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The Impact of Study and Time Management Skills Workshops on First-Year Optometry Students

Samantha Rice, OD, FAAO | Optometric Education: Volume 50 Number 4 (Summer 2025)

Abstract

Study and time management skills are crucial to student success in health professions education. This paper outlines a three-part workshop series for incoming optometry students to help improve these skills. The series reviews several topics, including active study techniques, time management, notetaking, metacognition, fixed vs. growth mindset, and more. When participants were surveyed about the program, they reported that they felt their study skills had improved. They also approved of the format and timing of the program, which suggests that incorporation of a study skills program into orientation may be beneficial for students as they begin optometry school.

Keywords

health professions education, optometry, study skills, time management

Background

The transition to optometry school is a challenge for many students. The curriculum is generally more fast-paced and content-heavy compared to undergraduate programs. Students often enter optometry school with an understanding that the courses may be more difficult than their previous coursework and their study methods may not be as effective.[1] For many students, this difficulty to adapt to graduate-level work became especially pronounced in the years following the COVID-19 pandemic. During the pandemic, many undergraduate courses switched from in-person, letter grade courses to online courses that were pass/fail.[2-4] When these students returned to in-person learning, they often exhibited deficits in their critical thinking and time management skills.[5]

To help incoming first-year students, the Midwestern University Chicago College of Optometry (CCO) collaborated with the university's Student Services-Academic Support department to develop the Study and Time Management Strategies workshop series. The workshops began in the fall of 2022 and have been held every fall quarter since. The workshop series is designed to help incoming first-year optometry students develop the skills they need to be successful in optometry school – including topics such as active study techniques, time management, making effective use of lecture time, metacognition, fixed vs. growth mindset and others. There have been updates to the program each year, and student feedback has been positive, with most students noting improved confidence in their study skills.

The program focuses on study and time management strategies because effective study skills and academic aptitude are two of the most important factors affecting success in graduate health programs. Academic aptitude is measured by standardized admissions tests and undergraduate GPA, both of which are completed before entering graduate school. In 2013, a study analyzed which factors best predict students' performance in optometry school: overall OAT (Optometry Admission Test) scores, reading comprehension scores and undergraduate GPA scores were the strongest predictors of success.[6] Studies in medical school have shown similar results, showing that MCAT scores and undergraduate GPA are predictive of students' performance.[7-9]

However, academic aptitude is not the sole predictor of academic success. Effective study skills also contribute to academic performance in graduate health programs, and these skills can be improved over time. A study by West and Sadoski[10] showed that effective time management and self-testing were more predictive of academic success than any aptitude measurement. Other studies have evaluated various study strategies among medical school students, with specific study strategies like spaced repetition, practice questions, creating one's own study notes and time management being shown as particularly effective techniques for succeeding in medical school.[11-12]

While there are many ways to effectively study for optometry school, this workshop series highlights some specific study and learning strategies. Among those featured are learning by teaching, metacognition and active recall. Studies have shown that medical students who teach others often improve their cognitive complexity and communication skills and become better learners themselves.[13-14] Metacognition helps students plan, monitor their study strategies, and self-regulate, all of which are crucial for effective learning.[15-16] Finally, the series also emphasizes the importance of active recall, which has been shown to improve students' ability to not only recall, but retrieve learned information.[17]

The Study and Time Management Strategies workshop series was designed with these research results in mind, and was presented as an interactive, engaging three-part series that highlights best practices in study skills to assist students as they begin their time in optometry school. The purpose of this publication is to outline the program and students' feedback on its format, timing and effectiveness.

Methods

In 2022, CCO created the Study and Time Management Strategies workshop series. In that first year, there were five workshops in the series, and they spanned the first half of fall quarter for the first-year optometry students. Based on student feedback, the workshops were condensed into three 2-hour workshops and moved to orientation week. The current workshop series is outlined below.

Pre-Workshop Assignment

Before the Study and Time Management Strategies workshops, incoming students complete a survey in which they self-reflect on their strengths and weaknesses as students. During the first two years of the program, students completed a survey that was created at CCO. Beginning in 2024, students completed the Learning and Study Strategies Inventory (LASSI), a research-based assessment of students' study skills and use of academic resources.

Session 1 – Transitioning to Grad School

The first session of the series has three main sections: metacognition, goal creation and hands-on practice with several study techniques. Metacognition is defined, and examples are provided of how this form of self-reflection can be useful in a graduate program, especially if a student is not performing as well as they expected. Next, the program reviews the importance of creating SMART goals that are specific, measurable, attainable, relevant and time-based.

Once the students have reviewed the importance of reflecting on one's performance and making plans for improvement, various study strategies are introduced, and optometry-specific examples are given.

These strategies include active engagement, self-testing, learning by teaching, mnemonics, chunking and spacing.

FIGURE 1
Quiz Results with Various Study Techniques

Quiz	Study Technique	2022 Avg. Quiz Score	2023 Avg. Quiz Score	2024 Avg. Quiz Score
1	Reading only	25%	22%	28%
2	Important points	70%	59%	66%
3	Active recall	73%	65%	78%
4	Learning by teaching	55%	53%	67%
Percent improvement between highest and lowest quiz scores		48%	43%	50%

Figure 1: Quiz Results with Various Study Technologies.
Click to enlarge

Students read four short excerpts from optometric textbooks, employ one of the study techniques that are discussed, then take a brief quiz to evaluate how well that study strategy worked for them. With the first reading, the students read the passage once, then complete the quiz. Unsurprisingly, this approach has always resulted in the worst quiz outcomes. With the second reading, students are instructed to stop after each subsection in the passage and write down the one or two most important points, then write down what is still confusing at the end of the excerpt. With the third reading, they practice active recall and self-testing. With the fourth reading, students practice learning by teaching. They read the full passage, then pair up with another student and take turns explaining the material to each other before completing the final quiz. All quizzes are completed on Canvas, and results are shared with the students immediately. The quiz scores from all four study strategies are shown in **Figure 1**. As evidenced by the quiz scores, students retain material much better when using one of the active learning techniques.

The first workshop concludes with a self-reflection activity in which students create two goals for the quarter and plan two specific steps they can take in the next week to help reach those goals.

Session 2 – Time Management

The second session is dedicated to time management and creating a study schedule. Students are given a five-step process to create a study schedule:

1. Identify obstacles
2. Perform a self-assessment of when and how they learn best
3. Complete individual course assessments to account for various deadlines, due dates, exams and quantity of course material
4. Evaluate their available time
5. Create a schedule

Once students have reviewed the general process for creating a schedule, they are introduced to two types of study schedules – the "to-do list study schedule" and the "hourly study schedule." The to-do list study schedule takes a wider view of a student's time and tasks. It is action-item oriented and lists all activities that must be completed by a specific deadline (end of the day, end of the week, etc.). Students identify the times during the week they have available for study, then they fill those times with the various tasks they have listed. By contrast, the hourly study schedule is more detailed, and students assign a course/topic to each available study hour.

At this point in the session, students are provided with their course schedule for the first 2 weeks of class and asked to make a study schedule around those commitments. Once they have had an opportunity to create their own schedules, they are discussed as a group. Students evaluate their schedules to see if they divided their time appropriately for their various classes, and if they allotted enough time for study and other non-academic activities in the week. They discuss the importance of self-reflection and adjust their study schedules as needed. At this time, the instructor also discusses tips for utilizing AI to create a study schedule.

