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OPTOMETRY & VISUAL PERFORMANCE

If a Tree Falls, Is It an Epidemic? Results of the OEPF Online COVID-and-Myopia Survey

A Review of Patient Care Platforms for Vision Therapy

Myopia Management—How to Apply the Current Scientific Evidence to Our Clinical Practice

Myopia Control—Who to Target with Myopia Interventions

Neuro-Optometric Rehabilitation for Post-COVID-19 Syndrome

Lockdown in Hong Kong Promotes Myopia Progression in Schoolchildren: A Case Report

Surveying the Scene: Results of the OEPF Online COVID-Related Conditions Survey

Telehealth Vision Therapy: Reflections After One Year of Implementation

When Will Things Go Back to Normal? Long-Term Effects of the COVID-19 Pandemic on Neuro-Developmental Optometric Care

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Optometric Extension Program Foundation

Editorial • Getting Back to Business as Usual...Ha!

Marc B. Taub, OD, MS • Southern College of Optometry • Memphis, Tennessee

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In late February/early March of 2020, I was in India lecturing at a local college. Even before getting on the plane, I had concerns, and so did my wife. I knew I could not let my hosts down, though, so off I went.

Everything was just fine until two days later. My trip to the Taj Mahal was canceled due to them closing the site, as there was a COVID outbreak close by. Temples and other hisitoric sites were being closed, or the number of visitors was being limited. Luckily, I was able to visit the grave of Mahatma Ghandi. The lectures went off swimmingly, and I had no trouble with flights or COVID. I consider myself lucky to have gone and to have made it home safe and sound. While I was in India, the United States recorded its first official COVID death.

We all have our stories of when we knew this was not going to go away in a matter of days to months. But wow...I am pretty sure most of us were not expecting to be dealing with the pandemic to the same extent almost two years later.

We all pivoted in some way. My institution, Southern College of Optometry, made the decision to close the clinical programs completely and to move classes online. They protected the students, staff, and faculty, and for that, I am grateful.

Private practices and some academic institutions made the decision to move to virtual vision therapy. They used Microsoft Teams or Zoom to connect with patients and worked out ways to get them equipment. I applaud their ability to think outside the box to continue patient care under the circumstances.

Little by little, months later, offices were able to start to open safely, if that term is even applicable. However, many patients were not able to come back out of their cocoons, and practices limited the number of patients in the office at one time. Virtual therapy continued, and hybrid therapy programs developed. Almost two years later, while most offices are back in full gear despite our new friend Omicron, some offices continue virtual and hybrid therapy, with varying levels of success.

In the early summer of 2020, Len Press and the team at *Vision Development & Rehabilitation* published a special theme issue on the topic of Telehealth and Vision Therapy. I will have to admit that I was amazed at how quickly that issue came together and a little jealous that Len pulled it off!

A year later, Len was being interviewed and was asked about doing a follow-up issue. While he appreciated the idea, he was going to take a pass. We talked, and I was happy to pick up the mantle and, in my opinion, help move the profession and behavioral optometry through the second phase of the pandemic.

In this issue, you will find a neat collection of articles. Several of the authors agreed to look back and provide a perspective on their original articles. There are two case reports detailing the impact of COVID and lockdown on patients. The results of two surveys put together by OEPF are detailed. There is so much in this issue that there is no way to describe all of the pieces, so I am going to get out of the way and just let you dig in.

Thank you to all of the authors who contributed to this theme issue.

Review Board Update

I would like to welcome the new members of the review board and one new associate editor. Joining us are Tyler Phan, OD; Emily Aslakson, OD; Jen Fisher, OD; JJ Lant, OD; Ira Krumholtz, OD; and Yazan Nadeev from the United States; Liat Gantz, PhD from Israel; Emilio Teran, PhD from Mexico; and Jeffery Leung, PhD from China. Rebecca Marinoff, OD will be moving up from the review board to be an associate editor.

Thank you to the following individuals who have served diligently and graciously for many years: Mitch Scheiman, OD, PhD; Robin Price, OD; Linda Sanet, COVT; Barry Cohen, OD; Paul Graham, BAppSc(Optom)Hons; Tim Hug, OD; Carly Lam, PhD; and Sam Wajuihian, OD, MOptom. Thank you also to Sarah Hinkely, OD for serving as associate editor for so many years.

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Wednesday, February 23 - Sunday, February 27, 2022
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VT2/Learning Related Visual Problems
Wednesday, March 16 - Sunday, March 20, 2022
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https://bit.ly/3pzNMQi

VT3/Strabismus/Amblyopia
Thursday, April 27 - Sunday, April 20, 2022
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SPEAKERS: John Abbondanza, OD & Geoff Heddle, OD
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Article • When Will Things Go Back to Normal? Long-Term Effects of the COVID-19 Pandemic on Neuro-Developmental Optometric Care

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ABSTRACT

Just as the COVID19 virus evolves and continues to affect the lives of billions of people around the globe, neuro-developmental optometric physicians are constantly monitoring, making changes, and updating their offices, as well as the treatment and care of their patients, to keep both patients and staff safe. Each day, more and more information is becoming available about COVID. We now know more about its transmission, which steps help reduce its transmission, and which steps do not. As we learn more about COVID and adapt to the safety precautions necessary to keep our communities safe, we adapt our protocols. The following article will discuss COVID protocols instituted at the Vision & Conceptual Development Center due to COVID, what has been updated, and what policies may be maintained even when the pandemic ends.

Keywords: COVID-19, telehealth, neuro-developmental optometry, pandemic, vision therapy, neuro-visual rehabilitation

Web-Based EHR Platform

While the Vision & Conceptual Development Center (VCDC) had a scheduling and billing program that could be accessed remotely, we had not converted our charts from paper to electronic prior to the pandemic and had no immediate plans for doing so. In March 2020, before stay-at-home orders were announced, the situation was looking ominous. We scanned the charts of our active vision therapy patients into a HIPAA-compliant, cloud-based platform that staff could easily access from home. As it became apparent that we would be providing telehealth for a prolonged period of time, we sought out a vendor that would provide a relatively easy transition from paper charts to electronic health records. While complete transition is an ongoing process, we switched vendors in July 2020, and it has been more beneficial than we expected. All documents, even those created on paper (Keystone Visual Skills, VO Star) are scanned into the patient's online record, allowing access 24/7. This has improved the ease of telehealth services, including parent conferences and virtual vision therapy sessions. No longer do we have to hunt for misplaced paper records. There has been an added benefit of reduced expense and a more patient-friendly interface compared to our old system.

Virtual Sessions

In March 2020, VCDC was under stay-at-home orders.[1] Initially, our office was all virtual; we were seeing all of our patients through telehealth evaluations and therapy.[2] When we resumed seeing patients in the office in July 2020, we alternated between in-office therapy one week and virtual therapy sessions the next. This was useful because it reduced the number of patients and staff in the office at one time. Staff would also alternate between in-office and virtual therapy every other week, seeing their same patients. This would have avoided a total closure of the office had there been an exposure to someone who tested positive to COVID-19, as it would have only affected half of our patients and staff. At that time, there was a higher demand for patients to continue virtual-only vision therapy. This reduced the number of therapists who needed to come into the

office, allowing some to remain at home and see all of their patients virtually.

Virtual therapy sessions allowed our patients to continue treatment during the COVID closures. They have also been wonderful for times where patients otherwise would not be able to attend their therapy appointments; for example, during climate-related closures, quarantining, transportation challenges, and vacations, to name a few. However, for many of our patients, virtual therapy sessions are not ideal. Many patients, especially those with special needs, need to have in-person interactions in order to learn and to grow through therapy. Those with brain injury have discomfort with screens. Some parents are unable or unavailable to support their children during virtual sessions. Some children are unable to focus and participate in Zoom sessions, and sometimes there is difficulty within the family regarding scheduling the use of computer/mobile devices and eliminating other types of streaming. "Zoom fatigue" due to parents and children all working remotely compounds many of these issues. It is our impression that over time, parents have become increasingly overwhelmed with the demands of working from home while supporting children with distance learning,[2,3] and they benefit from regular in-office visits when possible. By March 2021, the entire VCDC staff was fully vaccinated, and we resumed weekly in-office vision therapy for those who desired it. By the summer of 2021, most of our patients resumed in-office therapy. We continue to offer virtual vision therapy visits for those who request it and who are good candidates.

When transitioning to in-office examinations, we continued to use telehealth visits to limit the time needed to be spent in the office. Initially, all patients would have a telehealth history session (one hour for new patients, thirty minutes for progress evaluations/recall appointments). There would also be a one-hour telehealth conference for new patients to go over the results of the new-patient evaluations.

Although time-consuming, we find that new patients and parents of new patients appreciate the time and attention taken to understand them or their child before the evaluation. We find that patients/parents feel more comfortable discussing their child's history unmasked at their home and provide a more complete picture of their child's condition. Before this visit, the doctor has reviewed the intake form and all reports and records sent. After reviewing the history, the doctor decides the most appropriate exam components for the patient and explains what the exam will look like. This has been helpful for patients/parents to understand what will be done during the examination. These new-patient history sessions also allow the doctor to ask follow-up questions, to request information, and to allow for time to retrieve and to review other medical records before the in-person examination. We have continued to use these new-patient telehealth visits and will continue even after the pandemic is over.

Telehealth history sessions before progress-evaluation and recall appointments are now offered per patient/parent request. We find that once our patients and their families have had their initial evaluation, they feel more comfortable discussing their histories in person at the time of the examination.

Transitioning to telehealth visits for parent conferences after a new-patient evaluation was a move that we thought would be temporary. However, with the convenience of having this meeting during the workday without needing to account for travel time, we are finding that these appointments are easier to schedule, have a much higher rate of having both parents present for the conference, and will be an option that we will continue to offer. Having all of the patient's medical records online, such as RightEye reports, Van Orden Stars, etc., the doctor is easily able to show the parents all of the findings that would otherwise be presented in person. With most people, both patients and doctors, becoming much more knowledgeable about using video conference technology over the past year, these conferences occur seamlessly and will be continued in the future.

Masks

Masks continue to be required at all times in the office for all patients over the age of two and for all staff. With the rise of the Omicron variant, we now require N95-equivalent masks of employees and N95 or double surgical masks of all patients over two years of age. For patients under the age of two or who are unable to maintain wearing a mask, appointments are made during off-peak times to limit exposure to other patients.

Masks do limit non-verbal communication, such as smiling and lip reading, and they provide a barrier for understanding verbal communication. This has been a challenge for patients who have difficulties with receptive language and auditory processing challenges, as these patients are unable to see most facial expressions to read the other's mood and intent. It is difficult for patients who have articulation

challenges as well; by limiting their lips, they may be difficult to understand or get easily frustrated when asked to repeat what they have said. It is also often difficult for special needs patients to maintain wearing masks. In addition, non-verbal patients are also limited due to masks in their ability to communicate via facial expressions.

Despite its challenges, we do not anticipate discontinuing mask wear anytime soon. They are an excellent barrier to COVID-19. We may continue to insist at times that patients wear a mask, even when the pandemic is over, when they have a runny nose or any cold/allergy symptoms.

Frequent Patient Hand-Washing and Sanitizing

Continued hand-washing/use of hand sanitizers before patients enter the therapy room or doctor's office and frequent hand sanitizing during exams and therapy will be continued. Given the ease of hand sanitizing and washing, and the habit of it that most patients have now ingrained over the last 18 months, we will continue to require this in the future. It allows the patient and staff member to remain safe and also prevents the spread of COVID or other germs to future patients with minimal time required.

Temperature Checks

Our county continues to require the patient's temperature to be taken before they are permitted to remain in a healthcare facility. Temperatures of 100.4 degrees or over indicate a fever caused by an infection or illness. However, temperature checks are considered controversial by many. Some argue that the contact-less thermometers are inaccurate because they are looking at skin temperature and not core temperature, and they are easily affected by outdoor/room temperature and humidity levels. Others argue that they are often incorrectly used and thus are unreliable. Because people can spread COVID-19 without displaying any symptoms, and many who have COVID remain symptom-free, checking whether a patient has a fever is not an accurate screening device for COVID-19.[4-7] We continue to use detailed questionnaires with COVID-19 symptoms and exposure history that must be filled out before entering the office. In the future, we may discontinue temperature checks when given the green light by our county health department. We will consider checking temperatures on patients, especially non-verbal patients or those too young to provide accurate feedback, when we suspect that they may be ill.

Washing/Sanitizing Between Patients

Since at the time of this writing most of our patients are children not yet eligible to be vaccinated against COVID-19, while the Delta and Omicron variants cause increased community transmission, we continue to maintain levels of cleaning and sanitation more stringent than the baseline currently recommended by the Centers for Disease Control.[8] We sanitize all equipment, tables, and chairs between patients. We will continue to wash all equipment between patients in the future. Pre-COVID, all ocular equipment was wiped down with alcohol between patients, and manipulatives, such as blocks and pegs, were washed weekly. Tables were washed at the end of the day or more frequently as needed. Chairs were washed by the cleaning team twice per week; more frequently by office staff if needed. Because of COVID, we are finding that our patients really appreciate the full sanitizing that occurs between patients; it gives them a feeling that they are safe because they are in an office that is taking steps to stop the spread of COVID. In the future, we will continue to clean all equipment and the tables between patients. This makes the most sense for our patient population. We work with a high number of adults and children who have compromised immune systems and who would be more susceptible to germs encountered on equipment. We also allow them to use more hand sanitizer if they feel more comfortable. Cleaning is also helpful for many of our developmentally delayed patients. These patients often mouth equipment; in the past, we would clean the object after it became soiled. By preemptively sanitizing every piece of equipment, we are preventing patients from getting sick from what they just mouthed.

Equipment can be cleaned in front of the patient before use and then cleaned again after use. It can be marked with a sign that it is clean/sanitized. After using equipment, it is put into a bucket or storage container to be sanitized before being stored.

Air Purifiers and Fans

We have large air purifiers in every room of the office. Air purifiers help reduce COVID-19 particulates in the air. Fans allow fresh outside air to be circulated into the office. In addition to our screening questionnaire, wearing masks, and social distancing, the air purifiers and fans are part of our COVID-19

plan to reduce exposure in the office.[9] They also help patients feel more confident and comfortable in the office. They do produce some noise, so they can be a mild challenge for patients who have difficulty with hearing, particularly since these patients are not getting visual lip reading due to the masks. It can be difficult for staff to hear the patients, especially young children with significant language challenges, if they do not articulate clearly. Patients may get nervous that they are not communicating well due to their expressive language delay or articulation challenge and may be uncomfortable repeating themselves.

To put patients at ease and work around these difficulties, the doctors will mention during the video histories that the fans and air purifiers are installed for their safety but may make it slightly difficult to hear. We emphasize that they should feel free to ask the doctor to repeat herself and not to feel sensitive if someone asks them to repeat themselves.

Vision Therapy Kits

We provide a notebook with necessary equipment needed for vision therapy, including red/green glasses, a translucent eye patch, a Brock string, and other small tools that the patient uses near their face. This was traditionally given to the family and kept at home. During the pandemic, we have instructed patients to bring their kits to every appointment and to use their own equipment when possible. This allows our patients to feel safer, reduces the time spent cleaning materials, and reduces wear and tear on office equipment. It also helps us with home vision therapy compliance. Patients become more comfortable doing the home therapy when they are familiar with the equipment and feel more confident doing the home activities. Because they are using the kits regularly, we have seen a reduction in lost equipment. We also have more insight into their home practice: if their Brock string is all wound up and still in its bag, chances are the patient is not doing that activity as prescribed.

Encouraging Patients to Stay Home When Feeling Sick with Virtual Therapy as an Option

When a patient or their family has any symptoms, we encourage patients to stay home and whenever possible convert the appointment to a virtual telehealth visit. In the past, we had many parents bring an "under-the-weather" child into the office to avoid scheduling a make-up session. Now it's easier than ever for patients to keep their appointment virtually if they are well enough to do so, without bringing minor illnesses into the office.

Sliding Glass Window Between Administrative Area and Waiting Room

In addition to providing a barrier to keep staff safe, the sliding glass window aids in noise cancellation to keep the administrative area more private. This reduces sounds when answering phone calls and keeps clinical conversations more private in order to support HIPAA requirements better.

Flexible Workstations

To limit the number of patients in each room and to allow for ample social distancing, therapists have become more flexible and creative regarding where they perform certain tasks. Equipment that previously had a specific location in the office is moved to various locations as needed. For example, when available, doctors' exam lanes are used for VT to increase social distancing.

Staggering Start/Stop Times and Increasing Cleaning Time Between Appointments

All appointments used to be 50 minutes in length, starting on the hour. Since COVID, we have been stagging the start of therapy/exams on the half hour. This has not been difficult for the administrative staff to schedule, and clinical staff keep up with their own schedules. This reduces the number of patients/families in the waiting area, allowing for a calmer (less happy-hour) feel and more social distancing. It has had the added benefit of reducing stress on the administrative team by creating a steadier stream of patients throughout the day, rather than quiet periods punctuated by frenzy. We also reduced the session duration to 45 minutes to allow sufficient time for new cleaning protocols.

Being Smarter About Home Practice

In the office, we are easily able to understand where a patient is fixating and how accurate their eye movements are. However, depending on how the patient is facing their computer, we may not be able accurately to understand where they are looking to monitor fixation in a virtual encounter. Also due to connection challenges, there may be a lag in seeing what is presented or the stream may freeze and be hard to see. To address these challenges that primarily affect ocular sensorimotor procedures, we have introduced NeuroVisual Trainer[10] to our virtual and home therapy toolkit. NeuroVisual Trainer is

a web-based computer program that allows us to customize the home treatment plan for each patient, with a variety of oculomotor, fusion, and perceptual activities. We have found it easy for patients to use, and it allows monitoring of the patient's progress by the therapy team through a provider dashboard. Since implementing NeuroVisual Trainer, we have seen an increase in patient compliance with home practice.

Conclusion

When will things go back to normal? When was the last time you practiced normally? Personally, we haven't practiced "normal" optometry in almost 20 years. We're always learning more at conferences, from our colleagues, from our patients, and from the literature and research that is published. We are continuously making choices to help our patients, regardless of what the standard of care is in general optometry and ophthalmology. As we have learned more about the COVID-19 virus, we have learned how to keep our patients, our staff, and ourselves safe. We have to continuously keep learning: keep following the latest research, keep learning from our patients, and keep learning from our colleagues so that we can keep ourselves and our patients healthy.

Acknowledgment

Thank you to the doctors who are part of the Institute of Behavioral Optometry OEPF study group, who shared their experiences practicing during COVID-19 and shared ideas to bring this article into fruition. Thank you to the amazing staff at VCDC, who worked to develop, to implement, and to modify the COVID-19 protocols presented in this article; who shared ideas for this article; and who go above and beyond to provide the best patient care.

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Azimi Green MD, Zeller Manley AR. When will things go back to normal? Long-term effects of the COVID-19 pandemic on neuro-developmental optometric care. Optom Vis Perf 2022;10(COVID):9-13.

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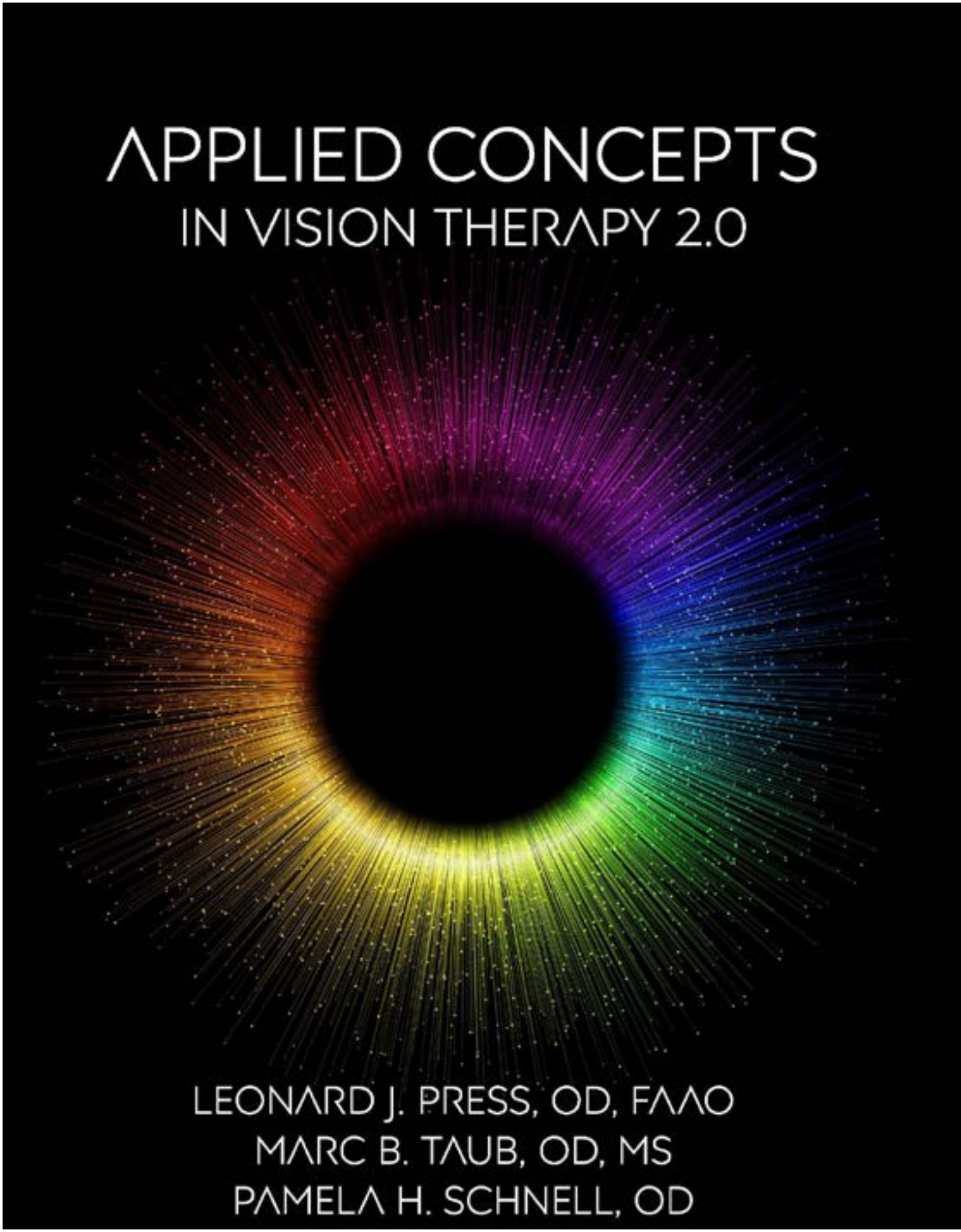

Article • Telehealth Vision Therapy: Reflections After One Year of Implementation

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ABSTRACT

The COVID-19 pandemic forced a rapid transition to telehealth vision therapy in order to ensure the continuation of care for patients at the Arizona College of Optometry. This editorial features the authors' reflections and opinions regarding the modality.

Keywords: telehealth, telemedicine, vision therapy

Introduction

In March 2020, the Pediatrics and Binocular Vision department of the Midwestern University Arizona College of Optometry (AZCOPT) rolled out a telehealth vision therapy initiative in response to the COVID-19 pandemic.[1] The goal was to continue to provide care for patients who had already initiated their vision therapy regimen, with a secondary goal of continuing to provide this modality for patients post-pandemic.

Multiple challenges with implementing telehealth vision therapy have been previously discussed, particularly at the outset of the pandemic. These ranged from determining which materials and activities would work best in a virtual setting to the difficulty of relying more heavily on parental involvement in order to ensure quality vision therapy sessions.[2] Solutions to these issues ranged from developing an RDS vergence training app to preparing pre-planned kits for patients.[1,3-5]

While telehealth's efficacy has been shown in multiple studies for other types of patient encounters, it has not been thoroughly investigated in vision therapy.[6-9] Previous studies have shown that in-office vision therapy is the gold standard when compared to home-based computer therapy and placebo control (CITT, CITT-ART).[10,11] However, it could be argued that telehealth vision therapy provides an experience more akin to in-office sessions, as the patient is interacting with a vision therapist rather than using a computer-driven response with visual demands.

Over the course of the pandemic, our clinic was purely virtual from March 2020 through May 2020. Patients who were currently undergoing vision therapy or who had already undergone a visual efficiency examination were offered our telehealth vision therapy services. A total of 10 patients elected to use this service, with the remaining either not responding to the request or choosing to wait for in-office therapy again. A detailed discussion of activities used and programming can be seen in our previous article.[1] Patients were allowed to return to our clinics beginning in June 2020. The total number of patients increased to 28, with only 4 patients (14.3%) electing to continue using the telehealth service. This drop in the telehealth vision therapy number seems to indicate a strong preference for patients and caretakers to undergo therapy in an in-office setting versus over the computer. This could be due to a number of factors, including the psychological impact of home confinement,[12] or to an increase in digital eye strain caused by an increase in computer work.[13] As vision therapy frequently causes patients visual discomfort in the earlier phases, it is possible that the added impact of these two factors may have made the telehealth service undesirable for long-term use. However, it is important to note that new

patients elected to receive telehealth services even when in-office services were available and offered (discussed later in this paper).

Our overall goal for this paper is to provide the reader with our reflections and lessons learned after nearly 18 months of providing telehealth vision therapy to patients. While no statistical analyses of patient encounters were performed to determine the overall efficacy of our efforts, we feel that our shared experiences highlight specific trends involving ensuring successful sessions, selecting activities, and selecting patients who would be most likely to have a positive experience with this new modality of care.

Reflections and Opinions of the Authors

The implementation process was overall smooth with few issues, despite the sudden change in clinical care forced by the pandemic. This is in large part due to the support that we received from Midwestern University's IT department in providing installation instructions for patients and providers. Most issues involved audio settings that were resolved within the first few minutes of an encounter. There were noted encounters where the camera did not work from our end; however, the camera always worked on the patient's end. This allowed us to continue with the session. No sessions had to be canceled or rescheduled due to technological issues throughout the pandemic.

Overall, we were surprisingly pleased with the results of telehealth vision therapy. Patient performance far exceeded expectations, with all but a handful of patients noting either improvement or complete resolution of their symptoms. A breakdown of patient ages and diagnosis categories can be seen in Table 1. Patients were exceedingly grateful for the opportunity to continue vision therapy during the statewide lockdown, as were patients who would have traveled long distances to be evaluated who otherwise wouldn't have been able to participate easily in vision therapy at our clinic. The most surprising request came from two sets of parents who wanted to use telehealth vision therapy for their child while they were on vacation in order to prevent disruptions in the therapy progress. We observed our students becoming more comfortable with providing telehealth vision therapy, and a discussion on providing vision therapy in this way has been incorporated into the binocular vision curriculum in the college.

There were three issues with our experiences. The first involved providing equipment to the patient and ensuring that the equipment made it back to our clinic once therapy was completed. Similar to Green et al,[2] our solution was to pre-program for multiple weeks out and provide our patients with a kit that could be picked up through a drive-by service. Paper activities could be emailed out to patients and/or their guardians prior to a session, but this was only beneficial if the household had access to a printer. Patients were required to return all equipment when they presented in person for re-evaluations. The equipment would be subsequently sterilized for future use. However, there were multiple instances of patients forgetting to bring equipment back, and many items were never returned. To ensure that material costs are not lost, practitioners may consider charging a deposit for equipment that is refunded upon return. In addition, the pre-programmed kits for patients did not include a large arsenal of lens and prism flippers due to concerns of equipment not being returned. Therefore, the number of vergence and accommodative activities that could be performed for patients was significantly reduced.

