

Article

Evaluating Changes in Quality of Life after Vision Therapy Using the COVD Quality of Life Outcomes Assessment

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ABSTRACT

Background: This study determined if completing an optometry school based home- and in-office vision therapy program could decrease symptoms and improve quality of life using the COVD Quality of Life Outcomes Assessment as a measurement tool. **Methods:** Forty-nine subjects ages 7-45 years with various visual diagnoses completed the 30-item survey before starting vision therapy (Visit 1), again at the six-week visit (Visit 6), and following the completion of the therapy (Final). Data were analyzed by Visit 1, Visit 6, and Final survey summed results. These results were divided into four domains: Physical-Occupational, Social Integration, Somatic Sensation, and Psychological, which are based on the original question categories. Data were also analyzed by age groups to determine if perceptions of changes in quality of life differ between groups. A lower score indicated less severe symptoms. **Results:** Mean scores were progressively lowered from Visit 1, to Visit 6, to Final Visit for all domains, in both the older age group (≥ 18 years) and the younger age group (<18 years). **Conclusions:** The COVD Quality of Life Outcomes Assessment was an effective way to measure quality of life changes after vision therapy in this patient

population. Vision therapy resulted in a decrease in subjects' symptoms.

KEY WORDS

vision therapy, quality of life, outcomes assessment

INTRODUCTION

The efficacy of vision therapy in treating disorders of accommodation,¹⁻³ convergence,⁴⁻⁶ divergence,⁶ and oculomotility⁷⁻⁹ has been well documented in numerous studies. In these studies, efficacy was defined as improved objective measurements in accommodative amplitudes and vergence ranges by the clinician.^{2,4} Although objective measurements by the clinician improved, subjective improvements in visual symptoms by the subjects were not always evident, or vice versa. These studies did not have very large sample sizes, nor was a standardized method of subjective symptom measurement utilized. How do we determine if the patient perceives vision therapy to be effective in relieving their symptoms and improving their quality of life?¹⁰

A study by Cook in 1995 addressed what patients and families feel are the most important benefits of vision therapy. The most commonly reported changes experienced by patients following vision therapy were: improved reading skills, decreased frequency of headaches, improved school performance, increased self-confidence, and enjoyment of reading.¹⁰ This study provided a starting point for determining which criteria should be included in a survey to assess the effects of vision therapy.

The College of Optometrists in Vision Development (COVD) developed a committee in 1995 to address the changes in quality of life as a result of vision therapy. This group, the Quality of Life Outcomes Assessment Committee, devised a 30-item questionnaire to administer to patients before, and after the completion of vision therapy.¹¹ This questionnaire (Appendix

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addresses symptoms associated with vision anomalies from four broad categories of quality of life: somatic, physical/occupational, social, and psychological. The *somatic sensation* symptoms in the questionnaire include headaches, asthenopia, pain, diplopia, dizziness, nausea and blurry vision (survey questions 1-7, 9, 29). The *physical-occupational* category addresses mobility, job, school, self-care, and ability to manage life without assistance (survey questions 8, 10-16, 18, 23, 24, 25). Symptoms associated with *social interaction* are addressed by asking about personal relationships with friends, family, peers, and community (survey questions 17, 20, 22, 26, 27). Lastly, the *psychological well-being* section includes overall satisfaction with life, anxiety, memory, and self-image (survey questions 19, 21, 28, 30).¹²

Some advantages of a survey are ease of administration, low cost, decreased examiner bias, and standardization. The main disadvantage of surveys is that they leave no room for elaboration by the clinician. The only way to elaborate on a patient's responses to the survey is to interact with the patient, thereby introducing examiner bias.¹²

When considering use of a survey, one needs to know its reliability. Maples conducted a study in 2000 to determine whether the survey developed by COVD was reliable. Having a reliable survey was defined as having repeatable scores upon multiple administrations of the survey. A group of optometry students were given the survey twice, separated by two weeks. There was no vision therapy intervention between the two administrations of the survey. This study found that there was no significant difference in responses/scores. The survey was found to have good test-retest reliability.¹²

