dizziness
Cervical Vertigo	Depression
	Agoraphobia
	Chronic Subjective Dizziness
	TBI / Post Concussion Syndrome

A comprehensive vision evaluation is performed, with particular attention paid to the patients' constellation of symptoms, the physical exam findings and the results of binocular testing (Von Graefe, Maddox Rod and Vertical Vergence tests). During the initial examination, once prism is applied, patients experience a reduction in the symptoms associated with VH. The visual system relaxes and adapts to the initial prismatic lens prescription, and in many cases one or more modifications to the prism prescription will be required<sup>18</sup>. Upon stabilization of the prismatic lens prescription (which occurs over the course of weeks to months), symptoms are noted to improve markedly or disappear completely.

## Discussion

It is a routine matter for patients to seek medical attention for symptoms of dizziness, headaches and anxiety, and it is not uncommon that for a subset of these patients, the evaluation and treatment can be difficult and most unsatisfying. In this group, thorough evaluation, consultation, testing and imaging does not provide an answer; multiple treatments are tried but often do not provide these patients with adequate relief from their symptoms. It is not unusual to eventually consider a psychiatric diagnosis in this cohort. This results in frustration for both the patient and practitioner.

It now appears that there is a diagnosis that may not only explain why these patients are symptomatic, but might offer them hope for amelioration of their symptoms as well.

Review of the literature reveals that there have been previous attempts to define, evaluate and treat this group of patients:

- Stevens first described vertical heterophoria in 1883 (*hyperphoria*), and associated this condition with dizziness, anxiety, fear of walking in crowds and a tilted head posture<sup>19</sup>.
- Guerraz and Yardley studied a condition called *Visual Vertigo*, in which certain complex disorienting visual stimuli (walking down supermarket aisles or in crowds or in structures with high ceilings; driving; or observing moving objects) provoke or exacerbate dizziness symptoms. They concluded that dizziness occurred in these patients due to difficulties resolving sensory conflict between visual and vestibuloproprioceptive inputs, with an over-reliance on the visual inputs<sup>13</sup>.
- *Psychogenic Dizziness* is a vague term that has been used to describe anxiety associated with dizziness of unknown etiology. Staab and Ruckenstein have more clearly delineated the relationship between nonvertiginous dizziness and anxiety, migraine headache, Traumatic Brain Injury (TBI) and certain antecedent and coexisting medical conditions (*Chronic Subjective Dizziness*)<sup>2</sup>.
- *Migraine-Anxiety Related Dizziness (MARD)* is a phrase coined by Furman, Jacob, Balaban and Marcus in 2005. Given the link between migraine & balance disorder and anxiety & balance disorder, it is their contention that there must be a subgroup of such patients that will manifest with migraine, anxiety and a balance disorder<sup>20</sup>.

It appears that the patients described in the aforementioned conditions are the same patients that we are identifying as having VH. While the various treatments associated with these conditions (surgery, medications, vestibular rehabilitation) have been helpful for some patients, many still remain symptomatic. By comparison, it has been our experience that treatment with prismatic lenses appears to be very effective in reducing symptoms in this patient cohort.

Prior reports indicate that headache and visual symptoms caused by vertical heterophoria could be treated with prismatic spectacle lenses. Roy wrote a series of articles in the 1950s that described the effective treatment of headache patients with prismatic spectacle lenses<sup>10,21,22,23</sup>. Schrier<sup>9</sup> wrote articles in the 1970s and 1980s that also described a similar patient population that was helped with prismatic lens treatment. We have discovered that in addition to headache and visual symptoms, dizziness and anxiety are also prominent in many of our patients with VH, and are amenable to treatment with prismatic lenses.

While the prevalence is unknown, many factors exist to suggest that VH is quite common:

- The major VH symptoms - dizziness, headache and anxiety - are common complaints requiring evaluation by the primary care physician.
- Facial asymmetry and vertical orbital misalignment is the norm rather than the exception – a number of our patients have noticeable vertical orbital misalignment.
- Our modern lifestyle predisposes us to become symptomatic from VH, particularly due to the visual demands of intense and prolonged near tasks (i.e. - computer work), and far tasks (i.e. - extensive driving).
- VH appears to be quite prevalent in those with TBI; the incidence of TBI is rising due to motor vehicle collisions, and most recently due to injury in the line of military duty.
- Over the last 13 years our practice has diagnosed and treated over 3500 patients with VH, with the majority of them (3000 patients) being seen over the last 5 years.

Prismatic lens treatment in VH patients has led to very favorable results - the average patient reports a subjective improvement in their symptoms of 80% compared to their baseline prior to treatment with prismatic lenses.

It is apparent that further research needs to be done in this area. In order to be able to diagnose VH with certainty, and to be able to accurately evaluate the progress of these patients with treatment, an Inventory or Questionnaire needs to be developed and validated. Further retrospective data analysis would be useful to more completely delineate both the characteristics and prevalence of these characteristics in this patient population. Prevalence studies in different patient subsets and in different specialty / subspecialty venues would be of interest. Prospective blinded studies to determine the actual effectiveness of the prism as compared to the placebo of the standard prescription without prism also need to be performed. The pathophysiology of this entity needs further elucidation. Physiological studies need to be performed to determine the function and interaction of the vestibular system in these patients. While much remains to be done in this area, our initial results show that using prismatic lens treatment for these patients' symptoms appears very promising, and is worthy of further evaluation.

## **Conclusion**

In this article, we redefine the constellation of symptoms, clinical findings and treatment associated with Vertical Heterophoria. VH appears to be very prevalent, and seems to address a substantial number of patients who were previously refractory to the management of their debilitating symptoms of dizziness, headache and anxiety. Prismatic lens treatment appears to be very effective in treating this patient population. Dizziness is a much more prevalent symptom of VH than had been previously described. Ongoing research is demonstrating that there appear to be other patient subsets that are affected by this condition. Much more data needs to be obtained to further determine who is affected by VH, as well as to delineate optimal diagnostic and treatment protocols and strategies.

“Who, indeed, could have supposed that a mere ocular defect could have given rise to so serious a train of evils...and who that had not seen it could believe that the correction by glasses of the eye trouble could have given a relief so speedy and so perfect that [the patient] herself described it as a miracle?”

S. Weir Mitchell, *Headaches and Eye Strain* April 1876 <sup>(13)</sup>

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