One solution to the above issue would be to use an online program or computer program that could continue to provide the patient with vergence activities using red/blue or polarized glasses. This was a solution employed by Bonilla-Warford and Knighton via Remote Web Vision Therapy (www.webvisiontherapy.com).[14] Patients would perform assigned tasks on the program while on the telehealth vision therapy call, allowing the practitioner to coach the patient through the task. A similar solution could be to have the patient purchase the Home Therapy Solutions (HTS) computer program, which allows the doctor both to set activity parameters and to monitor progress remotely. The Binovi Pro software is another option for practitioners looking to provide enhanced remote therapy. This application comes pre-loaded with not only a large number of therapy activities, but also with video demonstrations and written instructions. Additional features include being able to provide a plan of activities for patients at home, as well as progress reports for visual skills being trained. The downside for these solutions is that computer- and web-based programs often come at an additional cost to the practitioner, which is likely passed on to the patient. The financial hardships experienced by many during the pandemic may result in patients not being

able to afford these programs; therefore, this must be considered by practitioners before prescribing.

A second issue that we experienced involved selecting patients who were most likely to have success with telehealth vision therapy. This ties into our previous discussion of being precluded by equipment in providing the highest quality care. Our telehealth patients' diagnoses included vergence, oculomotor, accommodative, strabismic, amblyopic, traumatic/acquired brain injury, and perceptual disorders. Based on our experience, we found vergence and accommodation therapy to be the most challenging. The primary reason for this was due to the aforementioned difficulty in providing activities through pre-programmed kits and concern about receiving material back at the conclusion of the therapy program.

The final issue involved compliance and patient motivation. As mentioned before, only a small number of patients experienced no improvement in their symptoms. When reflecting on these patients, we observed that they had either canceled vision therapy prior to its conclusion or had exhibited poor behavior during sessions. This included high rates of no-shows for telehealth sessions, poor attitude during the session (for example, asking when the session would be finished or attempting to hide their eyes from the camera), and an apparent lack of parental involvement during the sessions apart from ensuring that the patient was on the call.

Our reflection on these three issues led to developing criteria to determine whether a patient should be offered telehealth vision therapy as a modality option for our clinic:

1. Patients are unable to attend weekly in-office vision therapy sessions due to significant scheduling conflicts or financial strain from long-distance travel
2. Patients must have exhibited excellent levels of maturity and attention during the visual efficiency examination
3. Patients and parents both must have high levels of motivation after acknowledging the challenge of providing care through a telehealth setting
4. Patients must not have severe accommodative or vergence deficits

Conclusion

We feel that it is reasonable to believe that telehealth video vision therapy is a modality that will continue in our field. This modality will likely be requested for patients who would otherwise be forced to travel long distances or manage around busy schedules. Our combined experiences lead to the belief that patients who undergo telehealth video vision therapy are just as likely to experience a resolution of symptoms as those who undergo in-office vision therapy. However, this cannot be confirmed until statistical analysis of our findings is performed. It is important to ensure that patients understand the additional commitment and self-reliance needed to maximize gains and that practitioners pre-program multiple weeks to ensure that activities and equipment can reach patients prior to the session. Future research should be performed comparing the success rate and duration of telehealth vision therapy to in-office vision therapy in order to determine its overall efficacy for patient care.

Acknowledgments

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David Damari, OD

Thursday, March 3, 2022 & Thursday, March 10, 2022 @ 8-10pm EST

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Jason Ng, OD, PhD

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Article • Lockdown in Hong Kong Promotes Myopia Progression in Schoolchildren: A Case Report

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ABSTRACT

Background: We describe two cases of monocular orthokeratology with rapid myopia progression in the contralateral untreated eye during a time that children stopped attending school due to COVID-19 and switched to an online mode of learning.

Case Reports: An 11-year-old female unilateral myopic anisometrope was fitted with an orthokeratology lens only in her left eye. The right eye (non-treated eye) showed myopic progression and axial length elongation, while the left eye (orthokeratology treated eye) showed no change in refractive error or axial length from Jan 2020 to Jun 2020, which was the class suspension period. The change in myopia (spherical equivalent) was -0.50 D in the right eye (non-treated eye) but remained unchanged in the left eye (orthokeratology treated eye). The change in axial length was 0.14 mm in the right eye (non-treated eye) and -0.1 mm in the left eye (orthokeratology treated eye) at around 5 months.

A 13-year-old female unilateral myopic anisometrope was fitted with an orthokeratology lens in her left eye. The refractive error of each eye was stable before the class suspension, but myopic progression was demonstrated in both eyes during class suspension. The change in myopia (spherical equivalent) was -0.75 D and -0.50 D in the right eye (non-treated eye) and the left eye (orthokeratology treated eye), respectively. The non-treated eye showed -0.25 D more myopic change than the treated eye in a 4-month interval.

Conclusions: Myopia progressed 2 to 5 times faster during lockdown; thus, the change of learning mode and lifestyle under the COVID-19 pandemic are possible risk factors for myopia progression. Protective behaviors and myopia control intervention should be publicized and implemented as promptly as possible.

Keywords: anisometropia, COVID-19, myopia control, myopia progression, orthokeratology

Introduction

A new coronavirus caused an outbreak of pneumonia in Wuhan of Hubei Province, China in December 2019. This coronavirus disease was officially named COVID-19 by the World Health

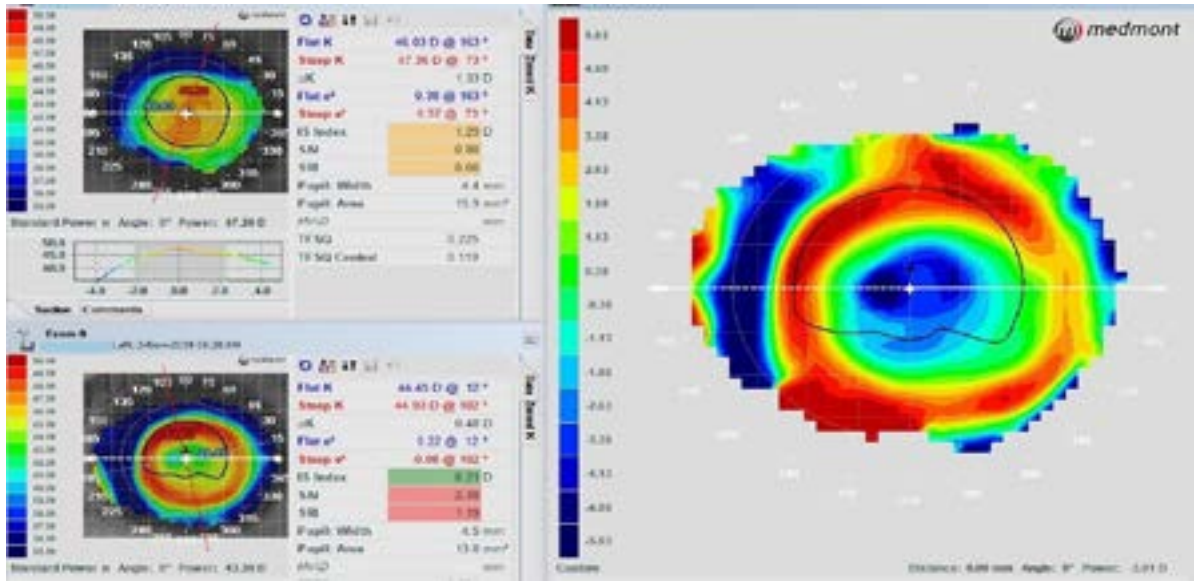

Figure 1. *Topography after one night of wear for patient 1*

Table 1. Horizontal Visible Iris Diameter (HVID), Keratometric Readings, and e-Value of the of the Flattest Meridian

	Eye	HVID	K-reading	e-Value
Case 1	Right eye	11.0 mm	46.00@002	0.64@002
	Left eye	11.0 mm	46.03@163	0.62@163
Case 2	Right eye	Nil	43.16@166	0.27@166
	Left eye	Nil	42.77@006	0.49@006

HVID=horizontal visible iris diameter, K-reading=keratometric reading

Organization (WHO) on February 11, 2020.[1] Since the first case of COVID-19 in Hong Kong was confirmed on January 23, 2020,[2] the government of Hong Kong has implemented a range of public health measures to suppress local transmission. One of the public health measures was school closure. The Hong Kong Government postponed class resumption for kindergarten to secondary schools several times and implemented class suspension in tutorial centers. In the light of the local outbreak of COVID-19 in early May, class resumption started from May 20th in several phases.[3] Most of the classes in secondary and primary schools resumed in early June of 2020. During the school closures, from late January to mid-June, schoolchildren in Hong Kong stopped attending class for at least 4 months. To maintain teaching and learning, many schools and tutorial centers began adapting online teaching during this period. Schools provided online lessons via videoconferencing, with schedules similar to those of usual schooldays. In addition, schools provided online assignments to students; students did not only use electronic devices for lessons, but also for completing online assignments, causing a dramatic increase in screen time. Besides changing children's learning mode, the outbreak also hinders schoolchildren from spending time outdoors, as people preferred staying at home as much as possible.[4] Near work and lack of outdoor activity are risk factors of myopia.[5-9] This paper describes two children with anisometropia who were fitted with orthokeratology in one eye for myopia control who presented with rapid myopic progression in the non-treated eye during the class suspension period.

Case Reports

Case 1

In July 2019, an 11-year-old girl was brought to the Optometry Clinic of The Hong Kong Polytechnic University by her parents for a routine eye examination. Unaided visual acuity of the right and left eyes was 6/7.6 and 6/30, respectively. The refractive error was plano-0.25x180 (6/6) right eye and -1.25-0.25x170 (6/6) left eye, tested by subjective refraction. The axial length (IOLMaster Ocular Biometer, Zeiss) was 22.55 mm and 22.90 mm in the right and left eyes, respectively. The intraocular pressure was normal, and external and internal ocular health examinations were unremarkable. There was no contraindication for overnight orthokeratology lens wear. Different myopia control measures were explained to the parents, and overnight orthokeratology was chosen.

The orthokeratology fitting session was scheduled in September of 2019; subjective refractive correction was -0.25-0.25x180 (6/6$^+$) right eye and -1.50-0.50x175 (6/6$^+$) left eye. Measurements of the horizontal visible iris diameter, keratometric reading, and e-value of the flattest meridian by corneal topography (Medmont E-300) are shown in Table 1. The corneal apex of each eye was found to be decentered down and temporal.

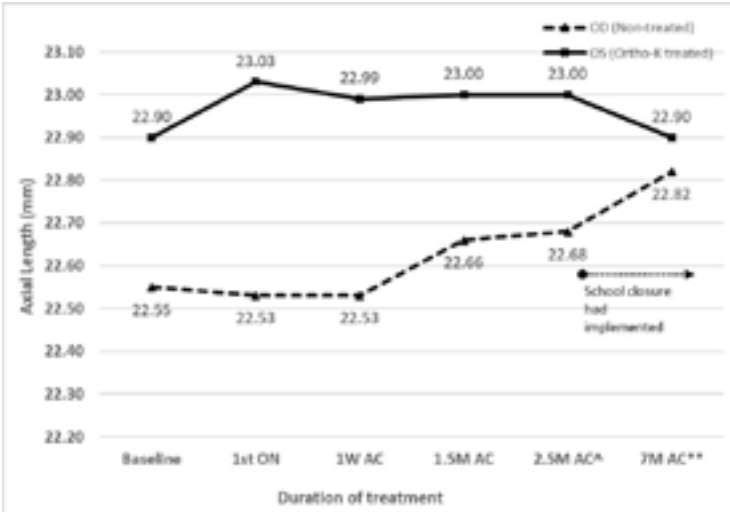

Figure 2. *Axial length changes for patient 1*

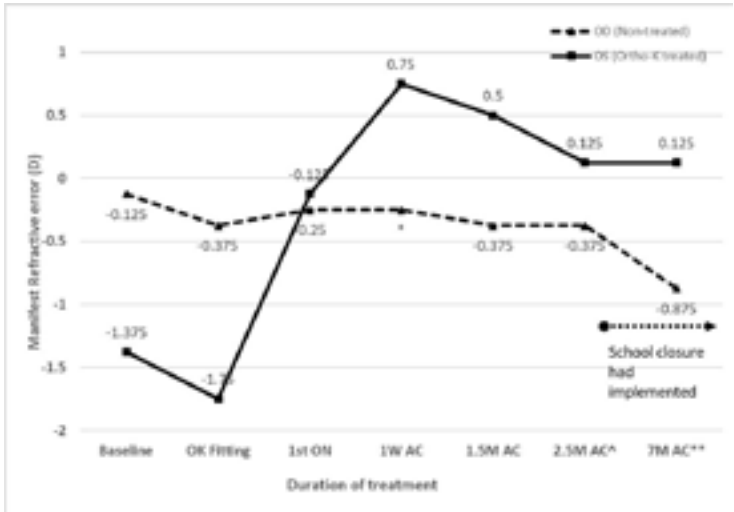

Figure 3. *Manifest refractive error changes for patient 1*

The patient was fitted with a Paragon CRT lens (Paragon Vision Sciences) in the left eye only. After instruction on lens insertion, removal, and lens handling and care, trial lens CRT 7.8-550-33 (base curve-return zone depth-landing zone angle) was dispensed. She returned to the clinic the next morning after 8 hours of overnight lens wear. Left eye unaided visual acuity was $6/7.6^{+2}$, and manifest refractive correction was +0.25-0.75x010 ($6/6^{-}$). Follow-up was scheduled for a week later, and slit lamp biomicroscopy revealed good corneal integrity. Subtractive topographical plots showed a bull's-eye pattern but excessive flattening of the cornea (Figure 1a). Left eye unaided visual acuity was $6/9.5^{+3}$, and the manifest refractive correction was +1.00-0.50x130 ($6/6^{-1}$). The patient also reported that her near vision was not as clear in the left eye. Therefore, another CRT lens (7.7-550-33) was ordered. She was advised to keep wearing the orthokeratology lens on alternate nights while waiting for the new lens. At the follow-up visit a few weeks later, she had worn the new lens for 3 consecutive nights. Unaided visual acuity was $6/6^{-2}$ and 6/6 in the right and left eyes, respectively. The manifest refractive correction was -0.25-0.25x010 ($6/6^{+2}$) and +0.50 (6/6). Axial length was 22.66 mm and 23.00 mm in the right and left eyes, respectively. External ocular health was unremarkable. She was instructed to wear the orthokeratology lens nightly. At a follow-up appointment scheduled a month later in January of 2020, the clinical findings were similar to the last visit; a follow-up was planned a month later and then every three months. However, to avoid crowded places during the local outbreak of COVID-19, the patient missed the February follow-up. She returned in June, which was almost 5 months from the last visit, but she consistently wore the overnight lens. Unaided visual acuity was $6/9.6^{-2}$ and 6/6 in the right and left eyes, respectively. Manifest refractive correction was -0.75-0.25x180 (6/6) and +0.25-0.25x090 ($6/6^{+}$). Axial length was 22.82 mm and 22.90 mm. External ocular health was unremarkable. As there was remarkable increase in axial length and myopia in right eye, orthokeratology treatment was also advised for the right eye. The measurements of axial length and manifest refractive error (spherical equivalent) from September 2019 to June 2020 are presented in Figure 2 and Figure 3, respectively.

Case 2

In April 2018, a 13-year-old girl was brought to a private practitioner for an eye examination. The subjective refractive correction was +0.25-0.25x165 (6/6) and -1.75-0.25x180 (6/6) in the right and left eyes, respectively. The intraocular pressure of each eye was normal, and external and internal ocular health examinations were unremarkable. There was no contraindication for overnight orthokeratology lens wear. Orthokeratology for the left eye was suggested, and fitting was done a week later. Measurements of the keratometric readings and e-value by corneal topography (Keratron Scout) are shown in Table 1.

The patient was fitted with E-lens (E&E Optics) in the left eye only. After instruction on lens insertion, removal, and lens care, the E-lens 43.00/10.6/-2.00/Boston XO (Flat K/lens diameter/target power/lens material) was dispensed. She returned to the clinic in the morning after overnight wear for two nights. Left eye unaided visual acuity was 6/6, and the manifest refractive correction was plano-0.25x180 (6/6). No corneal staining was found. At the follow-up visit one month later, the unaided visual acuity of each eye was 6/6, and the manifest refractive correction of the

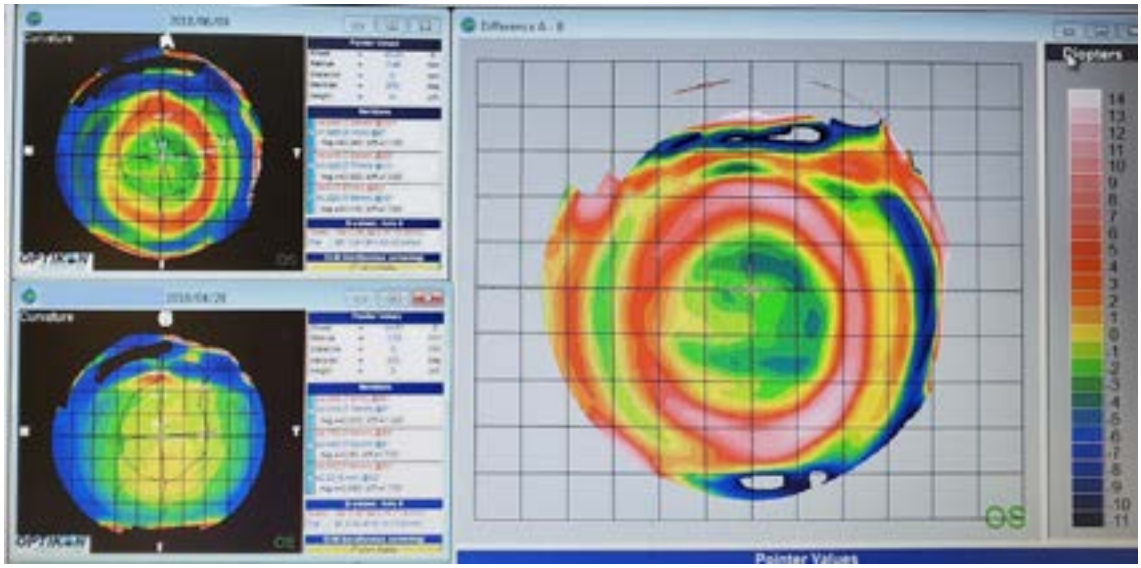

Figure 4. *Topography after one month of wear for patient 2*

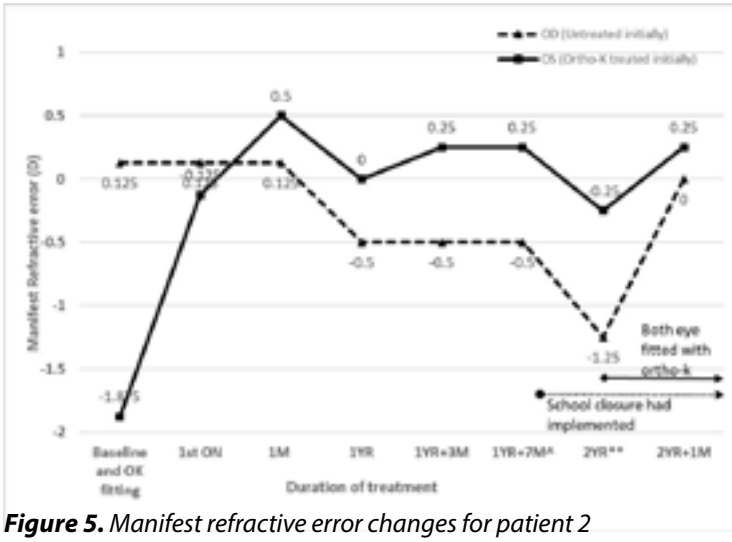

Figure 5. *Manifest refractive error changes for patient 2*

left eye was +0.50 D (6/6). Subtractive topographical plots showed a bull's-eye pattern (Figure 4). External ocular health was unremarkable. She was advised to wear the lens on alternate nights and to have regular follow-ups every three months. The manifest refractive correction was -0.50 D (6/6) and plano (6/6) in the right and left eyes, respectively, at the follow-up visit in May 2019. No lens use was advised for the right eye at that visit. The manifest refractive correction was -0.50 D (6/6) and +0.25 D (6/6) for the right and left eyes, respectively, at the follow-up visits in September 2019 and January 2020. At the follow-up visit in May 2020, the parents shared their concern about myopic progression, as the girl had spent more than ten hours per day on the computer and smart phone for distance learning since the school closure in early February 2020. Unaided visual acuity was 6/15 and 6/7.5^{+} in the right and left eyes, respectively. The manifest refractive correction was -1.00-0.50x170 (6/6) and -0.25 D (6/6). External ocular health was unremarkable. Orthokeratology fitting was now done for both eyes. Her right eye and left eye were fitted with E-lens 43.00/10.6/-1.50/Boston XO and E-lens 43.00/10.6/-2.00/Boston XO, respectively. Her unaided visual acuity was 6/6 in each eye, the manifest refractive correction was plano (6/6) and +0.25 D (6/6), and the external ocular health was unremarkable. She was advised to have regular follow-ups every three months. The measurements of manifest refractive correction (spherical equivalent) from April 2018 to June 2020 are presented in Figure 5.

Discussion

We presented two cases of monocular orthokeratology showing rapid myopic progression in the non-treated eye during the class suspension period (starting from late January 2020).

In the first case, referring to Figure 3, the refractive correction of the right eye (non-treated eye) was relatively stable before the class suspension. The right eye (non-treated eye) showed remarkable myopic progression and axial length elongation, while the left eye (orthokeratology treated eye) showed no change in refractive error and axial length from January 2020 to June 2020 (almost 5 months). The change in myopia (spherical equivalent) was -0.50 D in the right eye (non-treated eye), but there was no change in the left eye (orthokeratology treated eye). The change in axial length was 0.14 mm in the right eye (non-treated eye) and -0.1 mm in the left eye (orthokeratology treated eye).

In the second case, referring to Figure 5, the refractive correction of each eye was stable before the class suspension, but myopic progression was shown in both eyes during class suspension (January 2020 to May 2020, 4 months). The change in myopia (spherical equivalent) was -0.75 D and -0.50 D in the right eye (non-treated eye) and the left eye (orthokeratology treated eye), respectively. The non-treated eye showed -0.25 D more myopic change than the treated eye in the 4-month interval.

Several studies report that orthokeratology decreases the interocular difference in axial length in anisometropia.[10-14] A retrospective study by Long et al.[10] showed that orthokeratology slowed progression of axial elongation in the more myopic eye in both unilateral myopic anisometropes and bilateral myopic anisometropes, compared with anisometropes treated with spectacles, resulting in less difference in axial length between the eyes after one year of orthokeratology treatment. Another retrospective study by Fu et al.[11] showed that a reduction of interocular difference in axial length occurred in unilateral myopic anisometropes only. The two cases reported were unilateral myopes fitted with orthokeratology in one eye who showed reduction in the interocular difference in axial length, similar to the studies discussed here. However, both of the cases had started the orthokeratology treatment prior to class suspension (February 2020); the myopic progression in the contralateral untreated eye was faster after class suspension was implemented. Tsai et al.[12] found that the axial length difference between eyes in a low-anisometropia group (less than -2.50 D between eyes) decreased from 0.6 mm to 0.4 mm in 2 years. In case 1, the axial length difference between the eyes decreased from 0.32 mm to 0.08 mm in 5 months; the rate of change was much faster than demonstrated in the study.[12] We suggest that the remarkable reduction of axial length difference between the eyes was not only due to the retardation of axial elongation of the more myopic eye by orthokeratology, but also due to the more rapid myopic progression in the contralateral eye.

The rate of progression of the spherical equivalent refraction of myopic children in Hong Kong is about -0.033 D to -0.043 D per month, while the rate of progression of the axial length is about 0.015 mm to 0.02 mm per month.[15,16] The spherical equivalent refraction of the untreated eye changed -0.11 D/month and -0.18 D/month in the first and second cases, respectively, from January 2020. The axial length of the untreated eye increased 0.031 mm/month in the first case from January 2020. The myopia in terms of spherical equivalent refraction and the axial length of the untreated eyes escalated 2 – 5 times and 2 times, respectively, compared to the general progression in age-matched children in Hong Kong during class suspension.

We suggest that a change of lifestyle is associated with the rapid myopic progression in these cases. To suppress the local transmission of COVID-19, class suspension in school and tutorial centers was implemented from late January to early June 2020. Schoolchildren in Hong Kong stopped attending class for at least 4 months. To maintain teaching and learning, many schools and tutorial centers have been adopting online teaching during this period. Schoolchildren spent significant time attending online lessons, approximately 6 hours per day,[17] plus doing online assignments and playing games via different kinds of electronic devices, such as computers, tablets, or smart phones, leading to a remarkable increase in screen time. A meta-analysis found that more time spent on near-work activities was associated with higher odds of myopia and that the odds of myopia increased by 2% for every one diopter-hour more of near work per week.[5] The Beijing Childhood Eye Study,[7] a population-based cross-sectional study of 15,066 children aged seven to eighteen years, showed that myopia was associated with longer daily studying duration. A recent longitudinal population-based study found a significantly lower prevalence of myopia in Taiwan children aged 9-11 years with near-work distance >30 cm, discontinuing near work every 30 minutes, and more time outdoors during recess. The authors suggested that proper near work behaviors could be helpful in myopia prevention.[8] Besides changing the learning mode, school closure may also hinder the children being able to spend time outdoors, as children often engaged in outdoor activities during recess. Moreover, parents avoided allowing the children to go outside, since people preferred staying at home as much as possible during the COVID-19 pandemic,[4] further reducing their time spent outdoors. A meta-analysis found a significant negative association between time spent outdoors and the prevalence of myopia; the odds of myopia decreased by 2% for every one hour more spent outdoors per week.[6] A school-based intervention study also showed a significantly lower incidence rate of myopia and a lower rate of myopia progression in children spending their time on outdoor activities during recess.[9] We believe that the change of learning mode, leading to intensive near work, and

the reduction of outdoor activity are associated with the rapid myopia progression in the non-treated eye of these two cases during the COVID-19 pandemic. These case reports do not only reflect the important role of environmental risk factors on myopia, but they also raise awareness of the importance of myopia control, especially during lockdown. The number of confirmed cases of COVID-19 in Hong Kong rose again in early July 2020, and school closure was implemented again; school closures have been implemented in over 100 countries due to the pandemic.[18] Eye care practitioners should promote visual hygiene to schoolchildren and their parents and provide interventions to slow myopia progression as promptly as possible to better ensure the highest quality care.

Conclusion

Myopia progressed faster during lockdown in the presented cases. Visual hygiene and myopia control intervention should be publicized and implemented as promptly as possible.

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Article • Nutrition and Lifestyle Considerations During the COVID-19 Pandemic

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ABSTRACT

Background: The ongoing pandemic challenges our sense of control and equanimity. Despite the current environment and unknowns associated with COVID-19, there are many things that can be done to boost the immune system and help protect against the virus. Good nutrition, supplementation, and healthy lifestyle habits can support the immune system, reduce inflammation, and prevent infection. Proper nutrients reduce susceptibility to infection and disease progression and reduce long-term complications from COVID-19.

Several of the vitamins and nutrients that support immune function include vitamins A, C, E, D, B6, B12, folate, zinc, iron, selenium, magnesium, and copper, as well as omega-3 fatty acids.

In addition to proper nutrition, other suggestions for optimizing health, supporting overall immune function, and resisting infection include regular exercise, adequate sleep, and stress management techniques such as deep breathing, meditation, and relaxation.

Keywords: COVID-19, exercise immune system, nutrition, omega-3 fatty acids, sleep, stress management, meditation, water intake, viral infection

Introduction

The ongoing pandemic challenges our sense of control and equanimity. Despite the current environment and unknowns associated with COVID-19, there are many things that can be done to boost the immune system and to help protect against the virus.