This session concludes with a discussion of one of the biggest barriers to time management – procrastination. Students complete a procrastination quiz to identify their own downfalls in this area, and they watch a TED talk about procrastination and how it can be detrimental to the achievement of one's long-term goals.

Session 3 – Effective Use of Lecture Time & Notetaking, Test-taking Strategies & The Importance of Mindset

The final session of the series is divided into several subsections – effective use of lecture time and notetaking, test-taking strategies, the importance of mindset and an advice panel with second-year students.

Students entering optometry school have already completed several years of higher education, but they often struggle with how to best utilize their time during lecture and how to create their own study materials after class. In this part of the workshop, they review best practices for before, during and after lecture time. These include pre-reading, taking notes and actively participating during class, and creating their own condensed notes after class. As part of this section, students are provided with several examples of optometry-specific notes from previous students and then are given time to create their own chart/diagram of a basic science topic.

In the second section of this workshop, students review test-taking strategies. Many incoming students self-identify as poor test takers, and this portion is designed to improve their confidence when taking exams in optometry school. It begins with the importance of fully reading the question and highlighting key words, then reviews strategies to increase confidence in their answer choices and how to make an educated guess. This section also reviews how to best approach multiple response questions and clinical cases, as they will encounter many of those during their time in optometry school. Students are then shown several optometric exam questions, and they walk through how to utilize these strategies on real questions. Finally, this section concludes with advice from the Midwestern University Counseling Center on how to combat test anxiety both before and during an exam.

The next presentation in the workshop series focuses on the importance of a growth mindset. In a fixed mindset, students believe that they have fixed characteristics that cannot be altered. For example, they are poor test takers or are bad at math. In a growth mindset, students understand that challenges are an opportunity for growth. They recognize that failure to understand a concept or perform well on an exam is not a fixed characteristic, but merely an indication that they have not yet mastered that material.

The workshop concludes with an advice panel from second-year students who were selected based on their ability to maintain good grades while balancing the demands of student leadership and service. These students share their experiences from first year, what they wished they had done differently, and their advice for success.

Post-Course Survey

At the conclusion of the workshop series, students complete a survey evaluating the course, their own study skills, and what strategies they plan to take away from the course. Students could either include their names on the survey or complete it anonymously.

Results

At the end of the last workshop in the series, students were given an optional post-course survey. In 2024, 65 of the 65 first-year students (100%) completed the survey. Forty-nine students included their names with their responses, and 16 completed it anonymously.

The response to the workshop series was overwhelmingly positive. When evaluating the impact of the workshops on their study skills, 95% of students agreed or strongly agreed with the statement “This course was helpful in developing my time management and study skills.” Eighty percent felt they were comfortable making and following a study schedule, 100% planned to employ multiple techniques when studying, 78.5% felt more confident in their test-taking abilities, and 95% agreed or strongly agreed with the statement “I will make changes to my study and time management habits after taking this course.”

Students were also asked to evaluate the workshop series itself. Ninety-five percent of students felt the sessions were organized in a smooth and logical fashion, 86% felt it was appropriate to hold these workshops during orientation, and 98% agreed that they were able to understand what they were supposed to get out of the program. Ninety-five percent of respondents agreed or strongly agreed with the statement “Overall, this series was helpful to me as a new CCO student.” The full responses to these survey questions can be found in **Figure 2**.

FIGURE 2
Post-Workshop Survey Results

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
This course was helpful in developing my time management and study skills.	27	35	2	1	0
The sessions were organized in a smooth and logical fashion.	38	24	3	0	0
The timing of this series (during orientation) was appropriate.	34	22	7	2	0
I was able to understand what I was supposed to get out of the program.	38	26	1	0	0
I will make changes to my study and time management habits after taking this course.	43	19	2	1	0
I feel comfortable making and following a study schedule.	21	31	12	0	1
I plan to emply multiple techniques when studying.	38	27	0	0	0
I feel more confident in my test-taking abilities.	20	31	13	1	0
Overall, this series was helpful to me as a new CCO student.	40	22	3	0	0

Figure 2. Post-Workshop Survey Results. Click to enlarge

In addition to evaluating the course, students were also asked to reflect on their own study skills. When students were asked to rank their study skills before taking the course, 13.8% reported that their skills were excellent or very good, 38.5% described their skills as good, and 47.7% described their study skills as fair or poor. When students were asked to rate their study skills after completing the workshop series, they felt that their study skills had improved dramatically. Over half (53.8%) described their study skills as excellent or very good, 41.5% described them as good, and only 4.6% ranked their study skills as fair or poor. These results can be seen in **Figure 3**.

FIGURE 3
Survey Results of Self-Perception of Study Skills

	Excellent	Very Good	Good	Fair	Poor
How would your rank your study skills before this course?	1	8	25	23	8
How would you rank your study skills now (after taking the course)?	4	31	27	3	0

Figure 3. Survey Results of Self-Perception of Study Skills.
Click to enlarge

Discussion

Student feedback about the Study and Time Management Strategies workshop series was largely positive, with many students reporting an improvement in their self-perceived study skills. The students also appreciated the timing and organization of the series, which suggests that there is value in incorporating an interactive academic skills workshop during orientation, when students have both the time and the motivation to fully participate and learn. In previous years, when the workshop series extended into the first few weeks of the quarter, there was feedback from students to move this program earlier in the quarter. Not only did they prefer to learn these skills before classes began, but they also felt that they had the time and energy to focus on the workshops.

There are many study strategies classes and workshops offered either directly by health sciences graduate programs or through outside entities.[18-21] While several of these programs have been described in the literature, this is the first publication outlining a workshop series designed specifically for optometry students. The series was a collaboration between the CCO dean's office and the MWU Office of Academic Support. As such, it incorporated both general study and time management tips and real-world applications to optometric material. By focusing the content on optometry-specific topics and examples, the workshop not only gave students examples of what was to come in the following months and years of optometry school but also specific guidance on how to overcome challenges that they are likely to face.

Two of the major challenges in evaluating this workshop series are the multifactorial nature of study behaviors and student achievement and the fact that the workshop series has changed in content and timing during its first few years. An analysis[22] of the 2022 post-session survey was compared to student performance on a retention exam given at the start of their second year in 2023. That analysis demonstrated that students were most adept at identifying their areas of weakness, with a significant correlation between retention exam results and students' responses to survey items asking them to identify their poor study habits. However, this analysis compares an earlier version of the workshop, which included more sessions and was given later in the year. In the future, the plan is to continue this analysis with the current workshop format to assess the long-term impact on student retention and learning. Other limitations include that this survey is representative of only one cohort of students from one optometry school. The response to the workshop series may be different with a different population of students.

Conclusion

First-year students reported that the incorporation of a study and time management skills workshop series into orientation had a positive effect on their study habits. This publication describes a workshop series that is interactive and involves hands-on experience with actual study techniques, time management and test-taking skills that directly relate to the upcoming optometric curriculum. Study skills are an important predictor of graduate school performance[10] and providing proactive support and guidance may be helpful as students begin their time in optometry school.