After the COVD questionnaire was determined to be a reliable tool to measure quality of life, Maples and Bither conducted a study in 2002 to determine whether the survey would accurately document improvements in quality of life resulting from vision therapy in a clinical setting. In this study, the children (ages 7-17) were to fill out the pre- and post-therapy questionnaires with the help of their guardian in order to complete the survey as honestly and completely as possible. The examiners did not want the results to be biased by only having the parent complete the form. Also, by allowing the parents to help the child, the examiners ensured that the children fully understood the survey. The study found that the survey was an accurate means of portraying reduced symptoms following vision therapy.¹³

Private practices all over the United States are using the COVD survey to contribute information on changes in quality of life after vision therapy. We undertook this study using the survey at the Illinois Eye Institute to determine whether our patients' symptoms would be reduced and their quality of life improved following vision therapy. Due to the demographics and socioeconomic status of our patients, this is a unique

population to contribute to the existing research on quality of life after vision therapy.

METHODS

The study was conducted at the Illinois Eye Institute (IEI), the teaching clinic of the Illinois College of Optometry, located in Chicago. Subjects included in this study consisted of individuals of any age, race, sex, or nationality, who agreed to participate in a once-weekly in-office vision therapy program in combination with home vision therapy. Subjects with any diagnoses of binocular vision (including strabismus/amblyopia), accommodative, oculomotor, and visual information processing disorders were enrolled. All subjects completed a minimum of six vision therapy visits. The following were excluded from the study: patients with mental disability, patients who were not scheduled for weekly in-office therapy visits, minors whose legal guardian was not willing or available to give consent or assist in completing the survey. The study was approved by the Institutional Review Board of the Illinois College of Optometry. Forty-nine subjects from the IEI agreed to undergo vision therapy as a treatment for their visual conditions, and were enrolled in the study. The subjects ranged in age from 7-45 years. There were 26 subjects younger than age 18 years (mean age 9.7 years), and 23 subjects age 18 and older (mean age 25.7 years).

When an eligible subject began the vision therapy program, the attending optometrist explained the survey and obtained consent. The consent form was read and explained to minors, who signed the consent form along with their guardian. Minor subjects and their legal guardian were asked to collaborate to complete the COVD survey in order to obtain the most accurate responses. At the first therapy visit, the survey (see Appendix¹²) was completed before any vision therapy was done. Subjects were asked to complete the survey as honestly as possible. The same survey was given following the sixth therapy visit. If it was necessary that the subject continue therapy after the sixth visit, the survey was administered again after their last visit. The subject's responses from the surveys were compared to determine whether vision therapy had reduced symptoms and improved quality of life.

A numerical score of 0-4 was assigned to the pre- and post-therapy survey responses. A score of four points was assigned to symptoms marked "always." Three points were given if the symptom occurred "frequently." Symptoms checked "occasionally" received a score of two. One point was assigned to responses marked "seldom." If a patient marked "never," zero points were scored. Total scores were obtained by summing the scores for each individual question, and separating the questions into four different domains. The summed score for each of the survey administrations was calculated for each domain.¹³ A lower numerical score meant the subject experienced less severe symptoms than someone with

a higher numerical score. The four scores calculated for each survey were: *somatic sensation (S)*, *physical/occupational (PO)*, *social interaction (SI)*, and *psychological well-being (P)*.¹² The maximum possible scores for each domain were: *S*-36, *PO*-48, *SI*-20, and *P*-16.

The data were analyzed using Version 13 of the Statistical Package for the Social Sciences [SPSS, Chicago, IL] computer software program. A value of $p < 0.05$ was used to evaluate the statistical significance of the results. A Repeated Measures ANOVA Design was conducted to analyze the data. The data from each individual subject were summed and analyzed with a test of within-subjects effects. The summed scores were compared between Visit 1, Visit 6, and Final surveys completed. The summed data were then analyzed by each domain of survey items (*S*, *P*, *SI*, *PO*) for the three administrations of the survey. In addition, within each domain, a test of between-subjects effects was conducted, in which the data were divided into groups by age. Data from subjects < 18 years old were compared to those ≥ 18 years of age.