A review of the literature gives some insight into those who are at the greatest risk for infection, some of the reasons for that risk, and the nutritional considerations for immunity. The elderly; minorities, including American Indians, Native Alaskans, Blacks, and Latinos; and individuals with lower income are more susceptible to disease. Those with underlying medical conditions such as obesity, diabetes, hypertension, and chronic heart disease and those with hypoxia, chronic inflammation, immunodeficiency, and neuropathology have the greatest risk for mortality and increased severity of symptoms from COVID-19. Some of the factors that result in disparities in the effects and infection sequelae of COVID-19 relate to nutrition and lifestyle. Diets high in sugars, refined carbohydrates, and saturated fats, as well as a lack of exercise, impair immunity and contribute to risk for comorbid disease. Poor nutrition leads to chronic inflammation, disrupts adaptive immunity, and causes poor defense against viruses. Long-term, poor diet and an unhealthy lifestyle not only increase the risk for infection but also increase the risk for long-term consequences of COVID-19 such as neuroinflammation, leading to dementia and neurodegenerative disease. Older populations, in particular, do not get the vitamins, minerals, and essential amino acids needed for a strong immune system. Additionally, the elderly have more difficulty extracting necessary nutrients from the digestive system.[1]

Good nutrition, supplementation, and healthy lifestyle habits can support the immune system, reduce inflammation, and prevent infection. Proper nutrients reduce susceptibility to infection and disease progression, and they reduce long-term complications from COVID-19.[1]

Discussion

Some of the literature indicates that several vitamins and minerals play important and necessary roles in supporting the immune system. Deficiencies or inadequacies in these nutrients can increase susceptibility to infection. These nutrients are important for various immune functions, including developing and maintaining physical barriers, producing and engaging antimicrobial proteins, mobilizing both innate and phagocytic cells, producing antibodies, and activating destructive neutrophils and macrophages. They also are important for promoting and recovering from inflammation through cytokine production and antioxidant activity.[1,2]

Several of the vitamins and nutrients that support immune function include vitamins A, C, E, D, B6, and B12 and folate, zinc, iron, selenium, magnesium, and copper. Ideally, the intake of healthy, diverse food should provide the necessary nutrients. However, it is difficult to get all of the vitamins and micronutrients needed to maintain health and to prevent disease.[2]

One of the important vitamins recommended for supplementation is vitamin D3. Vitamin D3 can be synthesized from cholesterol in the body upon the skin's exposure to sunlight and is a hormone that requires fat in order to be properly absorbed. Vitamin D3 is critical not only for maintaining bone integrity, but also for proper immune function. It stimulates maturation of immune cells and can reduce the risk of respiratory infection. Rates of infection of COVID-19 appear higher in countries with higher latitudes and lower vitamin D3 levels, and vitamin D3 deficiency may be associated with increased hospital admission, disease severity, and mortality in older populations. In most adults, supplementation is necessary to achieve optimum levels and to prevent inflammation. Suggested serum levels are 50-80 mg/ml. The recommended dosage is 2000 IU daily, with up to 10,000 IU recommended short-term in those at greater risk for exposure or susceptibility to infection. Vitamin D3 can be found in cod liver oil; wild Alaskan pink, sockeye, and silver salmon; Albacore tuna; sardines; and fortified milk.[2-4]

Another very important vitamin for immune support is Vitamin C. Vitamin C is used throughout the day for most immune functions and can reduce the risk, severity, and duration of respiratory tract infections. For those who are sick or who require immune support, recommended daily dosage is 2000 grams, although up to 5000 grams is suggested, if tolerated, taken at intervals during the day. Food sources of vitamin C include orange juice and oranges; yellow, green, and red bell peppers; strawberries; Brussels sprouts; papaya; broccoli; cantaloupe; and kiwi.[2,4]

Zinc also supports immunity by building T lymphocytes and can reduce diarrhea or respiratory morbidity during infection. Recommended dosage is 8-11 mg daily, although 30-50 mg daily may be indicated for added immune support, and up to 220 mg can help with recovery for those with COVID-19. Long-term dosing should be less than 25 mg, as high zinc levels can interfere with copper levels. Zinc can be found in grass-fed beef, lamb, chicken, crab, lobster, oysters, spinach, pumpkin seeds, chickpeas, cashews, yogurt, oatmeal, and cocoa.[2-5]

Selenium is another nutrient important for immune function and reducing viral loads. Higher levels of selenium have been found in COVID-19 survivors versus non-survivors. Selenium is an essential cofactor in a group of enzymes that work with vitamin E to reduce oxidative stress. Selenium deficiency may negatively affect antioxidant defenses and result in an exaggerated inflammatory response. Selenium may also protect the respiratory system from viral infections and is a recommended supplement, particularly for older adults. Suggested dosage is 50 mcg. Selenium can be found in brazil nuts, tuna, halibut, sardines, shrimp, steak, turkey, liver, chicken, eggs, beans, oatmeal, rice, yogurt, lentils, and spinach.[3,6]

Omega-3 fatty acids support the immune system and reduce inflammation. It can also reduce coronary heart disease. Recommended daily dosage is 1000 to 2000 mg daily of EPA and DHA. Some of the highest sources of omega-3 fatty acids come from flaxseed oil and chia seeds, as well as walnuts, whole flaxseeds, salmon, herring, sardines, and mackerel. Other sources include trout, sea bass, edamame, kidney beans, and soybean and canola oil.[1,7,8]

Copper supports immune cell differentiation and provides defense against oxidative damage. Copper deficiency may play a role in celiac disease, cardiovascular disease, and Alzheimer's disease. The absorption of copper is influenced by the amount of dietary copper, with small amounts increasing bioavailability. The recommended copper level is 1000 mcg daily, and food sources include beef, liver, oysters, crabs, salmon, turkey, chocolate, potatoes, mushrooms, cashews, chickpeas, sunflowers, sesame seeds, millet, yogurt, avocado, figs, spinach, asparagus, tomatoes, and apples.

Magnesium supports immunoglobulin production, and the recommended dosage is 400 mg. Natural sources of magnesium include pumpkin seeds, chia seeds, almonds, spinach, cashews, peanuts, baked

potatos, brown rice, cereal, oatmeal, kidney beans, bananas, salmon, milk, halibut, raisins, avocados, and broccoli. Prebiotics include berries, grapes, figs, whole-grain fibers, yogurt, coffee, tea, honey, and chocolate.[9,10]

Other suggestions to support immune and overall health include taking a multivitamin with B6, B12, E, folate, iron, magnesium, and copper, as well as additional supplementation with lutein, zeaxanthin, alpha-carotene, amino acids, peptides, cyclotides, lipoic acid, spirulina, N-acetylcysteine, and glucosamine. Turmeric, quercetin, elderberry, and probiotics are also supportive of health and proper immune function and often require supplementation. Some of the recommended dosages include 1500 mg of lipoic acid, 15 g of spirulina, 1500 mg of N-acetylcysteine, 3000 mg of glucosamine, 2000 mg of turmeric, and 1000 mg of elderberry.[4]

Some basic dietary recommendations include rotating foods and increasing the intake of fruits and vegetables. Organic foods can increase the absorption of nutrients and best provide the vitamins and minerals needed. Limiting sugars, carbohydrates, and processed foods, including drinks with excess sugar such as concentrated juices and sodas, will decrease inflammation and support overall health. Eating foods, drinks, condiments, and spices with anti-viral properties is also recommended.[4]

Some of the anti-viral foods include the aforementioned fish, seafood, nuts, seeds, avocado, Brussels sprouts, broccoli, and grapes. Additionally, other beneficial foods include arugula, cabbage, cauliflower, dates, legumes, and radishes. Carrots and pumpkin provide both alpha- and beta-carotene, collard greens provide lutein and alpha-carotene, and spinach is an excellent source of lutein and beta-carotene. Sweet potato is a good source of beta-carotene, and green peas, kale, and turnip greens provide lutein. Bell peppers, goji berries, and yellow corn provide zeaxanthin, and grapefruit and tomatoes are good sources of lycopene. Apples, blueberries, and cranberries provide anti-viral polyphenols and quercetin.

Antiviral fruits and vegetables with anti-inflammatory and antihistamine properties include carrots, lemons, limes, grapefruit, eggplant, pumpkin, yellow peppers, squash, and zucchini. Anti-viral drinks include coffee and green, black, and hibiscus teas. Anti-viral condiments include garlic, onions, ginger, extra-virgin olive oil, and balsamic vinegar. Anti-viral herbs and spices include basil, cilantro, cinnamon, clove, cumin, echinacea, elderflower and elderberry, eucalyptus, horseradish, lemon balm, lemongrass, licorice root, olive leaf, oregano, rosemary, sage, spearmint, thyme, and turmeric.[4]

In addition to proper nutrition, there are a number of other suggestions for optimizing health, supporting overall immune function, and resisting infection. One of the most important factors is staying properly hydrated. Drinking plenty of water helps maintain hydration and supports detoxification. Suggested intake is half one's body weight in ounces daily.[4]

Exercise is also extremely important to overall wellness and supports cardiovascular, respiratory, metabolic, and immune health. A sedentary lifestyle and physical inactivity can compromise the immune system, resulting in systemic inflammation, oxidative stress, and immunosuppressive mechanisms. Moderate exercise can increase natural killer cells, neutrophils, and macrophages, and more intense aerobic exercise can increase monocytes that are critical for anti-viral activity in the body. Prolonged moderate exercise increases T-helper cells and enhances T-cell proliferation in some at-risk populations.[11]

Another key recommendation for good immune health involves sleep. Sleep is essential for proper immune system function. Circadian cycles influence the number of T cells and the production and presence of inflammatory and natural killer cells. For example, pro-inflammatory cytokines are highest during early nocturnal sleep, and anti-inflammatory cytokines and killer cells are highest during the daytime. Sleep appears to promote inflammatory homeostasis and may also play a role in the formation of immunological memory.[12]

Many studies now show that there is an optimal number of hours for sleep and that too little or too much sleep can be detrimental to health. In fact, sleep and immunity are linked such that the immune system alters sleep and sleep affects both the innate and adaptive immune response. An inflammatory response can induce an increase in sleep duration and intensity as well as cause sleep disruption. Increased sleep during an infection promotes immune defense, and sleep is associated with reduced infection risk, improved infection outcome, and improved response to vaccination. Decreased sleep, in contrast, can result in chronic, low-grade inflammation and is associated with inflammatory diseases such as diabetes, atherosclerosis, and neurodegeneration. The general recommendation is to obtain more than 7 hours but less than 10 hours of sleep each night. However,

considerations such as sleep quality, sleep deprivation, hormonal activity, and aging may factor into the amount of sleep needed for an individual.[13,14]

Stress management is important for overall health and wellness and allows for adaptability to diverse and difficult environments. Stress is a complex phenomenon, and some stress is necessary to mount responses to our environment. However, stress can also have deleterious effects on the body. Stress can be acute or chronic and can have differing effects on the immune system depending on the condition. Acute stress can enhance both innate and adaptive immune responses, such as activating neutrophil, macrophage, lymphocyte, and cytokine production and function. Chronic, sustained stress can suppress immune function by reducing immune cell numbers and activity, increasing immunosuppressive mechanisms, and inducing low-grade inflammation. Chronic stress can increase susceptibility to infections and diseases such as cancer, asthma, allergies, and autoimmune or inflammatory disease. The effects of stress may be variable as a function of the type of stress, age, and disease.[15-17]

Conclusion

The persistence of the pandemic, as well as the significant changes to the lives of many, is a chronic stress on society. The pandemic has disrupted supportive social networks, challenged financial security, induced fear, caused loss of life and livelihood, and has led to reduced coping mechanisms for sustained stress. Managing stress is crucial to maintaining health and peace of mind during a prolonged pandemic. There are a number of evidence-based techniques that have been demonstrated to reduce stress. These activities include diaphragmatic breathing, guided imagery, progressive muscle relaxation, biofeedback, autogenic training, mindfulness, meditation, emotional freedom techniques, and cognitive behavioral therapy. When stress levels are ongoing, it is important to recognize when they are interfering with everyday life. Managing emotions by feeling them, communicating about them, and taking action in effective ways is necessary during stressful times. Techniques such as slow breathing, stretching, meditation, and seeking support from trained professionals may be required to support and maintain a healthy immune system.[18]

As primary care providers, it is critical that optometrists understand the importance of nutrition and lifestyle recommendations that can support overall health and reduce the risk of infection and complications from COVID-19. Given the mounting evidence of the benefits of the proper nutrients for prevention and reduction of infection, optometrists should be at the forefront of healthcare providers making recommendations for good nutrition and healthy practices in their patient population. Of particular concern are those patients who are in high-risk groups, such as those who are elderly or who have comorbid diseases or limited resources. Simple lifestyle recommendations and nutritional consultation may make a positive difference toward preventing and overcoming COVID-19 infection. In light of the stress that the pandemic has had on the general population, proper nutrition, exercise, hydration, sleep regulation, and stress management can do a great deal to support the immune system and maintain health.

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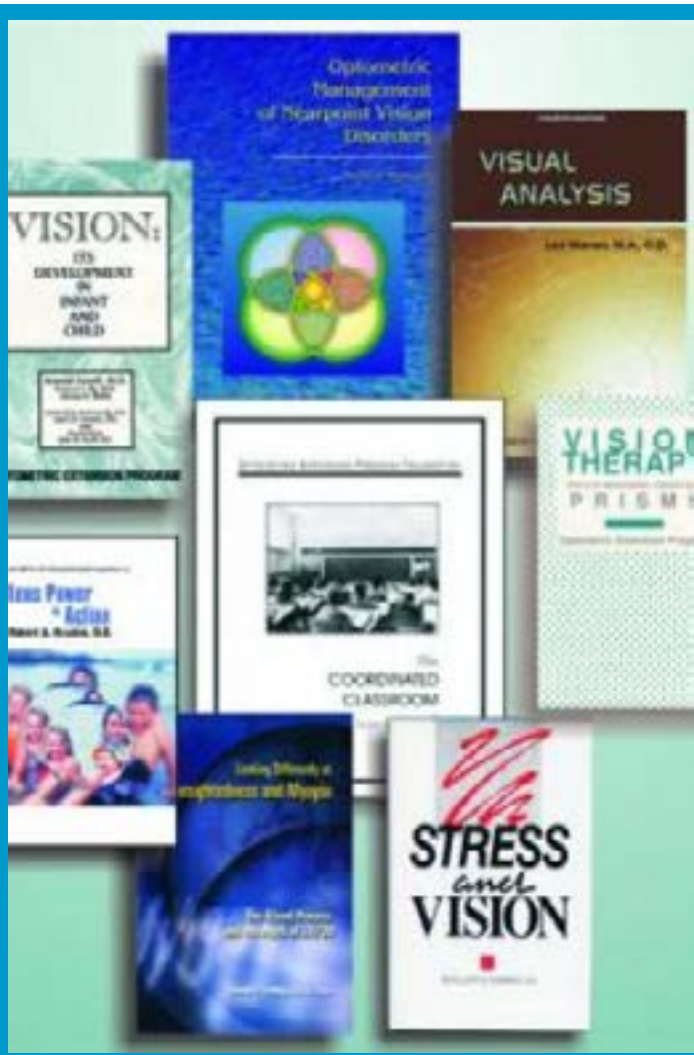

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Report: OEPF Lecture • Myopia management—How to Apply the Current Scientific Evidence to Our Clinical Practice

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The objectives of this presentation are that participants are able to: (1) apply to their clinical practice the current knowledge of myopia etiology, development, and progression; (2) educate families on myopia prevention and control options; and (3) practice evidence-based clinical care when managing myopia, including information on the possible benefits and risks of each treatment, determining the most appropriate length of treatment and understanding how to gauge success.

The first consideration is to define myopia, important for the management of myopia as well as the education of parents and children. Optically, myopia happens when distance images focus in front of the retina, rather than at the retina; we can use ophthalmic lenses to move the images back to the retina. It is important to understand that mismatch is typically due to an increased elongation (axial length) of the posterior segment of the eye.

Parents will likely want to know how frequent the myopia problem is. Currently, about a third of the world's population has myopia, heading for a majority of the population sometime around 2050. What is even more worrisome is that the prevalence of high myopia is also increasing. Prevalence does vary around the world, with the highest rates (80-99% of the "young" population) being found in south and southeast Asia.

When discussing myopia management options with parents, it is necessary to explain why it is important to control myopia. Myopia impairs distance vision when uncorrected (this is well-known), but parents may not know that myopia also impairs vision when corrected due to the stretch in the receptor grid of the retina caused by the excessive lengthening of the myopic eye. Higher amounts of myopia also limit the individual's options for refractive surgery later on. Overall, financial costs related to myopia in the U.S. exceed those of heart failure, lung cancer, or breast cancer. Even more importantly, myopia poses a significant risk for certain vision-threatening conditions such as myopic maculopathy or retinal detachment through retinal thinning. Myopic maculopathy, a relatively new condition, is already the second leading cause of blindness in Beijing, the third in Ireland and Israel, and the fourth in the UK—and these statistics are over 10 years old. Myopia is also associated with increased risk of primary open angle glaucoma and earlier onset of posterior subcapsular cataracts, as well as higher risk for complications after cataract extraction. The risk for these conditions increases with increasing amounts of myopia, but even low to moderate myopias pose higher risks than no myopia.

If we don't do anything to prevent it, a child with myopia will continue to progress until the late teens or early twenties, ending with higher myopia in adulthood if their myopia started earlier on. The good news is that we now have treatments available that can slow down, or even halt in some cases, the progression of myopia, so that individuals end with lower amounts. This is important because slowing myopic progression by just 1 diopter (e.g., ending with -5.00 instead of -4.00) may reduce the chance of myopic maculopathy

by 40%, retinal detachment by 30%, and primary open angle glaucoma by 20%.

Another question from parents that we may be asked is why their child got myopia. The myopia epidemic has shifted the world's viewpoint to acceptance now that the etiology of myopia is primarily environmental. Genetic disposition comes into play but may account for less than 10% of the variability. The environmental view reflects Skeffington's work, as well as early 1970s literature on native populations. Environmental changes associated with increasing myopia involve urbanization and schooling. The effect of schooling can manifest as myopia, and high myopia prevalence is higher in stringent religious schools versus general schools. Also, an increased total number of years of school is associated with a higher prevalence of myopia (and high myopia). Although we are not certain of the exact mechanism of myopia development, we know that the lengthening of the eye during childhood is a visually guided process. The normal process of emmetropization aims to match the length of the eye with the power of its optical components. When the lengthening of the eye continues beyond emmetropia, children develop myopia. Normal visual stimulation is required for the eye to know when to stop growing; for example, children need to be exposed to retinal images that include details (i.e., high spatial frequencies) for the eye to interpret the stop-growth signals correctly, but more specific information on the aspects of the retinal image that are important in normal emmetropization is needed to understand this process. Visual stimulation regulates retinal neurotransmitters and growth factors, which then modulate the scleral matrix to allow or cause axial elongation, but the specific pathway of these signals is also not well understood. To study some of these questions, the New England College of Optometry's Children's Vision Lab is conducting an NIH-sponsored study named PICNIC (Preventing myopia: Investigating Contributing factors to Nearsightedness In Children—neco.edu/PICNIC).

We do not yet have all the answers as to how the visual environment affects emmetropization, but we know that schooling increases the risk of myopia development or progression, and conversely, outdoors time is protective against the development and likely the progression of myopia. Why is outdoors protective? The answer is likely related to light, but is it light intensity or spectral composition? Sunlight intensity is much higher than any indoor lights, but indoor lights are also much more limited in spectrum than natural sunlight. Sunlight may also be important for its effect on the circadian rhythms, associated with eye growth rhythms, and may thereby alter postnatal growth regulation. The effect of vitamin D from sunlight exposure, increased depth of focus from pupil construction, and physical activity are not likely significant in this process. A factor independent of sunlight that may play a role is that the overall dioptric demand of outdoor environments is more distance-focused, so there is less dioptric variation across the visual scenes. Why is schooling and the associated near work a risk for myopia? Accommodative lag was suggested to be larger in myopes than in emmetropes, but the story seems more complicated; perhaps instability of accommodation is more important. The wider range of dioptric blur across the retina when we look up close may hinder the integration of signals across the retina; paracentral blur has been shown to be likely more important than central blur. Schooling, with the increased cognitive effort, also demands high levels of attention that favors central vision, decreasing peripheral and paracentral attention.

The next level of parental concern would be about treatment options. What options do we have for decreasing or preventing myopic progression in my child? Which option is best for my child? For each given treatment, do the potential benefits outweigh the risks? Should my child be treated if they only progress a little, or should they be treated only if progressing rapidly? Judging known risk factors, should my at-risk child be treated even prior to myopia being measurable? How will we determine success, and at what point should we stop the treatment?

First, prevention: a quick look at risk factors shows that parental myopia increases risk for myopia in children, as do decreased time outdoors and increased near work. Ethnicity also plays a role, with Asian children more likely to develop myopia than Caucasians. Refractive status measurements at young ages give us a good idea of where the child will end up; the risk of myopia is higher if at 6 years of age the child's hyperopia is less than +0.75 D. Given a higher risk profile, and understanding that outdoors time is protective against both development and progression of myopia, the first defense is to recommend that every child with or at risk for myopia spend more time outside: two or more hours per day. Near work considerations, such as moving viewing distances farther away and taking frequent breaks (every 20 to 30 minutes), are also helpful.

The recommended treatment should reflect the child's visual makeup, including accommodation and binocularity, as well as the family's availability. Tests include questionnaires about outdoors time and near work, as well as a thorough history of lens wear and family history, careful refractive status determination with retinoscopy and frequent cycloplegia, and measures of pupil diameter, binocular vision, and accommodation tests. Axial length is important, albeit not necessary, to monitor the treatment's effectiveness, and corneal topography is necessary if orthokeratology is chosen. Informed consent is recommended since most of the treatments are not FDA approved specifically for myopia control.

Available treatments are either optical (specially designed glasses or contact lenses) or pharmacological. With any of these, it is important to consider carefully what is the optimal lens correction for the child. We should aim to correct accurately, with minimal to no undercorrection, but also not over-minusing.

Bifocal and progressive glasses have been used for myopia control for decades, but their benefit is rather limited. They are more effective in children with larger lags of accommodation (more than 0.75 D) and esophoria at near. Newer designs of spectacle lenses use variations on peripheral defocus or peripheral light scatter. Preliminary studies with these lenses have shown promising results, although they are not yet available in the U.S. Spectacles may be the simplest and most economic treatment for many families.

Two general types of contact lenses are used for myopia control: orthokeratology and multi-zone soft contact lenses. Orthokeratology has been used for decades to correct myopia temporarily by reshaping the cornea. This treatment has been shown to slow down the progression of myopia, and the excessive elongation of the eye, in most children. The mechanism is not fully understood, but it may involve decreasing peripheral hyperopic defocus, although it also changes the aberrations' profiles and the accommodation and convergence dynamics. It even works in high myopia, when myopia can only be partially corrected. This is the treatment that shows the largest effect in myopia studies, although the studies have limitations: mainly the difficulty of having a placebo control group. If a child is using orthokeratology for myopia control, axial length should be evaluated to determine whether the treatment is being successful. A clinical consideration with orthokeratology includes the understanding that both the child and the family need to be willing and able to deal with contact lenses. The child's motivation is the number one factor for success! Orthokeratology can be an appealing treatment to children because they no longer need to wear glasses. It is also appealing to parents because the child only uses the lenses at night, when at home. Correctly fitting and centering the lenses is important for success. Associated risks include infectious keratitis (similar to other types of contact lenses), endothelial changes, and microvascular complications. Clinical trials are ongoing on combinations of orthokeratology with low-dose atropine.

Multi-zone soft contact lenses, either standard center-distance multifocal soft contact lenses or special designs such as MiSight lenses, also show benefit in slowing the progression of myopia. The presumed mechanism is also that peripheral hyperopic blur may be the driving factor in myopia, and the paracentral add power changes that peripheral defocus to myopic. But more evidence is needed; the full mechanism of myopic progression is probably more complex and includes other higher-order aberrations, binocular vision, and accommodation. Clinical considerations, as with orthokeratology, include that both the child and family need to be ready for wearing and adequately caring for contact lenses. Studies have shown that children have fewer complications than adults when using contact lenses.

A number of pharmacological treatments have been tried to slow down the progression of myopia. Atropine, a non-selective muscarinic antagonist, has shown effective results, although with varied degrees of success among different studies. There is still controversy regarding which dose is optimal and whether we should individualize the dose depending on the age and progression of the child. Higher doses may have greater risk for rebound effects, and lower doses may be more beneficial long-term. Currently, low doses of 0.01%, 0.02%, and 0.05% are typically used. Additionally, it is unclear whether the effect is as positive in controlling the lengthening of the eye, which is the goal of myopia control, as it is in controlling the progression of myopia in diopters. The mechanism for atropine's effect in myopia control does not seem to be paralysis of accommodation. The inner retina has been suggested as the area of action, although this is yet to be determined, and some involvement of the accommodative system is plausible given the differences found between diopters and the axial length effect. Questions remain as to whether atropine use is appropriate for pre-myopes. The clinical considerations include possible short-term side effects of photophobia and near blur, although these are rare, and if they occur typically go away after

two weeks. Drug hypersensitivity or toxicity are not likely. Other pharmacological agents being tested are pirenzepine (M1-selective antagonist), brimonidine (alpha-adrenergic agonist), latanoprost (prostaglandin analog), and 7-methylxanthine (adenosine receptor antagonist), as well as bilberry extract and croetin (carotenoid).

If myopia control is undertaken, it is important to determine whether the treatment is effective. Is the treatment working? If no progression is noted, which is rare, in either diopters or in the length of the eye, then we are sure that the treatment is successful. In most cases, however, we need to compare the progression observed after the initiation of treatment with the progression expected for the individual child, considering age, sex, and race. Typically, myopia progresses at 0.75 D/year or faster between 6 and 9 years of age, but by 10-13 years old, that rate drops to about 0.50 D/year. Axial length typically increases 0.32 mm/year in the 6- to 9-year-old group in myopes and at roughly half that rate between 10 and 13 years of age (about 0.19 mm/year). Progression of axial length is expected even in emmetropes, at rates of approximately 0.15 mm/year in children 6 to 9 years of age and about 0.09 mm/year in children 10 to 13 years of age. Again, these numbers depend on the child race and sex, and more concrete centile tables are currently being constructed. Online calculators are available, but these are of limited use as they assume that the expected progression and treatment effect is constant over time, which is incorrect. Note that the natural progression of myopia indicates that about half of all patients will stop progressing at around age 16 years, but that means that the other half will continue to progress until well into adulthood.

In summary, when it comes to myopia management, we have the obligation to recommend that all children with or at risk of myopia spend more time outdoors, reduce the amount of time spent doing near work, increase the viewing distance when doing these tasks, and have frequent breaks. Attempts to control myopia are necessary as it poses a high risk for vision-threating conditions. Treatments such as low-percentage atropine, orthokeratology, and multi-zone soft contact lenses should be considered. Keep watching for studies in this area as new information is available weekly.

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Report: OEPF Lecture • Myopia Control—Who to Target with Myopia Interventions

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The worldwide prevalence of myopia, by most accounts, is increasing. In some areas of the world, southeast Asia in particular, the percentage of the teen population that is myopic is significant. China's myopia has increased over 60% in the past 15 years to 95.5% of the teenage population. In the U.S., half of the teen population is now nearsighted.

The questions for myopia management are why and when do we need to manage myopic progression? Every diopter of myopia matters, but public awareness lags behind optometric research and concerns, which leads to a discussion of effective methods of myopia control. Control implies two parts: risk of myopia onset and risks for myopia progression. Will myopia happen? If it does start, can we slow it down? When will the progression stop?

Genetics plays a role, but low hyperopia in children is a key predictor for myopic progression. In the CLEERE study, a refraction close to emmetropia in North American children (7–13 years old) also has been shown to be the best single predictor of future myopia.[1] The exact threshold varies with age, from <+0.75 D at age 6, ≤+0.50 D at ages 7 to 8, ≤+0.25 D at ages 9 to 10, and ≤0 D at age 11 years. Recently, the International Myopia Institute has defined the condition of pre-myopia. Pre-myopia is a refractive state of an eye of ≤0.75 D and >0.50 D in children where a combination of baseline refraction, age, and other quantifiable risk factors provide a sufficient likelihood of the future development of myopia to merit preventative interventions. [2]

Heredity makes a difference, as does race/ethnicity. If both parents are myopic, the risk for children is at least three times higher. Asian children have a higher risk of developing myopia and an increased risk for high myopia (≤6.00 diopters) than other races.

