ARTICLE

Finding the "Eye" Amid a Pandemic Storm: A Holistic Guide Toward Visual and Autonomic Balance

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ABSTRACT

In March, 2020, the world was confronted with the COVID-19 pandemic and worldwide governmental orders to "shelter in place." Within days of this externally-imposed hardship, threatening plans for gathering in every community, behavioral optometry organized a platform for virtual education which united the vision therapy community in mutual self-education, shared over 55 countries around the globe. The following article is distilled from a 4-part series of lectures presented by the author, Dr. Samantha Slotnick, on "Making Remote Vision Therapy Valuable." These lectures constitute a guide for acting in a supportive capacity for our patients, with attention to the reciprocal roles of a balanced, open and available visual process, and a balanced autonomic nervous system. It addresses the impact of the sympathetic response on the visual system, and offers guidance to help patients self-modulate the state of their nervous systems, with both bottom-up and top-down direction. In particular it elucidates the role of the peripheral visual field in both stress modulation and binocular visual skill development. It offers recommendations on conducting optometric assessments through the telehealth interface, as well as providing vision therapy through a video-based portal. Through the hardship the pandemic has created, and the wonder of technology, this isolating experience may in fact serve as an opportunity to hone our single most valuable tool in our practice: Ourselves, and our ability to facilitate change for others.

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INTRODUCTION

This article is distilled from a series of lectures titled *Making Remote VT Valuable*, which were contributed to the "I Heart VT" platform in the first month of the COVID shut-down (www.iheartvt.org). For several weeks leading up to the shut down (necessitated by the pandemic of COVID-19), I had been actively supporting my "Vision Team" and patients with a conscious elevation of self-management protocols and supports. I purchased aromatherapy diffuser units to soothe our patients and staff with lavender, and to generate an unconscious impression of cleanliness with lemon oils. I began actively buffering my immune system with a liquid tincture of Echinacea, and offered to provide this for my team members. Our office in Westchester County, NY was at the center of the first hot spot for COVID-19 in the United States, and there was precious little time to acclimate. Every day brought new challenges, with schools closing and patients being quarantined. We responded with a problem-solving spirit, creating Zoom video-

conferencing accounts and transferring the majority of our patients to a remote-based vision therapy platform.

For the first few days of remote VT operation, I continued to receive patients for exams, and I could keep an ear open to my therapists conducting video sessions from the adjacent space. They were able to draw upon the familiarity and resources of our therapy room as they became acquainted with the platform and with the creative problem-solving which remote guidance requires. In the meantime, government guidelines rapidly evolved from limiting gatherings to less than 50 … less than 10 … less than 5 people in an area.

The societal wave of anxiety was palpable for every person in Westchester. Rubbing alcohol, toilet paper and Lysol disappeared from shelves within the first few days. In the office, we received last minute cancellation calls from panicked parents who opted to wait on line at the supermarket rather than keep an appointment. We donned surgical masks and increased our cleaning protocols between patients.

In these lunch gatherings, I actively coached my team on the importance of maintaining an energy of calmness and strength: Our patients needed it. My team members' families needed it as well. We discussed the abrupt change in the environment, the loss of schedule and routine, and the critical role of supporting our patients as human beings. This was not a new aspect of our therapy, but perhaps a new emphasis. I coached our therapists to help our patients in this difficult time re-establish their sense of having a foundation: One cannot build and grow upon unstable ground. We reinforced for patients their ability to employ conscious control over their own nervous systems, with techniques promoting breathing, visualization, and active relaxation. Our patients were in need of self-empowerment to weather the pulse of anxiety which had taken hold of their households, the county, New York State, the country, and the globe. Amid the cyclone of panic, fear and change, we coached our patients towards the proverbial "eye of the storm," the quiet, balanced centering of the self.

Understanding that it would be difficult for families to adapt to their new world and continue to manage their vision therapy home activities, I suggested that our therapists tune into their patients near the end of each session and try to identify: *What is the "ONE THING?"* What is the top priority for this patient? This could be an activity or simply a concept to keep in mind during the coming week, as will be elaborated below. It seemed most critical that our VT sessions help our patients feel stronger and more well with each encounter, and that home assignments should not weigh upon patients as an added load.

Background

During the third week of March, 2020, I was approached by Kelin Kushin on the prospect of providing content for a virtual conference, to be run for the month of April, as referenced in the Introduction above. She wrote:

> *In light of all the conference, course, seminar, etc cancellations all around the world for the foreseeable future, I am working on organizing a virtual world conference – it will be called the I ♥ VT conference – that will run the entire month of April. We have organizations and speakers from around the world coming together very quickly and it's very exciting. I want to talk to you about getting involved.*
>
> *It is non-commercial — no sponsors, no exhibitors, etc. It's not for making money at all, it's to bring people together in an organic and positive way to show we can still share and learn and collaborate despite the restrictions on physically gathering. We've got content for OD's, VTs, students and we have about 15 countries already represented.*

Please let me know if you are interested in participating.