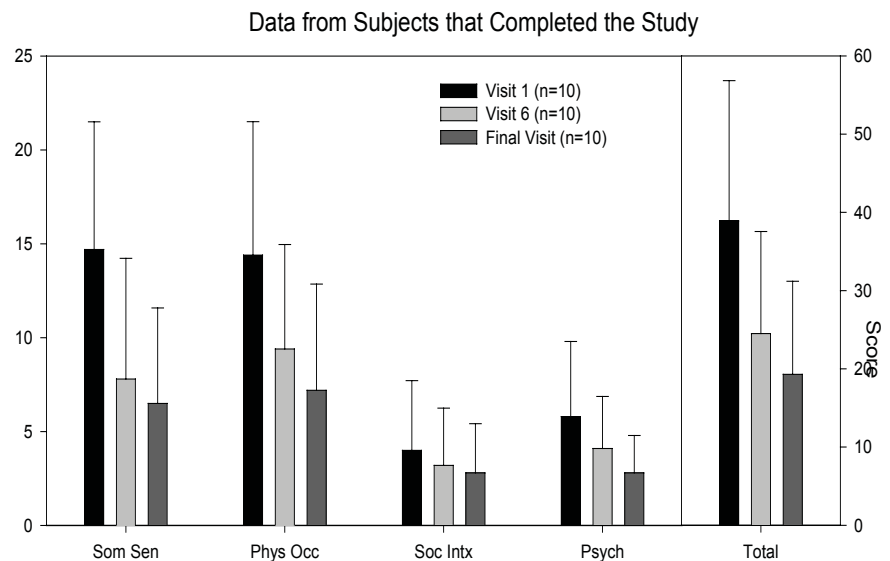
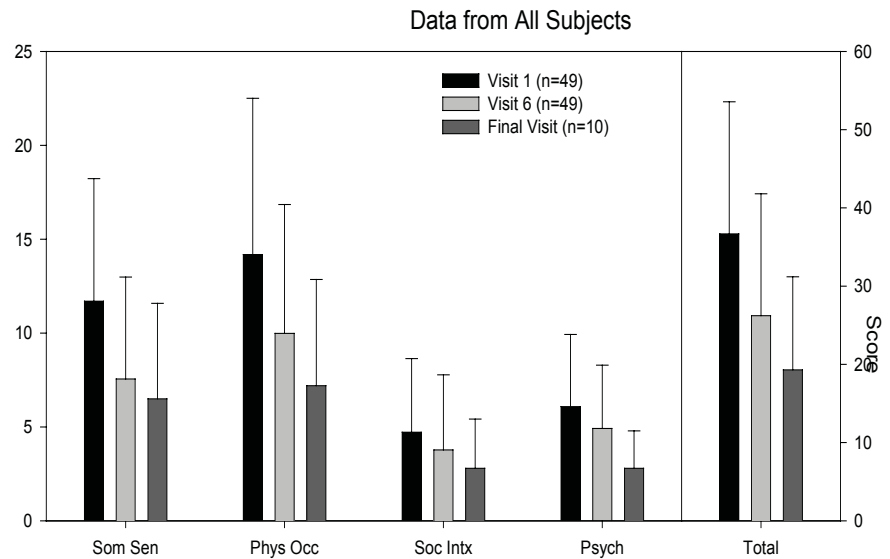
RESULTS

Table 1 shows the data from each of the three survey administrations separated by domains, as well as the total summed mean scores from all the domains together. The Repeated Measures ANOVA found a statistically significant difference ($p < 0.05$) between the scores from Visit 1, Visit 6, and Final visit for the *S*, *PO*, and *P* domains. The scores from the *SI* domain were not significantly different between the three survey administrations ($p = 0.226$). Figures 1 and 2 show a graphical representation of the data presented in Table 1. All mean scores were lowered from Visit 1 to Visit 6 to the Final visit for all domains, indicating a reduction of symptoms.