Environment also plays a role, which echoes the behavioral optometric philosophy. Environmental risk factors for increasing myopia include reduced outdoor activities, reading distances that are 20 cm and closer, continuous near-work periods greater than 45 minutes at a time, and perhaps cell phone use. Remote learning during the pandemic and related educational activities have been shown to increase the risk of myopia progression.[3,4]

Binocular vision disorders, including accommodation and fusional dysfunction, are associated with myopic progression. Esophoria at near and a high AC/A ratio, as well as reduced accommodative facility and increased lag of accommodation, have been reported in myopic children. In sum, early-age refractive errors, family history of myopia, race/ethnicity, visual environment (especially at near), educational activities, outdoors time, and some aspects of binocular vision apparently have some role in or relationship to increased myopia.

Understanding risk factors allows us to target higher-risk children and offer active management of those patients. Parents' concerns and cultural backgrounds will come into play, but planting the seeds early with good patient (parent) education is key. Asian children progress at a higher rate than non-Asian children. At 9 years of age, Asian children on average progress at -0.82 D/year, while in non-Asians, that rate is -0.55 D/year.[5] Peak ages for progression are

6 to 14 years old, with myopic-trend refractive errors at a younger age being a big sign of myopia. The rates of progression in both axial length and refractive status at 7 years old are almost double the rates at 11 years old. Axial length in emmetropic children increases about 0.1 mm per year from 6 to 14 years old.[6] In Asian myopic children, the increase of axial length at 7 years old can be five times the rate in emmetropic children aged 6 to 14 years old.[7]

Myopia management starts with a comprehensive eye and vision examination, possibly with cycloplegic refraction. Binocular vision tests should always be performed, then collect and evaluate risk factor information: parental myopia, visual environment, and educational activities. If available, axial length measurements should be performed. If orthokeratology is a consideration, topography is needed.

If you are actively managing myopia, what is the stopping point? At what age? Fifty percent of childhood myopic progressions stop by age 15, and 75% stop by age 18. The peak progression years are 7 to 14 years old.[8] Perhaps when myopia progression is lower than 0.25 D/year and in an age zone when we would expect the myopia progression to stop, the conversation should be started with parents and children about when the myopia treatment should be considered to stop.

Online learning became a new normal during the COVID-19 pandemic. Although there is no study done to compare the effect of screen size on myopia progression (such as computer vs. cell phone), one would expect smaller screen size to be associated with closer working distance, which has been confirmed to be one of risk factors for myopia progression. In addition, smaller screens are associated with smaller fonts, which lead to increased accommodative demand. Thus, eye care practitioners may consider recommending that children use digital devices with relatively big screens and asking children to avoid using cell phones for educational activities. Furthermore, eye care practitioners should promote good visual hygiene, including the 20-20-20 rule: every 20 minutes, take a 20 second break, looking 20 feet away.

All of that risk analysis, history, and parental concern comes into play: which active myopia management should be chosen? If a parent is concerned, "wait and see" may not be an appropriate and well-accepted strategy. A clinical case: 9-year-old Sophia was a moderately myopic child (-2.75) at an early age, the Asian daughter of very nearsighted parents, and spent an hour in outdoor activities daily. She was on the swim team and did one hour of homework daily. Orthokeratology might be a good option for Sophia as active myopia management.

Six-year-old Andrew presented a different profile; a different regimen was recommended. Andrew had annual examinations since he was 3 years old. Over the last 3 years, his hyperopia decreased from +1.50 DS, to +1.25, to +0.75, and finally to +0.25 DS. His father, mother, and older sister were all myopic, and his sister had used 0.01% atropine for 3 years. With remote learning, Andrew's mother became very concerned about myopia. The ATOM 3 clinical trial (effect of 0.01% atropine on myopia onset) won't be completed until 2023. With good parent education, Andrew's parents understood that there was no research evidence about the effect of 0.01% on preventing myopia onset. Andrew was started on 0.01% atropine, was counseled on his visual environment (he currently was doing remote learning 8 hours a day, as well as some video gaming), and was encouraged to go outside to play for two hours (total) per day.

In contrast to Andrew, 16-year-old Rachel, a very myopic (-6.00 and -6.25 sph, although her current lenses were -7.25) African American girl, and her father (-3.50 sph) wanted to try atropine. Screen time, again, approached 8 hours per day for remote learning plus homework, and Rachel also had a 3-hour-per-day addiction to TikTok and YouTube. Rachel showed 2pd esophoria at near with the cover test. After adjusting her lens prescription to the current (lower) power, Rachel was scheduled to return in 6 months to evaluate whether her myopia had stopped or was progressing.

New technologies for myopia management include spectacle lenses to defocus the paramacular area (DIMS, Stellest, Diffusion Optics Technology) and IVMED-85 eyedrops that crosslink the sclera and induce a hyperopic shift. A myopia progression and treatment calculator can be found at https://bhvi.org/myopia-calculator-resources/.

Clinical pearls are that in the rapidly developing field of myopia management, treatment plans will be individualized, and parents need information planted early. Parents can be very knowledgeable, so be prepared.

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New OEPF Publication Fresh off the Press

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Irwin Suchoff, OD
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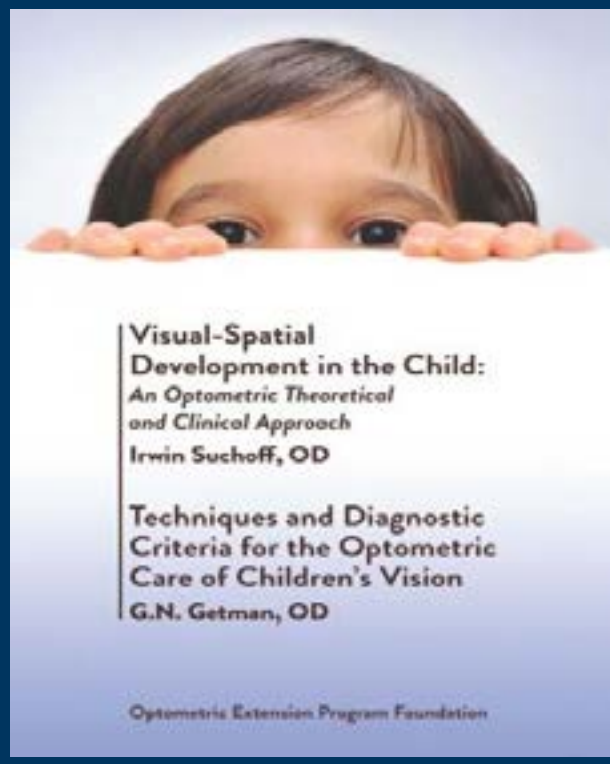

Article • A Review of Patient Care Platforms for Vision Therapy

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ABSTRACT

Currently, there are three platforms that can be used for home therapy logs and patient education: Binovi, NeuroVisual Tracker, and Anteo. Some of these platforms also allow for home testing and computer-aided therapy modules. All three require doctor-prescribed therapy. These apps can be used to aid in patient weekly visits, and some doctors/therapists choose to use them for remote/distance therapy.

Keywords: Anteo, Binovi, NeuroVisual Tracker, remote vision therapy, vision therapy

Binovi

The Binovi platform was designed to help vision therapy (VT) teams move toward a paperless process for the delivery of home therapy activities, therapist training, education, and the planning of weekly in-office vision therapy. Binovi requires the use of two applications: Binovi Pro for the doctors and therapists and Binovi Coach for the patient. Those practitioners offering VT know that compliance can be difficult with home treatment options. It can be difficult to obtain optimal compliance, and oftentimes, simple barriers can deter a family from following a plan. Binovi's applications are intended to reduce some of the barriers. The platform makes use of engaging videos, instructions, and log sheets to help facilitate home therapy.

In order for an office to use the Binovi Pro application, the office must use an iPad. Binovi Pro allows for the therapist or treating doctor to manage home therapy. The office dashboard is displayed in Figure 1. Each patient has a unique plan. The home screen lists all of the patients within the given practice. Adding a patient is simple, and after the form is complete, the patient is active (Figure 2). Each name has a black circle with the patient's first initial. The circle provides a quick view of patient compliance and duration. The outer blue ring represents how far along a patient is in the program. For example, a patient 20 weeks into a 40-week program of care would have half of the outermost ring around the circle. The inner red ring indicates whether the patient has logged in or not (Figure 3).

A patient can be selected from the list. Once selected, a patient-specific profile page appears (Figure 4). The profile page gives an overview of sessions and total time. The therapist/doctor can then select one of the circles that represents a week and see what was assigned in that specific week. The profile page also lists the average time for sessions and the duration of the last session. On the left column, there is a menu. The patient's home therapy plan can be edited. Once in edit mode, a list of available activities appears. Binovi has a large library of premade activities. Each procedure that has been provided has an overall detail tab. The therapy activity is given a category or categories. A purpose for each particular activity is provided. The materials needed are listed on this page, as well as a description. The premade activities also come with photos and a professional video demonstration. If an activity is unavailable, the doctor or therapist can upload their own and type in procedure criteria, such as purpose, instructions,

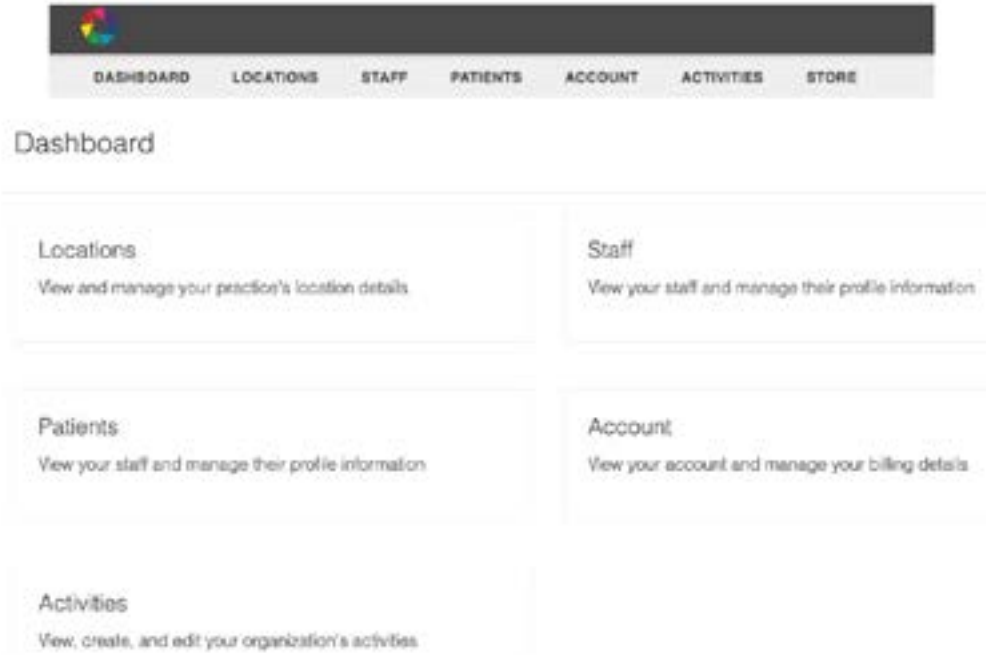

Figure 1. *The Binovi app dashboard (doctor/therapist view)*

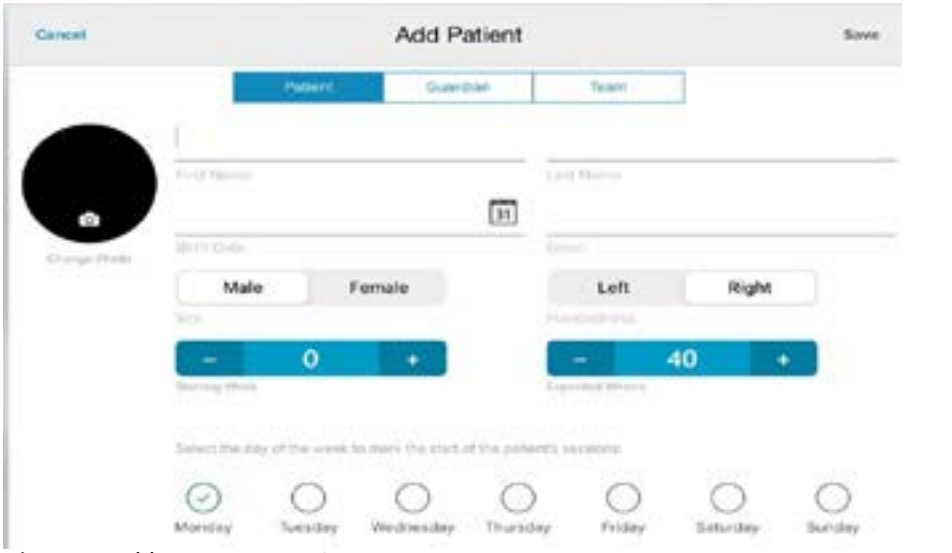

Figure 2. *Adding a patient in Binovi*

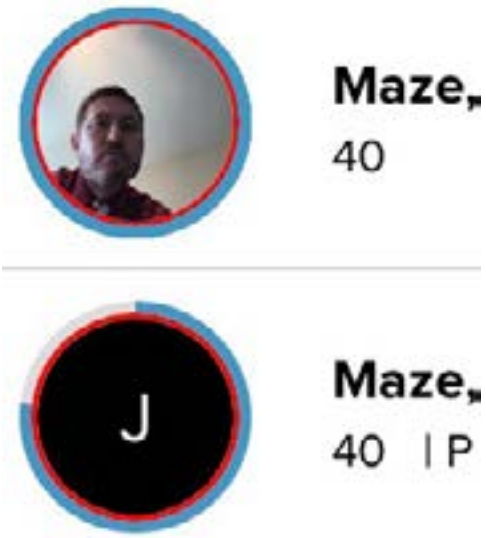

Figure 3. *Ring representation of progress in the Binovi therapy program*

Figure 4. *Patient profile*

and materials needed. The therapist can select any activities from a pre-populated list or add custom or office-specific activities. Variables can be changed, such as the length of the therapy procedure and the number of repetitions. Notes can also be made by the therapist to the patient. The left column has a menu option for internal notes and messages. The patient can send messages in a HIPAA-compliant manner to the therapist or doctor.

Binovi Pro plots compliance in a chart form. The practitioner is able to see how often the patient is doing the home therapy. The patient can select from a spectrum of emojis to represent how they felt during specific activities.

Binovi Coach is the patient platform. A user has to be invited by a treating therapist or doctor. Registration is simple, and an email invitation directly sends the patient to the app store to download the application. Once in the database, the patient selects the home therapy assigned to them. An example of the patient home screen on the app can be seen in Figure 5. Directions for each activity are provided, as well as demonstration videos. A timer and metronome are provided within the app for activities in which the

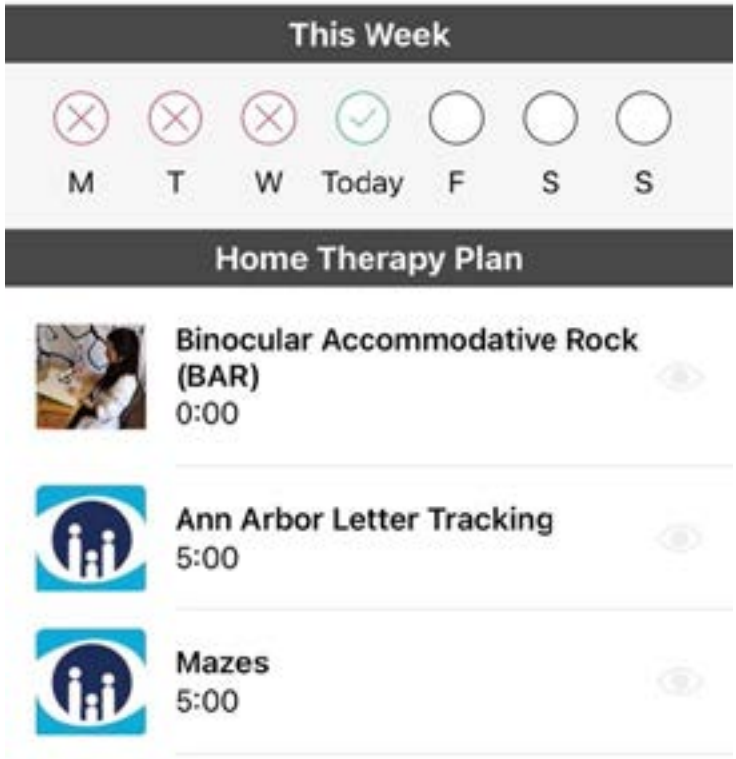

Figure 5. *Patient home screen (Binovi Coach)*

doctor or therapist chooses to assign one. The timer is particularly useful for patients and parents, as it allows them to keep track of how long each activity lasts.

The Binovi platform can be a great tool for remote therapy planning, as well as a tool to increase compliance by limiting barriers. Since the therapy sessions at home are automatically recorded, once the patient has started them, there is less risk of a patient reporting that they had high compliance but forgot to write it down. The application also eliminates the need for lengthy handouts, which are environmentally unfriendly, that can be left lying around or in a binder in a disorganized manner.

Activities assigned to the patient for a particular week are easy to access. However, although written instructions are available to the patient, it can be difficult for patients to find them within the program. Patients can view photos and videos of activities, if they exist. Patients can log activities at home in two ways. They can open the application and begin therapy, and Binovi will track the time worked on each activity. Binovi offers another option by which patients can log the therapy after the fact. A patient does not need the application open during the home therapy session to do this. They can simply indicate how much time was devoted to each activity and how each activity felt.

Binovi also has a doctor-education component. Modules include Sanet Seminars and Primitive Reflex Training with Patty Andrich. For an extra fee, these modules are available to clinics.

Anteo

Anteo is a web-based platform that was designed to expand your practice in-office and remotely. Anteo can be used by patients through the company's app or web-based program. Currently, doctors only have access to the web-based program. The patient app is available in both the Apple and Google stores. Anteo's platform is intended to streamline home VT and make remote VT more accessible. Patients can conveniently follow their treatment plan with homework, reminders, education, and tracking between office visits. Anteo also provides tools to create your own customizable symptom questionnaire to measure patient progress.

Doctors currently must use a web-based browser to add or modify a patient's account. The dashboard can be seen in Figure 6. The main menu allows an office to choose patients and programs and to view the library of activities. In the patient module, patients are categorized as active, invited, or inactive. The inactive patients are those designated as such by the practice or those who were invited but who did not complete the registration process within a reasonable time.

Within the patient module, the doctor can see a patient's progress in a weekly calendar (Figure 7), edit the care plan, view any care notes, and view any responses to symptom and quality-of-life questionnaires. Activities can be added weekly, or a program of care can be designed in advance and patients added to one of the programs. Modifications can be made weekly. A sample patient profile page can be seen in Figure 8. The activities assigned in previous weeks are collapsed, and a toggle button allows the doctor or therapist to see the specific activities assigned that week. As opposed to Binovi, the entire Anteo library also appears on this page on the right-hand side (Figure 9). When adding activities, a pop-up window appears with specifics such as repetitions, duration, equipment, etc. (Figure 10).

An email invitation is sent to the patient. Registration is easy for both patient and doctor and can be completed online or in the app. Once the patient is enrolled, an email notification is sent to

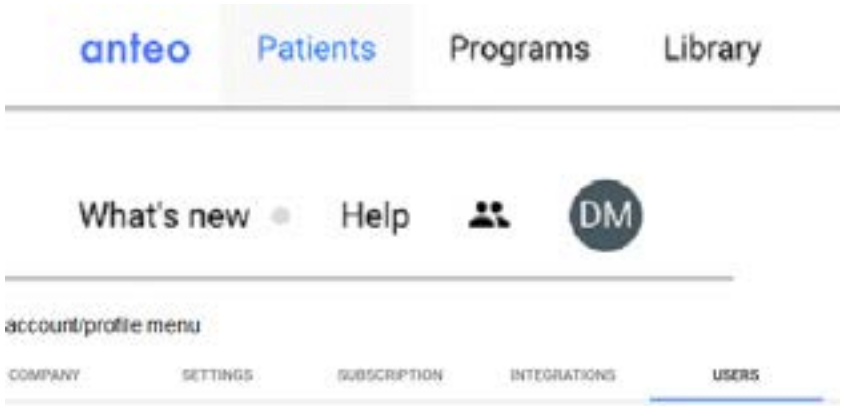

Figure 6. *Anteo dashboard (doctor's view)*

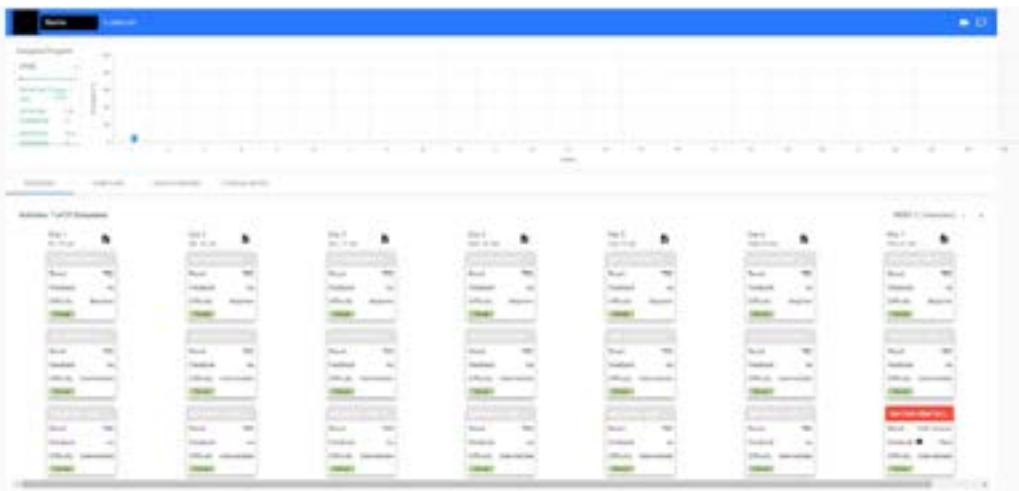

Figure 7. *Anteo calendar view of activities*

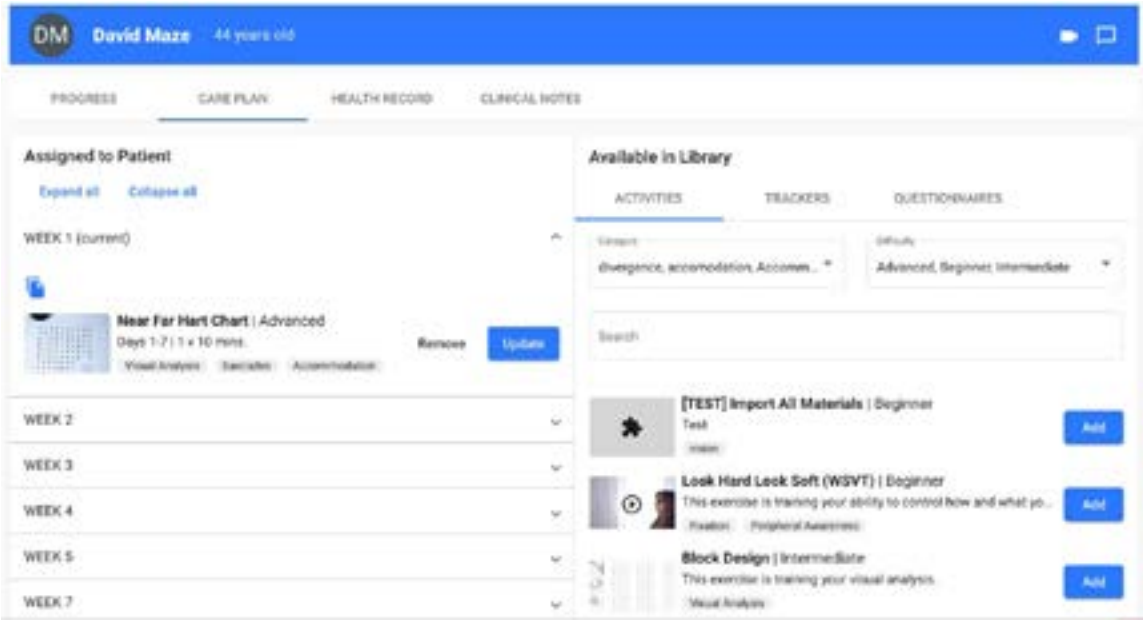

Figure 8. *Patient profile page in Anteo*

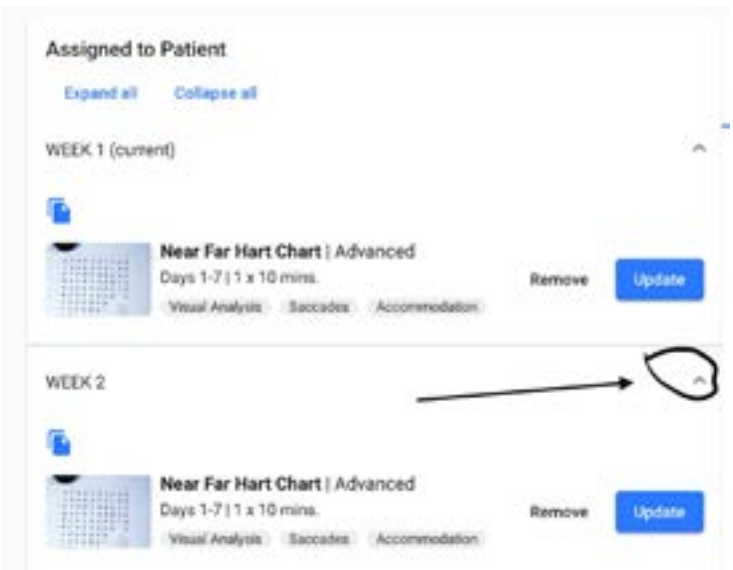

Figure 9. *Expansion of weeks to view activities assigned. Also note library available on patient profile page to add to patient's program.*

Figure 10. *Adding an activity in Anteo*

the doctor's office. Anteo comes with a vast library of activities and videos. Each practice can create a customized activity and easily upload a video and photos.

Parents and patients can view the activities assigned to them for that particular week, as well as view overall progress and compliance. Each activity has the written instructions and any accompanying videos. Patients can log therapy in a web browser or by using the app. However, in order for a session to count, the phone must not be "asleep," and the application must be open with the timer running. This can be problematic if a parent or patient is engaged in therapy but wants to log the home progress with the app. After each activity, patients can rate an activity as easy, moderate, or hard and leave notes for the therapist or doctor.

Anteo also has a large library of references related to efficacy of therapy, treatment options, and other vision therapy articles. Anteo is unique in that it offers pre-programmed grids that you can create for your clinic in addition to manually programming home activities. Program content will be automatically made available to patients based on the schedule that you define. However, deviating from the pre-programmed grids can be problematic, as changing one week affects programming for future weeks.

NeuroVisual Tracker (NVT)

NVT is a web-based platform. Doctors and patients log in with a web browser that is also compatible with a tablet browser (e.g., Safari). The interface is easy to interact with, and contrast is customizable depending on your patient's visual sensitivities. A top menu allows the user to edit information, customize exercises, print sheets, and read texts, and it provides access to archived users.