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References

1. McGinley B, Carlson N, Hoppe E. What were they thinking? Surveying study practices of entering students. Optom Educ. 2008;33(2):59-63.
2. Mostafa SA, Ferguson R, Tang G, Ashqer M. An analysis of the COVID-19-induced flexible grading policy at a public university. High Educ Policy. 2023 May;20:1-34. DOI: 10.1057/s41307-023-00315-2
3. National Center for Education Statistics: Undergraduate Enrollment, Condition of Education [Internet]. Washington, DC: US Department of Education, Institute of Education Sciences; c2023 [cited 2025 Feb 22]. Available from: https://nces.ed.gov/programs/coe/indicator/cha.
4. Rakes GC, Dunn KE. The impact of online graduate students' motivation and self-regulation on academic procrastination. J Interact Online Learn. 2010;9(1):78-93.
5. Becker TB, Fenton JI, Nikolai M, et al. The impact of COVID-19 on student learning during the transition from remote to in-person learning: using mind mapping to identify and address faculty concerns. Adv Physiol Educ. 2022 Dec 1;46(4):742-751. DOI: 10.1152/advan.00079.2022
6. Buckingham RS, Bush SR. Predictors of academic success for students at the Michigan College of Optometry. Optom Educ. 2013 Summer;38(3):92-99.
7. Donnon T, Paolucci EO, Violato C. The predictive validity of the MCAT for medical school performance and medical board licensing examinations: a meta-analysis of the published research. Acad Med. 2007 Jan;82(1):100-106. DOI: 10.1097/01.ACM.0000249878.25186.b7
8. Evans P, Wen FK. Does the medical college admission test predict global academic performance in osteopathic medical school? J Am Osteopath Assoc. 2007 Apr;107(4):157-162.
9. Silver B, Hodgson CS. Evaluating GPAs and MCAT scores as predictors of NBME I and clerkship performances based on students' data from one undergraduate institution. Acad Med. 1997 May;72(5):394-396. DOI: 10.1097/00001888-199705000-00022
10. West C, Sadoski M. Do study strategies predict academic performance in medical school? Med Educ. 2011 Jul;45(7):696-703. DOI: 10.1111/j.1365-2923.2011.03929.x
11. Sleight DA, Mavis BE. Study skills and academic performance among second-year medical students in problem-based learning. Med Educ Online. 2006 Dec; 11(1). DOI: 10.3402/meo.v11i.4599
12. Morey G, Morey VC, Gruman T, Al-Khayat T. A literature review on optimizing study strategies in medical education: insights from exam scores and study resources. Cureus. 2024 Nov 19;16(11):374034. DOI: 10.7759/cureus.74034
13. Dandavino M, Snell L, Wiseman J. Why medical student should learn how to teach. Med Teach. 2007 Sep;29(6):558-565. DOI: 10.1080/01421590701477449
14. Heys KH, Wawrzynski MR. Male peer educators: effects of participation as peer educators on college men. J Stud Aff Res Pract. 2013; 50(2):189-207. DOI:1515/jsarp-2013-0014
15. Medina MS, Castleberry AN, Persky AM. Strategies for improving learner metacognition in health profession education. Am J Pharm Educ. 2017 May; 81(4): 78. DOI: 10.5688/ajpe81478
16. Dunlosky J, Thiede KW. What makes people study more? An evaluation of factors that affect self-paced study. Acta Psychol (Amst). 1998 Mar; 98(1):37-56. DOI: 10.1016/s0001-6918(97)00051-6
17. Roediger H, Butler AC. The critical role of retrieval practice in long-term retention. Trends Cogn Sci. 2011 Jan;15(1):20-7. DOI: 10.1016/j.tics.2010.09.003
18. Nyland RL, Sawarynski KE. Setting students up for success: a short interactive workshop designed to increase effective study habits. MedEdPORTAL. 2018 Jul 26;13:10610. DOI: 10.15766/mep_2374-8265.10610
19. Workshops and Seminars [Internet]. Tallahassee: Florida State University, College of Medicine [cited 2025 Feb 25]. Available from: https://med.fsu.edu/facultydevelopment/workshop-list
20. Academic Success Resources [Internet]. Cincinnati: University of Cincinnati, College of Medicine [cited 2025 Feb 25]. Available from: https://www.med.uc.edu/education/medical-student-education/student-affairs/academic-support/pr

ograms/academic-success
21. Sisa I, Garcés MS, Crespo-Andrade C, Tobar C. Improving learning and study strategies in undergraduate medical students: a pre-post study. Healthcare (Basel). 2023 Jan 28;11(3):375. DOI: 10.3390/healthcare11030375
22. Rice S. Student self-assessment of study skills & long-term material retention. Poster session presented at: American Academy of Optometry; 2024 Nov 6-9. Indianapolis, IN.

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PEER REVIEWED

Using Strabismus Simulation Prismatic Glasses to Teach Cover Testing in Optometric Clinical Education

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Abstract

Background: *To evaluate the effectiveness of strabismus simulation using prismatic glasses to teach the cover test in a preclinical optometry course.*

Method: *Forty-seven first year students were divided into two groups and taught cover test with and without the strabismus simulation prism glasses. Pre- and post-cover test assessments were given to evaluate each group's learning gain.*

Results: *The control group's average pre and post assessment grades were 55.80 and 72.46 (P=0.096), respectively while these of the experimental group were 59.03 and 89.58 (P<0.01), respectively.*

Conclusion: *The strabismus simulation prism glasses were found to be an effective tool in teaching cover test.*

Keywords

cover test, simulation, strabismus

Background

There are many elements of a comprehensive eye exam, each of which requires significant time, hard work and practice to learn. These elements, which include a thorough case history, initial entrance testing, refractive status determination, functional vision assessments, and ocular health evaluations, are taught at the University of the Incarnate Word Rosenberg School of Optometry over the course of four semesters in a series of pre-clinical courses and labs. The students in these "clinical optometry" courses spend most of their time learning the techniques from their attending doctors and, in turn, practicing the skills on their classmates. Before students can provide comprehensive eye care to patients in clinics, they must first demonstrate proficiency to the instructors in performing the techniques on each other. In the authors' opinion, while many exam elements can be successfully learned through practice on any individual, certain skills, such as the cover test, are very difficult to master unless they are performed on many people with abnormal findings.