Table 1: Summed Survey Scores for all Subjects and Domains

	Visit 1* (n=49)	Visit 6* (n=49)	Final* (n=10)	p value [‡]
Somatic Sensation	11.7 ± 6.5	7.6 ± 5.4	6.5 ± 5.1	< 0.0001
Physical-Occupational	14.2 ± 8.3	10.0 ± 6.8	7.2 ± 5.7	0.002
Social Interaction	4.7 ± 3.9	3.8 ± 4.0	2.8 ± 2.6	0.226
Psychological Well-Being	6.1 ± 3.8	4.9 ± 3.4	2.8 ± 2.0	0.021
Total Score	36.7 ± 16.9	26.2 ± 15.6	19.3 ± 11.9	

* = Mean Scores ± Standard Deviation



Figures 1 & 2. Summed Survey Scores from All Subjects and All Domains. (Som Sen = Somatic Sensation, Phys Occ = Physical-Occupational, Soc Intx = Social Interaction, Psych = Psychological Well-Being)

Table 2 shows the data separated into age groups and the total summed mean scores for Visit 1 and Visit 6. The results from the final visit were dropped due to only 10 subjects completing the final survey. There were six subjects in the <18 years group and four subjects in

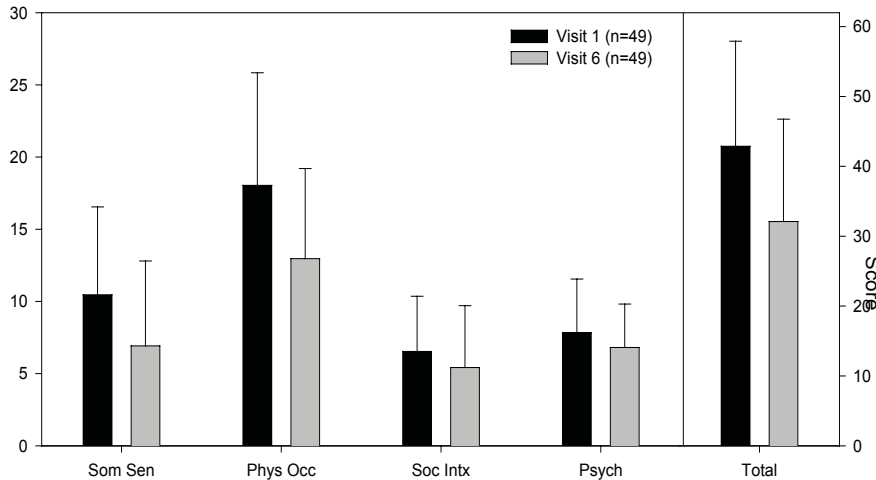
Table 2: Summed Survey Scores for all Domains by Age

	Visit 1*		Visit 6*		p value‡
	<18 y/o (n=26)	≥18 y/o (n=23)	<18 y/o (n=26)	≥18 y/o (n=23)	
Somatic Sensation	10.5 ±6.1	13.1 ±6.9	6.9 ± 5.9	8.3 ± 4.9	0.214
Physical-Occupational	18.0 ± 7.8	9.8 ± 6.7	13.0 ± 6.2	6.6 ± 6.0	<0.0001
Social Interaction	6.5 ± 3.8	2.7 ± 2.9	5.4 ± 4.3	1.9 ± 2.7	<0.0001
Psychological Well-Being	7.8 ± 3.7	4.1 ± 3.0	6.8 ± 3.0	2.8 ± 2.4	<0.0001
Total Score	42.9±15.0	29.7 ±16.4	32.1 ±14.6	19.6 ±14.1	