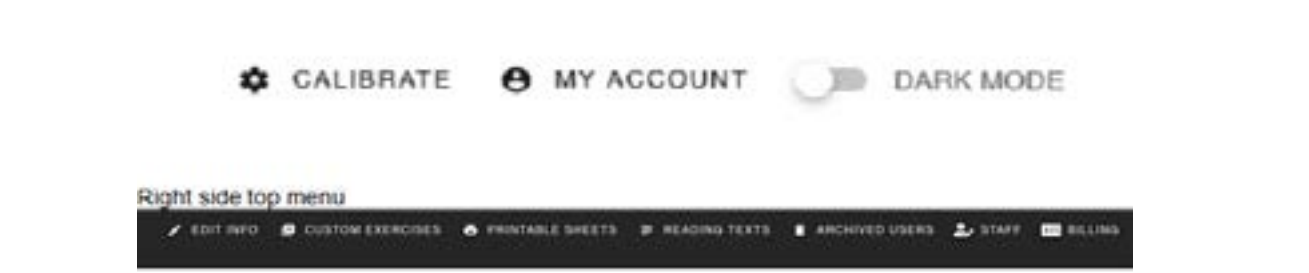

Figure 11. *Home page or dashboard of NVT*

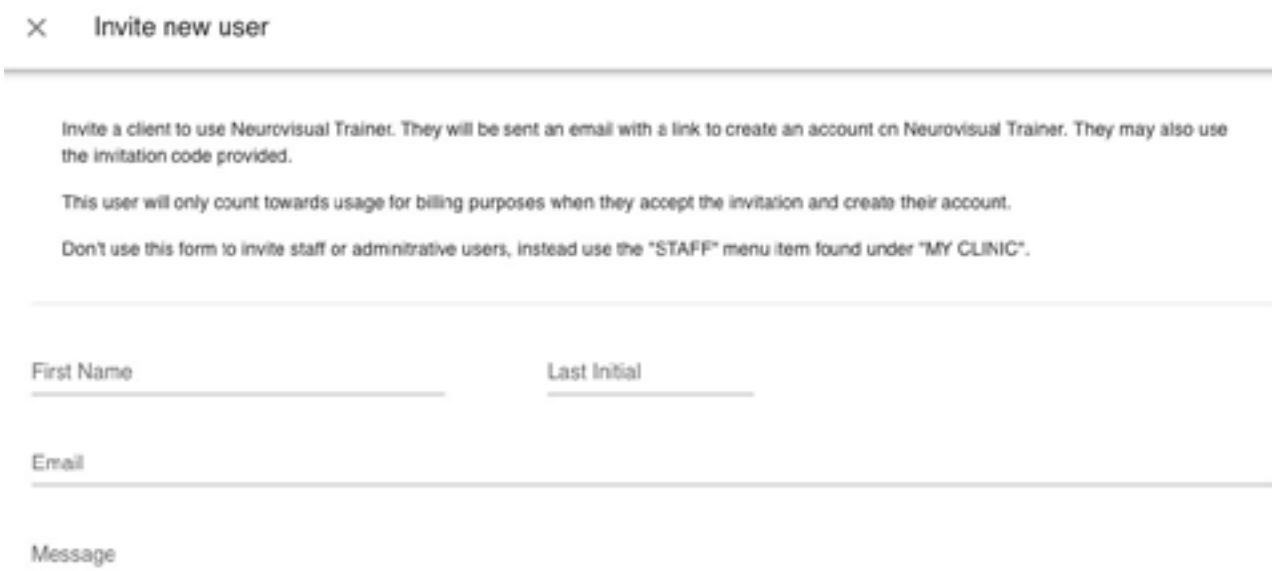

Figure 12. *Invitation to new users (doctor's view)*

An office can upload and manage custom exercises with videos, images, and text. These exercises will be available to all office users and can be assigned just like interactive exercises. NVT allows clinics to use remote therapy services by assigning home therapy activities, as well as diagnostic tools and computerized therapy. Diagnostic tools are located under the "exercises" tab. This can be seen on the homepage/dashboard of NVT in Figure 11.

Similar to Anteo and Binovi, a user has to be invited by a treating therapist or doctor (Figure 12). Registration is simple with an email invitation to set up an account. Once in the database, the patient will see the home therapy activities assigned to them. Directions for each activity are provided, as well as demonstration videos. A timer and metronome are provided for activities when the doctor or therapist chooses to assign one. After the patient completes the activity, a window pops up for patients to give feedback and comments. As patients practice their home activities, it is common for patients to memorize the Hart chart or other letter charts. Consequently, NVT has created customizable charts to prevent memorization.

Of the three reviewed, NVT seems to be the only one to offer computerized therapy within the software. All interactive therapy is customizable, with the ability to track progress over time. The online activities and tests are divided into six categories: anti-suppression, gross & fine motor, oculomotor, diagnostic testing, vergence activities (base-in and base-out), and visual perceptual testing, which also includes central/peripheral activities. NVT even has "moving window" and reading-related activities similar to VisionBuilder. Currently, the only computerized diagnostic testing is for stereoacuity. A great tool that seems to stand alone in NVT is the vergence activities. Red/green glasses or red/blue glasses are required. The program can be customized to allow for a red lens on either eye. Calibration simply uses the size of a standard credit card to determine screen width. NVT will be expanding their computerized therapy library to include free fusion.

Another feature unique to NVT is the ability to view the application as the patient sees it. Individual patients' home screens can be viewed by going to the doctor homepage, going to the desired patient you would like to view, and clicking the orange icon on the right. This feature can make guiding parents through the application easier.

NVT also has a videos section, which includes a wide range of explanations, from binocular accommodative rock to motor equivalents, syntonics, and primitive reflexes.

Overall Comparison

The use of technology in vision therapy is essential for many practitioners. Tools to eliminate paper and to create a central hub for documentation, assignments, and patient care can help offices become more efficient and effective with treatment. All three of these platforms use different techniques to provide step-by-step instructions for home activities, to encourage patient compliance at home, and to encourage communication between patients and their therapist or doctor. Table 1 shows a side-by-side comparison of each of these applications. Each has its own advantages and disadvantages. Binovi used professional actors on a set with professional lighting to create their videos. Anteo seems to have the largest library of activities and allows the office to create programs of care, minimizing the day-to-day assignment management. NVT uses vergence training and phoria measurement, eliminating the need for other software such as HTS or VisionBuilder. The free trials are a great way of seeing which software works best with your therapy setup. Anteo, Binovi, and NVT were helpful and responsive with questions and open to suggestions for improvement. Most are understanding if a trial period is not long enough and will be flexible to help you make your final decision as to what platform works best for you and your patients.

Table 1. Comparison of the Therapy Software

	Anteo	Binovi	NeuroVisual Tracker
Patient App	X	X	
Doctor App		X	
Videos for VT Activities	X	X	X
Progress Tracker	X	X	X
Computer Vergence Training			X
Pre-programmed Grids	X		
Chat/Video Feature	X	X	
Patient Feedback on Activities	X	X	X

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Article • Neuro-Optometric Rehabilitation for Post COVID-19 Syndrome

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ABSTRACT

Background: COVID-19 is a respiratory disease that causes systemic thrombosis and inflammation, which can result in both neurologic and ophthalmological sequelae. There are reports of both physical and functional manifestations of COVID-19 in the eye and the visual system. This case discusses neuro-optometric rehabilitation efforts for a patient who suffered functional visual problems as a result of acquired brain injury following a severe COVID-19 infection.

Case Summary: A 54-year-old Caucasian male presented to clinic with complaints of visual blur and monocular diplopia following his intubation and ventilation via extracorporeal membrane oxygenation intervention after contracting COVID. Neuro-optometric rehabilitation intervention included office-based therapy, home activities, syntonics, nutrition supplementation, and referrals to other rehabilitation team members. The patient continues to have residual functional visual deficits following his recovery from COVID-19, but he was able to return to driving and working within a few months of rehabilitation.

Conclusion: Following COVID-19 infections, patients may experience subtle neurological and functional visual deficits despite a normal ocular health assessment. It is critical to have these deficits properly evaluated in a timely manner and treated, when appropriate, to support a return to acceptable quality of life. This case demonstrates how neuro-rehabilitation optometrists can optimize patient outcomes despite residual functional visual deficits following a severe acquired brain injury from COVID-19.

Keywords: acquired brain injury, neuro-optometric rehabilitation, optometric vision therapy, post COVID-19 neurologic syndrome, syntonics

Introduction

December 2019 marked the emergence of a highly pathogenic coronavirus (COVID-19) that quickly progressed into a pandemic. COVID-19 is a respiratory disease that targets angiotensin-converting enzyme 2 (ACE-2) receptors that are located throughout the body, including neural tissues. Viral downregulation of ACE-2 receptors leads to endothelial dysfunction and prolonged hyperinflammation. These conditions can result in damage to the blood-brain barrier. As a result, innate immune cells are able to enter into the brain, furthering pro-inflammatory cytokine cascade activation that also promotes coagulable states. COVID-19 appears to be able to facilitate hypercoagulable states through mediating pathways of both thrombosis and inflammation.[1]

Those with low-grade chronic inflammatory disease, such as hypertension, previous stroke, metabolic syndromes, diabetes, and obesity, have a higher probability of greater blood-brain disruption and hyperinflammation. Longer-term neurological manifestations are expected in these individuals.[2]

Persistent post-COVID syndrome, or long COVID, is increasingly recognized as a distinct entity now dubbed as post COVID-19 neurological syndrome. Symptoms from hospitalized patients with severe disease are listed in Table 1, including neurologic sequelae of neuropsychiatric disorders (e.g., delirium), ischemic stroke, and encephalitis.[3] Another study by Northwestern examined the most

Table 1. Post-COVID-19 Neurological Syndrome (PCNS)

Conditions associated with PCNS
• Dizziness • Headache • Fatigue • Loss of taste and smell • Neuropsychiatric disorders • Ischemic stroke • Encephalitis

frequent neurological symptoms in non-hospitalized long haulers, including brain fog (81%), headache (68%), dizziness (47%), and blurry vision (30%).[4] Ophthalmologic findings in severe COVID-19 cases include retinopathy (hemorrhages, cotton wool spots, dilated veins, or tortuous vessels), optic neuritis, and extramacular nodules despite otherwise unremarkable retinal findings.[5]

Visual symptoms commonly reported after acquired brain injury include pursuit and saccadic dysfunction, vergence dysfunction, accommodative dysfunction, reduced stereopsis, deficits in visual information processing, and visual field deficits.[6] Optometric vision rehabilitation therapy has been shown to improve both visual symptoms and deficits resulting from traumatic brain injury.[7,8] Such rehabilitation techniques can be used to manage and treat functional visual deficits resulting from acquired brain injury secondary to neurologic sequelae of COVID-19.

Syntonics, or the use of selective wavelengths of color, has been used to reduce visual symptoms in patients with brain injuries.[9] A small subset of photoreceptors discovered in the early 2000s is responsible for projecting information via the non-image-forming pathway. This pathway influences circadian rhythms, melatonin suppression, sleep-wake cycle regulation, cognition, emotional regulation, intracranial nociception, and pupillary constriction. Intracranial nociceptors, or pain sensory neurons, innervate intracranial blood vessels and the trigeminal ophthalmic (V1) pathway to the trigeminal ganglion. Research has demonstrated therapeutic applications of blue, red, and green light for improving cognitive performance, altering circadian rhythm, and improving migraine symptoms, respectively.[10,11]

Rehabilitation optometrists are equipped with the tools and knowledge to assess, manage, and treat both the physical and functional deficits resulting from post-neurologic effects following COVID-19 infection.

Case Report

A 54-year-old Caucasian male presented in-office the month after his hospital discharge following COVID-19 infection. Symptoms leading to his hospitalization included severe headache localized to the left side of his head, high fever, gastric upset, oxygen saturation reduced to 54%, and failure of antibiotics and steroids to provide relief for a suspected sinus infection. The patient spent 22 days in the ICU, where he was intubated and ventilated via extracorporeal membrane oxygenation. He remained partially sedated throughout his hospital stay despite intervention and oversaw his own medical care using a whiteboard to communicate.

The patient's most recent MRI prior to hospital discharge showed moderate interstitial edema with persistent subtle petechial hemorrhages within both parietal and occipital lobes, worse on the left side. The pituitary gland, sinuses, corpus collosum, hippocampal gyri, and temporal lobes were unremarkable. No additional white-matter lesions were identified, and no cortical signal abnormalities were noted. His referring discharge neurologist diagnosed him with posterior reversible encephalopathy syndrome. No other rehabilitation referrals were given.

Prior health history before COVID-19 infection was remarkable for hypercholesterolemia and hereditary bilateral hearing loss. Other history included possible head bumps sustained from playing football in high school and while repairing his car. His only medication was simvastatin.

Presenting chief complaints included occasional tripling of words, dry eye, light sensitivity to indoor light, and difficulty tracking moving targets. He was unable to track or catch a ball. The patient reported monocular diplopia that had been present following his intubation, but this symptom was slowly improving. He reported difficulty reading computer text and phone messages since images would appear momentarily clear, then blur or change position. He veered left while walking when tired. Non-visual symptoms included numbness from hips to knees on both sides, mild memory deficits, and occasional speech drop in the middle of a conversation. His functional goals were to return to driving and to his work as a flooring manager.

Assessment Findings

Examination findings are summarized in Table 2. Refractive error was minimal, but visual acuity was unstable. The patient found it impossible to read the near acuity chart when the chart was moving. Reading efficiency also decreased when peripheral movement was introduced using a swinging ball in the background of a printed chart. Ocular health was age-expected except for mild dry eye syndrome and trace age-related cataracts in both eyes. Visual-skills testing showed unstable visual posture, vergence and accommodative infacility, reduced stereopsis, and convergence insufficiency.

Table 2. Baseline Examination Findings

Test	Result
Visual acuity	OD: 20/40 OS: 20/60
Retinoscopy	Plano OD, OS
Subjective refraction	Plano OD, OS ADD +1.50
Best-corrected distance visual acuity	Fluctuates; 20/40 to 20/60 OD, OS
Best-corrected near visual acuity	Fluctuates; 20/40 OD, OS
Cover test (uncorrected)	Distance: 2 exophoria Near: 4 exophoria
Near point of convergence	24/30" (red lens, discomfort)
Worth 4-dot	4 dots in all fields of gaze
Vergence (prism bar)	Distance: BI x/10/1 BO x/4/-1 Near: BI x/4/-2 BO x/4/2 (patient constantly reported targets were blurry throughout vergence testing despite fusion)
Vergence facility	Unable to complete due to visual fluctuations
Ishihara testing	Normal in both eyes
Stereo dino test	150' seconds of dino, 0' Randot forms or Randot circles
Lighthouse contrast sensitivity testing	1.4 OD, OS.
Maddox rod	Patient was not able to stabilize stimulus with rod over either eye. He noted both intorsion and extorsion.
Maples oculomotor test (pursuits and saccades)	5,4,5,5 OD, OS (ability, accuracy, head movement, body movement)
MEM	+1.00 OD, OS (fluctuating reflex was noted) over +1.50 readers
Ocular health	Unremarkable except for mild nuclear sclerosis and vitreous floaters in both eyes

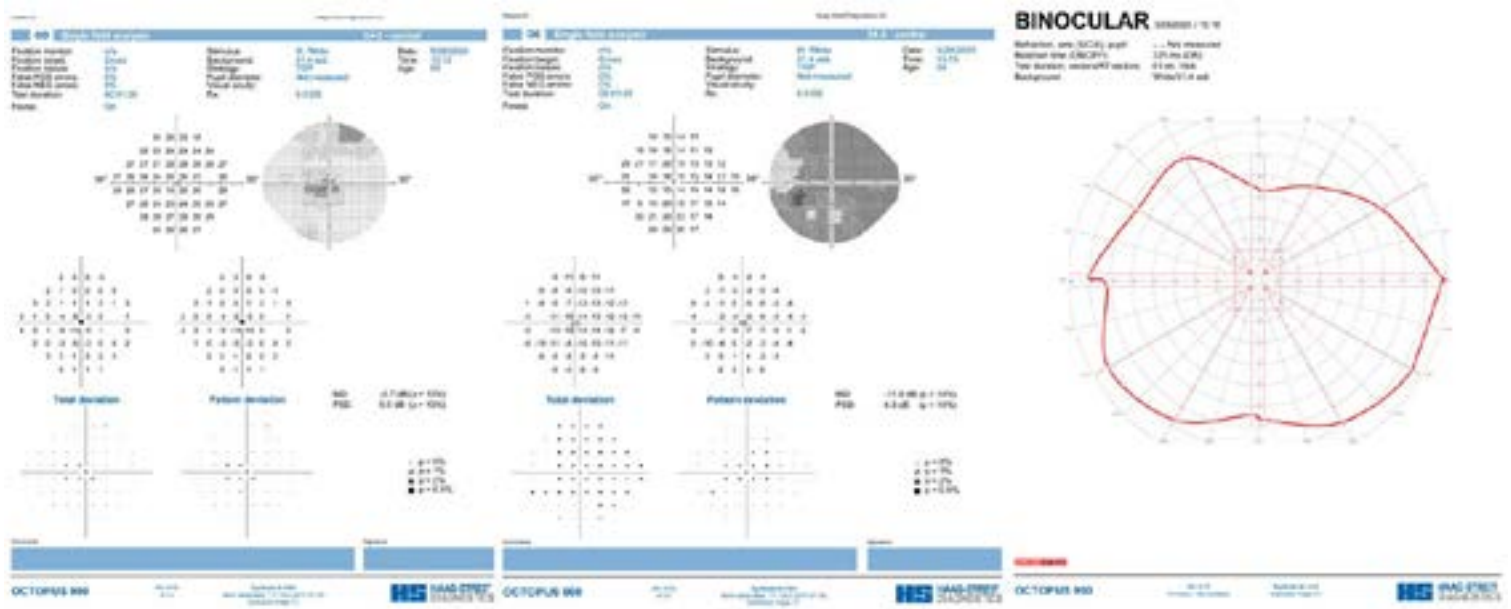


Figure 1. *Baseline threshold and kinetic visual fields; visual stamina was contributory to decreased performance of the left eye.*

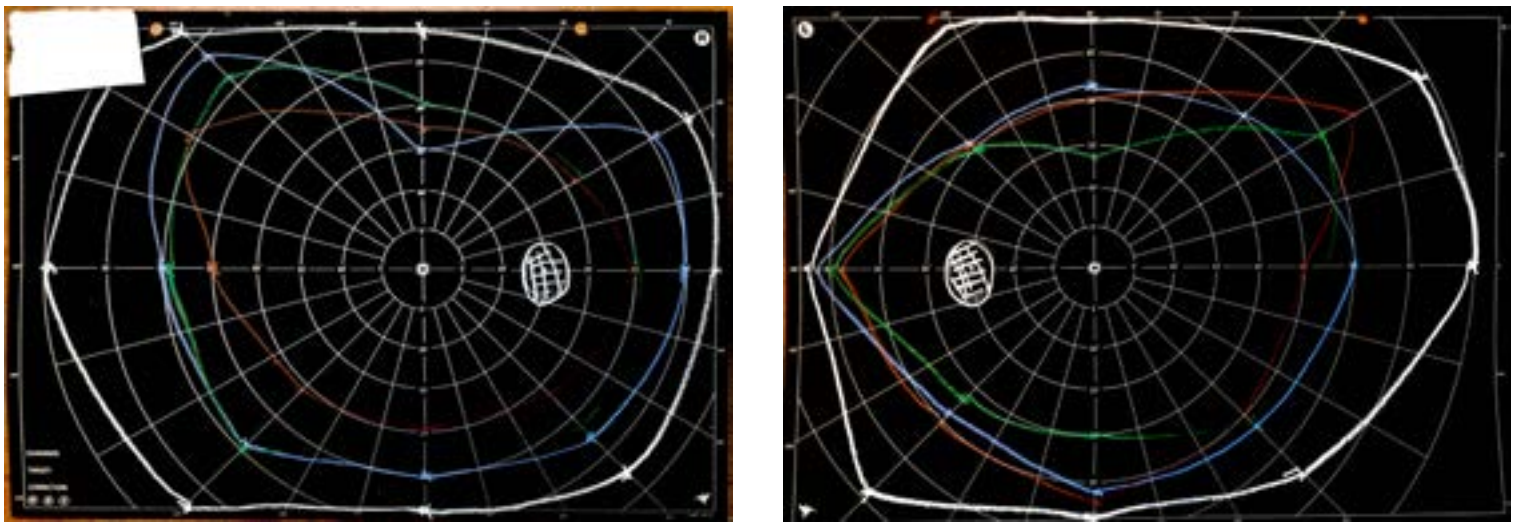


Figure 2. *Baseline color kinetic visual field; contraction and interweaving of the color kinetic fields were present.*

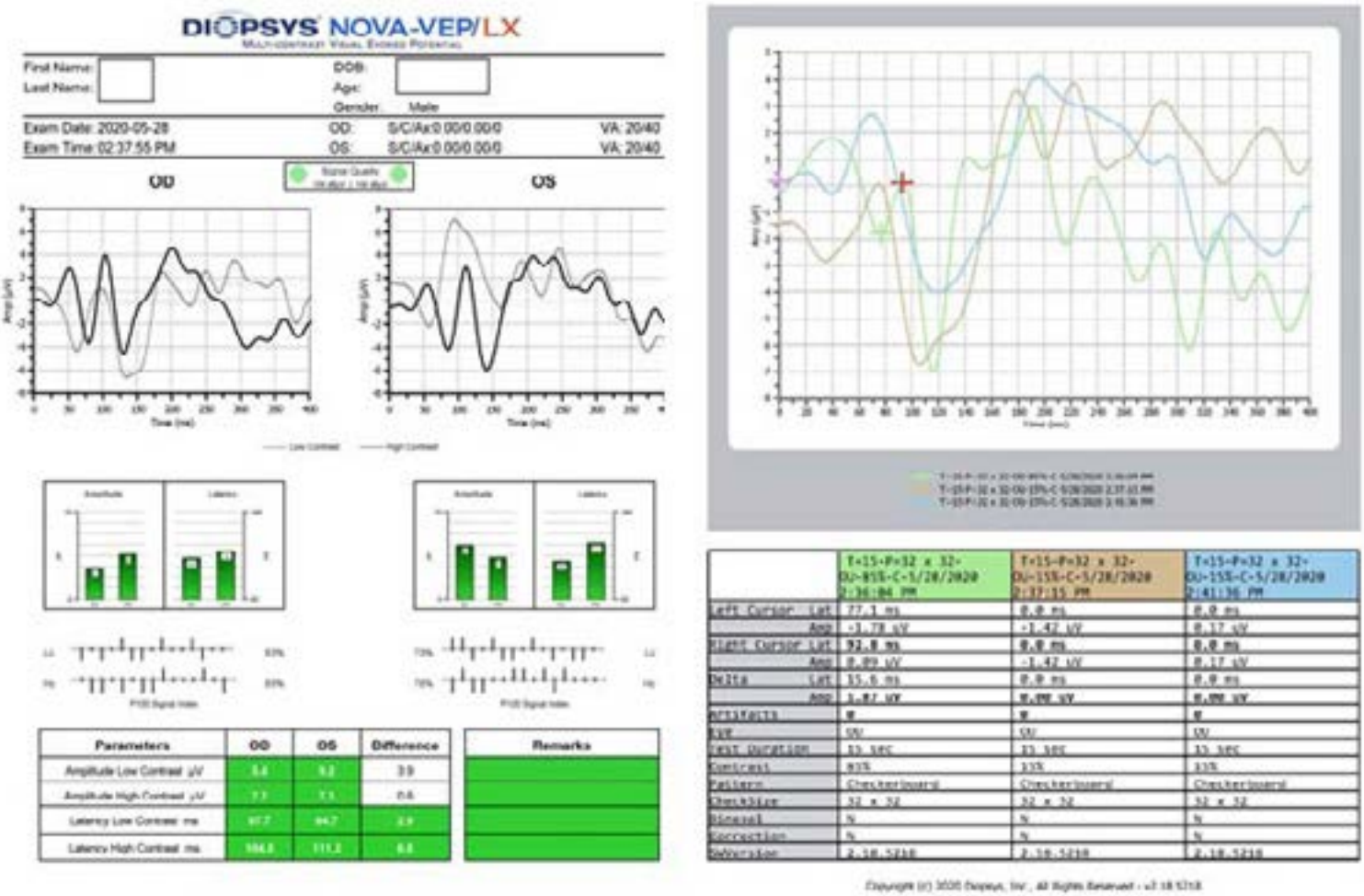


Figure 3. *Baseline visual evoked potential testing using Diopsys NOVA-VEP LX and TR program showing repeatable abnormal waveform for binocular magnocellular processing*

Threshold visual fields (24-2) showed mild depression in the left eye compared to the right (Figure 1). This asymmetry was performance-related due to decreasing stamina, although minimal fixation errors were noted. Kinetic visual fields were normal and full. Baseline color kinetic visual fields, shown in Figure 2, indicated mild contraction and interweaving of the color fields, although physiologic blind-spot mapping was normal in both eyes.

Visual evoked potential (VEP) testing was completed using the Diopsys NOVA-TR and LX system. A checkerboard pattern presented for 20 seconds and viewed binocularly at 2Hz temporal frequency with a central fixation target under 85% and 15% contrast was presented. The VEP showed normal monocular amplitudes and latencies for all contrast levels, but an abnormal waveform persisted with binocular low-contrast testing, as shown in Figure 3. There were brief moments of normal waveform observed during this test condition, but the patient noted discomfort with viewing this stimulus.

Diagnosis

This patient was suffering from visual dysfunctions from acquired brain injury secondary to posterior reversible encephalopathy syndrome following a severe COVID-19 infection. Visual deficits included convergence insufficiency, poor and limited vergence ranges, impaired motion processing, and visual-information processing difficulties. Ocular health was age-expected in both eyes, with the exception of mild dry eye syndrome.

Treatment Plan

Prescription blue-light-filter readers were dispensed. Prior to the infection, the patient was not using any reading eyewear. His fluctuating vision was not improved by prism, binasals, or tint in-office. Visual stamina was poor, with frequent fluctuations noted in accommodation, vergence, and visual acuity. Much of the patient's job involved digital screen time, either on the computer or cell phone, so it was important to improve visual comfort.

Omega supplement (Nordic Naturals) ProOmega 2000, approximately 3225 mg total omega (1687 EPA,

1312 DHA) daily, was supplied. Omega-3 fatty acids such as docosahexaenoic acid (DHA) have important structural and functional roles in the brain, with established clinical benefits for supporting brain development and cognitive function throughout life, in addition to improving dry eye symptoms. DHA is also used to support brain health during neurologic recovery.

Macuhealth was added three months after the initial consult. Carotenoid macular pigment supplementation, collectively lutein, zeaxanthin, and meso-zeazanthin, was used to optimize antioxidants in the retina and to enhance cognitive effects. This formulation, in a single capsule, consists of lutein (10 mg), meso-zeaxanthin (10 mg), and zeaxanthin (2 mg). The patient took one capsule orally per day.