Having provided remote vision therapy for several years, I thought I could offer some coaching on how to provide true value in remote vision therapy, similar to the guidance I was providing for my therapists. I quickly brain-stormed a four-part lecture series for the four Mondays in April, intending to offer a combination of tips, advice, and perspective.

I was excited about the far-reaching potential of connecting with a worldwide audience. My intent was to connect the dots between a balanced nervous system and an available visual system. What I was not prepared for was the overwhelming and positive feedback I received from doctors and therapists expressing appreciation that my series had *inspired* them.

Our practice identifies itself as providing a holistic approach to vision care. My own background and training in diverse healing disciplines has permeated my therapy programming and my approach to wellness. Many of the principles I employ in the therapy space constitute "foundation laying" by preparing the individual to be ready to receive visual information, and to organize it. I have held much of the connection between the body, the breath and the vision to be self-evident. My *I Heart VT* encounters helped me see that these connections are not as well-recognized as I had presumed.

This article offers substantiation for the direct impact that a balanced autonomic nervous system has on the visual process. It is my hope that this not only helps optometrists to expand what we consider to be within our scope of treatment, but that we doctors develop a deeper appreciation for the dictum, "physician, heal thyself."

Providing Valuable Remote Vision Therapy

Delivering remote vision therapy services provides an unusual opportunity for therapists and providers to expand their fundamental understanding of the visual process, and to develop outstanding communication skills. Patients in remote vision therapy have the potential to become more actively engaged in their treatment process, with the therapist directly facilitating activities in the patient's habitual environment. The true measure of progress in vision therapy is the ability for patients to apply their newly developed skills into real life. Real life provides constant opportunities for visual skills to be used and for visual information to be processed. Thus, the only true requirements for remote VT are for the therapist to be adaptable and flexible, with:

1. a robust understanding of the visual process and
2. a mindset on how to help each particular patient enhance the use of his/her own visual skills.

"Leave Them With 'One Thing'"

The therapy process is a vehicle for self-directed change. With that, a critical aspect for patients to adopt is the practice of short-term intention-setting. It is not the procedures which bring change, but rather the mindset of having goals and taking steps to meet them. If a patient comes away from a session feeling overwhelmed, then the therapy does not have its desired effect.

As noted above, I recommend that therapists conclude each session by helping each patient identify a single, most important objective for the week(s) to come, which will keep them moving in the right direction. This addresses the behavioral aspect of therapy, motivating and engaging patients to feel good about themselves as they readily meet their minimum hurdles. It helps patients develop a self-appreciation mindset, rather than dwelling on what they may have failed to do. When patients are intrinsically motivated toward change, and feeling proud of themselves for their active efforts, they will often take the opportunity to do more.[1]

How to select that "one thing"? When one's model of vision is well-integrated, the therapist can help the patient select an objective which addresses the individual's foundation, or the broadest base at which change can propagate through the system (depending on treatment goals). In my practice, I refer to this as finding the "first domino," whose impact carries forward through the entire system. Depending on the patients' particular challenges, they may be stumbling at various points along the way. However, by selecting a target which will lower a number of other hurdles, the patient can move through the therapy process more efficiently, and with greater self-satisfaction.

Autonomic Balance

Within the visual process, the use of one's peripheral visual field directly impacts the performance of all other visual skills.[2,3] The peripheral visual field is the processing area over which movement is detected, to guide smooth pursuit[4,5,6] and to inform the direction for saccadic eye movements.[7,8,9,10] Larger visual fields are far easier to fuse binocularly than small visual fields. (An informal conversation among astronomy enthusiasts identifies challenges with maintaining single vision with binoculars when viewing a limited/ nighttime visual field.[11]) With accurate binocularity offering a coarse guide on distance from a target, accommodation is quickly honed as well. Thus, it is a great advantage to enhance peripheral visual processing skills and availability.

An even earlier "domino" in this process is the Autonomic Nervous System (ANS), which directly impacts all of these skills and more. In fact, if a patient is in "sympathetic overdrive," all of the above visual skills are adversely impacted. Furthermore, the patient's memory and retention for the work accomplished in the session are adversely impacted as well. Effective therapy begins with effective management of the sympathetic nervous system response (see Table 1) and the sympathetic overdrive cascade (see Table 2).