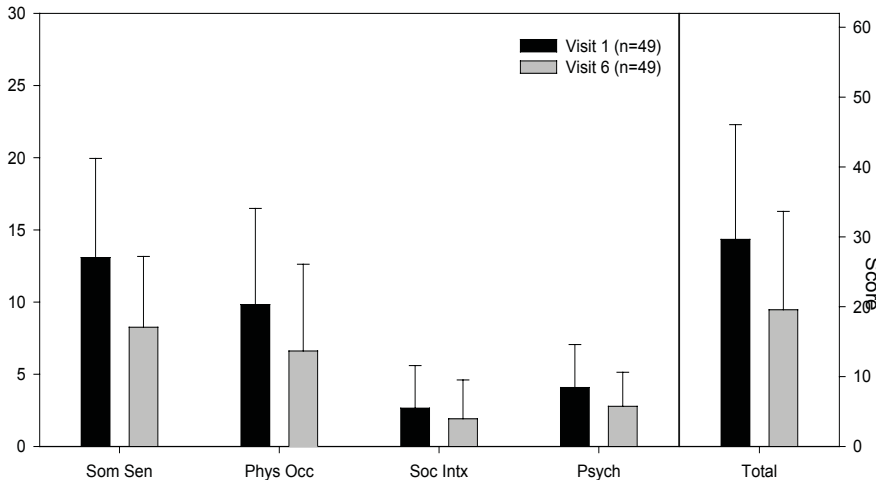
* = Mean Scores ± Standard Deviation

‡ = p value corresponds to comparison of scores between visits

Subjects under 18



Subjects over 18



Figures 3 & 4. Summed Survey Scores for All Domains for Visits 1 and 6, Ages <18 Years and ≥18 Years (Som Sen = Somatic Sensation, Phys Occ = Physical-Occupational, Soc Intx = Social Interaction, Psych = Psychological Well-Being)

the ≥18 years group who completed the full course of therapy, leaving us with too few subjects to compare the difference statistically between age groups/domains. Tests of between-subjects effects showed a significant difference ($p < 0.0001$) between the Visit 1 and Visit 6

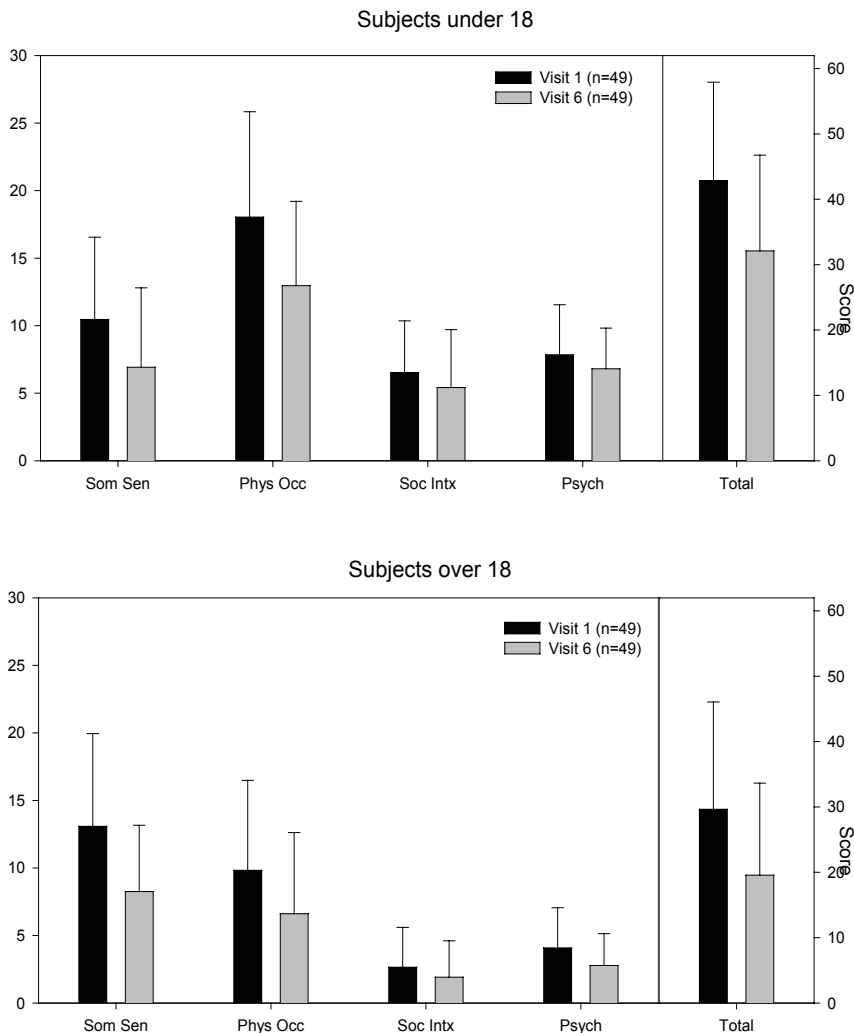
survey responses for the *PO*, *SI*, and *P* domains. There was no significant difference between age groups for Visits 1 and 6 in the *S* domain ($p=0.214$). Figures 3 and 4 show graphs representing the data presented in Table 2. All mean scores were lowered from Visit 1 to Visit 6 for all domains and age groups. Overall, our data showed that symptoms associated with disorders of visual function were reduced following the administration of vision therapy for each domain and age group.

