

# VISION THERAPY

## IN AN

# ADULT SAMPLE

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### ABSTRACT

*We conducted a retrospective review of adult (over 26 years of age) patients' records. These individuals had at least one therapy visit in the Vision Therapy Service of the State University of New York, State College of Optometry. The timeframe chosen was from September 2001 to September 2004. The review yielded 248 records that met the above criteria and, of these, 241 were available for review. The average age of these patients was 39.7 years. The data recorded for each patient were: occupation, referral source, symptoms or reasons to seek vision therapy, computer use, ocular and medical histories, medications, visual diagnoses, number of vision therapy sessions completed, reasons for cessation of therapy and patients' evaluations of the effect of the therapy. The most common symptom was eyestrain, reported by 28% of the patients. The most common diagnosis was convergence insufficiency, found in 50% of patients. The average number of therapy visits per patient was 12. Ninety four percent of the 80 subjects who had been queried, strongly or moderately agreed with the statement, "vision therapy has made a significant improvement in the ease at which I perform my daily activities."*

### KEY WORDS

*adult patients, computer use, convergence insufficiency, diplopia, eyestrain, medical*

*history, medications, occupation, ocular history, referral, symptoms, vision therapy*

### INTRODUCTION

There are a limited number of studies in the optometric literature regarding vision therapy (VT) and adult patients.<sup>1-5</sup> The majority of these studies dealt with convergence insufficiency.<sup>2-4</sup> To our knowledge, there have been no reports of the characteristics of these patients that could be used as a profile for planning purposes in both private and institutional VT clinical settings. The purpose of this study is to provide data regarding adult patients who were treated in the VT Clinic of the State University of New York, State College of Optometry (SUNY) during a three year period.

### BACKGROUND

Patients are evaluated and treated in the VT clinic after referral from within SUNY, or by a direct referral from an outside professional. In the former instance, the record of the last comprehensive optometric evaluation is provided. When the patient is referred from a source external to SUNY, a copy of the individual's most recent eye examination must be received prior to the initial VT evaluation. After reviewing that record, a VT staff optometrist decides whether a further comprehensive optometric evaluation, performed at SUNY, is required before the initial VT evaluation.

At the initial VT visit all patients receive evaluations which include: visual acuity, cover testing, externals, ocular motor status, phorometric testing of distance and near phorias and vergence ranges, and

accommodative testing. Additional or supplement testing can include ophthalmoscopy, refraction, cheirosopic tracing, vectogram ranges, fixation testing, correspondence testing, and more specialized ocular motility evaluations. When both the comprehensive and initial VT evaluations indicate that VT is an appropriate intervention, the clinician discusses the findings and recommendation to institute therapy with the patient. If the patient agrees, a schedule is developed for the number of visits to be conducted on a weekly or other appropriate basis. In virtually all instances the patient is under the care of the same staff doctor or resident when the therapy is provided one time per week. When VT is conducted more than once per week, every effort is made to have the same doctor or resident provide the service. In some instances these optometrists provide direct care, but in other instances these doctors supervise care given by students.

### METHODS

We conducted a retrospective review of charts for patients over the age of 26 who had at least one therapy visit, in the VT clinic at SUNY between September 2001 and 2004. The lower age limit of 26 was chosen in order to decrease the number of graduate and professional students, who, by virtue of being in school, may have more near visual demands than non-students. For those charts that met the criteria we recorded: patient ages, occupations, referral sources, entering symptoms or reasons for seeking VT, details of computer use, ocular and medical histories, medications being taken, visual diagnoses, the number of therapy sessions, the reasons for cessation of therapy, and patient opinion of the effects of VT.