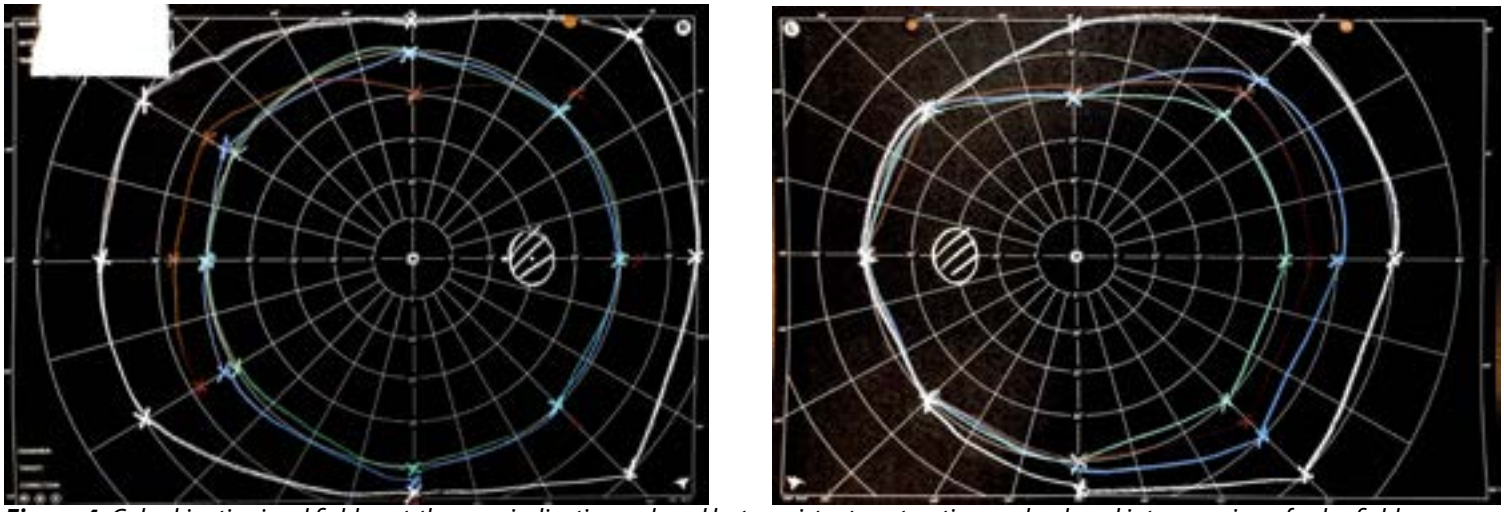
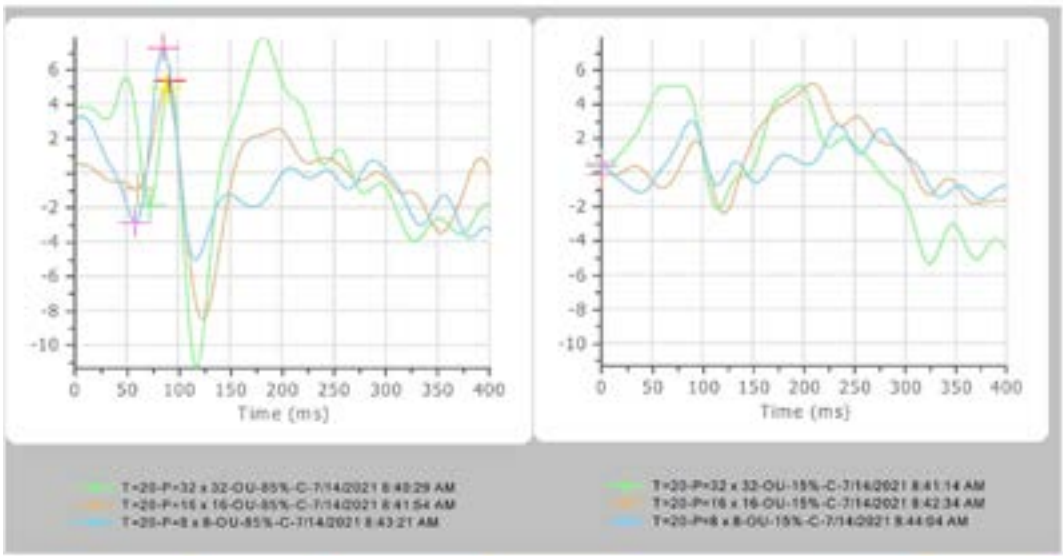


Figure 4. *Color kinetic visual field post-therapy, indicating reduced but persistent contraction and reduced interweaving of color fields.*



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Left Cursor Lat	72.3 ms	60.5 ms	58.6 ms	0.0 ms	0.0 ms	0.0 ms
Amp	-1.87 uV	-0.94 uV	-2.87 uV	0.55 uV	-0.16 uV	0.40 uV
Right Cursor Lat	**91.8 ms**	**87.9 ms**	**85.9 ms**	**0.0 ms**	**0.0 ms**	**0.0 ms**
Amp	5.37 uV	4.89 uV	7.27 uV	0.55 uV	-0.16 uV	0.40 uV
Delta Lat	19.5 ms	27.3 ms	27.3 ms	0.0 ms	0.0 ms	0.0 ms
Amp	**7.24 uV**	**5.83 uV**	**10.14 uV**	**0.00 uV**	**0.00 uV**	**0.00 uV**
Artifacts	1	2	2	2	2	2
Eye	OU	OU	OU	OU	OU	OU
Test Duration	20 sec	20 sec	20 sec	20 sec	20 sec	20 sec
Contrast	85%	85%	85%	15%	15%	15%
Pattern	Checkerboard	Checkerboard	Checkerboard	Checkerboard	Checkerboard	Checkerboard
Check Size	32 x 32	16 x 16	8 x 8	32 x 32	16 x 16	8 x 8

Figure 5. *Visual evoked potential testing post-therapy, with persistent magnocellular deficit in all checkboard sizes with low contrast.*

Table 3. Home and Office-Based Therapy Activities

- Hart chart saccades with addition to vestibular-ocular head movements then moving charts
- In-office projected quoits and non-projected vectogram
- Slotnick swirl with vestibular-ocular movement and/or bilateral gross motor activation (e.g. hand tapping) to reduce initial diplopia with initial presentation on a screen at near then progressing gradually to large distance projection
- Slap tap level A-D with metronome added gradually
- Marsden ball
- Brock string
- Infinity walking to metronome and while reading Hart chart

Table 4. Improvements in Visual Skills from Baseline Findings to Progress Evaluation following Completion of Optometric Vision Rehabilitation

Test	Baseline Evaluation Findings	Progress Evaluation Findings
Best-corrected distance visual acuity	20/40 to 20/60 OD, OS (fluctuates)	20/30 OD, OS (flicker fluctuation still noted)
Best-corrected near visual acuity	20/40 OD, OS (fluctuates)	20/20 OD, OS
Maples oculomotor test (ability, accuracy, head mvmt, body mvmt)	Pursuits: 5,4,5,5 OD, OS Saccades: 5,4,5,5 OD, OS	Pursuits: 5,5,5,5 OD, OS Saccades: 5,5,5,5 OD, OS
NPC (red lens)	24/30" (discomfort)	TTN (no discomfort)
Vergence prism bar (free space)	DBI: x/10/1 DBO: x/4/-1 NBI: x/4/-2 NBO: x/4/2	DBI: x/4/1 DBO: x/10/4 NBI: x/4/-1 NBO: x/25/18
Prism facility	Unable to complete due to visual fluctuations	10 cpm
Stereo	150' seconds of dino 0' Randot forms/circles	100" Randot circles, negative forms

Syntonics was prescribed due to contracted visual fields. Expansion of peripheral fields is expected to stabilize and improve motion processing ability. The patient used a home unit outfitted with a 40W incandescent bulb with alpha-omega (ruby) and mu-upsilon (teal) filters, 10 minutes each in a dark room without glasses daily. He completed approximately five months of syntonics with good compliance. Treatment was gradually tapered to twice per week as needed.

The goals of vision rehabilitation therapy were to stabilize pursuits, saccades, and vergence abilities and facilities and then to add head and body motion to simulate real-world tasking. Dichoptic stereoscopic techniques used peripheral awareness to improve localization. Due to a long commute, the patient was only able to come to the office once monthly. Office visits introduced new techniques and fine-tuned home-based therapy activities, with which he maintained compliance. Activities are listed in Table 3. Gross-motor work and movement of visual targets were gradually added to oculomotor and binocular activities to encourage multi-sensory integration of vision, auditory, vestibular, and proprioception. A total of six office visits were completed, with two follow-up appointments to re-assess ocular health and to ensure visual-skill stability.

Multiple referrals were also made to support the patient's return to his activities of daily living, in addition to his overall healing. Following the first appointment, a referral was made to a functional medical doctor to optimize nutrition for neurologic recovery. Another referral was made for assistive-device assessment that could provide text-to-audio to allow the patient to continue working, since reading emails and invocies was difficult for him. When visual-motion processing improved significantly, a referral was made to an occupational therapist who was a certified driving rehabilitation specialist. The patient completed and passed a behind-the-wheel assessment, which enabled him to return to work full-time.

Progress Evaluation

At the progress evaluation, completed at six months, the patient noted that words on his cell phone and computer appeared more stable, although he still noted mild visual shaking when he got tired. Words no longer appeared to double monocularly, to disappear, or to change positions. He noted that visual stability and light sensitivity improved notably after starting syntonics, then again when he started Macuhealth. He reported still not being able to read at speeds at which he had prior to the COVID-19 infection, but he attributed it to the mild cognitive impairment that persisted. He had also started on other medications and supplements from another healthcare provider, including baby Aspirin, turmeric, 5-HTP, multivitamin, B6, and magnesium.

The patient no longer veered to the left while walking when fatigued, despite having persistent neuropathy in both legs. He was driving regularly for a few months after passing his behind-the-wheel assessment with the driving rehabilitation specialist. He returned to work after three sessions of therapy and was now working 50 hours per week. He was tired when he presented to this visit.

Clinical findings that demonstrated improvement in visual skills compared to baseline are listed in Table 4. Vergence ranges were still limited but mildly improved. Mildly contracted color kinetic fields persisted in both eyes, but the degree of interweaving of the fields decreased, as shown in Figure 4. VEP, shown in Figure 5, was still abnormal for low contrast on all checkerboard sizes from 32 to 8. The patient was able to tolerate VEP testing much better compared to baseline.

It is likely that this patient could have further improved his visual skills through more optometric rehabilitation therapy sessions, but he was satisfied with his gains and was busy with work. He gradually self-weaned from all home therapy exercises as his visual stamina improved. He noted that his visual stamina worsened when he tried to cease syntonics fully, and he remained on a maintenance dose of one or two times per week.

Discussion

This case highlights the use of oculomotor and visual-skills therapy, nutrition, and syntonics in an optometric rehabilitation program. It is also important to refer to other functional providers when appropriate. Optometrists are critical team members in rehabilitation and returning patients to quality of life. In this case, visual symptoms were improved, and the patient was able to resume his job despite residual visual deficits.

Optometric vision therapy has been shown to help improve vergence, accommodation, and oculomotor dysfunctions following traumatic brain injury. Extensive repetition of oculomotor movements can improve amplitude and velocity for vergence and accommodation and can provide a decrease in patient symptoms in as little as six hours of laboratory-guided training.[12] The adult brain, despite a traumatic brain injury, has a considerable amount of neural plasticity. Dichoptic stereoscopic presentation, such as the projected Slotnick Swirl and vectographs, uses peripheral z-axis-egocentric awareness to improve target localization and to promote gross eye alignment.[13] For this patient, who did not exhibit strabismus, this technique was used to improve target localization and to provide better sensory ground for his motion sensitivity.

Gross-motor movement and auditory loading, combined with oculomotor movement later in his training, was used to mimic more real-world scenarios where vision integrates seamlessly with other sensory-motor systems. This was vital in helping the patient recover visual skills necessary for him to return to driving. Through home practice and office sessions, he was able to improve vergence ranges and facility, although vergence training and central awareness refinement were limited. Further training in these areas would probably have resulted in better end-of-day stamina, but he was satisfied with the progress. Visual skills were functional, but the patient was still mildly visually symptomatic when tired.

Visual motion sensitivity often refers to visually related symptoms, such as dizziness, imbalance, or disorientation, in response to peripheral moving stimuli. This patient, however, did not have these complaints, but his ability to read was impaired by background motion, suggesting some variant of visual motion sensitivity. This assumption of magnocellular damage from encephalitis was supported by initial VEP findings. Despite improvement in visual performance and reduction of visual symptoms by the end of optometric vision rehabilitation, VEP findings were still abnormal for binocular magnocellular processing, which appeared to correspond with his complaints of visual motion reoccurring when he was fatigued.

Visual field loss can result from pathology in the retina and/or brain. Although standard threshold perimetry and kinetic visual fields were normal, field constrictions were only discovered during color kinetic visual field testing. This finding suggests that despite residual edema in the parietal and occipital lobes, the damage was diffuse. Functional color field constrictions result from fatigue or from toxic, nutritional, emotional, or physical stress. This type of field testing is much more sensitive at detecting physiological imbalances in oxygen, edema, or metabolism when the tissue is damaged but not fully destroyed.[9] The need for this patient to continue syntonics maintenance after a failed attempt to stop this form of therapy suggests that syntonics is continuing to support his recovery from the extensive neurologic injury from COVID-19.

Optimizing diet for neurologic recovery is ideal. Omega supplements were initiated early in

treatment, both to address the dry eye and to reduce the secondary neuronal damages, like oxidative stress, from the traumatic brain injury. Improvements in episodic and working memory, spatial learning, attention, and reaction time have been observed by supplementing DHA to healthy young adults whose habitual diets were low in DHA.[14] Mechanistic investigations suggest that DHA influences multiple aspects of the pathologic molecular signaling cascade that occurs after mild traumatic brain injury.[15,16]

Macular pigment antioxidant carotenoids are found naturally in high concentrations to neutralize free radical products resulting from a metabolically demanding macula. Supplementation has correlated to visual acuity improvements when treating those with age-related macular degeneration.[17] Studies have shown significant dose response for lutein and zeazanthin supplements with their ability to increase macular pigment, reduce inflammatory factors, and improve glare and photostress recovery in healthy individuals.[18] More recently, changes in macular pigment optical density along with brain-derived neurotrophic factor appear to correlate with improved speed of cognitive processing and complex processing, as well as memory enhancement.[19,20] Supplements were used to optimize both vision and brain health for neurologic recovery in this case.

Conclusion

Optometrists are critical team members in rehabilitating and improving patient outcomes in those with functional visual deficits after acquired brain injury secondary to COVID-19 infection.

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Article • If a Tree Falls, Is It an Epidemic? Results of the OEPF Online COVID-and-Myopia Survey

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Introduction

If a tree falls in the forest, and no one is around to hear it, does it make a noise? If an epidemic happens, and no one notices, is it still an epidemic? Myopia is spoken of as an epidemic. Have we noticed any change in the epidemic in our clinics and offices as the world has gone into various lockdowns, forcing students into virtual learning and others onto screens for both work and recreation?

Information of one sort or another having to do with the COVID-19 epidemic has bombarded anyone paying even minimal attention to media. Few have escaped the mandated COVID shutdowns and lockdowns, even if they have escaped the virus.

Another epidemic—this one in vision—has been brewing much longer. Look at the titles of pieces discussing the increase in myopia in recent years and decades: "The Myopia Boom"[1] and "Myopia: A global epidemic."[2] Search one year of published scholarly papers on myopia, and hundreds, maybe thousands, of papers can be accessed. The increases in myopia have gotten the attention of a good share of the vision research world.

Myopia has always been part of the optometric clinical world. Optometry dealt with the concept of nearpoint stress and the biological unacceptability of near work before anyone else cared.[3] The near-work theory of myopia has had its detractors, but some research has supported the physiological unacceptability of near work, which can lead to increasing myopia.[4] Two recent studies link cell phone use to myopia.[5,6]

While the myopia epidemic has been brewing for decades, suddenly the world (and specifically schoolchildren) has been plunged into the biggest health-related experiment in history. Placing schoolchildren in front of computers for hours at a time for their schooling became a fact of life during lockdown and effectively became a forced laboratory on near work and myopia.

The Optometric Extension Program Foundation (OEPF), as part of its research emphasis, called on Clinical Associates and interested optometrists to answer six questions about their clinical experience as lockdowns eased. Survey respondents were asked to answer the question, "Do you see what I see? Is it your clinical impression that locking children indoors to view hours of school lessons on the computer and participate in online elementary school, middle school, and high school classes has increased the speed of the progression of myopia?"

Participants

On May 28, 2021, OEPF launched an online survey in an effort to assess expert opinions on whether we are seeing an increase in myopia over what we might otherwise expect during a time of virtual learning. Invitations to respond to the survey were sent to 11,533 people across the globe. From those eleven thousand-plus invitations, the survey generated 5307 post-engagements, meaning that someone actually looked at the message. Out of those engagements, 1246 optometrists responded and were counted by the survey software as filling out the full survey. Response counts to individual questions ranged from 1147 to 1344 (an average of 1210). Those 1246 counted optometrists represent at least 32 countries, although the bulk of responses came from the United States, followed by Canada, the Philippines, Australia, and India. The survey response can be accurately characterized as global, with the universal factor

driving interest in participating being the global nature of governmental response to the COVID epidemic and its effect on our patients.

Survey Questions and Reasoning

1. Do you treat children? Children are the most likely group to be actively developing myopia; therefore, the question clarifies whether this is a group of optometrists who would likely see increasing myopia.
2. Do you "actively" manage myopia (not just by prescribing single-vision distance lenses or contacts)? This continues to clarify the group responding: those who recognize myopic progression as worthy of interference.
3. Do you plan to "actively" treat myopia in the future? Having defined active treatment, the group can now include those who recognize the need to treat myopic progression even if they have not done so to date.
4. During the pandemic, have schools in your area switched heavily into online teaching such as Zoom classes? Screen time is a discussion point for increasing myopia. The forcing of screen time with online classes for elementary and middle school children in particular may be a factor if an increasing prevalence or amount of myopia are developing.
5. Is it your impression that the amount of myopia in these children is: increasing, the same, less, or hard to tell?
6. Compared to pre-COVID, are changes in myopia occurring: at a faster rate, at the same rate, at a slower rate, or hard to tell. These last two questions attempt to clarify whether myopia is increasing, in these experts' opinions, and whether it is increasing at a faster pace since COVID lockdowns happened.

Although some of the questions may seem redundant, the goal was to have no misconstrued questions. Respondents were encouraged to respond by being entered into a drawing for $10 Amazon gift cards.

Results

The respondents comprise a group of practitioners who treat vision problems in children. Ninety-nine percent of 1151 respondents (to that question) treat children and actively attempt to manage myopia progression. Ninety-two percent of 1147 actively manage myopia progression in some way currently, and an additional 4% (of 1149 respondents) are considering becoming involved in active management.

The children in the locations of these experts overwhelmingly were subjected to online classes, versus the in-person classes that children usually have for schooling. Ninety-five percent of 1234 respondents live where schools have shifted to online educational delivery such as Zoom classes; that is, 95% located in 32 countries throughout the world. Thus, this represents a worldwide phenomenon.

The support for an increase in myopia is less overwhelming but still substantial. Fifty-eight percent (782 of 1344 respondents) say that the amount of myopia is increasing, while 28% of those (381) think that it is about the same, 9% (115) think that it is less, and 5% (66) are unsure. When the question specifies comparing to pre-COVID myopic progression, 54% (of 1234) see faster changes, 28% think that it is about the same, 11% think that it is slower, and 7% are unsure (669, 349, 133, and 83, respectively). If we put all that together, currently, at least 782 optometrists worldwide who see children identify this as a worsening epidemic, and 669 of those think Zoom classes and similar responses to COVID are instrumental in making this epidemic worse. Time will tell, but that suggests that 85% of those who see the myopia epidemic worsening place part of the blame on lockdowns.

Discussion and Conclusion

The expert opinion of a worldwide group of optometrists who see children of the age of greatest risk for developing myopia and who are actively managing myopia is that lockdowns have increased the rate of development of myopia in their young patients. If we combine those who think that the pace has increased with those who think that it is about the same, 82 to 86% would say that, if there is an epidemic of myopia, it has not subsided and may be increasing in intensity.

If a tree falls in the forest, and no one is around to hear it, does it make a noise? If an epidemic happens, and no one notices, is it still an epidemic? In the case of epidemic myopia during the COVID experience, experts in children's vision worldwide have seen the epidemic in myopia, and it may be worsening thanks to lockdowns and the accompanying increased screen time for school classes.

Suggesting positives in a myopia epidemic that may be increasing in intensity may seem fatuous.

However, OEPF has been at the forefront of suggesting and providing the theoretical basis for expecting increasing myopia with increases in biologically unacceptable nearpoint stress. These experts, across the world, suggest that nearpoint stress as a cause for myopia was correct all along.

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Article • Surveying the Scene: Results of the OEPF Online COVID-Related Conditions Survey

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Introduction

"Survey says?" So said the host of the television game show "Family Feud" when he needed surveyed answers for a show question to contestants. In the medical world, surveys have their limitations and certainly can be subject to manipulation. However, expert opinion is also considered valid in evaluating signs and symptoms.[1] Expert opinions may be useful as long as we acknowledge that experts can flock together just as any crowd does. Respecting the words of Gustave Le Bon is appropriate: decisions made by a crowd, including people "of distinction, but specialists in different walks of life, are not sensibly superior to the decisions that would be adopted by a gathering of imbeciles."[2]

Randomized clinical trials (RCTs) are considered the gold standard for clinical medical research. However, even RCTs have their limitations. Expense and timeliness are two limitations.[3] When looking at eye and vision issues associated with COVID-19, timeliness is a paramount consideration in any investigation. Expense is a fact of life, limiting what gets done and who does the inquiry; that is, those researchers who can find funding do the research. Objectivity is the goal. For a survey, the study relies on the respondents to provide their own individual objectivity. Just the choice of questions for the survey involves subjectivity and confirmation bias that needs acknowledgment.

Perhaps by broadly casting a survey across country borders, the effect—or the bias—of the crowd might be limited. A survey asking for personal experiences from a variety of doctors across the globe might provide insight into what is seen in private clinic offices for symptoms of both the COVID virus and COVID vaccinations during this pandemic time.

Subjects and Methods

The authors constructed a survey and advertised it through a professional email discussion site. The survey included doctors' experiences in seeing COVID patients in their offices, seeing vaccinated patients in their offices, and their own personal experiences with COVID infection and/or vaccines. The biases that must be admitted are that these doctors are part of an email discussion forum that deals with binocular vision issues and children's vision rather than medical or surgical treatment of health issues. Therefore, rather than a truly random sampling, this is a group with broadly similar interests. Also, this group in large part represents private practice, not hospital or emergency room doctors. In all likelihood, separation from the hospital setting limits contacts primarily to non-severely sick patients. Acutely and severely sick patients may be more likely to go to the hospital emergency room rather than to a private optometric practice for any needed care.

The advantageous bias of a private practice group versus a hospital-based group is that private practice may be slightly more distanced from influences based on government COVID treatment policies. Those potential biases aside—both positive and negative—the survey attracted 1557 respondents from 18 countries. The number of respondents and the variety of practice settings across 18 countries may soften the worries of bias a bit. The breadth of

that response reduces chances for discussion across groups, so there is less chance of development of a crowd effect in potential respondents.

Optometrists were encouraged to participate in the survey with the possibility of entering a drawing for an Amazon gift card. The survey opened October 8, 2021 and closed November 15, 2021, so it was live for just over 5 weeks. The full survey questions can be seen in the appendix.

Results

Ninety percent of optometric offices in this group were open, and 88% saw patients during this pandemic time. Equal numbers of optometrists saw patients with COVID-19 disease-related eye and vision conditions and COVID-19 vaccine-related eye and vision problems or conditions. Anterior segment problems were seen in both disease and vaccine groups, at 35% and 32%, respectively, of reported problems. Reports of posterior segment problems had similar prevalence in the two groups, at 32% for the disease group and 33% for the vaccine group. Oculomotor problems were reported by 14% of optometrists as disease-related, and 15% reported oculomotor problems as vaccine-related problems. It is important to remember that these numbers are not a direct count of individual patient cases, but rather a count of reporting optometrists from the 1557 optometrists who have seen these conditions. No attempt was made to obtain numbers of cases in each reporting category from the respondents.

Reports of optometric treatments reflect the optometric group responding: that is, primarily vision therapy doctors. Treatments for the eye and vision problems grouped in equal response levels for disease- and vaccine-problem groups: active vision therapy (27% disease, 26% vaccine) was the most common, followed by syntonic-tint color therapies (19%), occlusion including binasal occlusion (19%), therapeutic lens prescriptions including prism lens prescriptions (18%), nutritional counseling (17%), and a group of other treatments that included appropriate medical therapies and referrals.

This group also responded to the personal question of whether the optometrists themselves had experienced either COVID infection and/or COVID vaccination and whether there were any problems with either. Only 68 respondents did not answer this question (4.4%). Therefore, more than 95% had experienced infection and/or been vaccinated. Of those, 65% had the vaccine, 19% were infected, and 16% had both the vaccine and were infected. Twenty-eight percent of the personal-response group had no eye or vision problems, leaving 72% of the 95% of respondents (>68% overall) having eye and/or vision problems.

Respondents took advantage of the opportunity to pick more than one response to the question about their own personal eye/vision problems, as evidenced by the 2603 responses to question 12, below. Oculomotor, corneal, retinal, and conjunctival problems all had about equal prevalence at 12 to 15%. Other problems were individually listed in 25% of responses. Twenty-one percent of respondents picked "none of the above" as to the problems they had encountered.

These experts were also asked to make an evaluation of whether they attributed their eye and/or vision problems to infection or to the vaccine. Of the 72% (>68% overall) who had eye and vision problems, seven percent were unsure whether to attribute their problems to vaccination or to infection, or perhaps to both. The remaining 65% were 1.6 times as likely to blame infection (40%) over vaccination (25%) as the culprit. Stated differently, over half of the respondents who were comfortable with assigning blame for their maladies assigned blame to vaccines, not the disease.

Discussion

Assigning blame or cause for health problems requires some sort of association in time between the symptoms and any suggested cause. In this case, a time link may differentiate between disease as a cause and vaccine/pandemic-response as a cause for any eye and vision symptoms. To assign blame, if you will, to a non-disease cause requires respondents to link that non-disease event to their symptoms in time. For example, the prior world-wide research survey suggests that myopia may have accelerated during the online learning that dominated schooling during pandemic lockdown.[4] An increase in myopia during the time of increased online schooling implies correlation, if not causation. This correlation-in-time example illustrates how disease and virus issues might appear to these experts and then be reflected in the current survey.

The first level of cause and possible effect is the disease itself. The disease causes eye and vision problems as these experts link the two in time. With a virus, anterior segment infection and, in particular, mucous membrane infection is perhaps to be expected. With the depth of infection of this

particular virus, retina and vitreous problems may not be completely surprising. Oculomotor problems seem likely with the level of fatigue that this virus apparently can cause.[5]

The fact that this survey adds vaccine effects, and those vaccine effects (linked by time) mirror virus-infection effects, is a bit surprising. Add to that the reports from the experts of their personal symptoms that were likely caused by vaccines over half as often as by infection, and a muddled picture of consequences of this pandemic time emerges. Limiting our view to eyes and vision, the disease has caused problems. However, so have the vaccines. In addition, the lockdowns have likely accelerated myopia.

Another of the possible effects of pandemic-and-response is the possibility of interference with brain development in developing infants by others covering faces for long periods of time.[6] The predictions from that may not be known for several years, and then acknowledgment of cause-and-effect will require looking at increases in facial responses through research in children who were infants before, during, and after pandemic-response epochs.

This group of experts responded to the situation as we would expect. That is, appropriate referrals seem to have been made, based on individual responses. In addition, appropriate lens, prism, and more active therapies have been used to relieve suffering. None of these therapies as we understand them would have made symptoms worse, so these therapists worked within their expertise to help. This group deserves kudos for helping instead of avoiding patients during this tough time.

Conclusions

Discussing pandemics and responses to pandemics can perhaps be more multi-dimensional than many would think. The discipline of economics discusses unintended consequences of actions in the economy. What we see in these two surveys, the first on myopia incidence and progression and the second on COVID infection and vaccination, as well as in the exploratory paper on face-recognition development, is that unintended consequences in this pandemic time are real. Behavioral optometry has a place in dealing with the consequences of both pandemic and response-to-pandemic, as shown by the application of therapies and advice falling within the optometric purview. The optometric community demonstrated that they are appropriately caring and involved in this difficult time.

This may serve as a cautionary tale. Responses to the pandemic have, and in the case of face recognition may, produce unintended consequences. *Primum non nocere*. First, do no harm. The optometrists in this survey seem to have followed that advice. Time will tell whether full societies have done as well.

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Appendix: The Survey Questions

1) Has your clinic been open and seeing patients in-person during the COVID pandemic? y/n
2) If yes, have you personally seen patients in your clinic during the COVID pandemic? y/n
3) If yes, have you personally seen patients with COVID disease-related conditions? y/n
4) If yes to Q#2, have you personally seen patients with (COVID) vaccine-related conditions? y/n

If NO to questions 3&4, please go to Q#11

5) What COVID disease-related conditions have you seen? Choose as many as apply.
- conjunctivitis
- corneal problems
- vitreous problems
- retina problems
- oculomotor problems
- field defects
- neurological problems
- none of the above/other

6. What vaccine-related conditions have you seen? Choose as many as apply.
- conjunctivitis
- corneal problems
- vitreous problems
- retina problems
- oculomotor problems
- field defects
- neurological problems
- none of the above/other

7. Did you treat those COVID disease-related eye and vision conditions beyond correction of refractive status? y/n

8. If yes, what treatments did you use for COVID disease-related conditions?
- therapeutic lenses and/or prisms
- tints and/or syntonics
- occlusion and/or binasal occlusion
- active vision therapy
- nutritional counseling and/or supplements

9. Did you treat those vaccine-related eye and vision conditions beyond correction of refractive status? y/n

10. If yes, what treatments did you use for vaccine-related conditions?
- therapeutic lenses and/or prisms
- tints and/or syntonics
- occlusion and/or binasal occlusion
- active vision therapy
- nutritional counseling and/or supplements

11. Have you had COVID disease or/and a vaccine?
- COVID disease
- vaccine
- both

12. Have you experienced any eye/vision effects?
- conjunctivitis
- corneal problems
- vitreous problems
- retina problems
- oculomotor problems
- field defects
- neurological problems
- none of the above

If None of the Above, thank you. You're done.