Table 1. Sympathetic Nervous System Modulatory Responses

- Pupils dilate.
  - Demand for accommodative accuracy increases (due to large pupils).
- Accommodative facility reduces (modulated by parasympathetic NS).
- Blood flow to the retinal periphery reduces, creating Tunnel Vision.
  - This is visible during retinoscopy as a decrease in the color saturation in the red/orange reflex.
  - Variations in retinoscopy color have been observed with cognitive engagement during near-point retinoscopy: There is a tendency for the reflex to brighten (flash white) when the viewer is under stress. Dulling of the red tone occurs with loss of cortical contact with the target.[12]

Table 2. Sympathetic Overdrive Cascade and Visual Imbalances

⇨ Dilated, imbalanced ("alpha-omega") pupils[a,13,14]

⇨ Constricted peripheral vision

⇨ Reduces available information for eye-tracking/ ocular motility skills

⇨ Reduces facility of eye-teaming (binocular alignment)

⇨ Reduces accuracy of distance estimation (binocular triangulation)

⇨ Reduces accuracy of accommodation (via binocularity, as well as lack of parasympathetic control with excessive sympathetic NS tone)

Over the last several years, our practice has observed a marked increase in the number of young patients who present with eyes "like saucers." These wide open pupils seem to be the mark of excessive time spent with video games, tablet and cell phone use. Transition into remote, video-based schooling has only increased these children's screen time exposure. Thus, our first phase of remote vision therapy takes a pointed look at each patient's sympathetic NS response. We want our patients

a. The "alpha-omega" pupil response is a closing down of the pupil with a rebound as large or larger than before the light was shown into the eye. The sympathetic response outweighs the parasympathetic reaction to light, redilating the pupil with an early pupil release.

to become proficient at self-assessment of their sympathetic overdrive symptoms, and we provide tools which support self-management of this life-long balancing act.

Treating Sympathetic Overdrive

Just as each patient may release stress through a variety of different outlets, providers have many portals through which we can help a patient learn to modulate their nervous system activity. We suggest selecting the path of least resistance for your patient from a variety of stress-reducing methods, including: Optometric Syntonic Phototherapy ("syntonics"), Primitive Reflex integration, Visualization and grounding techniques, Peripheral Visual Information Processing Skill (VIPS) development, and central-peripheral integration techniques. The following is a concise overview of these four methods that lend themselves to telehealth or remote vision therapy.

Syntonic Phototherapy

The term "syntonics" takes its etymology from the Greek *syn-* and *tonos*, meaning "same tone," and from the Greek term, *synton(os)*, to harmonize. Optometric syntonic phototherapy refers to the balancing of tone of the autonomic nervous system through the application of light frequencies.[b] In addition to selecting filter combinations through which patients may view a light source, we utilize a syntonic technique called "nascentization." Nascentization is "The act of employing frequencies through the visual functions to disturb or dissociate old combinations of nervous habits, thus rendering the patient susceptible to the formation of new combinations of nervous relationships."[15,16] Etymologically, *nascentization* is from the Latin, returning to birth. We employ the alpha and omega filters, one over each eye. Alpha passes light in the red band, stimulating the sympathetic response; omega passes light through the blues and violets, with a small peak of input in the red band as well, and stimulates a parasympathetic response. We use alpha over the non-preferred eye-channel (with rare exception). During nascentization, as the two stimuli are managed together, the brain and visual system are invited to re-establish balance, and to re-organize the respective roles of the right and left eye-channels in the gathering and processing of visual information.

The nascentization application has become the starting point for a host of activities that we employ, providing binocular biofeedback, and teaching the patient to exert responsibility and control over their own visual process. We utilize the "Slotnick Swirl™" as a viewing target, first for flat fusion and lustre, and later adding an accommodative component. These are available for download from my website as a set (see http://drslotnick.com/downloads).

Primitive Reflex Integration

These techniques are a wonderful way to help the patient bring the nervous system into balance, calling upon gross motor activities which establish body organization. In addition to helping the patient "ground" themselves and release excess energy, primitive reflex work helps the patient to create internalized maps, offering a critical foundation for developing and using externalized maps of one's space world.

Activities which discharge the Moro Reflex help the patient to better manage stress and the startle response. Employing the STNR (Symmetric Tonic Neck Reflex) prepares the patient to have greater ease with making transitions, both through space (for example, transitioning between near and far) and time (as when switching between activities). Working with the TLR (Tonic Labyrinthine Reflex) helps patients identify their own

b. For guidance on providing syntonic phototherapy, one may begin with resources provided through the College of Syntonic Optometry.

core/center as a reference, while attuning themselves to their orientation against gravity and the ground-plane. Working with the ATNR (asymmetric tonic neck reflex) helps the patient to exert conscious control over how they extend themselves into the world beyond their centers.[17,18]

Our patients have deeply enjoyed the "Meaningful Moves®" activities designed by our optometric colleague, Dr. Sarah Lane. Dr. Lane explains that the Hand Map and Foot Map help the patient reorganize the longest circuits of the body (to the palms and soles), and establish an organized map while simultaneously learning to release the plantar and palmar grasp reflexes.[19]

Visualization and Grounding Techniques

These activities can be combined with breathing direction as a powerful means to bring the patient's attention inwards. Once the patient has created supportive imagery which helps return their nervous system to balance, they can call upon their detailed image at any time and rapidly bring themselves back to the associated state. This can be one of relaxation, tension release, grounding, centering, orienting, and/or expansion. For an example, the iHeartVT.org archive will maintain my "Be a Tree" guided visualization.[c] Other visualization procedures that we employ include: "Melt into the floor," "Expand your Sphere of Awareness" (David Cook),[20] "Look soft like a butterfly alighting gently on a leaf," and soften your eyes/ orbits "like room temperature butter."

