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## Accommodative dysfunction in patients with cerebral palsy: Appropriate nearpoint prescribing

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## **Accommodative dysfunction in patients with cerebral palsy: Appropriate nearpoint prescribing**

### **Abstract**

This study was designed to inform the eyecare practitioner of accommodative dysfunction in patients with Cerebral Palsy (CP), and more importantly, to give guidelines for successful prescribing of nearpoint lenses. Files were obtained from the Oregon School for the Blind, in association with the Oregon Lions Statewide Low Vision Clinic. Inclusion criteria included a diagnosis of CP, a Monocular Estimate Method (MEM) retinoscopy finding indicating an accommodative dysfunction, and a nearpoint lens prescription prescribed. Surveys were sent to the vision teachers of these patients to assess the effect of the nearpoint lenses on daily activities. The results were analyzed and discussed; two successful examples were presented. It was found that patients who had the greatest success functioned on a higher cognitive level, received initial training with the prescription and continued support, and in addition, were given adequate time to adapt to the prescription. It was also shown that even though the patient may not appear to appreciate the aid a near prescription provides, a nearpoint lens should be attempted for those who are found to have CP with accommodative dysfunction.

### **Degree Type**

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### **Degree Name**

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### **Committee Chair**

J.P. Lowery

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TITLE PAGE

Signature Page

ACCOMMODATIVE DYSFUNCTION IN PATIENTS WITH

CEREBRAL PALSY:

APPROPRIATE NEARPOINT PRESCRIBING

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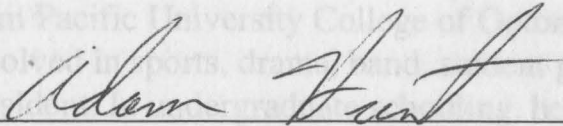
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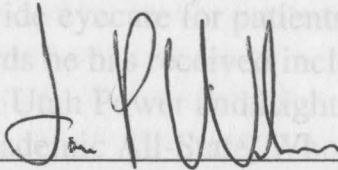
## Autobiographies

Adam Hunt

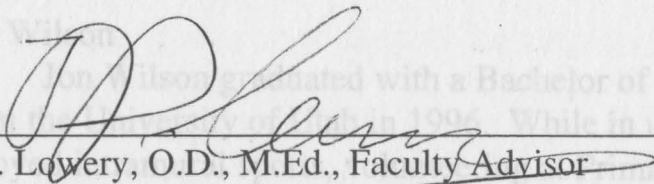
### Signature Page



Adam Hunt, Optometry Student



Jon Wilson, Optometry Student



J.P. Lowery, O.D., M.Ed., Faculty Advisor

## Autobiographies

### Adam Hunt

He was both born and raised in the state of Utah, graduating from South Sevier High School in 1989. His educational experiences continued on with his Bachelor of Science degree in 1996 from Southern Utah University. He plans on receiving his Doctor of Optometry on 5/20/2000 from Pacific University College of Optometry. In high school, he was involved in sports, drama, band, student government, and served as seminary president. In undergraduate schooling, he was active in Alpha Epsilon Delta, and Sigma Gamma Chi. He has also been involved in volunteer work, including serving a two year full-time mission for the Church of Jesus Christ of Latter-Day Saints. He has also been involved with Amigos, and was able to help provide eyecare for patients in El Salvador.

Awards he has received include; WICHIE scholarship, Regents scholarship, Utah Power and Light Scholarship, Dean's list, Eagle Scout, Football Academic All-State, Who's Who Among Band Students, and Sterling Scholar. His interests and hobbies include; family activities, sports, camping, and mountain biking.

### Jon Wilson

Jon Wilson graduated with a Bachelor of Science degree in biology from the University of Utah in 1996. While in undergraduate education, he enjoyed intramural sports, volunteering at Primary Children's Medical Center, and working as a youth advocate for at-risk youth with the Utah Division of Family Services. He also completed an undergraduate internship with the University of Utah Artificial Heart Laboratory. Currently, he is an active member of Amigos Eyecare and helped to provide eyecare for those in need as part of an Amigos/Northwest Medical Teams humanitarian mission to orphanages in Romania. He is also a member of Beta Kappa Sigma Optometric Honor Society. Upon receiving his Doctor of Optometry degree in 2001, he plans to practice in Utah.

He has received the following awards: WICHE Scholarship, University of Utah President's Scholarship, Mortar Board Honor Society, Phi Kappa Phi Honor Society, Golden Key National Honor Society Awards. His interests and hobbies include: family activities, snow sports, music, running, camping, and mountain biking.

## Acknowledgements

### Abstract

This study was designed to inform the eyecare practitioner of accommodative dysfunction in patients with Cerebral Palsy (CP), and more importantly, to give guidelines for successful prescribing of nearpoint lenses. Files were obtained from the Oregon School for the Blind, in association with the Oregon Lions Statewide Low Vision Clinic. Inclusion criteria included a diagnosis of CP, a Monocular Estimate Method (MEM) retinoscopy finding indicating an accommodative dysfunction, and a nearpoint lens prescription prescribed. Surveys were sent to the vision teachers of these patients to assess the effect of the nearpoint lenses on daily activities. The results were analyzed and discussed; two successful examples were presented. It was found that patients who had the greatest success functioned on a higher cognitive level, received initial training with the prescription and continued support, and in addition, were given adequate time to adapt to the prescription. It was also shown that even though the patient may not appear to appreciate the aid a near prescription provides, a nearpoint lens should be attempted for those who are found to have CP with accommodative dysfunction.

## Introduction

### Acknowledgements

We wish to thank, first and foremost, Dr. J.P. Lowery for his insights, direction, and efforts, in moving this project forward over the past two years. We also wish to thank those vision teachers who responded to our survey and took extra time to help us better know the patients we were profiling in our study. Our thanks also goes out to the staff at the Oregon School for the Blind for their assistance in obtaining the necessary records for our study.

Our families have also been so supportive throughout this project and we wish to especially thank them at this time. And last of all, we wish to thank Dr. Lowery for the commas.

ed to describe a group of conditions that have resulted from a non-progressive lesion of the developing brain. Cerebral palsy in and of itself is not a disease. Rather there are hundreds of various causes that can affect the brain and lead to CP. The lesion to the brain causes a disorder of both movement and posture. The non-progressive damage occurs before the brain has fully matured (usually designated as being 16 years of age). So diseases such as Tay-Sachs, which is a progressive disease would not be designated as a cause of CP nor would an automobile accident to an adult that resulted in brain damage be considered to be CP because the brain has already matured.