**Table 1. Reported Occupations of Patients (n=185)**

Occupational Category	Number (%) of patients
Student (GED, undergraduate, graduate, professional)	40 (21.6)
Service (security, waiter, etc.)	19 (10.3)
Art/Entertainment (artist, photographer, dancer, singer)	16 (8.6)
Professional (executive, CEO)	16 (8.6)
Financial (banker, accountant)	13 (7.0)
Writer (journalist, editor, freelance)	13 (7.0)
Not Working (unemployed, homemaker)	12 (6.7)
Education (teacher, principal, professor)	12 (6.7)
Attorney	12 (6.7)
Office work (secretary, receptionist, clerk)	12 (6.7)
Health Care (physician, dentist, nurse)	10 (5.3)
Retired	9 (4.8)
"Self-Employed"	1 (0.5)

**Table 2. Referral Source for Adults to Vision Therapy (n=241)**

Referral Source	Patients (%)
SUNY	n=170 (70.5)
Outside Optometrists	n=38 (15.8)
MBA Program from New York University	n=14 (5.8)
Outside Ophthalmologists	n= 7 ( 2.9)
Psychologists	n= 4 ( 1.7)
Vestibular Institute (Rusk Institute)	n= 3 ( 1.2)
Speech Therapist	n= 1 ( 0.4)
Occupational Therapist	n= 1 ( 0.4)
Otolaryngologist	n= 1 ( 0.4)
Vision Screening	n= 1 ( 0.4)
School	n= 1 ( 0.4)

**Table 3. Reported Symptoms or Reason for Seeking Vision**

Symptom/Reason for Therapy	Number (%) of Patients
Eyestrain	n=68 (28.2)
Diplopia	n=49 (20.3)
Loss of Place/ Words Move when Reading	n=49 (20.3)
Headaches	n=47 (19.5)
Near Blur/ Focusing Problems	n=40 (16.6)
Eyes Tired when Reading	n=38 (15.7)
Eye Turn Noticed	n=16 ( 6.6)
Learning Disability Concerns	n=14 ( 5.8)
Dizziness	n=6 ( 2.5)
Slow at Reading	n=4 ( 1.7)
Unable to Read/Poor Reader	n=3 ( 1.2)
Poor Standardized Test Taker	n=2 ( 0.8)
Poor Coordination	n=2 ( 0.8)
Myopia Control	n=1 ( 0.4)
Amblyopia Treatment	n=1 ( 0.4)

## RESULTS Subjects

Two hundred forty eight charts met the criteria. Of these, 241 were available for review. The average patient age was 39.8 years (range 26 to 81 years). The median age was 35 years. Five percent of patients were over the age of 65. Fifty nine percent of patients were female, 41% were male.

### Occupation

This information was available on 185 (76.7%) of the patient records. Of these, the most commonly reported occupation (21.6%) was student. This included 6% who were students at SUNY. The second most reported occupation was service (10.3%) that included waiter/waitress, security, etc. The list of reported occupations is presented in Table 1.

### Referral Sources

One hundred seventy patients (70.5%) were referred from within SUNY. The remaining 30% were referred from external providers. The most common external providers were optometrists (38 patients, 15.8%), followed by a neighboring university graduate program, (14 patients, 5.8%), ophthalmologists (seven patients, 2.9%), psychologists (four patients, 1.7%), and a vestibular treatment center (three patients, 1.2%). One patient was referred from each of the following sources: a speech therapist, occupational therapist, otolaryngologist, a vision screening, and school. See Table 2.

### Entering Symptoms or Reasons to Seek VT

These were determined by a review of the following: a history form, filled out by patients who had a comprehensive examination at SUNY, correspondence and examination notes for patients referred by outside providers, and symptoms reported during the initial VT evaluation. The most common symptom reported was eyestrain (28.2%). This was followed by diplopia (20.3%), loss of place and/or words move when reading (20.3%), headaches (19.5%), near blur/focusing problems (16.6%) and eyes tire when reading (15.7%). Other symptoms, reported by less than ten percent of the sample included awareness of eye turn, learning disability concerns, dizziness, slow reading speed and unable to read/poor reader. Less than one percent of patients reported the following reasons for seeking VT: poor standardized test taker, poor coordination, myopia control, and amblyopia

**Table 4: Status Post (S/P) Surgical Patients' Visual Complaints Prior to Starting VT**

S/P Strabismus Surgery (n=7)	S/P LASIK Surgery (n=6)	S/P Cataract Extraction (n=1)
Headaches (2 patients)	Diplopia (3 patients)	Diplopia
Diplopia (3 patients)	Eyestrain	
Focusing Problem	Myopia Progression	
Eye Turn Noticed	Loss of Place when near work	
Eye Tired		
Dyslexia Concerns		
None		

Some patients reported multiple symptoms  
Where no number is indicated, the complaint was made by just one patient