DISCUSSION

Research has supported the efficacy of vision therapy by objective measures in binocular vision diagnoses such as exotropia,¹⁴ accommodative anomalies,¹⁻³ vergence anomalies,^{1,5,6} and oculomotor anomalies.⁷⁻⁹ Patients seek treatment for their binocular anomalies because they have symptoms. Therefore, treatment is only successful if patients' symptoms have diminished after the course of therapy.¹² One can speculate that if a patient's symptoms have decreased, the quality of life of the patient has improved. Our research was undertaken to determine the effect of vision therapy on patients' subjective symptoms and quality of life using the COVD Quality of Life Outcomes Assessment for an urban population.

A previous study utilizing the COVD survey¹³ showed a dramatic decrease in symptoms from the pre-therapy to post-therapy survey administrations. Our results were consistent with the study by Maples and Bither, as our mean symptom scores were significantly lowered between the three survey administrations for the *S*, *PO*, and *P* domains. As shown in Table 1, all mean scores

were progressively lowered at Visit 6 and Final Visit for all domains. However, although the scores were lowered for the *SI* domain for each survey administration, they were not lowered significantly. It is possible that the questions



(17, 20, 22, 26, 27) addressing *Social Interaction* were not closely related to symptoms of binocular vision anomalies in our patient population, thereby producing a small change from one visit to another. As shown in Table 1, the scores for the *SI* domain were already quite low in comparison to the maximum score (20) for that domain. Few subjects experienced severe symptoms of the type included in the *SI* domain, so there was little room for improvement.

In addition, the data from this study were analyzed by age to determine if a difference in quality of life after vision therapy exists between age groups <18 years and ≥18 years for Visit 1 and Visit 6. Table 2 shows the data divided into age groups. For the *Physical-Occupational*, *Social Interaction*, and *Psychological Well-Being* domains for Visit 1, the older age group reported having less severe symptoms as compared to the younger age group. In the *Somatic Sensation* domain for Visit 1, the younger group reported having less severe symptoms than the older age group.

Similar results were found for the age groups for Visit 6. The *Physical-Occupational*, *Social Interaction*, and *Psychological Well-Being* Visit 6 results showed that the older group reported less severe symptoms than

the younger group. This finding may be due to general developmental/experience differences between the two groups. For instance, as one grows older, their overall social skills, self-esteem, and motor abilities tend to improve and become more fine-tuned. These topics are all addressed in the *PO*, *SI*, and *P* domains of the survey. Improvement with age may be an explanation for the lower scores of the older age group in the two survey administrations. Again, in the *Somatic Sensation* group, the older subjects reported having more severe symptoms than did the younger subjects. However, statistical analysis did not show a significant difference between the scores for the younger and older groups in the *S* domain. Both age groups tended to have a similar reduction in symptoms at Visit 6. It can be speculated that the older group was shown to have had more severe symptoms in the *Somatic Sensation* category at Visit 1 and Visit 6 due to the fact that the younger subjects may not have understood or been able to quantify the concept/meaning of such things as eyestrain, double vision, and blurry vision. The surveys were completed with a minimum of 5

weeks between Visit 1 and Visit 6, so it is unlikely that the subject would remember the individual questions on the survey or what their previous answers were.

One potential criticism of this study is that only 10 of the 49 subjects completed the final survey. In the <18 years of age group, six subjects completed the Final survey. Similarly, four of the ≥ 18 years group completed the Final survey. We desired to determine whether there was a difference in initial severity of symptoms between those who dropped out and those who completed therapy. For example, if some subjects initially had lower symptom scores, they might not have been as motivated to complete therapy. However, a Mann-Whitney U test revealed no statistically significant difference in initial survey scores (neither in total score nor any of the four domains) between the groups.