In the United States it has been estimated that there are approximately 500,000 persons who have cerebral palsy, which makes cerebral palsy one of the most widespread lifetime disabilities. One reason for this is that



## Introduction

The role as primary eye care providers carries with it the responsibility of meeting the needs of not only the public at large, but also the patients that have special needs in that population. One such group of special needs patients are individuals with cerebral palsy. As an eyecare provider, a detailed knowledge of cerebral palsy and the associated ocular and visual conditions is paramount in giving the highest level of care.

Cerebral palsy is the term used to describe a group of conditions that have resulted from a non-progressive lesion of the developing brain.

Cerebral palsy in and of itself is not a disease. Rather there are hundreds of various causes that can affect the brain and lead to CP. The lesion to the brain causes a disorder of both movement and posture. The non-progressive damage occurs before the brain has fully matured (usually designated as being 16 years of age). So diseases such as Tay-Sachs, which is a progressive disease would not be designated as a cause of CP nor would an automobile accident to an adult that resulted in brain damage be considered to be CP because the brain has already matured.

In the United States it has been estimated that there are approximately 500,000 persons who have cerebral palsy, which makes cerebral palsy one of the most widespread lifetime disabilities.<sup>1</sup> One reason for this is that

approximately 40% of CP patients live to the age of forty with many living into their seventies.<sup>2</sup>

The prevalence of cerebral palsy in the United States is 1.5 to 2 in every 1,000 births or roughly 4,000 new cases a year.<sup>2</sup> The incidence decreased from 1956- 1965 with better neonatal care and has remained fairly constant through subsequent years.<sup>1</sup> The etiology in CP is often unclear, being undetermined in as high as 40% of the cases. It has also been estimated that 95% of CP cases are related to complication of pregnancy and birth (see table 1 for causes).<sup>1</sup> Other more rare incidences of CP include infection, poisoning, malnutrition, and neglect. In 2% to 5% of CP cases there does exist a genetic component.<sup>2</sup>

Table 1 Causes of Cerebral Palsy

<u>Causes</u>	<u>Percentage of cases</u>
1 <sup>st</sup> trimester:	7%
teratogens	
chromosomal anomalies	
2 <sup>nd</sup> trimester:	32%
intrauterine infections	
problems in fetal/placental functioning	
Complications of labor and delivery	17%
Neonatal complications:	39%
Sepsis	
Asphyxia	
Prematurity	
Childhood:	5%
Meningitis	
Head injury	
Toxins	

In classifying CP there are two main divisions known as pyramidal and extapyramidal CP. These terms are not used as much in the modern literature but are useful in understanding the results of the brain lesion on the patient's functioning. The most common form of CP is pyramidal, which is now more commonly referred to as spastic CP. Damage to the pyramidal tract of the brain or the motor cortex leads to spastic CP. Here the body's muscle tone is greatly increased. A spastic CP patient is characterized by having a "clasped-knife" quality to movement. When an arm or leg is moved there is an initial strong resistance but it gives way abruptly as closing a pocket knife would.

With spastic CP, where the lesion occurred in the brain determines how extensive the arms and legs are involved. With spastic diplegia the legs are more affected than the arms. If only the legs are involved then the condition is called a paraplegia. Hemiplegia is when just one-half of the body is affected, and quadriplegia is where much of the cerebral cortex is damaged resulting in severe limitations of the arms and legs. With the increased muscle tone, muscle contractures often result. The contractures can severely limit movement so physical therapy as well as braces and splints are used to maintain a normal range of movement. Orthopedic surgery is also implemented such as lengthening the Achilles tendon to

improve walking. Another common problem area is the patient's hips. This problem is caused by increase muscle contraction of hip adduction over time that is powerful enough to dislocate the hip. Surgery is performed to release the hip adductor muscles and to remove the nerves that innervate these muscles. Fortunately today the incompatibility can be treated with an

The second major classification of CP is extrapyramidal with damage occurring to pathways outside of the pyramidal tract. The tracts affected are those passing through the basal ganglia where motor regulation and control is directed. A hallmark of extrapyramidal CP are slow writhing movements. A common cause of extrapyramidal cerebral palsy is a loss of oxygen during delivery and labor. This defect results in difficulty in controlling movement and maintaining one's posture, whereas in pyramidal CP there is difficulty with initiating movement.

With extrapyramidal, also known as athetoid, muscle tone is variable. The muscles may be very relaxed, sometimes referred to as floppy baby syndrome, or the muscles may be very rigid. This condition of rigidity is known as "lead pipe" extremities. Athetoid patients do not show the "clapsed-knife" muscle movement that spastics show. A major cause of athetoid is Rh incompatibility.<sup>2</sup> The mother is Rh negative and the fetus is Rh positive. The mother's immune system recognizes the new protein as

being foreign. The mother's immune system attacks the Rh protein in the fetus's blood through the placenta. The Rh factor in pregnancy does not result in a problem with the mother's first pregnancy, but in subsequent pregnancies the fetus will suffer from hyperbilirubinemia resulting in mental retardation. Fortunately today the incompatibility can be treated with an injection given to the mother within three days after her delivery.

The last major form of CP is ataxic with damage being done directly to the cerebellum resulting in balance and direction disturbances. Muscle tone may be either increased or decreased with the patient having difficulties in controlling the timing of motor movements. This difficulty result in overshooting or past-pointing. If the patient is able to walk, there is often a wide-based and unsteady gait observed. Often the form of CP will be a mix, the most common being spastic with ataxic.

The early signs of CP in infancy include excessive sleep, irritability when awake, a poor sucking reflex, a weak cry and general inattentiveness. They may show the classic floppy baby syndrome, showing very little muscle tone. The infant may also exhibit excessive muscle contraction and lie in an arched posture. After the age of three months infants normally lay holding their hands open, yet a child with CP will continue to have a clasped fist. There is also a persistence of primitive reflexes that may continue into

adulthood. Sitting up, crawling and walking are often delayed or may even be non-existent. The child's walk may be affected and a common gait is known as scissoring because of the increased muscle tone in the adduction and internal rotation of the hips. Toe walking is also common due to an increase in the flexor tone in the legs.

Medication for patients with CP to improve function has had limited success. The medication most commonly used for spastics is diazepam (Valium), which causes drowsiness and excessive drooling. For children with ambulatory challenges an appropriate wheelchair is essential that maintains the hips, knees, and ankles in a posture that provides support and comfort.

The lesion to the brain does not only effects the body's muscles but also mental capacity. It is estimated that 60% of CP patients are mentally retarded.<sup>1</sup> It has also been noted that the type of CP the patient has greatly influences the degree of mental retardation. Hemiplegia is associated with the best intellectual outcome with generally normal intelligence. With spastic quadriplegia, athetoid and mixed CP fewer than 30% have normal intelligence. Of the 60% that are mentally retarded, the degree of mental retardation is 15% mild, 35% moderate, and 50% being severely retarded.<sup>1</sup>

Epilepsy is another common complication affecting up to one-third of CP patients. Spastic forms of CP have the highest incidences of seizures.<sup>1</sup> Hemiplegia patients suffer from Grand mal seizures, while quadriplegic suffer from more minor motor seizures.