**Table 5: Medications by Class and Ocular Side Effects.<sup>9</sup> Prescription or non prescription medications reported to be taken by 94 of the 241 patients (39%). Medications with potential ocular side effects that are listed in the right column are in bold type.**

Anti-Psychotic Medications	
Medication Name	Potential Side Effects
<b>sertaline (Zoloft),<sup>a</sup> bupropion (Wellbutrin),<sup>b</sup> risperidone (Risperdal),<sup>c</sup> paroxetine (Paxil),<sup>b</sup> alprazolam (Xanax),<sup>a</sup> olanzapine (Zyprexa),<sup>d</sup> escitalopram oxalate (Lexapro),<sup>e</sup> fluoxetine (Prozac),<sup>d</sup> lamotrigine (Lamictal),<sup>b</sup> hydroxyzine (Atarax),<sup>a</sup> nafazodone (Serzone),<sup>f</sup> citalopram (Celexa),<sup>e</sup> buspirone (Buspar),<sup>f</sup> nortriptyline (Pamelor),<sup>g</sup> Lithium</b>	blurred vision, diplopia, vision abnormality, accommodation changes, visual field defect
Asthma and Allergy Medications	
Medication Name	Potential Side Effects
Montekulast (Singular), <sup>h</sup> fluticasone/salmeterol (Advair), <sup>b</sup> Albuterol, <b>cetirizine (Zyrtec),<sup>a</sup> Theophylline, loratadine (Claritin),<sup>i</sup> Atrohistj, mometasone furoate monohydrate (Nasonex),<sup>i</sup> fexofenadine (Allegra)<sup>k</sup></b>	blindness, eye pain, decreased accommodation
Anti-hypertensive Medications	
Medication Name	Potential Side Effects
<b>Digoxin, Verapamil, Hydrochlorothiazide (Hydrodiuril),<sup>h</sup> Warfarin, doxozosin mesylate (Cardura),<sup>at</sup> valsartan (Diovan),<sup>g</sup> terazosin (Hytrin),<sup>k</sup> Atenolol, amalodipine besylate (Norvasc),<sup>g</sup> metoprolol (Toprol),<sup>m</sup> nifedipine (Procardia),<sup>g</sup> eprosartan mesylate (Teveten)<sup>n</sup></b>	vision changes, blurred vision, abnormal vision, diplopia, oculomotor disturbance, nystagmus, eye pain

- a. Pfizer, New York, New York
- b. Glaxo Smith Kline, Brentford, Middlesex, United Kingdom
- c. Janssen, Titusville, New Jersey
- d. Eli Lilly, Indianapolis, Indiana
- e. Forest Pharmaceuticals, New York, New York
- f. Bristol Myers Squibb, Princeton, New Jersey
- g. Novartis Pharmaceuticals, East Hanover, New Jersey
- h. Merk, Whitehouse Station, New Jersey
- i. Schering-Plough, Kenilworth, New Jersey
- j. Medeva Pharmaceuticals, Rochester, New York
- k. Sanofi-Aventis, Bridgewater, New Jersey
- l. Abbott Laboratories, North Chicago, Illinois
- m. Astra Zeneca, Wilmington, Delaware
- n. Biovail Pharmaceuticals, Ontario, Canada

\* This medication also can be used in the treatment of Benign Prostate Hypertrophy (BPH)  
Medications in bold have vision side effects specifically listed in the package insert

treatment. See Table 3, and note that the total symptoms and reasons for seeking VT is 295; this is because some patients had more than one symptom and/or reason.

### Computer Usage

One hundred and eighty (75%) of the patients had been questioned about computer use. Ninety percent (90%) of these individuals reported that they did use computers, but further details were not consistently recorded.

### Ocular History

Fourteen patients (5.8%), reported prior ocular surgery. A further breakdown showed that seven patients reported prior strabismus surgery, six had LASIK surgery and one had cataract surgery. The most common complaint reported by all of these patients was diplopia: 3/7 status post strabismus surgery, 3/6 LASIK patients and the cataract patient. These and other complaints reported by at least one patient in each surgical category are listed in Table 4.

