

# A SURVEY OF THE PREVALENCE OF BINOCULAR & ACCOMMODATIVE DYSFUNCTIONS IN A SAMPLE OF OPTOMETRY STUDENTS

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## Abstract

*Optometrists acquire the skills to diagnose and manage dysfunctions of accommodation and binocular vision by formal courses and clinical experiences during their professional education. All institutions provide required courses and some provide elective courses in the Diagnosis and Management of Binocular Vision Problems. The purpose of this study was to determine the prevalence of accommodative and vergence dysfunctions in students enrolled in such an elective course. Subjects were 48 third year optometry students at the New England College of Optometry. The sample was 30% male and 70% female, ranging in age from 24 to 31 (Mean= 24.5 yrs). Each subject underwent a comprehensive vision examination. According to the findings, subjects were placed into either a Binocular Dysfunction (BD) or a No Binocular Dysfunction (NBD) group. Forty-two percent were in the BD group. Of this BD group, 25% reported symptoms such as blur after reading, headaches, and asthenopia, while the remainder did not. This study indicates a high prevalence of accommodative and vergence dysfunctions in this selected sample of optometry students. These preliminary results indicate a need for improved awareness, diagnosis and management of binocular dysfunctions for prospective primary care optometrists.*

## Key Words

*accommodative dysfunction, asthenopia, optometry students, prevalence, vergence dysfunction*

## Introduction

It has been reported that at least 7 to 10% of the general population has some type of problem with accommodative or binocular functioning.<sup>1,2</sup>

Optometrists provide primary eye and vision care to the American public and are often the first practitioners to examine patients with these dysfunctions. To ensure that optometrists acquire the skills that are necessary to diagnose and manage accommodative and vergence dysfunctions, all schools and colleges of optometry provide required courses and clinical experiences in the Diagnosis and Management of Binocular Vision Problems, while some additionally provide elective courses. Indeed, all students must pass these required didactic and clinical courses in order to receive the doctor of optometry degree, and pass several portions of the profession's National Board examinations in order to obtain state licensure.<sup>3</sup>

Thus, it would seem reasonable to assume that there would be a low prevalence of undiagnosed and untreated accommodative and vergence dysfunctions in optometrists and optometric students.

The purpose of this study was to determine the prevalence of accommodative and vergence dysfunctions in optometry students enrolled in an elective course for

the diagnosis and management of binocular dysfunctions.

## Subjects

A cohort of 48 third year optometry students who were enrolled in an elective course in the Diagnosis and Management of Binocular Vision Problems at the New England College of Optometry comprised the sample population. There were 30% males and 70% females, ranging in age from 24 to 31 (Mean= 24.5 yrs). All were reported to be in good health with no reported family history of strabismus, amblyopia, or neurological disorders. They were reportedly not taking any medications at the time of the examination.

## Methods

Each subject underwent a comprehensive vision examination by a third or fourth year optometry student under the supervision of one or the other of the authors. This included an observation of external ocular and facial areas, assessment of pupillary responses, versions and ductions, cover test, stereopsis, and color vision. An evaluation of the ocular anterior segment and adnexa was completed with measurement of intraocular pressure, examination of the ocular media, the ocular posterior segment, and visual field screening (confrontation).

Although a refraction was preformed, all accommodative and binocular function tests were done with the habitual prescription in order to simulate the usual condition under which the subject functioned.

**Table 1.**  
**Diagnostic Categories Used in This Study.**  
**A Full Listing of Numerical Criterion for Each Test**  
**Is Found in Reference #8.**

1. Accommodative Dysfunctions  
 Accommodative excess, Accommodative insufficiency, and/or accommodative infacility are characterized at least two of the following diagnostic findings:
  - Low accommodative amplitude relative to age
  - Reduced accommodative facility
  - Reduced ranges of relative accommodation (NRA and/or PRA)
  - Abnormal lag of accommodation
2. Convergence Dysfunctions
  - a) Convergence Insufficiency (CI)  
 CI is characterized at least two of the following diagnostic findings:
    - >3 exophoria at distance and >7 exophoria at near
    - Receded near-point of convergence
    - Reduced positive fusional vergence ranges
    - Low NRA
  - b) Convergence Excess (CE)  
 CE is characterized by at least two of the following diagnostic findings:
    - >2 esophoria at near
    - Reduced negative fusional vergence ranges at distance and/or near
    - Fails accommodative facility
    - Low PRA
3. General Binocular Vergence Dysfunction  
 General binocular vergence dysfunction is characterized by at least two of the following diagnostic findings:
  - Restricted or imbalanced vergence ranges
  - Suppression of binocular vision
  - Defective stereopsis
  - Otherwise not classified as a convergence dysfunction

Further testing, based on standard protocols, included near and distance heterophorias and vergence ranges, near point of convergence (NPC), a comparison of negative relative accommodation to positive relative accommodation (NRA/PRA), accommodative amplitude, accommodative facility, lag of accommodation and stereopsis testing.<sup>4</sup>

People with accommodative and vergence anomalies often report symptoms of discomfort and/or visual inefficiency. The more common symptoms are the following: asthenopia, headaches, pulling sensation, blurred vision, intermittent diplopia, inability to sustain concentration, pulling of the eyes, burning or tearing of the eyes, blurred vision after prolonged near work, and blurred vision after prolonged distance viewing.<sup>5</sup> The subjects were asked if they had, or were currently experiencing such symptoms, and these were recorded.