Behavioral and emotional disorders are also a concern. Behavior problems include self-injury and hyperactivity. These behaviors have been found to increase during adolescence, and are seen more in CP patients with normal intelligence.

For the purpose of our study we wanted to note not only the incidence of decreased accommodative function, but also more importantly what is the affect of a near prescription for these patients. In this retrospective study we also wanted to evaluate what conditions lead to an improvement of the patient's function with a near lens. Factors such as the severity of CP, the patient's developmental level, and the training or help the patient received in how to make use of the near prescription.

### **Ocular Disorders Associated with Cerebral Palsy**

It has been known for some time that a high association between cerebral palsy and ocular disorders exists. Jones and Dayton in 1968 reported that between 56 and 78 percent of children and 64 to 82 percent of

adults with cerebral palsy have some ocular disorder.<sup>4</sup> Earlier studies by Lossef (1962), Diamond (1959), and Guibor (1953) also revealed that the number of ocular disorders in this population was highly significant. The most prevalent ocular disorders reported in early studies are as follows: strabismus (esotropia more frequent than exotropia), reduced visual acuity, ocular pathology (optic atrophy most common at 17%<sup>5</sup>), nystagmus, and high refractive errors.<sup>5,6,7</sup>

A 1979 study by Maino specifically showed refractive errors and strabismus to be the most frequently presenting ocular defects in those with cerebral palsy. He reported that strabismus exists in about 2-4 percent of the normal population, but is found in up to 60 percent of the cerebral palsied population.<sup>8</sup> The incidence of high refractive errors was also more common than in the normal population. Specifically, hyperopia of two diopters or more was 2 to 10 times more frequent in cerebral palsied children, while hyperopia of less than two diopters was more frequently found in normal children. The incidence of myopia less than six diopters did not differ between normal and cerebral palsied children. However, there was a significant difference (0.1 level of confidence reported) between the two groups when the myopia was six diopters or greater.<sup>8</sup>



Maino also reported a correlation between the type of cerebral palsy and type of refractive error for each individual. Those with athetoid type cerebral palsy were more likely to have hyperopia, while most children with cerebral palsy of the spastic type were found to be highly myopic.

Strabismus, unlike refractive error, was not found to correlate with any subgroup of cerebral palsy.<sup>8</sup> There is also some evidence from previous studies that most of the ocular disorders associated with cerebral palsy are approximately twice as common among those with spastic rather than athetoid cerebral palsy.<sup>9</sup>

Even though ocular deficits have been found to be highly correlated with cerebral palsy, early studies give little or no mention of accommodative findings associated with the condition. The study by Lossef found weakness of accommodation in only two cases out of 88 cerebral palsied children examined.<sup>5</sup> Diamond found what he defined as “unusual problems of accommodation and convergence”, and noted several cases that seemed to have no other problems aside from a limitation to vision at the near-point.<sup>6</sup> In both studies, no mention of the methods used to assess accommodative function were given. Diamond only suggested that longer reading distances be used in those individuals with accommodative limitations in the cerebral palsy population.

Studies by Duckman were some of the first to provide substantial information about the incidence of accommodative dysfunction in those with cerebral palsy. In 1979 Duckman reported on an unpublished pilot program created in 1957 that sought to remediate some of the visually related disorders found in the cerebral palsy population. The program was conducted by the Nassau County Optometric Society at the Nassau Cerebral Palsy Center. The program began with fourteen cerebral palsied children with what was described as significant visual motor dysfunction, ending in 1960 with eleven of the original fourteen children. This optometric training program was directed at improving accommodative skills, eye-hand coordination, fixation ability, binocular fusion, and form perception through the use of visual performance training.<sup>10</sup>

According to Duckman, the pilot study revealed several significant observations. Those involved in the pilot program commented on the accommodative findings:

“Other youngsters demonstrated an almost total lack of the ability of the eye to accommodate or change the focus of their eyes to adjust for near seeing. Since later training improved this ability, we must conclude that the mechanism was intact although this was by no means certain at the outset. Shifting accommodation at all was almost impossible at the outset for one of the boys being trained. With training, this ability improved greatly.”<sup>10</sup>

In the same paper, Duckman reported on his own program that was established with the goal of identifying and remediating, through visual training techniques, the visual deficits in a population of children with cerebral palsy. More specifically, program objectives were aimed to improve visual skills or abilities that pertain to the learning situation, such as: fixation ability, eye-hand coordination, binocular organization (if the child was binocular), spatial organization, form perception, and accommodation.<sup>11</sup>

The program was initiated at the Matheny School, an inpatient hospital and educational facility specifically for cerebral palsied children. Duckman reports that the school had a population of children who were more physically involved but had significantly higher intelligence than a random cerebral palsy population. Selection of the candidates for his program were further narrowed by teachers, therapists, and consultants who made lists of those children they felt had visual problems.<sup>10</sup>

Twenty-five students were selected as possible candidates for the program. Baseline visual testing, including accommodation skills, was performed to determine which of the 25 would be followed through the program. The inclusion criteria for the one-year visual training program were as follows: intellectual capacity to follow instructional sets, sufficient

motor control to participate in prescribed activities, and commitment on the part of the hospital to retain each candidate for at least one full year. The ten students who were selected were children with well-defined visual problems, who would be capable of participating in a therapy program on an intellectual and motor skill level.<sup>11</sup>

All accommodation testing was subjective in nature. Specifically, the accommodation skills were tested with +2.00/-2.00 D lens flippers on the right eye, the left eye, and both eyes together. Failure of the test was indicated when the patient was unable to clear his acuity threshold line within twenty seconds. When failure of the test occurred, loose minus lenses were used to quantify how much accommodation the child could stimulate.<sup>10</sup>

Duckman states that all visual dysfunctions in this population that were revealed upon preliminary testing were predictable, except the very high incidence of accommodative insufficiency, which seemed to be universal. In the population that he studied, he found that the children almost demonstrated "paralyses" of accommodation, since most were unable to make shifts of as little as 0.25 D in their accommodative system.<sup>10</sup>

Of all of these children in his program, Duckman reported that only six underwent training for accommodation insufficiency and of these

children, two-thirds showed improvement in accommodation facility and flexibility. Initially, because of the accommodative function in all ten children involved in the program, it was believed that cerebral palsy might affect brain centers that control accommodation. However, the results led Duckman to conclude that accommodation can be trained in those with cerebral palsy.<sup>11</sup>