The cover test is an objective test[13] designed to both identify and quantify the presence of an ocular misalignment, which is any "deviation of the line of sight from those directions necessary for bifoveal fixation."[13] An ocular misalignment is considered a phoria when both visual axes are aligned under binocular conditions and a tropia when both visual axes are not aligned under binocular conditions.[14] A unilateral cover test (UCT), which includes observing the movement of the fixating eye when the other eye is first covered[13], is designed to identify a strabismus (tropia or eye turn) and its component directions.[13] An alternating cover test (ACT) includes alternating occlusion between the two eyes and holding occlusion in place for 2-3 seconds.[13] The eye which was just uncovered is observed.[13] The ACT is performed to determine both the direction and magnitude of a phoria or tropia.[14] The ACT is not able to differentiate a phoria from a tropia.[14]

The simultaneous prism and cover test (SPCT) can also be utilized to measure the associated magnitude of the deviation of a strabismus.[15] However, because many students have normal ocular postures, students often struggle to identify a larger phoria or strabismus. Further, because these students do not have the necessary experience with abnormal postures, measurement outcomes are likely to be impacted.[1] Cover test findings are crucial in both the identification and management of phorias and strabismus. As phorias and strabismus can sometimes have a pathological origin, accuracy in performing cover test is crucial. Releasing a correct glasses prescription, referring for strabismus surgery, referring for vision therapy, or even ordering neuro-imaging hinge on a properly performed cover test.[2]

The educational experience and clinic readiness of the students can be enhanced if the students can experience ocular abnormalities through simulation early in their optometric education.[3-7,9-12] There have been many attempts to create such clinical simulations using various techniques and technologies, and such simulations generally provide a greater understanding of ocular abnormalities and benefit students' learning. Examples include simulations in color vision, visual impairment, strabismus and other conditions.[3-7,9-12] While all these methods have been shown to be beneficial in aiding student learning, there is a cost associated with acquiring the equipment to achieve the necessary simulated conditions. The purpose of this prospective parallel study is to investigate the effect of custom-made prism glasses, designed to simulate strabismus, on the students' ability to interpret the cover test without SPCT in a second semester first-year optometry lab.

Methods

Forty-seven optometry students (23 in the control group; 24 in the experimental group) who were registered in the second semester first-year clinical optometry course at the UIW Rosenberg School of Optometry participated in this prospective parallel study. This study was approved by the UIW Institutional Review Board. Informed Consent was obtained from all participants. The participants learned cover test skills in the previous first semester first-year clinical optometry course and passed the requirements of that course.

The participants were initially instructed to take an online cover test assessment which consisted of six multiple choice questions asking to evaluate and diagnose a series of different ocular alignments by watching animated cover test videos. The questions tested three lateral and three vertical deviations, and all questions were randomized. The animated cover test videos were created by the first author using PowerPoint and converted into an MP4 file. The software utilized to conduct the quiz was ExamSoft (Dallas, TX). The students were not given any feedback on their quiz performance. The students were then instructed to take a survey following the quiz regarding their subjective opinions on their understanding of cover test and interpretation of results (**Table 1**). Canvas (Salt Lake City, UT) learning management system (LMS) was utilized as the platform to conduct the online survey. After the prelab quiz and survey, a 15-minute lecture was given to review the basic concept of phorias and tropias.

TABLE 1
Survey questions

I am confident in my ability to differentiate between a tropia and phoria on cover test.	1. strongly disagree	2. disagree	3. neutral	4. agree	5. strongly agree
I am confident in my ability to differentiate between an eso and exo posture on cover test.	1. strongly disagree	2. disagree	3. neutral	4. agree	5. strongly agree
I am confident in my ability to identify different vertical postures on cover test.	1. strongly disagree	2. disagree	3. neutral	4. agree	5. strongly agree

Table 1: Survey Questions. Click to enlarge

After the mini-lecture, half of the students were then assigned the role of "patients" while the other half were assigned the role of "student doctors." Each student doctor performed a cover test on every student from the "patient" group, and then the roles were switched. In this manner, every participant examined a minimum of 11 different patients, with a maximum of 12 different patients. A time duration of 3 minutes was allotted for each examination. Students were instructed to perform distance cover test and document the observed ocular alignment at every station. They had to determine if a phoria or a tropia was present, identify the deviating eye and interpret the direction of the deviation (ortho/eso/exo/hyper/hypo) through UCT and ACT. Students were not required to determine the magnitude of the deviation through SPCT. Three optometry professors and two third-year optometry student teaching assistants were utilized to offer consultation to ensure that the participants were performing cover test and interpreting results correctly. Both groups were instructed to seek help if they had questions.

After the cover test skills were performed, the laboratory concluded with another online cover test assessment using ExamSoft software. Although different questions were used in the post-lab quiz, the format was kept the same (six randomized multiple choice questions with three lateral and three vertical deviations). Feedback was not provided for their quiz performance. The participants were then instructed to complete a final survey using the Canvas LMS, to rate their subjective opinions on their understanding of cover test and interpretation of results. Questions were identical for pre- and post-surveys. Depending on their response, a score of 1 through 5 was given to reflect their subjective confidence level (**Table 1**).

Assignments to the experimental or control group were established by the students' regularly scheduled laboratory day. The laboratories were administered on separate days and the students were instructed to report to their scheduled laboratory day without knowing if they would be a part of either the experimental or control group. The method we used in the experimental and control groups were identical except that each "patient" in the experimental group wore prismatic glasses to simulate vertical or horizontal strabismus, whereas no simulated strabismus glasses were used in the control group. The experimental group was instructed to wear contact lenses if they needed refractive correction so that they could wear prism glasses without issues.

The prism glasses were designed to simulate constant monocular horizontal or vertical strabismus. 6 to 10D prism was prescribed in each eye to induce diplopia. In addition, +4.00 to +5.00DS or Spherocylinder lens was prescribed in one of the eyes to degrade the visual acuity, simulating an amblyopic eye (See **Table 2** for detail). A penlight was used as the fixating target. A patient wearing the strabismus simulation glasses was instructed to always choose to look at the clearer target of the two unless only one target was seen due to occlusion.

TABLE 2
Details of prismatic glasses

Glasses A:	OD: PL DS OS: +4.00-3.00x045	10 BO 6BO
Glasses B:	OD: PL DS OS: +3.00-2.50x045	10 BI 6BI
Glasses C:	OS: +3.00-2.50x090 OD: PL DS	6BO 10 BO
Glasses D:	OS: +4.00-3.00x090 OD: PL DS	6BI 10 BI
Glasses E:	OD: PL DS OS: +5.00DS	10 BO 10 BO
Glasses F:	OD: PL DS OS: +5.00DS	10 BO 10 BO
Glasses G:	OS: +5.00DS OD: PL DS	10 BI 10 BI
Glasses H:	OS: +5.00DS OD: PL DS	10 BI 10 BI
Glasses I:	OD: PL DS OS: +4.00DS	8 BU 6 BD
Glasses J:	OD: PL DS OS: +4.00DS	8 BD 6 BU
Glasses K:	OS: +5.00DS OD: PL DS	6 BU 8 BD
Glasses L:	OS: +5.00DS OD: PL DS	6 BD 8 BU

Table 2: Details of prismatic glasses. Click to enlarge

Results

As a class, 264 and 288 cover tests were performed in the control and experimental groups, respectively. In the control group, all examinations revealed phoric ocular posture. In the experimental group, the majority of patients manifested strabismus. Some patients' ocular deviation changed from phoria to tropia over time most likely due to fatigue and prolonged occlusions. (**Figure 1**)

FIGURE 1
Cover test findings in Control and Experimental Groups

Control Group			Experimental Group		
Deviation	# of CT finding	%	Deviation	# of CT finding	%
Ortho	66	25.00%	Ortho	0	0.00%
XP	170	64.40%	XP	8	2.80%
EP	27	10.20%	EP	2	0.70%
HyperP	1	0.40%	HyperP	0	0.00%
XT	0	0.00%	XT	89	30.90%
ET	0	0.00%	ET	92	31.90%
HyperT	0	0.00%	HyperT	49	17.00%
HypoT	0	0.00%	HypoT	47	16.30%

Figure 1: Cover test findings in Control and Experimental Groups Click to enlarge

The control group's average pre- and post-cover test assessment grades were 55.80 and 72.46 (P=0.096), respectively, out of 100 points. The experimental group's average pre- and post-assessment grades were 59.03 and 89.58 (P<0.01), respectively. Thus, the control and experimental groups improved their assessment grades by 29.87% and 51.76%, respectively (**Figures 2A and 2B**). The rate of improvement in the control and experimental groups were 16.67 and 30.56 points (P=0.15), respectively. There was no statistically significant difference in the average pre cover test assessment grades between the control and experimental groups (P = 0.74).