We therefore reasoned that the large drop-out rate was likely due to our population base. At the time of the study many of the younger subjects were from low-income families and qualified for a grant that covered the first six visits of vision therapy. These subjects otherwise had no insurance that covered vision therapy. The majority of the subjects utilizing the grant discontinued

therapy after six visits, rather than pay out-of-pocket. Our population also included professional students who made up the majority of the older age group. There was a large drop-out rate among the students as well. It can be speculated that the students were unable to finish the course of therapy due to general scheduling issues and time constraints. The students' academic schedules changed quarterly, and they may have discontinued therapy for such reasons as being busy with exams, or leaving school on academic recess.

Another drawback with our population was that the younger group had only two teenagers, and the rest were all younger than 13 years of age. This makes the average age of the younger group much different than the average age of the older group, resulting in a large dichotomy between the groups. The two groups may have experienced different symptoms due to their diagnoses. There are very few adults with oculomotor dysfunctions compared to children. The symptoms children experience from such dysfunctions may be quite different from symptoms that adults experience. Due to the limited age ranges represented in this study, the results may not be able to be generalized to a larger population.

Following the initiation of this study, Maples investigated a COVD survey with 19 items, versus the 30-item COVD questionnaire used in this study. It was shown by test-retest reliability that the shorter version was an acceptable substitute for the original survey.¹⁵ Although the longer COVD survey is made up of the most common symptoms experienced by patients who seek vision therapy,¹³ the shorter, more condensed version may have been a more user-friendly way of obtaining objective measurements of subjective symptoms.

Although any accommodative, binocular vision, oculomotor, and visual information processing diagnoses were included in this study, the majority of our subjects had vergence and accommodative disorders. In future studies, improvements in symptoms should be correlated with the visual diagnoses for each subject. Such an investigation would provide valuable information to the field of optometry as to what symptoms are associated with specific visual diagnoses, and how much these symptoms decrease after the course of vision therapy. This survey should be used in conjunction with objective measurements of visual function in order to determine if there is a connection between objective improvements in visual function and subjective perception of improved symptoms.

Overall, this study demonstrated that subjects' symptoms were reduced following a course of vision therapy. It cannot be determined whether vision therapy was the only influence on the results of the surveys. However, vision therapy played an integral part in decreasing subjective symptoms and improving overall quality of life in this patient population.

CONCLUSION

This study showed vision therapy to be an effective means of reducing symptoms associated with binocular vision, accommodative, oculomotor, and visual information processing disorders. Using the COVD Quality of Life Outcomes Assessment provided a means of identifying subjects' perceptions of improved overall quality of life following the completion of an in- and out-of-office vision therapy program. Gaining additional information about quality of life after vision therapy increases the practitioner's knowledge about what patients expect to achieve after completing vision therapy. This may lead optometrists to develop therapies more focused on improving certain areas of the patient's quality of life. Continued research in this area may allow patients to become more satisfied with vision therapy because it has improved their visual symptoms and their overall quality of life.

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Appendix: Quality of Life Survey

File # _____ DOB _____ Ethnicity _____ Gender M/F Visit 1/6/Final

Rx given: OD _____ 20/___ OS _____ 20/___ Rx for: _____

Diagnoses (list all): _____

Please check the column that best represents the occurrence of each symptom.

	Never	Seldom	Occasionally	Frequently	Always
1. Blurred vision at near					
2. Double vision					
3. Headaches associated with near work					
4. Words run together when reading					
5. Burning, stinging, watery eyes					
6. Falling asleep when reading					
7. Vision worse at the end of the day					
8. Skipping or repeating lines when reading					
9. Dizziness or nausea associated with near work					
10. Head tilt or closing one eye when reading					
11. Difficulty copying from the chalkboard					
12. Avoidance of reading and near work					
13. Omitting small words when reading					
14. Writing uphill or downhill					
15. Misaligning digits in columns of numbers					
16. Reading comprehension declining over time					
17. Inconsistent/poor sports performance					
18. Holding reading material too close					
19. Short attention span					
20. Difficulty completing assignments in reasonable time					
21. Saying "I can't" before trying					
22. Avoiding sports and games					
23. Difficulty with hand tools – scissors, screwdriver, calculator, keys					
24. Inability to estimate distances accurately					
25. Tendency to knock things over on desk or table					
26. Difficulty with time management					
27. Difficulty with money concepts, making change					
28. Misplaces or loses papers, objects, belongings					
29. Car sickness/motion sickness					
30. Forgetful, poor memory					