13. If you experienced any of the eye/vision problems, did the timing of them make you suspect COVID disease or suspect the vaccine?
- No eye/vision problems experienced
- I attribute the problems to COVID disease
- I attribute the problems to the vaccine
- I don't know which

Article • Virtual Vision Therapy: Lessons Learned

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Introduction

In the early phases of the COVID-19 pandemic, our vision therapy (VT) practice, Alderwood Vision Therapy Center (AVTC), quickly pivoted into remote vision therapy. We detailed our experiences in an article two years ago,[1] and this paper serves as an update on our team approach to the transformation to virtual VT, also known as remote VT. As we write this paper, the pandemic has gone through several iterations in the form of variants, which reinforces our philosophy of being prepared to offer a hybrid of traditional in-office therapy that dovetails with virtual VT. The option of telehealth appears to be "the new normal" in increasing numbers of healthcare practices.

With the necessity of shifting to telehealth services for many service providers at the start of the pandemic twenty months ago, VT offices predictably followed suit. Although virtual VT had been offered in limited ways before the pandemic, it became the main course of action for many offices across the country in order to maintain services to patients. While some of our therapists at AVTC had some limited experience with virtual VT, it was never used as the primary way to provide VT for patients in our office.

Thankfully, there was a lot of crowd sourcing, sharing new VT tools and ideas throughout the vision therapy/optometry community to build a foundation. This was crucial for our office; all of our fifteen therapists pulled together to share and to build what virtual VT would become during the lockdown. This was an exceptional and extraordinary time for all of us as we supported each other in this unknown and unpredictable phase. After the lockdown was lifted for medical clinics in our state, most of the staff, including the doctors and therapists, resumed doctor appointments and vision therapy sessions in the office with a variety of new COVID safety protocols.

Background

It appeared that virtual VT had served its temporary purpose, and in-office vision therapy would continue as it is best known. However, two of our vision therapists fell into the high-risk category for COVID and by default have become the primary providers of virtual VT throughout the last twenty months of the pandemic in our clinic. Their goal was to develop a quality and viable virtual VT option for those patients whose own health risks prevented them from attending traditional in-person therapy. These therapists discovered that with flexibility, creativity, and a commitment to exploring new techniques that adapted traditional methods to the online platform, virtual vision therapy could indeed not only be beneficial, but also successful.

It became clear that there were distinct advantages to offering virtual VT to our patients. Not only was it an option for those who felt safer during the ongoing pandemic by not having to come into the office, but we have also been able to provide therapy to patients who are out of state and even out of the country. Some of our virtual patients don't have VT clinics in their community, so virtual VT provides easier access to these patients who are at a significant distance.

Another discovery was that virtual VT is accommodating to patients who struggle with vertigo, dizziness, and vestibular issues due to a TBI. Surprisingly, many of these patients who also struggle with light sensitivity and screens found that the on-screen option was a greater advantage over having to drive to the office, when driving itself was a major obstacle. Representative comments from one such patient can be found in Appendix A.

Another patient in her late 70s, who had in-office therapy off and on for about three years, typically between traveling months at a time prior to COVID, continued online during the pandemic. She struggled with deficient stereopsis and depth perception,

spatial awareness, and balance issues and had been diagnosed with convergence insufficiency, a slight vertical imbalance, and eye movement irregularities. In the past, she would show some improvement following each unit of VT, but after traveling and returning, she would regress and need to start over. Rarely if ever did she make time to practice between her office sessions. Her comments can be found in Appendix B.

These two patient success stories are typical of a vast majority of the positive outcomes in which we have had the privilege to share while practicing virtual VT during the pandemic. Despite the overall success of this option, there have been some patients who were not adequately served through the online platform. The balance of this article addresses our experiences with factors that contribute to the success of our patients, as well as some of the challenges in delivering virtual VT. Practice management implications are included as well.

Conducting Virtual Evaluations

This section will be relatively brief because we learned that initial patient evaluations do not work well for us when conducted virtually. We are aware that some practices have been successful in conducting evaluations virtually by having another doctor or assistant in a remote location administer tests under the video supervision of the specialist. In other instances, doctors are using the virtual encounter initially as an extended form of intake or patient interview. Our overall experience has been that there are nuances of the doctor-patient encounter that cannot adequately be administered remotely, at least for the initial evaluation. While the same generally holds true for progress evaluations, there is more flexibility in that regard. We refer the reader again to our previous paper, which encompassed this subject.[1]

Remote communication with patients continues to be either through Zoom or doxy.me (Table 1). We have digitized some of our assessment tools, such as the DEM, but screen sharing can be challenging.

Table 1. Comparison of doxy.me Versus Zoom Platforms

	doxy.me	Zoom
HIPAA compliant	Yes	No (patients sign a consent)
Screen share cost	Yes ($39, $59 per user/month)	No cost
In our office	Doctors use at $59/month	Most use Zoom

Obviously, the competence of the patient on the other end, as well as the presence of individuals who can be of assistance in the patient's remote location, plays a large role in the success of conducting remote evaluations or progress evaluations. A tool that we have used extensively for remote vision therapy has been NeuroVisual Trainer (NVT), spearheaded by Drs. Cameron McCrodan and Paul Rollett. Dr. Rollett has an excellent blog with an embedded YouTube video that demonstrates how to conduct virtual or remote progress checks using the NeuroVisual Trainer program.[2]

We use the Compulink EHR system in our practice, and accessing this through the cloud has been a key component to our success. We integrate reports about the patient from other providers for the doctor to review prior to the initial consultation. Compulink has a telehealth portal,[3] but to date we have not implemented that and continue to rely on doxy.me or Zoom for remote encounters with the patient.

Success Factors in Virtual Vision Therapy

The patient profile best suited to success in virtual VT is not bound to a conventional category or set of diagnostic criteria. On the contrary, virtual VT has been successful with a variety of case types, ranging from vision and learning to strabismus and amblyopia to patients with traumatic brain injury (TBI).

Crucial factors that influence patient success in virtual therapy include an open mindset and the willingness and ability to adapt their home environment to vision therapy as needed. Is the patient willing to trust their therapist and the therapeutic process? As with traditional in-office therapy, mindset makes all the difference between success and failure. Even with an open mindset, there still needs to be the willingness to adapt their home. Are they willing to take the time to set up a Marsden ball in their home or use common home items for therapy? Do they have access to a printer so that charts and other materials can readily be printed?

While we mentioned earlier that we do not favor conducting initial progress evaluations remotely, the issues above lend themselves to being discussed during a patient video conference prior to beginning VT. Patients have become increasingly receptive to such videoconferencing due to telemedicine protocols encountered with other healthcare practitioners.

Regarding virtual VT programs, as previously noted, a core program that we have used successfully

is NVT. Virtual reality (VR) programs with home therapy access have also yielded positive outcomes. These range from Oculus technology with VividVision[4] to proprietary versions of VR available online,[5] and practices have begun actively to promote the option of virtual VT, making patients more comfortable with its viability.[6] We have incorporated Dr. Sarah Lane's excellent array of downloadable materials, which are accessible online.[7]

Aside from VR technology, commercially available apps, and the downloadable materials noted above, we have created a home therapy kit to provide materials that patients use during remote VT sessions. These are individualized for the patient and can include an array of lenses, prisms, and filters, as well as materials such as Brock strings, life savers, and eccentric circles. Some practices use customizable kits from Bernell (https://www.bernell.com/category/Vision-Therapy) or Emergent (https://www.emergentvt.com/free-kit). For optometric phototherapy, we use Syntonac goggles and other home therapy kits and materials (https://www.syntonac.com/goggles). Patients pre-pay for home therapy kits either by coming to the office or by paying remotely, in which case they also pay shipping and handling fees.

As important as materials can be in facilitating virtual VT, the observations that a therapist makes regarding patient performance and the feedback provided to the patient remain a mainstay of any successful vision therapy experience. Our therapists communicate closely with one another on ways in which to watch small signs in the face, neck, and shoulders, and they can see effort in the muscles as a patient is working on a task. Verbal coaching around body awareness has also helped, especially for patients who are teens and older. Patients have learned to pay attention and to report any body changes and increases or decreases in tension. In that respect, monitoring the patient is not too different than what occurs during in-person therapy with regard to patient education and awareness. The therapist can communicate remotely by asking probing questions about body awareness, feet placement, and balance.

Successful patients have adapted to the idea that they need to move around in their spaces at home or the office. They can set up the camera so that the therapist can observe reflex work on the floor, infinity walk, jumping jacks, and even Marsden ball activities. Overall, despite it being more challenging to observe body movement virtually, it can be done with an open mindset, flexibility, and a willing patient.

The limited access to the variety of VT supplies that can be used in-office may constrain virtual therapy, but it also allows the therapist to be curious and to discover new ways to introduce visual concepts and skills to the patient at home. For example, in virtual vision therapy, we don't have access to a pegboard, but most people have a colander at home and some toothpicks or q-tips. In addition, the colander can be manually turned to create a rotating pegboard.

Consider yoked prisms as another example. They can be obtained through our office for home use and have been instrumental for patients in learning about spatial changes and adjustments. Stick prisms can be used for observing and experiencing spatial changes and making adjustments. Additionally, two dissociated stick prisms work wonderfully for practicing voluntary vergence or squinchel.

Tranaglyphs and 3D peripheral sliding circles at home enable a version of what we do in-office with vectograms, along with multi-depth slides, 3D anaglyph YouTube videos, and the NVT flat vergence and random stereo options. NVT added a rotator with eye-hand coordinator and peripheral charts upon our request to offer options similar to the Sanet Visual Integrator (SVI) at home. Parquetry was adapted to virtual vision therapy by placing magnets on the back of foam shapes so that they can be viewed attached to a magnetic slant board vertically in the camera. Dr. Sarah Lane also created a virtual slide version of parquetry that has been helpful.

Overall, many tools have been successfully adapted to meet the same visual goals as traditional vision therapy equipment. As hybrid forms of therapy continue to evolve, in which patients alternate coming to the office with doing virtual VT outside of the office, the materials and communication methodologies developed help the patient practice and transfer their skills between VT sessions as well.

Challenges with Virtual Vision Therapy

The profile of a patient not amenable to virtual VT is typically someone who struggles with attention and motivation, especially when it involves engaging with or communicating through the screen. This has been particularly true for children who are younger than age nine. It is essential in these cases to have an involved parent, older sibling, or a responsible individual present throughout the duration of therapy. In addition, the parent's investment in understanding the therapy and commitment to supporting their child with home practice increases

their level of success. This condition has also been true with traditional office therapy as well.

Some of the challenges with virtual VT verge on the comical. This has included curious pets who decided to become part of the experience, or partially clad family members walking by who unwittingly became part of the scene. In other instances, meeting these challenges can help convert potentially disastrous outcomes into successes. Two examples of this with children are provided in Appendix C.

However, sometimes even with an open mindset and the willingness to adapt, some people's home environments have not been conducive to spatial exploration and movement, they may not have had proper lighting or a dedicated quiet space to hold a virtual session, or their internet connection has not been reliable. It is vital to have an adequate screen size on which the patient can work at home. In addition, patients who need more proprioceptive feedback from their environment and/or an in-person assistant during therapy tend to opt for in-office sessions over virtual, even when hybrid therapy combining in-office and remote VT is offered.

Even with the best intent of all parties, technology can be challenging to navigate. This includes, for example, poor internet connectivity that makes transmission during the session spotty, or difficulty with patient positioning of the camera to allow the doctor or therapist to monitor eye movements, alignment, postural skews, etc. However, when all is working well, virtual technology can provide some distinct advantages, such as capturing eye position, head tilts, or Hirschberg reflexes on screen shots to photodocument performance in the patient's file. While activities such as primitive reflexes are amenable to virtual therapy, sometimes the patient has to work their way into a comfort zone of being observed at home.

The management side of virtual VT can be very challenging. This includes patient communication with patient care coordinators regarding scheduling. Appropriate HIPAA forms need to be completed and kept on file. Additionally, of course, there is the issue of fees, as well as third party considerations, which we will discuss in the next section.

Practice Management Aspects of Virtual Vision Therapy

A key component in arriving at a reasonable fee structure for VT revolves around the time structure for each therapy visit and associated administrative considerations. Each session of virtual vision therapy through our practice is 30 minutes. We have found that more than 30 minutes of screen time induces a counterproductive fatigue factor. The fee for service for 30 minutes of therapy is the same as our fee for a 45 minute in-office therapy session. The 15-minute differential is spent in administrative and support time for that session. These services include e-mailing, planning, and accessing resources specific to individual patients for each session.

It is important to stay on time when rendering virtual VT. On one hand, there is less uncertainty with patients having travel issues in getting to the office on time. On the other hand, connectivity issues can present unplanned delays. That is another reason that the 30-minute session virtual therapy session affords a needed buffer. Even when a hybrid vision therapy program is undertaken, and a patient comes in for an in-office session, our 45-minute time slot includes 40 minutes of engagement and 5 minutes allowed for proper cleaning and disinfecting measures.

Two of our fifteen vision therapists have been solely engaged in virtual VT since the pandemic started, one working five days per week and the other three days per week, representing 48 patient sessions of VT weekly. Parenthetically, the fact that they do not have access to our inter-office chat system renders communication a bit more challenging when they are working from home. Between those two therapists and the rest of our therapy staff, we have had as many as 164 patients in virtual VT per week. Before June 2021, the demand for virtual VT had been decreasing. Since that date, with COVID variants increasing, and in particular the recent spike from the Omicron version of COVID, demand has been increasing again.

There is variability in terms of third-party reimbursement policies for virtual VT as telehealth. Our understanding is that with all insurances, everything is billable in the same manner for either virtual or in-office visits until the pandemic is declared to be over. However, it is vital to check with your state optometric board to ascertain what the guidelines are for conducting telehealth visits. For treating patients who are from a state in which you do not hold an optometric license, it is wise to check with their optometric board as well. When speaking with patients regarding virtual VT services, we are careful to use the word "billable" rather than "covered," as covered implies that the service will be reimbursed. A good reference on the subject of virtual VT and telehealth/telemedicine billing and coding was authored by Drs. Richman and Fitzpatrick.[8]

Conclusion

Parents can be hands-on and part of the virtual VT process, enabling them not only to be more involved, but also to witness their child working toward mastery and to see changes directly. Therapists enjoy the creative aspect of virtual VT, including finding items around the house that can be adapted for therapy use. Complementing that are the apps, downloadable materials, and customized VT kits that have been developed for virtual VT.

Our patients, as well as our staff, have generally transitioned well to virtual VT or to a hybrid combination of in-office and virtual VT, although it is not optimal for everyone. Some patients, particularly those who have travel constraints or who do better in home environments due to sensory or other issues, actually do better with remote/Zoom therapy than in-office therapy, consistent with positive telemedicine experiences in other healthcare fields. They can modify aspects of the home environment, such as the lighting or sound levels, to maximize comfort.

Our impression is that telehealth and virtual VT is here to stay and is therefore an important tool to master and to use as appropriate. The extent to which various hybrid arrangements evolve, and the balance between in-office and virtual therapy sessions, will be a function of how long the pandemic remains with us.

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APPENDIX A: Comments From Patient with TBI After Virtual Vision Therapy

These are comments from a patient who was life-flighted to a hospital after a devastating car accident, was intubated, and spent ten days in a trauma center. Her goal was to address and alleviate the headaches that she experienced following her TBI when using screens. She also wanted to increase her screen tolerance so that she could return to work full-time as an online educator.

"As I started VT during the pandemic, I only ever did vision therapy online from home. I was very impressed by my therapist's ability to adapt vision therapy exercises for online application, as well as with her ability to ask questions that told her what was happening for me and what I was experiencing with my vision…I learned that my headaches stemmed from problems related to eye teaming and seeing in depth, which also very often made me dizzy and unstable when walking or moving in various planes (squatting, bending, turning, etc.) I didn't feel stable on my feet or in many situations before I started vision therapy. The vision/TBI caused vertigo and made me nauseous frequently as well. …I loved how plugged in my therapist was to how I was feeling or what I was experiencing, and it was very helpful that she verified and checked in on how I felt about the exercises. She was always ready to accommodate and adapt the VT exercises. She took time to explain what value each exercise added and what problem of mine they addressed, as well as explaining goals we were working toward so that I knew what we were going for even as I worked at my own level. I can say that having virtual vision therapy rather than driving in to the office was a far superior situation for me. Driving was one of the problems I needed to address with VT, so not having to drive back and forth to Lynnwood in traffic was great for me. Additionally, the added time that I gained by not driving gave me space in my schedule to breathe and reduced my stress, which is especially key when recovering from a TBI or a car accident, in general. …I am now working pretty much full-time and can be on screens long enough to get a lot done. When I need a break, I respect my limits and apply the exercises I was taught to relax my eyes, or I take a break and go for a walk. I no longer have vertigo and have extensive knowledge that I can apply to my vision issues… I feel online therapy was a better option for me than in-office would have been."

APPENDIX B: Comments from Geriatric Patient About Virtual Vision Therapy

These are comments from a patient in her 70s diagnosed with convergence insufficiency, a slight vertical imbalance, and eye movement irregularities. She previously did vision therapy over the course of three years, frequently interrupted by her travel plans, and failed to do any consistent out-of-office therapy reinforcement. She began doing virtual VT at the end of November 2020, and she has improved by leaps and bounds during the past year. Her near point of convergence (NPC) has normalized, and her fusion and depth perception are more stable, with expanded fusional vergence ranges. Balance has improved, especially in downgaze, which has allowed her to step off curbs with more confidence while walking. She has been seeing steady progress and commented that doing therapy virtually has been better and more successful for her personally than any other time she has done VT in the office. The added bonus of having therapy set up in her home allowed her to practice and reinforce therapy procedures more often than before. One of her goals was to improve her spatial awareness so that she could resume typing effectively. Here's what she has to say about her experience.

"In my case, I live an hour-plus from in-person therapy options that were threatening to this aging patient in a period of COVID-19. While the initial decision to go virtual was made based on distance and protection, the advantages of the approach were found to be in how service was provided and the surprisingly positive benefits of the creativity involved in adjusting tools and approaches to work well in a virtual environment. A number of tools just don't work virtually but gave rise to innovative development of other, highly effective alternatives that actually worked better for me in terms of improving my eye teaming and my depth perception. The therapist was able to focus on my issues in a way not possible in person and to suggest reworks that made a real difference. For example, I had found that my spatial judgment was weak, but the therapist found ways to help me actually improve my accuracy when typing on a keyboard. For a writer and researcher like me, this was invaluable."

APPENDIX C: Challenges of Virtual VT with Young Children

While all cases are thankfully not this extreme, one of the unique aspects of virtual therapy is enabling the patient to operate in a "safe zone" at home, as occurred with a young patient who was accepted into vision therapy who has suicidal ideations. It is an understatement to say that his mindset was difficult for success, and that resulted in us changing the way that we start our sessions. He is encouraged to tell the therapist one thing that is challenging and three things that are successful. Although communication has been challenging, we are working together to focus his attention on things that make him feel successful. He is able to have his dog present while doing therapy. His room makes him more comfortable. We use objects that have meaning to him; for example, we use his favorite stress ball to track. Mirror superimposition was done with his mom's face superimposed on his dog's face. Superimposing the two created humor while working on binocularity. He is able to share his successes in soccer and introduced us virtually to a soccer coach from England who was staying with him. Our patient was proud of himself and excited about what he was doing and sharing.

Virtual therapy has helped children diagnosed with ADHD; for example, this hyperactive young girl we worked with had a very limited attention span. I learned that she liked to be creative. She was better able to pay attention when engaged in a search task directed through the screen. For example, asking her: Can you find a white object that you could catch something in? Can you now find a white object that you can throw into something? She found a colander and a ball that the dog played with. She was excited about putting them together. We used red/green glasses and made several luster activities this way. Her attention and planning skyrocketed. We also modified a a visual motor worksheet concept so that she drew on the kitchen tiles and created her own patterns. We were able to get her to clap and jump with shapes on the floor. She was able to do this activity for 20 minutes and didn't want to stop! The challenge in a case of this nature was to enable the patient to make her own modifications to the activity, rather than being forced to follow pre-set rules, which gave her a greater sense of control and better engaged her attention. Being able to put her spin on things and increase the complexity of activities as she built confidence was very helpful in building her attention skills. In this instance, not having traditional therapy material but relying on exploring together virtually to access what was in her natural environment at home helped with the transfer of skills that we were building, such as assisting with setting the table and attention to detail.

Article • Presenting the Results of the Evaluation

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Introduction

Whether we are in the middle of a pandemic, or when life is back to a real normal, it is vital that you are able to educate your patients in such a way that it inspires them to take action.

During the pandemic, many VTODs switched to video conferencing with parents, which presented a number of challenges. Many of the demos they relied on were no longer possible to use, such as having the parents wear prism while reading so they could experience what it is like for their children. Others relied on their written reports to be their messenger to the parents, with the expectation that they would move forward with vision therapy. While some were successful with this approach, many were not.

When people who are struggling contact your office (and no one else has been able to help them), all that the doctor (and/or the staff) needs to say is one thing that makes sense, and they are ready to move forward. It is typically hard to discourage them.

Many doctors experienced a sudden increase in patients because parents were home with their children while they were attending school online, and it was easy to see that they were struggling. These parents either spoke with friends who referred them or searched online to get their answers. It was significantly easier to get these patients to follow through with vision therapy.

Vision Therapy & Lenses

When recommending lenses, you rarely have a patient who doesn't follow through with your recommendations. It is also very unusual to have a patient ask for a full understanding of optics before purchasing glasses. This is because everyone is familiar with the fact that some people need glasses. Also, the patient can see the difference immediately in the phoropter or trial frame.

Vision therapy is not a subject that enjoys this level of familiarity. People tend to be skeptical of things they have not heard about. This makes it especially difficult to communicate with patients who have come to you for a regular eye examination when you find a binocular dysfunction and vision therapy is the treatment of choice. The whole idea of vision therapy is unfamiliar to them, and patients are reluctant to follow through—unless insurance covers it...and then it becomes acceptable.

Binocular vision and perceptual problems are not as easy to demonstrate to the patient as refractive errors. In addition, many times the decision makers are not the person with the problem, especially when the patient is a minor. Many parents have a hard time relating to the difficulties that their child is having.

The third major difference is in terms of commitment. With lenses, you are asking for a one-time expenditure of perhaps $100 to $300 (or more) and one to two hours of the patient's time. Even then, when the patient inquires about designer frames and hears the price, the first reaction is usually, "I can't afford it." Yet, given time and a mirror, a good percentage of your patients actually purchases the designer frames.

However, vision therapy requires a much stronger commitment. Forget about the financial commitment for a moment; just consider the number of times you want the patient to return to your office, and the entire length of the program, not to mention any home activities you might require. This requires a great commitment on the part of the patient and any caregivers involved, especially parents.

All of this explains why VT case acceptance, especially in areas where it is not covered by insurance, is not as high as it should be. Therefore, it becomes critical to the success of any vision therapy practice that the doctor and their staff understand how to get patients to follow through with their recommendations.

Preparing for the Presentation

Case presentation has become an integral part of a successful vision therapy practice. When insurance covers vision therapy, patients are more apt to follow through, regardless of the quality of the actual case

presentation. As long as patients understand that they need to do it and agree that there is a problem that needs to be remediated, the majority of the patients will follow through with treatment. However, even when insurance covers vision therapy, many patients don't avail themselves of the opportunity.

I have done an extensive amount of research to find out why patients don't follow through with treatment when it is indicated. In working with numerous behavioral/developmental optometrists, the result has been an in-depth 19-step sequence for presenting the need for vision therapy. Clients have found that case presentation can have a profound impact on the number of patients who follow through with the recommendation for vision therapy, as well as attendance and overall patient compliance.

When one parent or spouse is uncertain and another is skeptical, those can be much harder to convince. While some of these cases may move forward with care, when they discover that insurance won't cover it or reimburse them, or hit any other obstacles, they drop out.

The following is a chapter I wrote a number of years ago that goes into more detail on how to educate your patients successfully on the need for care. I hope you find it helpful. If you have any questions, please feel free to email me. I am happy to help.

Over the years, I have discovered that it can take quite a bit of work for a doctor to master case presentation skills. While this chapter does not allow for the type of interaction required in order to ensure you will be able to master the entire 19-step sequence, it will give you some overall guidance on the subject of case presentation that I hope you will find helpful.

First, let's start with the five major ingredients that make up a successful VT practice:

I. The ability to attract new patients
2. The ability to get patients to accept treatment
3. The ability to get patients to follow through with the entire treatment program
4. Good clinical outcomes
5. Patients and parents raving about your results to others

While each part is important, getting patients to accept treatment seems to be a major stumbling block for many practices. Case acceptance is the result of good case presentation skills. A good case presentation results in patients who:

I. Understand their visual problem
2. Understand what is involved in the solution to their problem
3. Are willing to do whatever is necessary to handle the problem, including:
   a. Pay the fees
   b. Attend all therapy sessions
   c. Do the home activities

Why Don't Patients Follow Through with Vision Therapy?

You have completed your examination of the patient and know the treatment protocol the patient needs. If he or she needs glasses, contacts, or even surgery, you are confident and can easily tell the patient what is needed. Yet, when it comes to recommending vision therapy, it becomes a different situation. The following are some of the barriers that interfere with patient compliance:

1. False information: Probably the biggest barrier that you will hit is the one created by false information, opinions, or preconceptions.

As an example, the majority of the population believe that 20/20 means you have "perfect" vision or "there is nothing wrong with your eyes." I have even spoken with some optometrists who have actually said this to patients. It is very hard for parents to understand their child has a vision problem if they do not understand what 20/20 means. Therefore, it becomes vital that you actually have a discussion with the patient and parents about the meaning of 20/20 at the outset. Even if the patient isn't 20/20, the lay-person's understanding is that glasses will help them see 20/20, and that is all that is needed.

One client shared this story with me. He had a 12-year-old patient who was thrilled that someone had finally figured out what was wrong. Unfortunately, the mother was just sitting there not reacting to what was being said by the doctor. Nothing was penetrating. The son thought his mother was just stupid. How could she not see his excitement and that this doctor was absolutely correct in his diagnosis?

Fortunately, my client finally asked the mother for her understanding of 20/20. She slowly answered, "It means you have perfect vision, there is nothing wrong with your eyes." Well, of course, her son had 20/20 eyesight, so nothing was wrong. After reviewing with her what 20/20 really meant, he said it was like a ton of bricks landed on her. All of sudden, she looked

up at the doctor and said, "Is that what's wrong with Johnny?" She followed through with treatment.

There are quite a few labels which children are given for symptoms which indicate a learning-related vision problem. These labels can give the parents a false sense that they have a solution, even though the solution is just a label. For example, many patients and parents have been told Johnny's negative behavior is the result of laziness, lack of motivation, ADD, ADHD, etc. If this misinformation isn't dealt with appropriately at the outset, it will be very difficult to get your message across.

2. Insurance does not always cover any or all of the vision therapy: If insurance covers vision therapy, it is an indirect validation that this is an accepted form of treatment. When insurance doesn't cover it, the validity of vision therapy tends to come under question. In addition, if the patients do not understand the value of what is being presented, it doesn't matter what your fees are, they will be too expensive. For these reasons, it can become difficult to get patients to follow through with therapy.