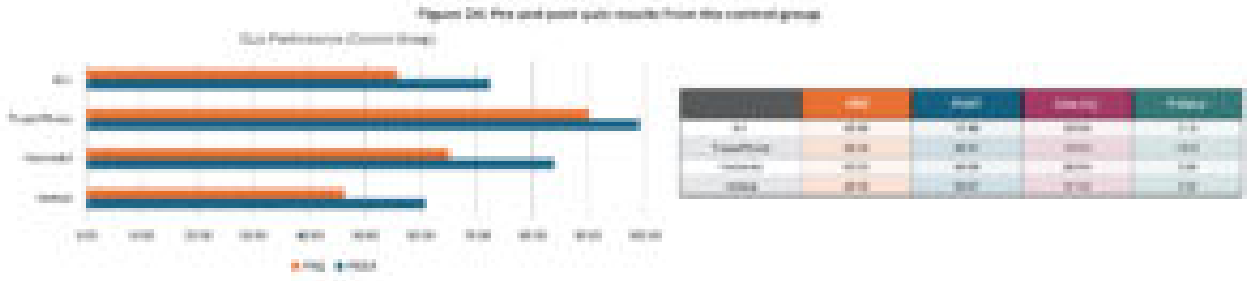

Figure 2A: Pre and post quiz results from the control group Click to enlarge

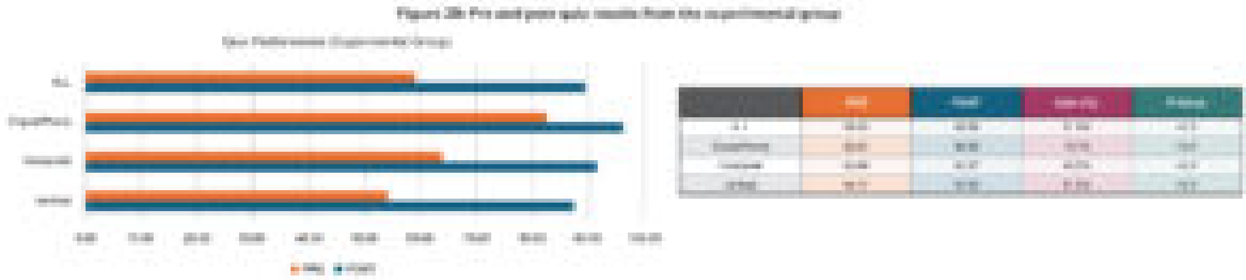

Figure 2B: Pre and post quiz results from the experimental group Click to enlarge

Their performance was further analyzed under three different learning objectives, which were also reflected in the lab survey: (1) ability to differentiate tropia vs. phoria, (2) ability to accurately evaluate horizontal deviations, (3) ability to accurately evaluate vertical deviations. For the first learning objective, each group improved their performance with statistical significance (P<0.01 each). For the second learning objective, the improvement seen in the control group was not statistically significant (P=0.06), while it was in the experimental group (P<0.01). For the third learning objective, the improvement seen in the control group was not statistically significant (P=0.23), while it was in the experimental group (P<0.01). Also, the greatest improvement was observed in their ability to accurately evaluate vertical deviations in the experimental group with a 61.5% gain (**Figures 2A and 2B**).

Some similar patterns were seen when survey results were analyzed. The control group's overall pre- and post-survey results were 3.73 and 4.33 (P<0.01), respectively out of 5 points. The experimental group's overall pre- and post-survey results were 3.69 and 4.67 (P<0.01), respectively. The control and experimental groups improved their survey results by 16.32% and 26.34%, respectively (**Figures 3A and 3B**). The rate of improvement in the control and experimental groups were 0.61 and 0.97 points (P=0.11), respectively. There was no statistically significant difference in the pre survey results between the control and the experimental groups (P = 0.86).

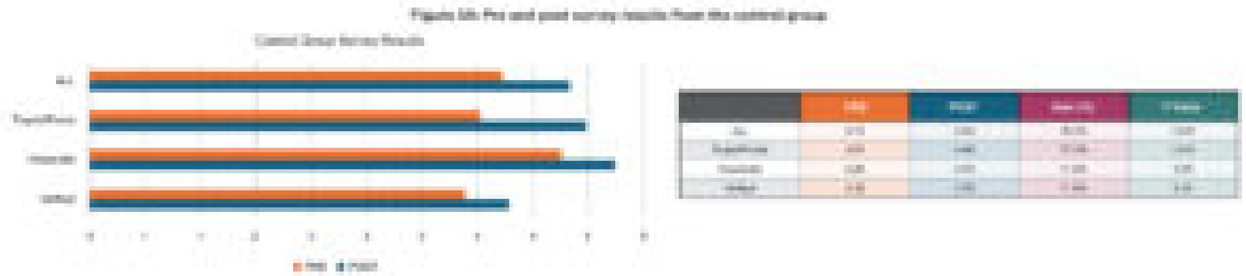

Figure 3A: Pre and post survey results from the control group Click to enlarge

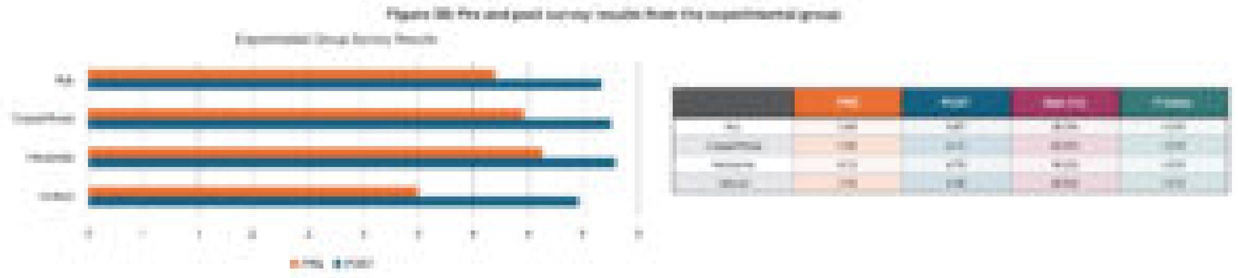

Figure 3B: Pre and post survey results from the experimental group Click to enlarge

Analysis of the survey results based on each question showed a similar pattern as seen in cover test assessment results; while there was no statistically significant positive change in their confidence level in evaluation of horizontal or vertical deviations in the control group (P=0.05 and P=0.16 respectively), there was statistically significant improvement in the experimental group (P<0.01 each).

Discussion

The traditional method of teaching cover test stands deficient at helping some students master this clinical skill prior to encountering strabismic patients in clinic which starts in the third year of the program. It remains true that under the current academic paradigm, students gain a rudimentary appreciation for diagnosing strabismus. However, when such practice is upon non-strabismic eyes predominantly, some students garner a limited opportunity to genuinely master cover test, or even gain the required confidence before seeing real strabismic patients.