### Medical History

We limited physical medical conditions to those that are associated with significant ocular and visual sequelae. On this basis, one patient reported Multiple Sclerosis (MS), another reported Parkinson's Disease and a third reported Cerebral Palsy (CP). Patients with MS can have a variety of oculomotor problems, including internuclear ophthalmoplegia, impaired saccades/pursuits and gaze limitations.<sup>6</sup> The patient with MS complained of a loss of place when reading and was diagnosed with convergence insufficiency and oculomotor dysfunction. Parkinson's Disease has been associated with difficulties in pursuits and saccades, as well as with difficulties in convergence and accommodation.<sup>7</sup> The patient with Parkinson's Disease reported diplopia and was diagnosed with intermittent exotropia. Among the visual consequences associated with CP are refractive anomalies and binocular disorders.<sup>8</sup> The patient with CP was concerned about difficulty when reading and was diagnosed with convergence insufficiency, accommodative insufficiency and oculomotor dysfunction.

### Medications

Forty three percent of the 241 patients reported that they were not taking any medication. Nineteen percent did not have a medication history on file. The remaining 38% of patients reported using one

or more prescription or non-prescription medications. Of these, 8% were unsure of the name or use for at least one medication.

The most commonly reported medications by name were levothyroxine (Synthroid) (nine patients), oral contraceptives (seven patients) and sertraline (Zoloft) (seven patients). Whereas, the most commonly reported medications by class were psychotropic drugs (anxiety, bipolar disorder, depression, schizophrenia) reported 36 times, followed by medications for allergies/asthma, reported 18 times, and hypertension/cardiac drugs, reported 15 times. A list of all medications reported in the above classes is listed in Table 5.

### Visual Diagnoses

These were determined by ICDM-9 codes recorded on the examination record. Most patients had multiple diagnostic codes. We used the first three listed, but did not differentiate by primary, secondary or tertiary diagnosis. The most frequently diagnosed condition was convergence insufficiency, reported in almost 50% of patients. The following diagnoses were present in greater than 10% of patients: accommodative insufficiency (28%), binocular instability/fusional vergence dysfunction (28%), oculomotor dysfunction (20%) and convergence excess (12%). See Figure 1. Suppression of binocular vision, subjective visual disturbance, intermittent exotropia and alternating intermittent exotropia were present in about 2% of in each of these categories. Other diagnoses that occurred in 1 to 2 % of patients included: refractive amblyopia, esotropia, exotropia, unilateral intermittent exotropia, vertical heterophoria, alternating exotropia, alternating intermittent esotropia and hypertropia. One time diagnoses, present in 0.4% of patients included: unilateral esotropia, cyclotropia, esophoria, fourth nerve palsy, smooth pursuit difficulty, congenital nystagmus, accommodative esotropia, eccentric fixation, hypotropia, unilateral intermittent esotropia, accommodative spasm and strabismic amblyopia.

### Number of Therapy Sessions

The average number of therapy visits per patient was 12 (range 1-64). The patient who had 64 visits was a status post LASIK patient who had discontinued, and later resumed therapy during the time period that was queried.

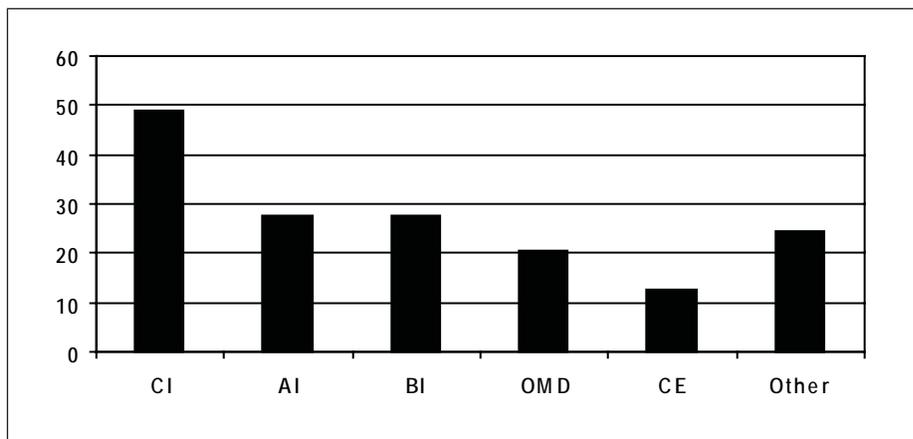


Figure 1: Percentage of Visual Diagnoses by ICDM-9 Code (n=241).