There is a tandem relationship between the sympathetic nervous system and the use of one's *peripheral vision*:[2] While it is true that an individual under extreme stress biases his/her attention to the immediate emergency before them, a person can also be trained to attend to one's peripheral vision. This confers the advantage of alerting the individual to what may be approaching. Thus, they are more inherently aware of their surroundings and as a result, their place within the surround, leaving them less frequently caught by surprise and less likely to be startled. Syntonic and primitive reflex methods can be conceived as bottom-up approaches to sympathetic NS management. In contrast, visualization and peripheral awareness activities can be considered top-down, mind-over-matter methods of modulating one's nervous system.

Once the sympathetic NS is receiving attention and support, the patient becomes more physiologically *and* cognitively[21] available for visually-centered therapy. With the "first domino" mindset, remote vision therapy can continue to yield functional fruit if the patient learns to maximize peripheral visual information processing skills (VIPS). Targeting peripheral VIPS helps to pave the way for all binocular activities, oculomotor skills, and accommodative work.

Training Peripheral Visual Information Processing Skills

The purpose of vision therapy is to help the patient learn to make more efficient, effective use of their visual process. In order to do this, the patient must learn to gather visual information efficiently, and to direct their visual attention efficiently. Visual availability begins with an open peripheral viewing area. There is a reciprocal relationship between *receiving* visual input and *directing* the eyes (visual receptors) in preparation for the next packet of visual input.

Marrying the data[22] over the binocular visual field into a single, solid percept is inherently more automatic when a large peripheral viewing area is processed for each eye. When one's attention is limited to a small central part of the field, it is relatively easy for the brain to independently

c. https://www.iheartvt.org/april-sessions, week 3, April 13, 2020. This lecture is also available for download from my website, Making Remote VT Valuable part 2 (at about 35 minutes into the lecture). https://bit.ly/3hj86AJ.

parse central data received through one eye without relating it to the data originating from the other. However, as one expands the receptive visual field, the natural potential for pattern recognition helps the brain merge the right eye and left eye perceptions into a single composite image. The perception of stereopsis is the result of the perceived offset of *non*-central points in the visual field as detected by one eye compared to the other. Thus, training peripheral vision facilitates binocular potential.

Whether working with patients remotely or from within an office-based vision therapy environment, training peripheral VIPS raises the potential for binocular VIPS.[23,24] Patients who may have hit a plateau in their progress when working directly on binocular vision skills may find that peripheral visual field expansion work creates a new, engaging, intrinsically motivating set of activities which directly subserves the entirety of saccadic eye movements, binocular fusion ranges and recoveries, visual-motor planning, central-peripheral integration, stereo-volume and stereo-acuity, visual processing speed, reading comprehension, timing, and many more aspects of the visual process.

There are four key principles we employ to train peripheral VIPS:

1. Tachistoscopic presentation
2. Peripheral motion stimulation
3. Simultaneous processing in problem-solving
4. Time factor/ anticipation

Tachistoscopic presentation is the rapid presentation of visual information, such that there is insufficient time to execute a saccadic eye movement. Saccades are executed after a latency of 200-250 milliseconds.[25] The standardized tachistoscopic visual memory test[d] presents digits for 1/6 second (0.167 second). In therapy, by limiting target presentation to about 0.25 second, the viewer does not have sufficient time to take multiple glimpses of the target. In therapy, targets may be arranged in a variety of layouts to help the patient learn to process and trust non-central visual information (either entirely peripheral, or combining central and peripheral presentations). This can be done with clusters of letters, numbers, shapes, colors, forms, etc. It can expand to include multiple items over a grid, arrangements of shapes over a board at the desk[e,26] and rapidly presented images projected onto a whiteboard or chalkboard.[f]

How might such rapidly gathered information be put into use in real-world scenarios? In order to gauge the influence of use of the visual field during visual search among those with physiological field limitations, Eli Peli and colleagues designed a study to compare saccadic eye movements between patients whose visual fields were limited to "tunnel vision"[g] and normal controls. Experiments evaluated walking in the streets of Boston, as well as a visual search task in a laboratory. Interestingly, patients with visual field limitations frequently made saccades beyond the edge of their visible field. "Subjects said that objects in their post-saccadic views are perceived as if they have been there all along and just became visible, rather than perceived as suddenly emerging." This suggests a non-visual, top-down origin of the eye movement, as a means of gathering visual information to fill in the world-view, rather than to gather additional details from a target which is already within view.[27]

d. Test software available within "PTS Test", by HTS, Inc. (Home Therapy Solutions), https://visiontherapysolutions.net

e. We use parquetry blocks, in the style of the Wachs Visual Blocks test.

f. Dr. Gregory Kitchener, Cincinnati, OH, provided a highly instructive seminar on the "Form tach testing procedure," demonstrating the tachistoscopic presentation of forms onto a chalkboard which are viewed at a distance and then reproduced on the board: "same size, same shape, same place." IHeartVT series, April archive.

g. All study patients had visual field loss due to retinitis pigmentosa, and no isolated islands of vision, as confirmed with Goldmann perimetry.