A study five years later on a group of 60 children with cerebral palsy, also from the Matheny School/Hospital, revealed similar results. Again, all accommodative testing was performed subjectively. Of the sixty children tested, 100% failed the  $-2.00$  D lens flipper and 53% failed the  $+2.00$  D lens flipper. All tests were performed at a distance of 13 inches with a 20/30 acuity target. Duckman also reported on tests of accommodative amplitude, assessed by having the child clear print with successively higher power minus lenses until the blur point was subjectively noted. Using this method Duckman found that the mean highest minus lens which could be cleared by the study group, monocularly, was  $-1.50$  D. Therefore, he concluded that the amplitude of accommodation was lower than normal, on an age-expected basis, for all the subjects of his study.<sup>12</sup>

As in his previous study, Duckman instituted a program centered on visual training techniques as a means of remediation, and where necessary,

the application of lenses.<sup>11,12</sup> Accommodative training included monocular lens rock, accommodative pushup, lens facility, and shifting focus from near to far targets. Of the 36 children who completed the program, fifteen were given near prescriptions to alleviate unspecified near point symptoms experienced early in the training program.<sup>12</sup>

Post-training data was collected on all of the thirty-six children who completed the program. After training, 57% could clear both sides of the +2.00/-2.00 D lens flippers monocularly. There was also a mean increase of 3.09 D reported in the area of accommodative amplitude, with an increase in those finishing the program of 98.6%.<sup>12</sup> It should be noted that this study, as previously, did not use a control group for comparisons.

A few other reports of reduced accommodation in cerebral palsy exist; however, most of them are anecdotal in nature. In 1980, Scheiman reported that ten of a group of thirty children with cerebral palsy failed the accommodative facility criteria for his study at the nearpoint.<sup>13</sup> His testing, also subjective in nature, was performed on a population of cerebral palsied children with normal intelligence. It should be noted that due to the nature of the condition, response times and ability would be affected on subjective tests even in patients with normal intelligence levels. Even so, these additional studies continued to reaffirm that accommodation skills are an

area of significant concern in the nearpoint environment of the cerebral palsy population.

In 1991, Ettinger was one of the first practitioners to publish guidelines for performing a visual exam on the patient with cerebral palsy. She found that when testing is to be performed, accommodative findings can be assessed subjectively in patients with whom accommodative amplitudes and accommodative facility are possible. The recommended method is also with +2.00/-2.00 D lens flippers for facility and loose minus lenses for accommodative amplitude. To gather baseline accommodative data, however, she found that more objective tests such as dynamic retinoscopy, including the monocular estimation method (MEM), to be the most reliable in assessing accommodative function in the patient with cerebral palsy.<sup>14</sup>

Such objective findings were the basis of a 1996 study on accommodation function in a population of patients with cerebral palsy by Susan Leat at the University of Waterloo. She used a modification of Nott retinoscopy to determine the frequency and severity of accommodative deficits experienced by those with the condition. In the standard Nott technique, the target is stationary and the observer moves with the retinoscope to find the point of neutrality. The primary modification for the study was in the accommodative stimulus or target of fixation. Leat used an

internally illuminated stimulus composed of pictures to gain more attention, and the stimulus was arranged so that the observer could move closer to the subject. In this way both leads as well as lags of accommodation were able to be measured.<sup>15</sup>

Forty-three subjects with cerebral palsy were involved in the study. Sixty-five percent had been diagnosed with spastic cerebral palsy and 25.5% of the subjects had not been diagnosed with a specific type of cerebral palsy. The subjects also included one child with a diagnosis of athetoid, two children with ataxic, and one with a mixed diagnosis of athetoid and ataxic cerebral palsy. All individuals who were not able to steadily fixate a target, had an inability to detect shapes, or were outside the age range of 3-35 years were excluded from the study. Cognitive ability or the level of cerebral palsy involvement was not a factor of exclusion.<sup>9</sup>

Preliminary testing was performed on each of the subjects which included measurement of: habitual spectacle correction, manifest refractive error, oculomotor status, eye movements, and ocular health. An estimation of the involvement of cerebral palsy was also assessed in the areas of physical ability, communication ability, and cognitive ability.<sup>9</sup>

All accommodative response measurements on the forty-three subjects were assessed with the modified Nott retinoscopy technique. This



was done with the subject wearing habitual correction. The manifest refraction was used when the habitual prescription was greater than 0.5 D different from the preliminary manifest refraction findings. In four cases wearing of the habitual or manifest refraction was not achievable because of intolerance to wearing a trial frame during testing. None of these cases exhibited an uncorrected spherical component greater than 0.75 D or an uncorrected cylinder component greater than 1.25 D.<sup>9</sup>

The specific method of testing involved the subject observing the modified illuminated near target binocularly, and the retinoscope was moved to find the neutral point. The dioptric distance of the neutral point was then noted on an accommodative rule. The accommodative response of each subject was noted at accommodative demands of 4, 6, 8, 10, and 12 D. At the conclusion of testing all results were compared to the appropriate age group of control data.<sup>9</sup>

The results revealed that forty-two percent of the subjects tested demonstrated "an accommodative response outside the 95% confidence limits of normal."<sup>9</sup> In the subjects that had shown accommodation reduced outside of the normal range, most had reduced responses at each of the accommodative demands that were tested.

"Six subjects had accommodative response within the normal range at an accommodative demand of 4 D, but reduced accommodation at all higher

accommodative demands. Therefore, it was easy to classify subjects into 'normal' and 'reduced' accommodation; there appear to be two clearly definable populations among subjects with cerebral palsy with regard to their accommodation."<sup>9</sup>

Amplitude of accommodation was also estimated objectively in the study.

This was done by finding the maximum accommodative response that each child demonstrated for any target distance. Overall, twenty-nine percent had a maximal amplitude of accommodation of equal or less than 4.0 D, which is significant when considering the ability to sustain nearpoint tasks.<sup>9</sup>

The factors that were associated with accommodation were statistically referenced to a significance value of 0.015. The analysis showed that the greatest factor associated with reduced accommodation was visual acuity. "However, it must be noted that good acuity does not preclude reduced accommodation: 19.5% of children with VA 6/12 or better had reduced accommodation."<sup>9</sup> Ocular health was also found to be a significant factor.