CI= Convergence Insufficiency

AI= Accommodative Insufficiency

BI= Binocular Inefficiency/Fusional Vergence Dysfunction

OMD= Oculomotor Deficiency

CE= Convergence Excess

Table 6: Reasons for Cessation of Therapy

Reason for Dismissal	Number (%) of Patients
None Reported/Self Dismissed	n= 97 (40.2)
Completed Program	n=82 (34.0)
Attendance	n=31 (12.9)
Insurance	n=11 (4.6)
Work/Schedule Conflicts	n= 6 (2.5)
Move/Transfer Care	n= 4 (1.7)
Vacation	n= 4 (1.7)
Other	n= 4 (1.7)
Illness/Hospitalization	n= 2 (0.8)
Program Inappropriate	n= 1 (0.4)

### Reasons for the Cessation of Therapy

Upon the completion of therapy, the doctor noted the reason for completion as is indicated in Table 6. Forty percent of patients self-dismissed or the reason for cessation of therapy was not recorded. Five percent of patients had only one therapy visit. Thirty four percent of patients completed the program, as determined by the doctor. Thirteen percent were dismissed because of poor attendance. Five percent of patients reported termination of therapy due to insurance issues. Other reasons for discontinuation of therapy included: work/schedule conflicts, moving/transfer care, vacation, other, and illness. One patient was dismissed because the program was deemed inappropriate. In this case, the patient was a presbyope who wanted therapy to eliminate her need for reading glasses. Four patients were included under the category of "other" which consists of patients whose problems were later determined not to be visual in nature, as

well as patients who developed other conditions during the course of therapy. Two of these patients were believed to have vestibular problems and were referred for vestibular therapy. One patient developed giant cell arteritis during therapy and was referred to a neuro-ophthalmologist for treatment. A final patient was suspected of having Myasthenia Gravis, and again was referred to a neuro-ophthalmologist. Table 6 presents the number and percentage of patients in each of the categories.

### Patients' Evaluation of the Success of Therapy

At the conclusion of therapy patients were asked to answer the following question, "Vision therapy has made a significant improvement in the ease in which I perform my daily activities." The choices were "Strongly agree," "Moderately agree," "Moderately disagree," and "Strongly disagree." Eighty patients were asked the question. Of those, 70% strongly agreed with the statement, 24% somewhat agreed, while 6% moderately disagreed.

## DISCUSSION

Students were the most numerous individuals in our sample. This gives support to our impression that students of all ages constitute the bulk of patients in many, if not most VT practices, because of the significant degree of near point requirements. However, as indicated in Table 1, in virtually every other occupational category there is an emphasis on near point work. This suggests that those with a high amount of near work in their occupations were likely to seek optometric VT. However, near visual demands may not always be occupation related; some patients may have hobbies that involve computer use, or extensive near vision demands such as stamp collecting. We propose that an appropriate question during the history would be to have the patient estimate the total amount of time he or she devotes to near point activity during the average week.

Almost 50% of the present study's patients were diagnosed with convergence insufficiency. See Figure 1. This high frequency of occurrence of the condition in our sample is in line with other studies of VT in adults,<sup>2-4</sup> and suggests that this might be the most common reason for these individuals to seek the service.

In the present study, the average number of VT sessions was 12. Cohen and Soden reported on males over the age of 60 treated who received VT in a hospital clinic.<sup>4</sup> The average number of therapy sessions in that study was also 12.

Of the 80 subjects who were asked whether the VT made a significant improvement in the ease with which they performed daily activities, 94 % reported that they either strongly or moderately agreed that it did. In the Cohen and Soden study<sup>4</sup> 96% of their 60 patients showed both subjective and objective improvement in symptoms and signs, while 4% showed only subjective improvement in symptoms. Nine months later, 83% of subjects maintained subjective and objective improvement, 8% maintained objective improvement, but had symptoms, and 8% maintained neither subjective nor objective improvement. We believe that the present study would have been enhanced if we compared entering objective findings to those at the end of VT. Additional valuable information could have been obtained by assessing the objective and subjective findings some months after VT had terminated.