There was one notable difference between the subjects and the controls: Subjects with limited visual fields tended to make far more vertical saccades, particularly when walking.[27] This is likely due to a need to check the ground for obstacles, rather than detecting them over an open field. Indeed, this is a common habit which vision therapy patients learn to change during activities such as Infinity Walk, expanding peripheral awareness to include floor-level obstacles while maintaining eye-level fixation for a chart on the wall. Tachistoscopic training also primes patients to process peripheral information, by presenting targets without providing sufficient time for central fixation and evaluation. With practice, patients learn to make more *functional* use of the open visual field.

Peripheral motion stimulation takes advantage of the fact that the visual system is designed to detect change within the visual field. Motion is one of the key means of drawing attention, whether it is presented centrally or peripherally. *Central* motion stimulation is the principle on which the MIT (Macular Integrity Tester) is based, as well as the Slotnick Swirl™. In contrast, peripheral vision draws attention through motion accentuated in the retinal periphery. Consider a fly whirring in your peripheral view, or the sudden awareness of activity which may draw attention and initiate a glance into your peripheral visual field, often along with a reflexive head turn. Individuals who are in the habit of tunnel-vision can widen their field of awareness through peripheral motion, cueing the patient to attend to information falling on the peripheral retina. By presenting activities which require a response to such stimuli, the patient learns to attend to, process, and become available for peripherally presented data. Examples include:

- Tossing a beanbag towards the patient while she maintains central fixation on a steady target, or reads a chart suspended on a stand or Space Fixator.
- Presenting a kinematic target over the visual field with computerized games. Lumosity.com® offers a game with movement over a large field, called "Ebb and Flow," where the viewer indicates either the direction of motion or the direction the objects are pointing, depending on their color.
- Games which employ balancing objects or creating a mobile without knocking it over (Suspend, by Melissa and Doug®) naturally generate peripheral motion via the interconnectedness of parts. Removing parts ("unbuilding" the structure) tends to be more effective at stimulating peripheral retina, sometimes creating movement where the player had not anticipated it.

Simultaneous processing in problem-solving taps into the potential of visual information processing to assess an array of visual data in a single instant. When that single instant is finite, we refer to the presentation as being tachistoscopic. However, when presented with puzzles or challenges, the viewer employing simultaneous processing of the array is rewarded with a speedy solution, integrating and organizing spatial

Figure 1: IQ Fit puzzle, simultaneous processing example: Can you assess the empty space, the two pieces, and visualize the solved puzzle?

relationships over an area or volume of space. This is the "A-ha!" moment where the solution is instantly apparent, based on the simultaneous consideration of multiple components, rather than achieved through trial-and-error or sequential considerations of each component. In **Figure 1**, the game shown is IQ Fit,™ by SmartGames.® In this example, pieces have already been placed according to a map from the challenge booklet, leaving the spatial challenge of completing the puzzle with the two remaining pieces without leaving empty holes. Each three-dimensional piece consists of a spine with leg-extensions which are orthogonal to the spine and to each other. Each piece may be placed so that either one leg or two legs are protruding from the spine, for a total of eight potential orientations. The example shown in Figure 1 includes the two pieces remaining. Can you assess the empty space and the two pieces, and visualize the solved puzzle?

Figure 2 shows four potential first-steps (Figures 2a-2d) which may be considered in a sequential, trial-and-error fashion. Which one of these yields the proper solution? Which *process* rewards the efficient, effective use of visual information processing skills? The ability to simultaneously assess and consider multiple forms over a field is employed with a combination of expanded peripheral visual processing, visualization and visual manipulation. While a sequential approach to the same challenge may ultimately yield the same solution, it is not likely to do so consistently with the same efficiency. The sequential approach can be carried out with central attention, whereas the simultaneous approach necessitates the expansion of visual attention into the peripheral field. (For the solution see **Figure 5**.) Thus, by working with games and puzzles which present visual challenges that reward the efficient skill of simultaneous visual processing, patients can be trained to expand the visual area or volume over which they routinely process visual information. This opens the functional visual field, which broadens the area of visual availability, and in turn supports binocular alignment and stereo-volume processing.

There is a reciprocal relationship between one's sympathetic state of arousal and one's comfort when presented with visual puzzles: It is worth acknowledging that individuals who enjoy visual puzzles tend to employ a calm, neutral, available state while observing the puzzle components, naturally expanding their available visual processing area, and thus closing on solutions efficiently. For those who find puzzles stress-provoking, they are likely experiencing a stress-reaction while viewing the same challenge. This biases the stressed viewer's visual field towards tunneling, and thus the viewer may resort to hasty attempts at trial-and-error to meet the challenge, with less consistently rewarding outcomes.