Leat also found other factors that were closely associated with reduced accommodation in cerebral palsy, but only significant when the P value was adjusted to 0.05 instead of 0.015. The factors at this level were physical ability, strabismus, and abnormal eye movements. Other factors such as communication ability, cognitive ability, age, mean sphere and

cylinder values, and consistency of fixation during dynamic retinoscopy were found to not be statistically related to reduced accommodation in cerebral palsy.<sup>9</sup>

Even though the study by Leat had the main objective to report on the presence of accommodative anomalies in those with cerebral palsy, when reduced accommodation was found, the parent or caregivers were offered a near lens prescription as an option for the individual. Only four cases were actually given a near prescription for near work. "The number of subjects accepting a near prescription is lower than would be expected if the subjects had been seen as patients, because of the context of taking part in a study rather than seeking clinical advice."<sup>9</sup>

Due to the high association with refractive error and accommodative function deficits in the cerebral palsy population, Leat recommends that all eyecare professionals specifically take objective measurements of accommodation and refractive error and prescribe when it is indicated. In a 1987 article, Duckman also recommends considering prescribing for near in cases of reduced accommodative response, even though his overall approach is a program of visual training.

"It is often necessary to prescribe plus for near work. However, motor involvement must be considered and often precludes the use of a bifocal add for near point. To properly use a bifocal segment, it is necessary to have good head, neck, and trunk control, as well as adequate visual motor skills. If these are not

present, bifocal segments are contra-indicated. It is often possible to give plus adds in single vision lenses for classroom and/or near vision use...the patient should also have a distance correction, if needed, for other activities.”<sup>16</sup>

Both Duckman and Ettinger give manifest refractive error prescribing recommendations for those with cerebral palsy. Specifically, Duckman suggests prescribing for all high refractive errors (over 8.00 D myopia, 4.00 D hyperopia, 4.00 D astigmatism). Moderate refractive errors (3.00-8.00 D myopia, 2.00-4.00 D hyperopia, 2.00-4.00 D astigmatism) is an area where Duckman suggests individual judgement, and “low refractive errors need not be dealt with in terms of spectacle Rx unless the patient has enough functioning to allow him or her to communicate symptoms such as blurry vision or asthenopia to the practitioner.”<sup>16</sup> Ettinger, by contrast, recommends prescribing if there are any complaints of blur and all cases of 1.50 D of myopia, hyperopia, or astigmatism, regardless of the presence of symptoms.<sup>14</sup>

Leat only alludes to prescribing for those with reduced accommodation and cerebral palsy in her study. She specifically recommends that MEM can be used to prescribe the necessary nearpoint lenses for this population, and further, mentions the importance that such intervention can have on individuals in the cerebral palsy population.

“The finding of reduced accommodation in many children with cerebral palsy has considerable educational and communication implications. Many of these children rely on near vision for communication boards or computers as augmentative communication devices. Any child who cannot see clearly at near will be at a severe educational, and possibly developmental disadvantage. It remains to be seen, how much difference the prescription of near corrections may improve their performance.”<sup>9</sup>

Because the clearest possible vision at near for this population is paramount, it is crucial to assess the effects of nearpoint prescribing on those with cerebral palsy. Such knowledge can make a critical difference in the level of care these patients receive and ensure that eyecare providers have helpful insights in knowing how to best serve the visual needs of this population. Therefore, the purpose of our study is to assess the performance effects of near corrections on a population of patients with cerebral palsy and profile some of the factors that can lead the eyecare practitioner to successful nearpoint prescribing for these patients.

## Methods

To begin with we selected patient files from the Oregon School for the Blind, which is the base for an outreach developmental low vision clinic, The Oregon Lions Statewide Low Vision Clinic. We located 15 records that had a diagnosis of CP, an accommodative posture assessment, and were given an eyeglass prescription for near point activities. All of the 15 records

showed accommodative dysfunction. We next drafted a letter of intent (see attached) to the parents and vision teachers of these patients concerning our study. We then asked them to fill out a twelve question survey we constructed (see attached) that addressed a wide range of activities these patients are involved in on a daily basis. After reviewing the data collected it was decided to best approach this project as a case study.

The fifteen patients whose records we obtained had their accommodative posture measured using the Monocular Estimate Method, or MEM. A target is used with figures of the appropriate size and contrast. In order to demonstrate the validity of MEM retinoscopy for accommodative posture we reviewed several papers on dynamic retinoscopy. In a study done by Rouse, London, and Allen on dynamic retinoscopy, it was determined that MEM retinoscopy was found to correlated extremely well with lab results of accommodation through the use of a phoroaccommodator. In the paper they also describe the technique of MEM.

“The patient is seated comfortably under adequate illumination, with the target at the patient’s habitual near working distance. The target is a white card having words in 8 or 12 point type and appropriate for the patient’s grade level. The words are printed within 1.25 cm of a 1.25 cm diameter hole in the card. The card is attached to the retinoscope so that the retinoscope streak passes through the hole into the patient’s eye and the reflex can be observed by the examiner. This arrangement assures close alignment of the visual axes of the patient and examiner, and is within the tolerances calculated by Haynes to avoid the various aberrations caused by being off axis. The vertical streak is moved quickly across the horizontal meridian of one eye and then the other and the motion of the reflex is observed. An estimate of the magnitude of the motion is then made. The streak

is again moved quickly across the eye as a measuring lens is briefly interposed in the spectacle plane. This monocular measurement is made quickly in an attempt not to disturb the binocular accommodative response nor interfere with binocular fixation. Moses reports an average reaction time of about 0.36 sec to an accommodative stimulus; therefore, a measurement within that time should not be disruptive. The measurement obtained is the accommodative lag. The procedure is repeated for the other eye to determine the existence of any difference in accommodative response between the two eyes. Typical clinical findings are +0.50 to +0.75D of accommodative lag under the above conditions."<sup>3</sup>

## Results

Of the fifteen surveys sent out we received back seven, or a 47% response. Each of the vision teachers that were sent a survey also received follow-up communication concerning the study and were encouraged to solicit as many other sources as possible to evaluate the effects of the nearpoint lenses on the individual's performance. Most notably, this included the parents of the student as well as other educational specialists.

From the seven surveys we received back, only one commented that the glasses prescribed were never worn by the student at school. A second survey commented that the glasses were only worn one time at school and specifically, the vision teacher stated that head control was a far larger issue for the student than the glasses themselves.

Three of the seven surveys returned were primarily neutral in response to the questions asked. The first of the three stated that the glasses were worn inconsistently and the frame appeared to have an improper fit. A

second reported the student only wore the glasses 10% of the time for close work, but were not able to observe any real difference in visual ability. The third of the three neutral surveys returned stated that the student was very low functioning cognitively, making some of the observations difficult to assess. However, the vision teacher had noticed several areas of improvement since the prescription was given: the student was more cooperative in the classroom and at home, less agitated or frustrated by nearpoint tasks, had a greater ability to identify objects and discriminate details at near, and had an increased ability to perform daily occupational and personal hygiene type tasks.