In this study, the experimental group was exposed to various manifestations of strabismus through the simulation glasses and showed a greater gain in their interpretation and evaluation of cover test findings based on pre and post quizzes. While the control group also showed an improvement in their assessment performance, they were not exposed to a single patient with strabismus, and their improvement was smaller compared to the experimental group and not statistically significant. This non-statistically significant improvement may be explained by the fact that the subjects had already been previously exposed to traditional lab teaching and experiences. Thus, reviewing cover tests under the same conditions had no significant impact on them mastering the technique further under the same teaching conditions. Perhaps the gain we observed in the control group was the skills and knowledge that they had slowly forgotten since the previous semester.

Although the experimental group demonstrated a higher rate of improvement in cover test assessments and surveys, there was no statistically significant difference between the two groups. This can be explained since some students scored 100% on the pre assessment and/or survey, there was no measurable further improvement. This led to high variability in the rate of improvement especially in the experimental group (**Figures 4A and 4B**). This limitation may be addressed if this study is done earlier in the curriculum so that the rate of improvement is more measurable.

FIGURE 4A

Control group's rate of improvement (ROI) measured in cover test assessments.

	PRE	POST	ROI
Student 1	100	100	0
Student 2	100	100	0
Student 3	100	100	0
Student 4	100	100	0
Student 5	100	100	0
Student 6	83	100	17
Student 7	83	83	0
Student 8	83	67	-17
Student 9	67	100	33
Student 10	67	100	33
Student 11	67	50	-17
Student 12	50	83	33
Student 13	50	50	0
Student 14	33	100	67
Student 15	33	100	67
Student 16	33	83	50
Student 17	33	50	17
Student 18	33	17	-17
Student 19	17	83	67
Student 20	17	67	50
Student 21	17	17	0
Student 22	17	0	-17
Student 23	0	17	17
Mean	55.80	72.46	16.67

Figure 4A: Control group's rate of improvement (ROI) measured in cover test assessments. Click to enlarge

FIGURE 4B

Experimental group's rate of improvement (ROI) measured in cover test assessments.

	PRE	POST	ROI
Student 1	100	100	0
Student 2	100	100	0
Student 3	100	100	0
Student 4	100	100	0
Student 5	100	100	0
Student 6	83	100	17
Student 7	83	83	0
Student 8	83	83	0
Student 9	83	33	-50
Student 10	83	83	0
Student 11	67	100	33
Student 12	67	67	0
Student 13	50	83	33
Student 14	50	100	50
Student 15	50	100	50
Student 16	50	100	50
Student 17	33	100	67
Student 18	33	100	67
Student 19	33	83	50
Student 20	17	100	83
Student 21	17	100	83
Student 22	17	100	83
Student 23	17	67	50
Student 24	0	67	67
Mean	59.03	89.58	30.56

Figure 4B: Experimental group's rate of improvement (ROI) measured in cover test assessments. Click to enlarge

Based on our findings, using strabismic simulating glasses can enhance diagnostic training and improve students' accuracy to diagnose strabismic eye abnormalities. The analysis of the participants' pre- and post-cover test results revealed that the experimental groups' cover test performance improved after one session of training with strabismic simulation glasses compared to the control group's cover test performance. Students' confidence levels were also found to be higher in the experimental group, where they worked with patients wearing the simulation glasses which provided them with an opportunity to observe and practice performing cover test on strabismic-looking eyes.

The greatest strength of the strabismus simulating glasses was teaching students the accurate evaluation of vertical deviations. There was a distinct gap in the achievement gain between the two groups when observing the mastery level of vertical deviation (31.3% vs 61.5%). Similar results were seen in their confidence level based on the surveys (11.5% vs 48.6%). These results indicate how students' limited exposure to vertical deviation can adversely affect their clinical confidence and ability to diagnose this type of misalignment. However, the experimental group showed significant improvement in their clinical skills and confidence after using the simulation glasses. This shows the value of exposing students to abnormal clinical findings to facilitate their learning.

The authors noticed a greater level of engagement among the students in the experimental group, which was deemed to be a positive effect of simulation glasses. For most of the students, it was their first time seeing strabismic eyes. Also, many students found it fascinating to see the familiar eyes of their peers turning into strabismus. There were many exclamations of surprise and excitement during the lab. The authors also noticed that the experimental group took more opportunity to ask questions due to the complex nature of the cases. However, the students were not given extra assistance intentionally during the actual cover test procedure in each group.

In addition, the simulation glasses provided an opportunity for students to experience cover test from the perspective of a strabismus patient. One of the challenges instructors encounter when teaching cover test is how quickly students want to move the occluder. Sometimes they move it so fast that they do not give a patient sufficient time to fixate with the amblyopic eye when the dominant eye is occluded. Although this issue was witnessed by some students in our labs, it also allowed students to experience as a strabismus patient how difficult it can be to re-fixate on a blurry target when only a split second was given.

Our results show that the strabismus simulation glasses are a great additive teaching tool with respect to cover test instruction. This low-tech teaching device has been proven to serve as a supplemental apparatus to help improve clinical performance by optometry students.

Conclusion

In conclusion, based on the improved performance of the experimental group in this study, the strabismus simulation glasses were found to be an effective and valuable additional tool in teaching cover test to optometry students and should be utilized as a key component in cover test basic training.

References

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1. Anderson HA, Manny RE, Cotter SA, Mitchell GL, Irani JA. Effect of examiner experience and technique on the alternate cover test. Optom Vis Sci. 2010 Mar;87(3):168-75. DOI: 10.1097/OPX.0b013e3181d1d954
2. Holmes JM, Leske DA, Hohberger GG. Defining real change in prism-cover test measurements. Am J Ophthalmol. 2008 Feb;145(2):381-5. DOI: 10.1016/j.ajo.2007.09.012
3. Hovis J, Muntz A. Simulating color vision deficiencies on clinical tests with a blue light. Optom Educ. 2013;38(2).
4. Irwin C, Desbrow B, McCartney D. Effects of alcohol intoxication goggles (fatal vision goggles) with a concurrent cognitive task on simulated driving performance. Traffic Inj Prev. 2019;20(8):777-782. DOI: 10.1080/15389588.2019.1669023
5. Ma MKI, Saha C, Poon SHL, Yiu RSW, Shih KC, Chan YK. Virtual reality and augmented reality – emerging screening and diagnostic techniques in ophthalmology: A systematic review. Surv Ophthalmol. 2022 Sep-Oct;67(5):1516-30
6. Miao Y, Jeon JY, Park G, Park SW, Heo H. Virtual reality-based measurement of ocular deviation in strabismus. Compuut Methods Programs Biomed. 2020 Mar;185:105132. DOI: 10.1016/j.survophthal.2022.02.001
7. Moon HS, Yoon HJ, Park SW, Kim CY, Jeong MS, Lim SM, Ryu JH, Heo H. Usefulness of virtual reality-based training to diagnose strabismus. Sci Rep. 2021 Mar 15;11(1):5891. DOI: 10.1038/s41598-021-85265-8
8. Strabismus Simulator [Internet]. San Francisco, CA: American Academy of Ophthalmology Knights