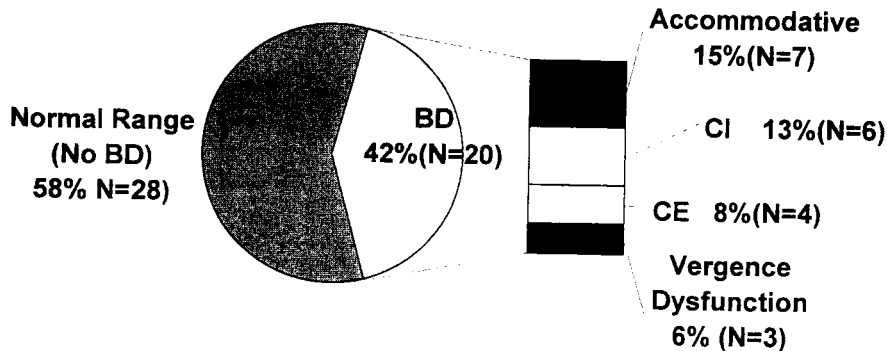
The authors had developed diagnostic categories for this study, based on a modified Duane's Classification<sup>6</sup> and ICD-9-CM criteria<sup>7</sup> and these are presented in Table 1. Pass/fail decisions for the accommodative, vergence and stereopsis tests were based on established clinical criteria.<sup>8</sup>

The authors reviewed the findings for each subject and, after agreement, decided whether that individual was to be placed in one or more of the diagnostic categories. When an individual fit into more than one category, one of the diagnoses was designated as primary. In order to be diagnosed into any of these categories, the subject had to show at least two of the specified clinical findings. Two categories emerged: No Binocular Dysfunction (NBD) or Binocular Dysfunction (BD).

**Results**

1. There was no evidence of internal or external ocular pathology in any of the subjects.
2. Some 42% (N=20) of the subjects fell into the BD group. The data for this group was further classified into the primary diagnoses of CI, CE, and accommodative dysfunction.(Figure 1.)
3. In the BD group, 25% (N=5) reported at least two symptoms commensurate with anomalies of accommodation and/or vergence.<sup>5</sup>
- 4.5. Virtually all of the BD subjects (N=19) were diagnosed with a second-

**Figure 1**  
**Distribution of**  
**Accommodative /Vergence Dysfunctions**  
**vs. Normal Patients**



ary condition. This type of combined deficiency has been reported for over 85 years.<sup>9</sup>

## Discussion

Individuals who perform sustained near work and have accommodative and/or binocular vision problems with accompanying symptoms are often unable to perform these nearpoint tasks in an optimal manner. A case in point relates to computers which are becoming a part of daily life in the workplace and at home. Thus an individual with accommodative and/or binocular vision problems might well be limited in the amount time they are able to productively use the computer because of headaches, eye strain, blurred vision, eye irritation, double vision, excessive tears or dry eyes, pain in the eyes or excessive blinking or squinting.<sup>10</sup>

We are of the opinion that computers have become a given for both optometric students as part of their curricula, and for optometrists as part of their practices.

Research into the pervasiveness of the problem of symptomatic accommodative dysfunction in non-presbyopic clinical patients (i.e., not randomly selected) revealed that 9.2% of these individuals had accommodative insufficiency, 5.1% had accommodative infacility, and 2.5% had accommodative spasm.<sup>1</sup> The most common binocular dysfunction appears to be CI.<sup>12</sup> The reported prevalence of CI is 1 to 25% of clinic subjects while the average prevalence of CI in the general population is 7%, and this is similar for adults and children.<sup>2</sup>

Modern optometry has needed neither special legislation nor education beyond the doctor of optometry degree to diagnose and treat these accommodative or binocular dysfunctions. Further, the profession has published a system of practice guidelines devoted to accommodative and vergence dysfunction.<sup>11</sup> Consequently, it would seem reasonable to presume that optometrists and optometric students should have a low prevalence of unidentified and/or untreated accommodative and vergence dysfunctions.

However, in this admittedly small sample of selected optometry students, there was a significantly higher prevalence of accommodative and binocular dysfunctions than has been found in other adult populations. For example, there was 15% prevalence of CI, while

other studies find that prevalence to be less.<sup>12-14</sup>

In the present study, these conditions were not only untreated, but at least one out of four of the 20 students in the BD group had corresponding symptoms that could negatively impact their performance as a students and professional health care providers. Further, these students supposedly had in-depth professional knowledge that symptoms associated with sustained near work and accommodative and binocular dysfunctions can be successfully managed with proper lens correction and/or vision therapy. While there are other conditions that can cause these symptoms, these students apparently did not consider the possibility of an accommodative or binocular dysfunction as at least contributory.

A question that we feel is raised by this study is whether the findings are universal within the profession's students and practitioners. This requires further research. However, there are indications that our findings might be just the "tip of the iceberg". During February and early March, 2002, there has been a great deal of related discussion on a website that caters to optometric practitioners and educators who have interest and expertise in the diagnosis and management of accommodative and binocular vision dysfunctions.<sup>15</sup> In general, there is concern that the basic optometric curriculum has been steadily lessening attention and hours to these dysfunctions. And Suchoff has pointed out that while optometry had previously been more sensitive to the behavioral aspects of vision, the increased scope of practice has moved the profession's philosophy toward a less behavioral, and we would add, less functional stance. He makes the case that this is occurring at a time when medicine is moving in the opposite direction.<sup>16</sup>

Standards of clinical care and clinical practice guidelines stipulate the responsibility of optometrists to diagnose these binocular and accommodative conditions accurately, discuss the diagnosis, the risks and potential benefits of existing treatment options with the patient, and initiate treatment when appropriate.<sup>11</sup> Therefore the findings in the present study indicate a need to increase the awareness of the legal, ethical and moral responsibility of these prospective primary care optome-

trists to diagnosis and manage accommodative and binocular dysfunctions.

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