The final two surveys we received back gave very positive responses. Both reported that the student wore the glasses 90% to 95% of the time while in school. One of the two surveys incorporated comments from two aides and one teacher for a total of three specific evaluations for this student. Those completing the surveys for both students strongly agreed that the students' overall performance in daily nearpoint activities had improved. Other areas of greatest improvement included that the student was more alert and responsive to nearpoint objects and tasks and their ability to identify objects and discriminate details at near increased.



Since both of these children had such great success with the new glasses, further information was extracted on each case to help determine the factors that contributed to the large amount of improvement that they experienced. Specifically, each of the vision teachers were directly contacted to gather additional information about the personality characteristics, degree of cerebral palsy and function, and the support system for each student at home and school to aid in adjustment and implementation of the nearpoint lenses.

#### Case 1- CJ

CJ is a 15 year old patient with a medical history of prematurity with developmental delay and cerebral palsy. Visually, He has been diagnosed with retinopathy of prematurity, amblyopia, and exotropia. His distance visual acuities were OD 20/800, OS 20/200 and OU 20/200. Near acuity was measured binocularly at 20/200 OU. He was wearing no Rx. His retinoscopy results were OD +0.75 -0.50 X 100, OS Plano sphere. His MEM demonstrated almost no accommodative response, and was plano with a +1.50 lens. Peripheral fields showed no restrictions. CJ also demonstrated a right exotropia and also had nystagmus. He also showed poor tracking accuracy and his eyes often moved to a supraducted (upward) position and

would hold for a few seconds. The final RX: OD +1.75, and OS +1.50, was prescribed for near work only.

CJ's vision teacher enlisted the help of two aids and one teacher in completing our survey. They state that CJ wears his glasses 90% of the time for near activities and that they strongly agree that CJ's performance has improved. In a follow-up phone call with CJ's vision teacher we learned more about what contributed to the near Rx success.

The vision teacher informed us that CJ is not confined to a wheelchair, and that he is able to attend high school. He is very personable around people that he is familiar with. CJ is reading at a primary level and enjoys looking at pictures in books. When reading glasses were first suggested for CJ, his mother explained that they had tried glasses in the past and that the glasses hadn't made any difference. The vision teacher went out and bought a pair of reading glasses from a drug store and started working with CJ on how to use a pair of reading glasses. He helped CJ describe what he was seeing and actually teach what he was seeing.

The vision teacher explained how just improving someone's acuity doesn't mean that they can automatically perceive what is now in focus in front of them. He told us that CJ was reading 72 point print without his glasses and that now with the near glasses he is able to read 24 point print.

After CJ's mother saw his improvement she consented to have the prescription filled for the reading glasses.

### Case 2- J.P.

J.P. is a 9 year old female with cerebral palsy. Visually, she has been diagnosed with hyperopia, astigmatism, esotropia, and amblyopia. Her prescription at the time was; OD +5.25-3.00x160, and OS +5.50-3.00x025 and was worn full time at school. With this prescription, her distance acuities were OD 20/250, OS 20/70, and OU 20/70 using picture cards. Near acuities were OD 20/250, OS 20/50, and 20/50 OU. Retinoscopy showed refractive values of OD +5.50-3.50x170 and OS +5.50-3.50x020. At near, J.P. did not show any subjective accommodative response, however, MEM revealed that her accommodative response varied from +0.50 to +1.50, and she was unable to sustain the response for more than five to ten seconds. A near lens of +2.00 brought her conjugate focus to 40 centimeters. These accommodative findings were measured in her left eye only because J.P. also demonstrated to have esotropia and amblyopia in her right eye. Fixation was central in the left eye, and tracking and saccades were found to be full and fairly accurate. Anterior and posterior segment

student and currently performs below grade level. Although her vision

findings were unremarkable. The final prescription of OD +5.25-3.00x165, OS +5.25-3.00x022 with a +2.00 bifocal add was given to be worn full-time.

There was some concern that J.P. would not be able to properly utilize the bifocal that was prescribed, but the team (doctor, vision teacher, and parent) decided that if any improvement could be made with the glasses it should be attempted. J.P.'s vision teacher completed our survey and noted that J.P. wears the new spectacles prescribed approximately 95% of the time while in school. She strongly agreed that J.P.'s performance in classroom and near activities has improved since she received the new glasses. Areas of greatest improvement included increased ability to identify objects and discriminate details at near and being more alert and responsive to nearpoint objects and tasks. Additional discussions with J.P.'s vision teacher allowed further insight into what contributed to the success J.P. experienced with the near prescription. J.P. currently uses a wheelchair as her primary means of mobility, although she has had several hip surgeries in the past few years. The surgeries have allowed her to walk short distances with braces while being assisted by a therapist, and she can maneuver her wheelchair independently very well. J.P. attends a mainstream elementary school where she is an ESL student and currently performs below grade level. Although her vision

teacher notes that J.P. can be stubborn and controlling at times, she is social and initiates conversations on occasion.

J.P. comes from a home where only Spanish is spoken. She has support from both of her parents, however, they often cater to her needs. Her home environment is described as dark, with the lights often off. Television is the primary activity and many people live in the crowded apartment. J.P. almost never wears her glasses at home, and although her parents are supportive of her use of the glasses, do not encourage her to use them for activities in the home. J.P.'s vision teacher states that her parents support of the use of the glasses in all environments seems to be increasing since they have seen the improvements in J.P.'s performance at school.

Her vision teacher reemphasized that at first they felt that perhaps J.P. did not have enough head and neck control to have the bifocal be effective. However, she has been pleasantly surprised to find that J.P. has adapted to the bifocal very well and her posture has improved as a result of using the bifocal each day at school. Before receiving the bifocal, J.P. would posture her neck down and in toward her chest and rarely elevate her neck to look up. In the process of adapting to the bifocal and near lens, J.P. began holding her head more to access the near and distance portions of the bifocal.

J.P.'s vision teacher also noted that she has made very large gains in her social and academic performance since she received the new bifocal prescription. Specifically, she commented on how J.P. looks at people when they are talking to her and holds her focus more often when attending to near objects or demonstrations. Her attentiveness in the classroom has increased dramatically. She also reported that previously, when J.P. was not wearing the bifocal, she could not grasp or hold near objects. After wearing the bifocal for one year she is now doing math independently in class and holding her own pencil. J.P.'s vision teacher reports that there are no real visual concerns for J.P. at near now that she is using the bifocal. Due to the notable improvement, J.P.'s elementary school requires her to wear the glasses at all times in the classroom.

## **Discussion**

As previously mentioned, one of the main purposes of this paper was to find out what factors contribute to success in prescribing nearpoint lenses for a patient with cerebral palsy. The overall goal was to not only note the existence of accommodative dysfunction in the cerebral palsy population through consideration of past studies and the study group for our project, but

also to aid the general eyecare practitioner in providing the best vision care for cerebral palsy patients.