Templar Eye Foundation Pediatric Ophthalmology Education Center; c2015 [cited 2023 August 9]. Available from: https://www.aao.org/education/interactive-tool/strabismus-simulator

9. Rouse MW, Winkelstein A. A Strabismus Diagnosis Laboratory for the Evaluation of Concomitancy. Journal of Optometric Education.1990;15(2)42-46.
10. Steinman SB. The Oculomotor Suite: Educational Software for the Interactive Demonstration in the Classroom of Strabismus and Oculomotor Paralyses. Optom Educ. 2007 Oct 1;33(1).
11. Jipan Y. Research and Application of Optometry Retinoscopy Teaching Based on Three-Dimensional Simulation. The Romanian Review Precision Mechanics, Optics & Mechatronics, 2016, Issue 49
12. Adams SL, Wyles E. A Novel Approach to Clinical Education through Distance Learning. Optom Education. 2020;48(2).
13. Benjamin WJ. Borish's Clinical Refraction. 2nd ed. Oxford, UK: Butterworth-Heinemann Elsevier; 2006. pp. 389-394.
14. Carlson NB, Kurtz D, Hines C. (2003). Clinical procedures for ocular examination. 3rd ed. New York: McGraw-Hill Medical; 2003.
15. Holmes JM, Leske DA, Hohberger GG. Defining real change in prism-cover test measurements. Am J Ophthalmol. 2008 Feb;145(2):381-5. DOI: 10.1016/j.ajo.2007.09.012

Features

ASCO News

Call for Associate Editor

Mia Jordan | Optometric Education: Volume 50 Number 4 (Summer 2025)

The Association of Schools and Colleges of Optometry invites applications for the position of Associate Editor of its peer-reviewed journal, *Optometric Education*.

Responsibilities

The Associate Editor collaborates with the Editor on the editorial content of ASCO's journal, including sharing the writing of three editorials per year. The Associate Editor consults with the Editor on appointments to the journal review board and works with the Editor and Managing Editor in facilitating a smooth peer review process. They also assist with the development of issue features and solicits manuscript contributions to the journal.

Skills and Quali?cations

Strong writing and editing skills, educational publication experience and a demonstrated interest and involvement in optometric educational issues are required. The successful candidate will possess the Doctor of Optometry degree and have a minimum of 3 years experience in optometric education. The Associate Editor position is a volunteer role.

Application Requirements

To be considered, interested candidates should send the following application packet:

- A cover letter describing past experiences in professional writing and editing
- A curriculum vitae
- Two writing samples

Information and Application submission

Deadline: December 1, 2025

Contact: Dr. Keshia S. Elder, elderk@umsl.edu

Literature Review

Literature Review: Treating Pediatric Patients with Amblyopia, Acute Acquired Comitant Esotropia, and Small-to-Moderate Angle Intermittent Exotropia

Marc Taub, OD. MS, EdD | Optometric Education: Volume 50 Number 4 (Summer 2025)

Randomised trial of three treatments for amblyopia: Vision therapy and patching, perceptual learning and patching alone (Published by: *Ophthalmic Physiological Optics,* 2025)

Authors: Rosa Hernandez-Andres, Miguel Angel Serano, Adreian Alacreu-Crespo, Maria Jose Luque

Amblyopia is about more than simply visual acuity. The condition impacts sight, binocular vision, accommodation, eye movements and perceptual skills. Traditional treatments include patching, atropine and vision therapy.

New to the treatment paradigm is the use of computer-based programs, including those using virtual reality to encourage binocular vision. This study compared three treatments (patching, patching combined with vision therapy and perceptual learning) vs. a control group.

Eighty-eight children aged four to 12, with a mean age of 7.11 ± 2.19 years, were recruited for the study. The children with amblyopia (n=52) were randomly assigned to one of the three treatment groups. Inclusion criteria for the amblyopic group were monocular amblyopia with spherical refraction up to +/-9 compensated with spectacles, interocular difference in VA (IOD-VA) ? 2 lines, strabismus up to 35pd, and no other surgery other than for strabismus. Those taking medication that might impact visual or cognitive functions, or those with neurological/developmental disorders or ocular pathology, were excluded.

Patching was performed after school under adult supervision for 2 hours per day. Monocular perceptual learning took place via a program designed by the authors. An achromatic schematic face (eyes, mouth and circular outline) was superimposed on a noisy achromatic background. The participants were instructed to click on the smiling face. As a prize, the children received stars for the correct clicks. Visual acuity was based on the entering visual acuity in the amblyopic eye, and contrast was progressively reduced based on performance. After 3 months, the duration of gameplay was increased to 24 hours for children between ages four and six and 36 hours for older children.

The patching and vision therapy group also patched for 2 hours after school, but for only 3 days per week. This group also completed monocular activities at home (20 minutes if younger or 30 minutes if older) in three categories of activities: accommodation (Hart chart at three distances), eye-hand coordination (filing in letters, mazes), and ocular motility (Marsden ball, pursuit eye movements with a penlight). Every 2 weeks, the supervising adult was given new activities. The outcome measures were visual acuity, stereoacuity and IOD-VA. Their treatment period was also 3 months.

Statistically significant changes were observed between the three variables for all three treatment groups. The patching group showed the smallest effects in visual acuity and stereoacuity. Compared to the control group, all variables showed significance except stereoacuity for the patching group. In comparing the three groups, visual acuity showed significance between the patching vs monocular perceptual learning and the patching vs patching + vision therapy. Compared to baseline, the patching + vision therapy group showed the greatest gain in visual acuity; both monocular perceptual learning and patching + vision therapy showed the largest gains in stereoacuity, and monocular perceptual learning demonstrated the greatest improvement in IOD-VA.

This study demonstrates the importance of active treatment in the approach to amblyopia, as the improvement in visual acuity, stereoacuity and IOD-VA was greatest in either the monocular perceptual learning or patching + vision therapy groups. One interesting point to consider is how the two treatments were both monocular, and yet there was a binocular impact as seen in the stereoacuity. If this transfer were possible, it begs the question of the effect of binocular vision therapy or perceptual learning, either with or separate from patching. With the influx of computer-based binocular programs or a vision design focusing on a binocular approach, this is a logical next step.

(Reference: Ophthalmic Physiol Opt. 2025 Jan;45(1):31-42. doi: 10.1111/opo.13395. Epub 2024 Oct 12.)

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Three-year Outcomes of Botulism Toxin Versus Strabismus Surgery for the Treatment of Acute Acquired Comitant Esotropia in Children (Published by: *American Journal of Ophthalmology,* 2025)

Authors: Michael TB Nguyen, Crystal SY Cheung, David G. Hunter, Michael J. Wan, Ryan Gise

A child with esotropia in the chair can strike fear in the hearts of even the toughest optometrist. After ruling out the worst-case scenarios like brain tumors, optometrists ultimately have to diagnose and provide the most appropriate treatment.

Depending on the nature of the esotropia, traditional treatments include plus lenses, surgery or even vision therapy. A newer treatment involves injecting the intraocular muscles with botulinum toxin (BTX). BTX is less invasive, less expensive and allows for more expeditious treatment. This study compared BTX and traditional surgery in a population of children with esotropia.