Birnbaum et al, reported on 60 males over the age of 40 whom they treated.<sup>3</sup> They

created three groups: office and home VT; home VT; and a control group that was given literature on visual hygiene. Success was defined as the absence of diplopia, and the ability to read comfortably for 1 hour without headaches or eyestrain, at least 75% of the time. Success was further defined as improvement in at least three of the following signs: near point of convergence with and without red lens, near phoria, and near positive fusional vergence. Based on these criteria, VT was successful in almost 62% of the patients who had taken active VT; more specifically, this included slightly more than 30% in the office and home VT group, and slightly more than 30% in the home VT group. The control group had a 10.5% success rate.

In Wick's study, 166 adult subjects were all over 45 years old. They had been diagnosed with either convergence insufficiency or visual skills problems.<sup>1</sup> The latter condition was defined as: high distance or near phorias; greater than 2<sup>A</sup> of fixation disparity (associated phoria); suppressions on distance or near vectogram testing. Success was defined in terms of the elimination of symptoms and improvement of optometric tests. Overall, there was a 92% success rate. Those patients with convergence insufficiency (N=134) responded better than those with skills problems (N=27), 93% versus 85% success respectively. Almost 50% of patients with convergence insufficiency required additional treatment. However, the majority of these patients were older than 75 years, suggesting that this group of patients may require more treatment sessions than younger patients.

Thus, the present study adds further evidence, that adults with functional vision problems can benefit from VT. Our study also illustrates that patients who have had prior ocular surgery may also have symptoms that can be ameliorated with VT. We included patients with strabismus, Lasik and cataract surgeries. Patients with Lasik surgery have been found to develop binocular problems after surgery.<sup>10</sup> Although these problems may have been present prior to surgery, symptoms might not have developed until after surgery. Another study found that 0.1% of patients who have cataract surgery develop persistent diplopia secondary to strabismus.<sup>11</sup> Of the 20,453 patients who had cataract surgery, 19 (0.093%) developed strabismus with diplopia. The majority of patients (eight) were treated with strabis-

mus surgery, while four were treated with prism correction, three were treated with orthoptics, and two patients opted for no treatment, as their diplopia was not constant. Two patients were lost to follow up. Overall, 11 of the 19 patients (58%), were able to have binocular vision restored.

A notable finding in the present study was the number of adults on medications with possible ocular effects. Wren reviewed drug classes with regard to ocular side effects.<sup>12</sup> She found that sulfonyleureas, tricyclic antidepressants, central nervous system stimulants, H1 and H2 blockers, tetracyclines and thioridazine were found to have ocular side effects such as diplopia, blurred vision and accommodative problems. This further shows the importance of taking a detailed medication history with all adult patients seeking optometric care, including duration of pharmacological treatment. In some cases, it is possible that patients may benefit from a change in medication instead of prescribing VT and/or prisms and lenses. This requires that the optometrist consult with the patient's other health care providers.

The 34% of cases in which the doctor determined completion of the program should be viewed as a conservative number. See Table 6. Some patients may have completed the program, but the attending doctor did not indicate this on the dismissal form. These patients were included in the "none reported" category. Further, the largest percentage for cessation was in the category *None Reported/Self Dismissed* adds additional confusion. Follow up for patients in this category can lead to improved practice management in any VT practice. For example, some of these patients may have self dismissed because of insurance reasons and not explained such to the doctor; Others may have felt that they were cured, and still others may have felt a worsening of symptoms and stopped VT. It is important to remember that patients may notice that their symptoms worsen during the first weeks of therapy.<sup>13</sup> Patients should be educated of this possibility so that they do not equate an initial worsening of symptoms with the idea that therapy is not working.

## CONCLUSION

The present study regarding adult patients who received VT is unique in that it investigated variables that other reports did not. For example, 39% of the 241 subjects were taking a wide variety of medications. Another is that while conver-

gence insufficiency was the most frequent diagnosis, accommodative insufficiency, binocular inefficiency/fusional vergence dysfunction and ocular motor deficiency were present in clinically significant numbers of the sample. The data regarding the reasons for cessation of therapy, to our knowledge, has not been reported for adult VT patients.

Our study can serve as a template for future investigations of the characteristics of adult VT patients. Since this study was retrospective, complete data in some cases was unavailable. Future studies should be prospective so that more complete data can be obtained.

### Acknowledgement

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