First, as suggested in the previous studies, a thorough objective evaluation of the accommodative system is paramount. Even with appropriate diagnosis and prescription lenses, there are several factors that contribute to the successful utilization of the lenses prescribed. These key points include: the patient's cognitive level and awareness of improvement with nearpoint prescription, time given to adapt to the prescription, initial training received and continued support at home and school, and physical disabilities that may compromise the utilization of the nearpoint prescription such as posture and muscle control.

The CP population creates a challenge for the clinician to obtain information necessary to aid the patient. This is especially true for those with mental impairment and cognitive limitations. Objective measurements are heavily relied upon, such as distance and near retinoscopy. Objective measurements are also heavily relied upon in a pediatric population, and in many ways working with a CP population requires the same approach. For instance, an older CP patient with perceptual and cognitive difficulties will often function comparably to a normal functioning younger child. The CP patient with these types of disabilities will require the same type of training,

education, and time to make perceptual adaptations. A case in point is when it is known that a problem exists with a child that can be aided optically, appropriate lenses are prescribed and the patient is strongly encouraged, if not required, to wear the lenses. The standard holds even if initially there seems to be no subjective improvement. This is especially true in cases such as high hyperopia and anisometropia. The patient may not be able to initially appreciate the aid that their glasses will give them. It is only after time that it becomes more apparent that the glasses are improving their ability to function visually. In much the same way the CP patient with mental disabilities may not initially exhibit an appreciation of the assistance given by the nearpoint prescription.

This was evident in the cases that gave a neutral response to the nearpoint prescription in our study. Four out of five of the children were non-verbal with lower cognitive levels, as indicated by acuity measures and a diagnosis of Cortical Vision Impairment, which in combination with CP, indicates global physical and mental disabilities. Conversely, in the cases of CJ and JP, both students were able to communicate at the time of examination and have been mainstreamed into the public school system. Therefore, as discussed above, it would follow that the patients with lower cognitive levels may not display an observable appreciation for the nearpoint



correction, as did J.P. and C.J., who are higher functioning. However, when accommodative dysfunction is measured in CP patients with lower cognitive function, a near prescription is merited based upon the accommodative findings alone. In light of other more responsive patients, it is known that the potential exists that the quality of visual information they receive can be enhanced.

Adequate time to adapt is another key factor in the success of the CP cases we studied. Logically, due to the nature of CP being a condition that affects motor control it is not surprising that additional time is required to initiate physical adaptations. It follows that any observable increase in visual performance may be delayed, even though there may be an improvement in clarity at near. In a study by Bader and Woodruff on a sample of 287 mentally retarded patients, it was noted that the greatest improvement with a spectacle correction is not seen until the second month of wearing the prescription. Bader and Woodruff go on to state:

“Classroom behavior may take at least a month to undergo modification. Poor fixation, poor eye-to-eye contact, poor visual acuity, poor focusing ability, and poor binocular coordination generally result in less than optimum performance in school work. Ocular fatigue and eyestrain, headaches, and other symptoms could cause the individual to decrease concentration, attention would drop off, and performance would be impaired. The individual would tend to avoid tasks that induce these symptoms and behavior in the classroom might deteriorate.”<sup>17</sup>

Even though Bader and Woodruff's study involves a general population of mentally retarded patients, sixty percent of CP patients have mental disabilities. Thus, Bader and Woodruff's findings would correlate to a significant proportion of CP patients with visual needs.

The initial training received and continued support at home and school can also have a great bearing on the success of the nearpoint prescription with these patients. Those with CP need a thorough training process, beginning with the eyecare provider, to help them learn how to use the new nearpoint lenses to improve their near vision. Both JP and CP received a notable amount of training from the practitioner and vision teacher alike, upon receiving the prescription. Many CP patients may be more likely to be successful with a nearpoint prescription when adequate training is given to help make physical adjustments and adaptations for optimal use.

A continued support system surrounding the patient in regards to the implementation and resulting success of the nearpoint lenses is vital. Proper education for those individuals involved in working with the CP patient is almost as important as training the patient. As the eyecare provider, it is critical to provide education to the patient, parents and educators about the reason the lenses were prescribed and instructions for proper use. It is also

crucial to stress the importance of utilizing the prescription both at school and home with these patients. The eyecare provider should work with the vision teacher to ensure that teachers and parents are supportive of the new prescription. At times, it may be found that parental support for the nearpoint lens may be small or nonexistent at first. For example, in the cases of CJ and JP, parental support was not initially manifest until improvement was demonstrated at school. Both cases demonstrated that with encouragement, from both parents and educators, success with the nearpoint prescription is more likely to occur.

Often, postural and physical limitations may appear to be significant barriers to successful spectacle wear. For example in the case of J.P., it was believed that she did not have the neck control or strength to successively use a bifocal. She was given adequate training at first and in addition, her classroom teacher required her to wear the bifocal lenses as prescribed. This gave her the opportunity and time to demonstrate that she indeed had the capability to effectively make use of a bifocal lens. Ironically, in J.P.'s case, the nearpoint prescription helped her to improve her posture and coordination. This may be due, in part, to the enhanced visual stimulus provided by the nearpoint prescription and the necessity to hold her head up to utilize the lens.

In conclusion, despite the various factors working against the eyecare provider, the efforts made by the practitioner can definitely make a difference for these individuals. A thorough evaluation of the accommodative system must be performed on the CP patient. CP results in the loss of muscle control, thus also affecting accommodation. As demonstrated by our study these patients can greatly benefit from a near point lens prescription. Like all patients, CP patients are worthy of the practitioner's best efforts to provide them the vision that enables them to function at their highest potential. Additionally, the practitioner offers the patient the highest level of care and does not assume that it will not be accepted. Often in this population the physical and cognitive abilities may lead the practitioner to believe that a lens prescription is not warranted. The CP patient should at least be given the opportunity and time necessary to benefit from a nearpoint prescription.