A record review of patients who underwent treatment for esotropia between 2000 and 2020 for acute, acquired comitant esotropia was completed at Boston's Children's Hospital. Two treatment options were compared: BTX and traditional strabismus surgery. For the BTX group, the toxin was injected into both medial recti muscles under general anesthesia. In most cases, five units of botulism toxin were used. The patients were between two and 10 years of age at the time of onset and were required to have at least 36 months of documented follow-up. Also required in the documentation was the onset had to occur within 6 months of the initial assessment.

Exclusion criteria included previous treatment with either BTX or surgery, the presence of neurological/developmental abnormality, relevant pathology based on imaging, greater than 3D of hyperopia, or greater than 10pd reduction in magnitude with hyperopic correction. The primary outcome was success at 36 months, which was defined as: 1. 10pd or less horizontal deviation measured by prism-and-alternate cover test; 2. Retreatment within 36 months (BTX or surgery); 3. Evidence of binocular vision based on the Titmus fly test or fusion on the Worth 4 dot at 1/3m.

The success rate was significantly higher in the BTX group (89%) than the surgery group (59%) at 6months (p=.005) but there was no difference at 36 months (BTX, 72% vs surgery, 56%; p=.24). At both 6 and 36 months, the median deviation and median stereoacuity were not significantly different. At 6 and 36 months, five of 44 and 12 of 44 patients failed treatment in the BTX group; eight of these patients underwent retreatment. In the surgery group, these values were 13 of 32 and 14 of 32 in the same periods, respectively, with 10 patients receiving retreatment. No serious or permanent complications from either treatment were recorded. Postoperative ptosis was found in 45% and exotropia in 48% of the BTX group, with an average resolution of 6 weeks and 5 weeks, respectively. Of note, the time from onset to assessment, onset to treatment, and assessment to treatment were all significantly lower in the BTX group.

The authors concluded that botulism toxin treatment was noninferior to traditional surgery at 36 months. While "noninferior" is being used statistically by the authors, the BTX group showed a higher success rate and a lower rate of retreatment. Those children were identified earlier, and treatment provided quicker.

Based on the results of this retrospective study, I would go one step further than the authors in their conclusions that BTX should be considered the first-line treatment for acute, acquired comitant esotropia in children younger than 10 years of age. This topic should be broached and discussed with parents before an ophthalmological referral. Finding a specialist who offers this treatment is also crucial. A prospective study would be the most logical next step for these authors.

(Reference: Am J Ophthalmol. 2025 Apr:272:1-7. doi: 10.1016/j.ajo.2024.12.025. Epub 2025 Jan 3.)

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Effect of office-based vergence and anti-suppression therapy on binocular vision and accommodation in small-to-moderate angle intermittent exotropia: A randomised clinical trial (Published by: *Ophthalmic Physiological Optics,* 2025)

Office-based vergence and anti-suppression therapy for the treatment of small-to-moderate angle intermittent exotropia: A randomised clinical trial (Published by: *Ophthalmic Physiological Optics,* 2024)

Authors: Martin Ming-Leung Ma, Ying Kang, Mitchell Scheiman, Qiwen Chen, Xuelian Ye, Liuqing Pan, Jiayu Deng, Guangxing Su, Guohui Zhang, Xiang Chen

Currently, there is no consensus treatment for intermittent exotropia. Surgical treatment brings with it a high reoperation rate. Non-surgical treatment includes patching, prism, vision therapy and overminusing. Vision therapy, despite the lack of randomized clinical data, has shown success in treating intermittent esotropia, but many of the studies were completed prior to the advent of a validated outcome measure. The two papers discussed (same study population) compared vision therapy to an observation group for children with intermittent exotropia.

Forty children ages 6 to 17 were enrolled at the Zhonghan Ophthalmic Center in Guangzhou, China. The participants received either 16 weeks of office-based vergence and anti-suppression therapy (OBVAT) with home reinforcement, or were simply observed. One supervised therapy session of 60 minutes was completed weekly, along with 15 minutes of home reinforcement 5 days per week. The therapy protocol was adapted from the Convergence Insufficiency Treatment Trial, as distance vergence and anti-suppression activities were added. The inclusion criteria included a distance exodeviation between 10 and 30pd with a near deviation no greater than 10pd than the distance. Stereoacuity had to be 400 arcsec or better, and the Office Control Score had to be greater than Grade 2 at distance and between zero and four or orthophoric at near. The Office Control Score is a five-point scale with the following grading characteristics:

- 5 = Constant Exotropia
- 4 = Exotropia > 50% of the 30-second period before dissociation
- 3 = Exotropia < 50% of the 30-second period before dissociation
- 2 = No exotropia unless dissociated, recovers in >5 seconds
- 1 = No exotropia unless dissociated, recovers in 1-5 seconds
- 0 = No exotropia unless dissociated, recovers in

No history of vision therapy, strabismus surgery, nystagmus, amblyopia or restrictive/paretic strabismus was allowed. No medication known to impact accommodation or vergence, a history of ocular/neurological disorder or learning disability that would interfere with therapy was permissible. Testing was completed at 8 and 17 weeks. The data from the 17-week visits is presented.

The following measures showed significant difference between the OBVAT and observation groups: Office Control Score at distance (p=0.008), Fusion Maintenance Score (p=0.007), vergence facility (p=0.005), near Worth 4 dot (p=0.001), and positive (p<0.001) and negative fusional vergence (p=0.001) at distance and positive (p<0.001) and negative fusional vergence (p=0.004) at near.

The OBVAT participants were more likely to show ?1 point of improvement in Office Control Score at 17 weeks (p=0.006), but the same could not be said for those showing ?2 points of improvement (p=0.67).

The following measures did not show significance: Office Control Score at near, distance, and near stereopsis, the Newcastle Control Score, angle of deviation via cover test at distance or near, Chinese Intermittent Exotropia Questionnaire, near point of convergence, amplitude of accommodation, and distance Worth 4 dot.

Only eight of the 20 participants in the OBVAT group completed all of the activities in the protocol. Of those 12 who did not, they completed on average 22.4 +/-6.2 of the 30 procedures.

Office-based vision therapy is a viable option for children with intermittent exotropia and an alternative to surgical correction. These two papers showed the impact on the control of the tropia and various measures of binocular vision and fusion. Of note, while all participants completed the 16 weeks of therapy, less than half completed the therapy treatment protocol. It could be surmised that if therapy had been completed, the improvement levels might have been even better. While this data provides support for those who offer vision therapy, it also serves as a wake-up call to primary care optometrists to alter their referral patterns for children with intermittent exotropia.

(References: Ophthalmic Physiol Opt. 2025 Jan;45(1):50-66. doi: 10.1111/opo.13415. Epub 2024 Nov 8. Ophthalmic Physiol Opt. 2024 Mar;44(2):356-377. doi: 10.1111/opo.13264. Epub 2023 Dec 26.)

Dr. Marc Taub is a professor at Southern College of Optometry. He teaches in the vision therapy and pediatric clinics. He is also the co-supervisor for the Pediatric and Vision Therapy Residency. Dr. Taub is a Diplomate of the American Academy of Optometry and Fellow the College of Optometrist in Vision Development and National Academies of Practice and is active in the Optometric Extension Program Foundation.

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