Time factor/anticipation is the fourth key principle we employ to train peripheral VIPS. Patients can be trained to organize the relationship between their central vision and their periphery in a variety of patterns. As we begin differentiating ourselves from the ground, exerting ourselves against gravity, we learn to value top/bottom organization.[2,28,29] Subsequent differentiations help us to establish left/right organization and central/peripheral organization, rotating our attention through quadrants or clock-hours. The reading process, for example, favors a linear/matrix approach, depending on the layout of text in one's native language. Exploring these organizational arrangements through *sequential* visual activities employs the fourth dimension, time, in combination with space.

By inviting the patient to direct their eyes ("look") at the next location, the patient has the opportunity to first assess where the "next" object is in the periphery, relative to central attention. Before executing a saccadic eye movement toward the peripheral object, the visual system calculates the vector of movement required to bring the area of peripheral interest onto the central retina for further assessment (i.e., to

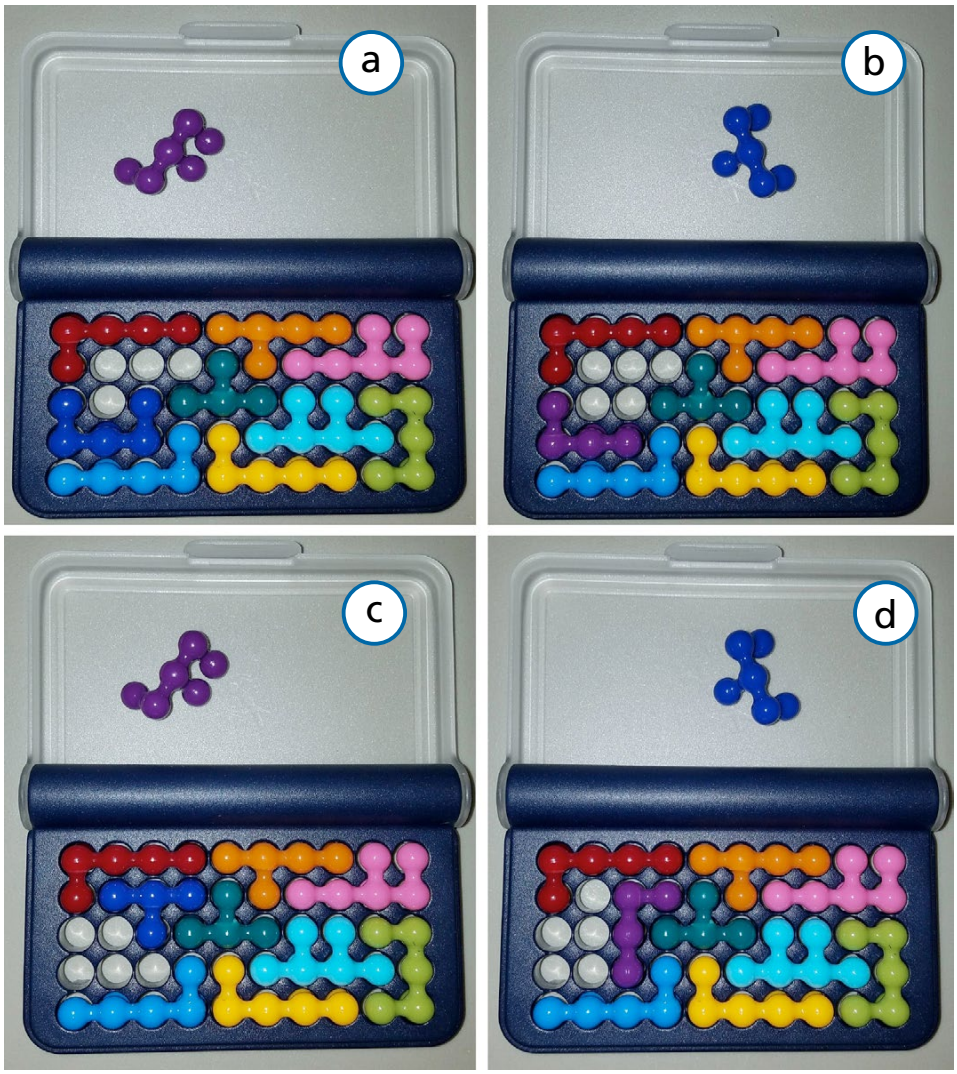

Figure 2: IQ Fit puzzle, sequential processing example: Which one of these "first trials" will yield the proper solution? (See Figure 5 for solution.)

"centrate"). It then calculates which extraocular muscles to engage in order to reach the intended destination. All of this is accomplished with a high degree of automaticity, but the process can be refined with some conscious application of attention and visual motor planning, calibrating the most efficient movements required to centrate upon specific areas of the peripheral retina. Essentially, the patient learns to expand and organize their visual attention over a series of related moments, developing an organized relationship in space-time between "Now" and "Next."