1. *Medical Primer, Second edition Baltimore, Brooks, 1986.*
2. *Mason DM: Diagnosis and Management of Special Populations, St*
3. *estimate method of dynamic retinoscopy, American Journal of*
4. *palsy, Arch Ital Pediatr 25(3): 251-264, 1968.*
5. *Lossei S: Ocular findings in cerebral palsy, American Journal of*
6. *American Journal of Ophthalmology 48(5): 711-730, 1959.*
7. *Exuber GP: Some eye defects seen in cerebral palsy, Am J Phys Med*
8. *Mason JH: Ocular defects associated with cerebral palsy: a review, Review of Optometry (10): 69-72, 1979.*
9. *Leat SJ: Reduced accommodation in children with cerebral palsy, Ophthal. Physiol. Opt. 16(5): 385-392, 1996.*
10. *Duckman RH: The incidence of visual anomalies in a population of cerebral palsied children, Journal of the American Optometric Association 50(7): 1013-1016, 1979.*
11. *Duckman RH: Effectiveness of visual training on a population of cerebral palsied children, Journal of the American Optometric Association 51(6): 607-614, 1980.*

## References

12. Duckman RH: Accommodation in cerebral palsy: function and remediation, *Journal of the American Optometric Association* 53: 281-283, 1964.
1. Batshaw ML, Perret Y: *Children with Handicaps A Medical Primer*. Second edition Baltimore, Brooks, 1986.
2. Maino DM: *Diagnosis and Management of Special Populations*. St Lewis, Mosby, 1995.
14. Etinger ER: Optometric evaluation of the patient with cerebral palsy, *American Journal of Optometry and Physiological Optics* 61(7): 724-726, 1986.
3. Rouse MW, London R, Allan DC: An evaluation of the monocular estimate method of dynamic retinoscopy, *American Journal of Optometry and Physiological Optics* 59 (3): 234-9, 1982
15. Rouse MW, London R, Allan DC: An evaluation of the monocular estimate method of dynamic retinoscopy, *Ophthalm. Physiol. Opt.* 6(3): 234-9, 1982.
4. Jones MH, Dayton GO: Assessment of visual disorders in cerebral palsy, *Arch Ital Pediatr* 25(3): 251-264, 1968.
16. Duckman RH: Visual anomalies in cerebral palsy, *American Journal of Ophthalmology* 54: 1113-1118, 1962.
5. Lossef S: Ocular findings in cerebral palsy, *American Journal of Ophthalmology* 54: 1113-1118, 1962.
17. Diamond S: Ocular evaluation of the cerebral palsied child, *American Journal of Ophthalmology* 48(6): 721-730, 1959.
6. Diamond S: Ocular evaluation of the cerebral palsied child, *American Journal of Ophthalmology* 48(6): 721-730, 1959.
7. Guibor GP: Some eye defects seen in cerebral palsy, *Am J Phys Med* 32(6): 342-347, 1953.
8. Maino JH: Ocular defects associated with cerebral palsy: a review, *Review of Optometry* (10): 69-72, 1979.
9. Leat SJ: Reduced accommodation in children with cerebral palsy, *Ophthalm. Physiol. Opt.* 16(5): 385-390, 1996.
10. Duckman RH: The incidence of visual anomalies in a population of cerebral palsied children, *Journal of the American Optometric Association* 50(7): 1013-1016, 1979.
11. Duckman RH: Effectiveness of visual training on a population of cerebral palsied children, *Journal of the American Optometric Association* 51(6): 607-614, 1980.

12. Duckman RH: Accommodation in cerebral palsy: function and remediation, *Journal of the American Optometric Association* 55: 281-283, 1984.
13. Scheiman MM: Optometric findings in children with cerebral palsy, *American Journal of Optometry and Physiological Optics* 61(5):321-323, 1984.
14. Ettinger ER: Optometric evaluation of the patient with cerebral palsy, *Journal of Behavioral Optometry* 2(5): 115-122, 1991.
15. Leat SJ, Gargon JL: Accommodative response in children and young adults using dynamic retinoscopy, *Ophthal. Physiol. Opt.* 16(5): 375-384, 1996.
16. Duckman RH: Vision therapy for the child with cerebral palsy, *Journal of the American Optometric Association* 58(1): 28-35, 1987.
17. Bader D, Woodruff ME: The effects of corrective lenses on various behaviors of mentally retarded persons, *American Journal of Optometry and Physiological Optics* 57(7): 447-459, 1980.

Sincerely,

Jon Wilson and Adam Hunt  
J.P. Lowery, O.D.  
Pacific University College  
of Optometry

January 7, 1999

Letter of Intent:

As students of Pacific University College of Optometry, we are conducting the following survey in order to assess the effect of glasses on a group of cerebral palsied individuals. Under the direction of Dr. J.P. Lowery, we have been assessing the vision needs of students served by the Oregon Statewide Low Vision Clinic. There are an estimated 750,000 cerebral palsied patients in the United States and their lives can be greatly enhanced if eye doctors will take the time to assess the focusing ability of these patients, and give appropriate glasses. Often, these patients are corrected for distance vision only, when a pair of glasses for near would be more beneficial for educational and other daily activities.

The goal of this project is to show that cerebral palsied individuals often do have a greatly reduced ability to focus at near distances, and to provide doctors with a guideline on how to best serve the visual needs of this population.

For this reason we are gathering information from parents, vision teachers, and others who work closely with patients that have received a pair of glasses for near work. Since the group that received glasses for near work from the Oregon Statewide Low Vision Clinic is small, your participation is critical to the success of this project. Please take a moment to complete the following short survey. A self-addressed, stamped envelope has been provided for your convenience. The information you provide will have the potential to help improve the quality of vision care for not only this small study group, but all cerebral palsied patients. Thank you for your time and effort in making this project a success.

Sincerely,

Jon Wilson and Adam Hunt  
J.P. Lowery, O.D.  
Pacific University College  
of Optometry

Please respond to these statements regarding the functioning of your child/student during nearpoint tasks. Nearpoint tasks are any activities that involve vision within three feet of the individual.

Please use the following scale when giving your responses:

1-Strongly Agree; 2-Agree; 3-Neutral; 4-Disagree; 5-Strongly Disagree  
If the statement does not apply, give N/A as your response.

<u>Statement</u>	<u>Response</u>
1. The student wore the glasses prescribed according to the doctor's recommendations daily (especially while involved in sustained near tasks) approximately ____% of the time. ( <i>please quantify</i> )	_____
<i>Statements 2-11 correspond to the time period after receiving the glasses:</i>	
2. The student's overall performance in daily nearpoint activities has improved.	_____
3. The student can perform near tasks for a longer period of time without fatigue.	_____
4. The student is more alert and responsive to nearpoint objects and tasks.	_____
5. The student is more motivated to participate in nearpoint activities.	_____
6. The student is more likely to perform near tasks independently.	_____
7. The student is more cooperative in the classroom and at home.	_____
8. The student becomes less agitated or frustrated by near tasks.	_____
9. The student's ability to perform daily occupational and personal hygiene tasks has increased.	_____
10. The student's ability to identify objects and discriminate details at near has increased.	_____
11. The student's ability to see and utilize adaptive communication aids has improved.	_____
12. The student's performance in reading/keyboarding tasks has increased.	_____

*Please note any other observations/comments that you have regarding the use and vision behavior of your child/student with the glasses. If you need additional space use the back of this form.*