The problem is not, however, managed care or the insurance companies. It is the fact that patients without insurance coverage have to be more motivated to go ahead with the program than those with insurance. The problem is how to increase a patient's motivation to follow through with your recommendations regardless of the cost. Patient motivation will be discussed later in the chapter.

3. Lack of understanding: Most patients come to you for a solution. They are having difficulty with their vision. They want to see better. The majority of the population is not walking into your office expecting a lecture that explains why they are more myopic than they were two years ago. Nor do they want a lecture on how and why someone becomes myopic. All they want is for you to handle their problem. As far as patients are concerned, they don't need to understand how glasses work, all they care about is that they can see better after they get the glasses you have prescribed.

However, when it comes to vision therapy, it is critical that the patient understands what is causing the problem and what is involved in the solution. The key word here is "understand." Just because you tell the patient (and/or their parents) about the vision problem in clinical terms or by sharing the results of all the tests that were performed, it does not mean that they understand what you are saying. You need to use terms they will understand (layperson's terms). An example of how to present your findings is presented later on in this article.

You might say, "I ask them if they have any questions and they always say they understand." Unfortunately, people don't always realize they don't fully understand something until they get home and try to explain it to someone else. At that point, the person they have explained it to says, "This doesn't make sense." The patient's response is, "Yes. You're right, it doesn't." The end result is that they go for a second opinion or search the internet, which confirms their negative reaction, or they just don't move forward with care. Either way, the patient doesn't get the care that is needed and continues to struggle unnecessarily.

A good exercise is to give your presentation to your spouse or a friend, converting all technical terms to layperson's terms or using analogies. At different points in your presentation, ask the person to be honest and tell you what their understanding is of what you said. You will be surprised at the answers.

4. Lack of commitment: Your patients will hit many obstacles along the way to complying with your recommendations. How can you ensure patients have the fortitude to do everything which is needed for a successful outcome? Let's forget about the financial component for a moment. You are asking them to come to your office how many times per week? For how long? And you want them to do activities at home? If there is any opposition in their household, it will be difficult for the patient to continue without sufficient understanding and commitment. Some examples of obstacles are life is too busy, spouse isn't supportive, and teachers/doctors with negative opinions.

All this takes exceptional commitment on the patient's and parent's part. Commitment comes first from their understanding of how the symptomatology they are having is connected to the vision problem you have isolated. Next, they need to see that the solution to their problems is the vision therapy program. If you can connect the problems the patient or child is having with the vision problem presented in your office, they will become motivated to get through the program.

Too many doctors get so excited about explaining what the vision problem is and how to treat it. They lose sight of the fact that their patients need to see how the vision symptoms relate to the real-life problems the patient is having and how the therapy program will handle these problems.

5. Lack of symptomatology: One of the hardest cases to present is the one where the patient appears to have no symptoms even though your clinical findings show there to be a problem.

If your patients have made accommodations in their lives in order to compensate for the visual problem, it will be very difficult for them to believe there is a serious problem. These are the cases that will go for a second opinion if you don't present it properly. These are also the cases that will agree with the second opinion if they disagree with your diagnosis.

In this case, you must develop the problems they are having before presenting the solution. Otherwise, the solution will not have any value to them. If the patient won't volunteer any symptoms while in your office, give the patient a symptom list. Make sure the patient knows what to watch for and to call you if any of the symptoms are observed. Good case presentations are not a matter of trying to convince someone. They are a matter of showing how the vision problem is contributing to the patient's real-life problems or symptoms.

6. Losing the patient: One of the biggest difficulties doctors face is that patients rarely say, "I don't understand," or "Doc, this doesn't make sense." You ask the question, "Do you have any questions?" The usual answer is "No." So, the obvious conclusion is that they understand you. Correct? No.

The situation is that most patients do not have a strong desire to understand everything about their problem. They want a solution to their problem, not a course on behavioral optometry. They are paying you to give your professional opinion as to what should be done. After all, you are the one with the degree. However, in vision therapy, if the patient does not understand the problem and how it relates to their vision, there is a good chance they will not follow through with your recommendations or go for a second option. This is quite a dilemma.

The answer is to ensure that you don't "lose the patient" during the case presentation. The following are a couple of signs and symptoms that indicate you have lost the patient.

They hide behind insurance: "We just can't do this if insurance doesn't cover the treatment." Almost all patients will want you to check their insurance before starting. The danger signal is if the patient is expressing the negative attitude that they will not go ahead without insurance.

They want to go for a second opinion: And when they go for a second opinion and it contradicts your recommendation, they side with the second opinion.

The solution is an "interactive" case presentation, where you are doing as much questioning and listening as you are talking. This means you are:

- Finding out about the patient's problems, symptoms, and concerns;
- Relating the presentation to these problems, symptoms, and concerns;
- Checking for understanding several times during the presentation;
- Watching for signs you have "lost" the patient and handling them as soon as you notice them.

Overcoming the Barriers to Case Acceptance

The problem to solve is how to give a presentation which will overcome the barriers just discussed. The answer breaks down into two skill attributes.

Skill 1 – Clinician

The doctor must have the professional training and skill to:

- Make an accurate diagnosis,
- Determine the best treatment protocol,
- Ensure the vision therapy program gets excellent results.

Skill 2 – Patient Motivator

When a patient does not go ahead, it is because there was not enough motivation on the part of the child or parent. The doctor must have the training and skill to:

- Ask questions to understand what will motivate the patient,
- Determine from these questions how best to communicate with the patient;
- Communicate with the patient in such a way that the patient (and their parents) become motivated to do whatever is needed to start and follow through with therapy.

Motivation skills are not typically taught in school. Many practitioners feel it is a sort of "magic" that some doctors have and they somehow do not.

The first step to raising case acceptance occurs when you recognize that the above two skills are two separate abilities. Being a good clinician does not automatically mean patients will go ahead with your recommendations.

The next step is to recognize that you spent hundreds of hours of training and practice to become a good clinician. The skill to motivate patients can also be learned, but it takes hours of training and practice. The good news is that, with training and practice, this is a skill that can be developed.

Patient motivation is the result of:

- Handling any false information or preconceptions so that the patient is receptive to hearing your message;
- Handling any initial concerns that might prevent the patient from being receptive;
- Establishing the need for therapy. You must show how the real-life problems and difficulties the patient is struggling with are related to their vision problem. If the patient has no symptoms, education becomes a key component to ensure the patient understands what the problem is and what symptoms to watch for;
- Showing how your therapy program will handle the problems and difficulties. This gives the patient and parents hope. With hope comes commitment.

The case history helps to establish the need for treatment. Time does not always allow for the amount of discussion required to verbally gather all the symptoms from the patient. Doctors often miss cases which need care because they fail to gather the appropriate information in the case history. It is vital that you are gathering the correct information in writing from the patient. Otherwise, when your schedule gets busy, you may forget to ask one key question which would have told you how to proceed. The solution is an in-depth symptom list which is filled out prior to the examination. Once a binocular problem or behavioral vision problem is established, a second history form should be filled out at the time of the additional testing. This form should have more in-depth questions.

Example: Mrs. Jones is bringing Johnny in for an eye examination. To ask her in-depth questions about her child's home and school behavior would not make sense to her. Because of this, she might decide not to answer these questions, leaving you with insufficient information. It is better to merely ask questions about symptoms at the first visit, then let the parent know the case is more involved and requires additional testing. It is also good to let the patient know that the symptoms they are observing are indeed vision related. Now you are justified in asking for more in-depth information, and you will find the patient and/or parent much more willing to share.

Patient and Parent Understanding

A key step to motivating a patient is to find out what problems they are having that are a direct result of their vision symptoms. The next step is to ensure the patient understands their vision problem. Speaking in layperson's terms is a must.

For example, don't say, "Mrs. Jones, Johnny has a severe convergence problem and, in addition, I am finding he has an accommodative infacility." The patient will not understand you. Try something like, "Mrs. Jones, when Johnny is reading or looking up close at things, he is having a lot of difficulty using his eyes together correctly. That's why he avoids reading and board games. In addition, he has trouble looking at things in the distance after looking at things up close. It is also why he has trouble seeing the chalkboard at school after looking at his notes or reading."

Periodically asking the patient what their understanding is of what you have said is better than asking if the patient has any questions. Many times, patients are either afraid to ask questions or don't realize they have questions until you ask about what was just said.

Report Development

Contrary to what others have said, it is my view that reports are not critical to case acceptance. There are many uses for reports, and you need to determine how you want to use the report before you write it. If you want to use it to communicate with the parent who wasn't present for the consultation, then you need to ensure it communicates in layperson's terms. If you want to use it to communicate with a physician or a teacher (to help stimulate referrals, etc.), then it needs to be written differently. You have to keep in mind your audience when you write your reports. Reports will vary according to how your vision therapy program is designed. It is important for you to survey your patients or their parents to find out what format is best for them.

The Case Presentation: Frequently Asked Questions

1. Should you schedule a separate appointment for the case presentation?

One of the problems that doctors face in talking with patients about their need for vision therapy is

that time does not allow for any level of in-depth discussion. If you do not have sufficient time, then you need to schedule a separate consultation. Effective case presentations can take a good bit of time, anywhere from 30 minutes to two hours, and you do not want to do this when there is already an information overload from the examination.

Some doctors try to squeeze the presentation into the end of the examination: "Because my case acceptance is so low, I don't want to waste my precious chair time." Doing this will not only waste your consultation time but your examination time too, as you will surely continue to have low case acceptance. The solution is not to shorten your presentation but to learn how to do better case presentations.

If you have the time and the parents are eager to hear the results, if you can make arrangements for someone to watch their child, then you can go into the presentation on the first appointment. Of course, if the child is in meltdown mode, you will have to schedule a second visit just for the consultation.

If the patient is coming from quite a distance and you feel that there will be reluctance for returning a second time, you can schedule it all to be completed on the first appointment. However, the patient and parents need to be informed that the appointment will be for a long time, and arrangements need to be made to have the child watched.

If you know that the patient coming in was referred by a non-OD referral source and is a potential VT case, then these two appointments should be scheduled at the time the initial appointment is made.

2. Should the child be present?

Some doctors feel it is good to have the child present for the consultation. My experience has been that parents are much more candid and willing to talk when the child is not present. It is easier to ensure you achieve a good level of understanding when there is communication flowing in both directions.

3. Is there a charge for the case presentation?

This is up to you. It is definitely easier to get the patient to return for the additional visit if you say something like, "I would like to spend some time reviewing the results of Johnny's tests before we go over your options. The good news is that I can definitely help you. The next appointment is at no charge. When would be a good time?"

If you would like to charge for the consultation, the best way to do this is to present the additional testing fee and the consultation together as one fee. Later, if needed, you can break it down into two separate numbers for insurance purposes.

As mentioned earlier, if you are discussing your recommendations for treatment after a regular examination, it is going to be a bit more difficult to charge for the additional appointment without offering some amount of explanation. However, if some additional tests would help you fine-tune your diagnosis or your recommendations, it is better to let the patient know that some additional tests are needed and that you will review the results of all the tests and your recommendations at that time. Again, please make sure you state that the good news is that it looks like you will be able to help, and that the symptoms they complained about appear to be connected to a vision problem, adding that you will be happy to review all the information with them once the additional tests have been completed.

4. Who should do the consultation?

If the doctor has done the evaluation, then the doctor should do the consultation. The patient wants to hear from the doctor. However, if your schedule is so busy that it is almost impossible to schedule consultation appointments, then you could offer the patient a choice.

> *Mrs. Jones, Dr. Smith is only available for consultation from 11:00 – 1:00 on Mondays. We realize that this might be difficult for you to schedule, so we can arrange for our head therapist to present the doctor's findings to you if you prefer. Her schedule is a bit more flexible. If you still have questions, the doctor will be happy to meet with you after that."*

This way the patient is making the choice.

5. Should I use sales techniques?

When patients come to see you, they are expecting to see a doctor, not a salesperson. If you start using sales techniques, they will become suspicious. All actions should be geared toward establishing a trust relationship. Typical sales techniques can often distract from such a feeling of trust.

For example, if you went to a heart surgeon and they said, "I am going to explain what is going on with your heart, and then when I am done I am going to ask you to make a decision." You would become suspicious. You would ask yourself, "Why do they have to 'sell' me on this. Are they just in this for the money?" What is expected of a doctor is that they:

- Tell you what is wrong,
- Tell you how serious it is and how it relates to your life,
- Tell you what needs to be done about it,
- Answer any questions you have.

In other words, by trying to sell the case, you can inadvertently alienate the patient, making them more likely to go for a second opinion.

6. Why isn't explaining the problem enough?

When patients are paying privately for your services, they need to understand, not just be told, what is wrong. If you work towards achieving maximum understanding, the patient will go ahead with vision therapy (provided you can demonstrate how the symptoms they are observing are connected to the visual problem you have diagnosed).

7. Should I use a script?

Scripts of what to say can be very helpful. If you say something to a patient during a presentation and it gets a good response, write it down and use it again. You might also get helpful things to say from colleagues or consultants. Indeed, it is a central part of my own case acceptance program.

However, scripts are not a substitute for knowing what you are trying to achieve. In fact, just parroting phrases can actually harm your case acceptance rate when you sound like you are using a script.

Scripts are only beneficial if they help you achieve the goal of motivating the patient to accept your recommendations. One suggestion I can give you is to think of the patient as a blank slate, with no knowledge of vision or how the eyes work. Explain the condition to the patient as you would to a young child.

8. Why should I practice my case presentation with laypeople?

It is very helpful to work on your case presentation skills with a layperson. After all, your patients are laypeople. When someone has been in a field for a long time, there is a tendency to lose sight of what is new information to a layperson and what is clinical information which took you hours, if not years, to master. You can't expect your patients to grasp these concepts in a matter of minutes. By working with a layperson, you get a better perspective on what can actually be understood and how simply you need to communicate your message. Also, professionals tend to use technical jargon which has little meaning to the lay public.

To get an idea of how well you are doing in getting your message across, try this exercise. Sit down with one of your staff or your spouse and have them imagine being a parent. Tell them what symptoms and difficulties the child is having. Then present the case the same as you would if they were a real patient.

After you have completed the presentation, ask the following questions:

- What is your understanding of your child's problem?
- How does this problem relate to any difficulty your child is having in school or in life?
- What is your understanding of what is required to solve this problem?
- Do you have any questions which weren't answered?
- How would you explain what I shared with you to your spouse?
- Do you feel you would want your son or daughter to get this treatment if insurance didn't cover it?

As you listen to the answers, observe how certain the person is of the information received. How many times do they have to pause and/or guess as to what you said? This will give you an idea of what occurs when the parent goes home. As a note, it is best if you don't tell the person you will be quizzing them after the consultation. You want to get honest feedback, as if they had been a patient in your office. Since people are different, do this on a variety of people and get each one's feedback.

A day or so later (or even a few hours later), ask the same person some of the above questions again and see how much they remember. This will give you a good feel for whether or not you are getting through.

If you find that you are unable to get your message across, then it is time to seek the help of a consultant who specializes in case presentation skills.

9. Should I lower my fees to improve case acceptance?

If the patient does not understand why the program is needed, or has not truly decided that this is the right thing to do, it doesn't matter how low your fee is—it will be too expensive. Think about it. If someone had mentioned you might look at cars but you had not made the decision that you actually wanted a car, a salesman could go hoarse working out various payment options. You would not be ready to move forward.

If patients are telling you your fees are too high, the first thing to do is to work on your case presentation and make sure you are building the patient's desire for treatment.

10. How should I handle the insurance coverage question?

When a patient has insurance, they will want to do everything possible to see if it will cover VT. If you know for sure their plan will cover it, it's a simple discussion. The problem occurs when you don't know or if it is a plan you have had difficulty with. A simple statement such as this is usually sufficient in letting the patient know: "Some plans cover it and some do not. We need to check into your plan to know for sure." If you can structure your practice so that patients pay for their services and then get insurance to reimburse them directly, you will be one step ahead.

Having said that, whether you take insurance or not, if the patient has insurance, it is best if you can have one of your staff check the patient's insurance coverage prior to the actual consultation, so you can speak with confidence regarding their insurance.

If you take insurance, the key question you need to know is if insurance is denied, will the patient go ahead with treatment anyway? The way that you can determine the answer to this question is by paying attention to what the patient is communicating.

If the patient is saying, "We know we need to do this regardless of what insurance will pay," you know they understood the message. If, however, the patient says, "I'll only do this if insurance will cover it," then you know that they truly do not understand the need for treatment, especially if there is a negative attitude that goes with that statement. In this situation, if the patient was being completely honest, they would say, "Doctor, I truly do not understand what you have told me and don't see the urgent need for therapy. I don't know what questions to ask to understand better and don't want to insult you or appear stupid." Unfortunately, patients are usually not so open and honest. Therefore, it becomes vital that you really listen to what is being said and get feedback from your staff to find out what was said to them. Some patients are embarrassed to admit they have questions or concerns when speaking with you but will open up to your staff.

If the patient will not go ahead unless insurance will pay, then you must realize that the patient truly does not understand the need for care. At the point where you or your staff see this is the case, this is a good time to ask the question, "Mrs. Jones, what is your understanding of why I have recommended this course of treatment?"

As a note, the only way you will be able to create a practice which is independent of the insurance companies is by ensuring all of your patients truly understand their need for care.

11. What if the patient is asymptomatic?

If the patient is asymptomatic, there will generally be less inclination towards immediate treatment, or any treatment at all, for that matter. In these cases, education is the key. Do not try to pressure the patient into starting. Make sure the patient understands the problem and any symptoms to watch for. Let the patient know that you would like to hear from them if they notice any of the symptoms you have listed. If the patient develops symptoms, they will want to go ahead.

12. Should I offer payment options?

Patients can become very tense when discussing finances. The last thing you want to do is offer an all or nothing scenario. Be flexible. By offering several payment options, you are offering choices. This makes the financial discussion one of which payment plan works best for them rather than whether they are going to do the program or not.

13. What if the patient is reluctant to decide?

You do not want the patient to feel pressured into deciding before leaving your office. You do want to be sure your patients understand:

- Their vision problem,
- How the vision problem relates to the symptoms they are complaining about,
- What is involved to handle the vision problem,
- The different payment plans available.

Once all this is understood, the next step is to give the patient the option of scheduling before leaving. This must be done very gently, as you do not want the patient to feel pressured to schedule. The attitude in working with the patient is more one of ensuring that if there is a particular time and/or day of the week that works well for them and is available they have the option to schedule. You want to help work out a treatment schedule.

14. What if the patient does not want to go ahead?

What is appropriate follow-up for those cases that don't sign up right away? As in the asymptomatic case, education is the key. Do not try to pressure the patient into starting. Make sure the patient understands the problem and how the symptoms may lead to worsening problems. Give the patient a symptom list with instructions to contact you if any of the symptoms get worse. At the right time, the patient is then called to find out their current status.

Who should make the call? The person who does the follow-up call should be knowledgeable about vision therapy and the symptoms that relate to vision problems. This person should also be able to read the doctor's records and figure out what

problems the patient has. The staff member must be knowledgeable, reassuring, and above all, concerned about the patient's welfare.

The content of the call will vary according to each individual situation. If possible, have the doctor review the chart and give you a question to ask the patient. The question must be specific to that particular patient. For example, "The doctor asked me to call to see how Johnny is doing. He specifically wanted me to find out if Johnny is still getting headaches at the end of the day?" If he still has the symptoms or they are worse, saying, "In that case, he asked me to set up a time for Johnny to come in for some additional testing. Would you have time on Monday?"

If it has only been a month or two since the patient was seen, here is another example of a possible follow-up call. "We are putting together the schedule for next month, and the doctor asked me to call and see how Johnny is doing?" Ask specific questions and get the information. "Based on what you have said, it sounds like it might be a good idea to get Johnny started in our vision therapy program. Do you have any questions about how the program is structured?"

If the patient or parent is reluctant to schedule and the patient is symptomatic, the caller can say, "OK, I will let the doctor know." At that point, the doctor can ask the staff person to call back with further questions, or, time permitting, call the patient directly.

Calling to find out if the patient is ready to move forward with vision therapy gets old very quickly. You can only call so many times before you wear out your welcome. The key is to make each call different and as effective as possible.

Conclusion

The key to your success lies in two abilities:

1. Your ability to get excellent therapy outcomes,
2. Your ability to motivate patients to accept and complete vision therapy.

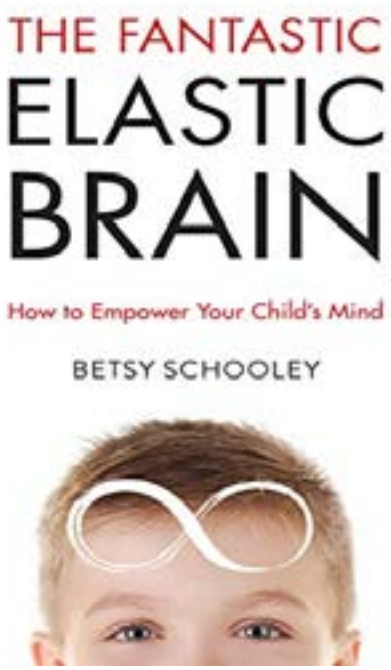
If you have concerns about the quality of your vision therapy program, it is vital that you get that resolved as rapidly as possible. Some excellent resources include OEPF, COVD, NORA, and ISVA. All four organizations hold regular conferences where excellent continuing education programs are presented.

Clinical knowledge and skills are not enough. To be successful, you must be able to motivate patients to accept and complete the therapy program. These skills play a critical role in ensuring that patients get the care that they need. Patients will pay for vision therapy out-of-pocket, if need be, when they truly understand the need for care. If you plan on having a practice that is not dependent upon third-party coverage, it is vital that you develop sufficient communication skills to ensure that patients follow through with your recommended treatment plan. It takes training and practice, as does anything that is worth achieving.

Correspondence regarding this article should be emailed to Toni Bristol at tonibristol@expansionconsultants.com. *All statements are the author's personal opinions and may not reflect the opinions of the representative organization, OEPF, Optometry & Visual Performance, or any institution or organization with which the author may be affiliated. Permission to use reprints of this article must be obtained from the editor. Copyright 2022 Optometric Extension Program Foundation. Online access is available at www.oepf.org and www.ovpjournal.org.*

Bristol T. Presenting the results of the evaluation. Optom Vis Perf 2022;1(COVID):66-74.

The Fantastic Elastic Brain: How to Empower Your Child's Mind
Betsy Schooley



The Fantastic Elastic Brain covers many topics pertinent to optometrists, vision development, and vision therapy. This book explains how visual problems develop and how parents can begin at their child's birth to be sure that they do not develop vision difficulties from feeding, crawling, or retained reflexes. It gives examples of how vision therapy used in behavioral optometry retrains the brain to perform visual skills more effectively.

Two chapters are devoted to eyesight, vision, visual skills, amblyopia, strabismus, and vision therapy. Other chapters relate to our field, including retained reflexes, dyslexia, autism, educational kinesiology, and Balametrics. Nearly every chapter has accompanying brain activities and exercises.

This book is very readable for patients and parents of patients in vision therapy in your office as an explanation of why vision therapy is needed and what can be accomplished. It should be in every optometrist's office.

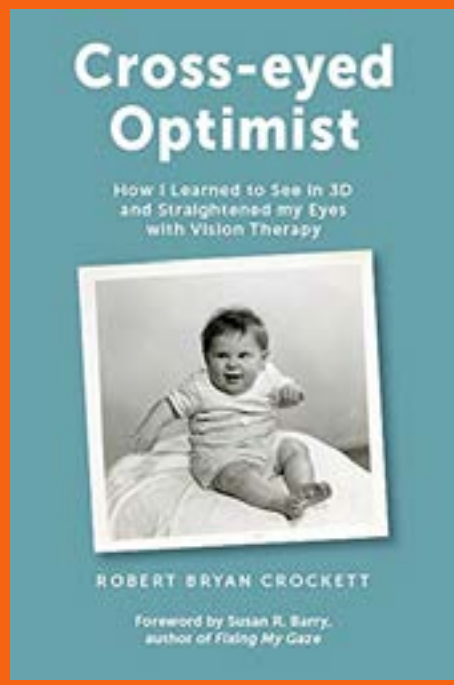
Cross-eyed Optimist: How I Learned to See in 3D and Straightened my Eyes with Vision Therapy by Robert Crockett

After developing crossed eyes (strabismus) as an infant, Robert underwent two eye muscle operations by the age of five. He was left with two eyes that appeared straight but did not work together. All his life, doctors told him he'd never see in 3D.

Like the four percent of people who have a binocular vision disorder, he saw his world as "flat." Worse, he felt broken, and he endured lifelong difficulties with reading, concentration, behavior, spatial awareness, and more.

Despite his vision challenges, he became a pilot, master boat builder, MBA recipient, and life coach – by first hiding his problem, then learning how to adapt to a world that he couldn't see properly.

At 70, he discovered vision therapy – a non-invasive method of retraining the brain and harnessing the power of neuroplasticity to see in 3D. This is Robert's story of a lifelong struggle and the joy of finally getting his eyes to work as a team. As an optimist, he never gave up, and he now encourages others to consider vision therapy, a proven alternative to surgery.



To purchase click https://bit.ly/2XXnxd

Upcoming Events

OEPF Clinical Curriculum - VT1/Visual Dysfunctions
Wed, February 23 - Sun, February 27, 2022
LOCATION: Over the Internet
SPEAKERS: Geoff Heddle, OD & Robert Hohendorf, OD
EVENT INFO: https://bit.ly/3EJnqSF

OEPF Clinical Curriculum - VT2/Learning Related Visual Problems
Wed, March 16 - Sun, March 20, 2022
LOCATION: Over the Internet
SPEAKERS: Geoff Heddle, OD & Robert Hohendorf, OD
EVENT INFO: https://bit.ly/3pzNMQi

OEPF Clinical Curriculum - VT3/Strabismus/Amblyopia
Thurs, April 27 - Sun, May 1, 2022
LOCATION: Over the Internet
SPEAKERS: John Abbondanza, OD & Geoff Heddle, OD
EVENT INFO: https://bit.ly/3Ghqohp

Troubleshooting Your VT: A Deep Dive into Making VT Successful for Your Patient
Sat, February 8 - Sun, February 9, 2022
12 hours (6-hour sessions)
LOCATION: Over the Internet
SPEAKERS: Tom Headline, COVT
EVENT INFO: https://bit.ly/3iflhn4

Adding Color Vision in Your Practice: A 4-hour Workshop
Sat, June 18 & Sun, June 19, 2022
4 hours (2-hour sessions)
LOCATION: Over the Internet
SPEAKERS: Jason Ng, OD, PhD
EVENT INFO: https://bit.ly/3EXPUII

Follow-up to Multisensory Model Neurological Implications for Improved Optometric Success and Treatment
Sat, February 12 - Sun, February 13, 2022
12 hours (6-hour sessions)
LOCATION: Over the Internet
SPEAKERS: Celia Hinrichs, OD & Randy Schulman, OD EVENT INFO: https://bit.ly/3Gfwyi7

School Accommodations for Schooling of All Levels
Thurs, March 3 & Thurs, March 10, 2022
4 hours (2-hour sessions)
LOCATION: Over the Internet
SPEAKERS: David Damari, OD
EVENT INFO: https://bit.ly/3kK0TgD

Building Blocks: Vision Therapy for Young Children
Sat, April 23 - Sun, April 24, 2022
12 hours (6-hour sessions)
LOCATION: Over the Internet
SPEAKERS: Jennifer S. Simonson, OD
EVENT INFO: https://bit.ly/335itpa

Ins and Outs of TBI/ ABI/Stroke and Overall Brain Injury, with discussion of case studies and the opportunity to discuss your own cases
Sat, October 15 - Sun, October 16, 2022
12 hours (6-hour sessions)
LOCATION: Over the Internet
SPEAKERS: Melissa Zarn, OD & Chris Borgman, OD
EVENT INFO: https://bit.ly/3ouvl0s

For a complete list of events, please visit the OEP website at: bit.ly/OEPFcalendar