Keep in mind that "looking" is the active direction of visual attention toward an area or volume of space. The purpose of looking is to prepare oneself to *receive* data from the area/volume to which the eyes have been directed. While we may discuss these processes as if they are a sequential dance between peripheral awareness and central attention, this is an artificial distinction of the components involved in a simultaneous process: Where we look depends upon what we *already* see. What we receive depends on where we look. However, what we *perceive* depends on our ability to integrate *attention* over an area or volume of space … which is often larger than one's visual field in a well-organized visual system![27]

When we introduce a metronome or rhythmic component (such as a rebounder), we engage patients' awareness for multiple, successive "moments." As patients work through activities which are conducted in sync with the metronome, patients learn to plan their actions. The act of *anticipation* prior to execution trains patients to reach into the next moment of time, organizing "Next" with respect to "Now." This is accomplished whether attending to gross motor, fine motor, oculomotor, or the pragmatics involved to transition from one posture to the next.

Central-Peripheral Integration Activities

By introducing a temporal component, activities are layered with the potential for visually-guided *movement*. This may (or may not) be synchronized with an auditory ground. Planning engagement with space over time presents a prime opportunity to develop the building blocks for binocular vision. Central-peripheral integration activities provide a template for employing one's enhanced visual information processing skills during binocularly-guided movement control. This is the purpose of the visual process: To direct *action*.

Central-Peripheral Integration invites the participant to see the *whole*, where one is in relation to the whole, *and when* one is in relation to the whole. Familiar vision therapy activities which engage the patient to manage central/peripheral organization include the "Randolph Shuffle,"[h,30] and Ralph Schrock's "Look, Ready, Touch, Back" exercise.[31] Both are typically conducted with a metronome pulsing at 60 beats per minute, inviting the patient to synchronize speech and/or action with the auditory "ground." Beyond engaging retinal periphery, these exercises offer participants the opportunity to bring themselves into balance, and to stay *present*. The participant is present to proprioceptive aspects of the self and to directionality: *How am I?/ How do I feel?* and *Which way am I going?* Thus, the participant orients the self to the surround. In this regard, central/peripheral integration activities further support one's proficiency in bringing the nervous system into balance. By achieving a calm, neutral awareness for the *whole*, time becomes readily available to execute each *part*.

Treating Patients Through a Telehealth Interface

Working with patients through a video interface creates obstacles for vision care providers. However, many optometrists who offer vision therapy and rehabilitation are drawn to this field because it provides a creative outlet for problem-solving and troubleshooting. In fact, by simply directing our solution-oriented skills to the *interface*, this subset of optometrists is uniquely well-suited to adapt ourselves and conduct a number of assessments remotely. By stepping aside from our ingrained exam-room protocols, many of the objects of our assessment can be explored and monitored for progress. **Table 3** offers suggestions for conducting consults and progress-evaluations through a live video interface.

Patients involved in a remote vision therapy program will lose access to office equipment, machines and vectographic slides. However, the purpose of vision therapy is to help the patient make more efficient, effective use of their visual process in *the real world*, not on our office equipment. There are many alternative presentation options:

- Think "big picture":
  - Place a high priority on bringing the autonomic nervous system into balance.
  - Use free-space activities to present new visual concepts in body organization, visual motor integration, and central-peripheral organization.
  - Use distance to alter accommodative demand.

- Keep it interactive:
  - *The chart is not the activity!*
  - Use charts to direct visual attention. But take the opportunity to engage the therapy process of reflection, self-assessment, and planning.
  - With each activity, **Visualize, Evaluate and Plan:** Ask the patient, "How did you do? What did you like about what you did? What would you like to improve?" **(Figure 3)**

- Use the video interface:
  - You can present a target through the screen and watch eye movements directly, using the patient's webcam.
  - Zoom.com meetings allow the attendees to share a "white board" and to draw on it.
  - Patients can be given the "Remote control" to write on the board or to control a shared screen.

h. The Randolph Shuffle found its way to optometry via optometrists who had been trained at the Randolph Air Force Base. See Appendix for description and video demonstration.

Table 3. Adapting Optometric Management for the Video Interface

What do you want to know?	How can you answer your clinical question over video?
Symptoms/ complaints/ concerns?	Case history, COVD-QOL checklist
Can each eye see clearly? Equally clearly?	Visual Acuity, OU, OD, OS Conduct at distance/some limitations at near. Requires Measuring tape and knowing the letter height. Use the equation: $VA = \frac{\text{[test distance]}}{\text{[distance at which the smallest letter read subtends 5' arc]}}$[i]
Accommodative flexibility?	Present accommodative targets at distance and near. Assess the speed for refocusing and compare between the eyes, and to age-related expectations.
Are both eyes aiming in the same direction? At Distance? At Near?	Conduct Cover Test: • Direct the patient's fixation. • Direct the patient's covering/uncovering of the eyes, or alternate covering. • Use the webcam as a target for near. • Look directly above/beyond webcam for far.
Does patient have full range of ocular motility? o Binocularly? o Monocularly?	Observe ocular motilities directly through the screen, bringing gaze into all Diagnostic Action Fields (DAFs). May need to demonstrate target movement and viewing distance to an assistant from the side-view, using landmarks of the shoulders and a target about 16" in front of patient.
How are the patient's eye tracking skills? o saccades o smooth pursuit o steady fixation	Place sticker(s) on your finger(s) while guiding and observing patient motility, OU and OD/OS.
What is the patient's range of single-and-clear binocular vision?	Conduct NPC (Near Point of Convergence) test, observing both convergence and subsequent, steady divergence. Pair observation of eye movement with target movement. May need to demonstrate the test for the patient / assistant from the side-view. Similar testing can be explored with successive binocular fixations between a proximal and a distal target: Keep the near target ~2-6" from nose at midline (skill dependent). Move the distal target into left/right/up/down-gazes.[32]
Are the eyes healthy? Is there a medical concern?	Good quality anterior segment ocular photos can be obtained/ emailed with most modern smartphones. Employ risk/benefit consideration when addressing symptoms indicating a posterior segment or systemic concern.

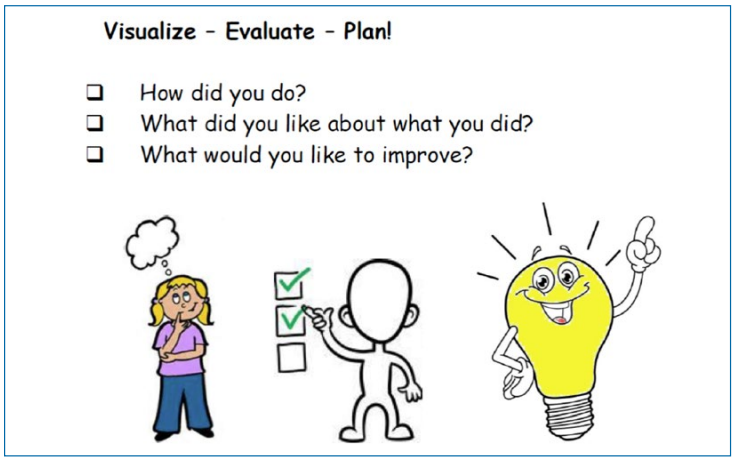

Figure 3: **The therapy process:** Reflect on performance, self-assess, and make a plan to modify the performance. If the performance was near-perfect, have your patients consider how they would like to *load* the activity to raise the challenge.

  - o Computerized vision therapy software can be presented as a shared screen over the video interface.

- Keep binocular alternatives in mind:
  - o Present free-space binocular activities, such as Pointer/Straw, Horizontal Rotations (tracing a circle through space along the patient's z-axis, **Figure 4**), Thumb-Pinky Vergence Rock,[33] Marsden Ball activities, Brock String, Eccentric Circles, "Magic Eye" images, and other free-fusion targets.

i. Randomizing Visual Acuity Charts designed for telehealth interface use, with automated calculations in both 20/__ and 6/__ notation, are available for download from http://drslotnick.com/downloads.

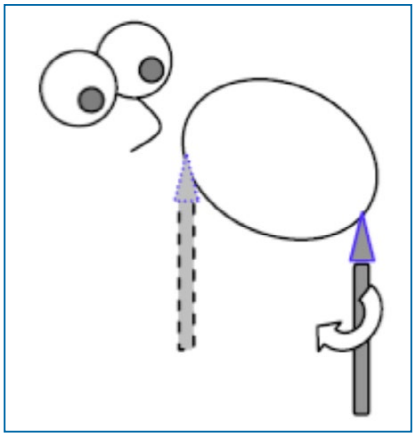

Figure 4: **Horizontal Rotations:** Visualize a horizontal circle (parallel to the floor). Visualize a rubber band connecting both eyes to the pen tip. Now trace the circle while tracking the pen. Explore clockwise, counter-clockwise, right hand, left hand.

- o Add a loose prism for small jump ductions in free space.
- o Equip patients with red/green glasses with removable filters to create MFBF (Monocular Fixation in a Binocular Field) activities in free space (for which you may filter only the preferred eye, leaving the non-preferred eye an unfiltered view of a colorful game).*

** Employ the family's personal game collection, and elevate their toys and games into vision therapy activities!*

- o Red/green lustre can be used for near/far fixations on a white chart.
- o Red/cobalt blue filters can be used for a variety of exercises based off the Slotnick Swirl™, including BAR (Binocular Accommodative Rock) with flippers, and small jump ductions with prisms.

- Support the perceptual skills that support binocular vision:
  - o Tachistoscopic presentations/ games
  - o Peripheral motion stimulation
  - o Present puzzles and games which encourage "visual thinking" over an area/volume. (Simultaneous processing in problem solving)
  - o In addition to working OU, work on VIPS through OD and OS, particularly in the presence of binocular dysfunction. (Even non-strabismic patients can behave as though they have monofixation syndrome!)

Recommended Remote VT Equipment:

- Flippers: ± 0.50 *and* ± 0.75
  - o In combination, this can yield ± 0.25, 0.50, 0.75 and 1.25, for either binocular or monocular use.
- Stick prisms ("prism lollipops"): 4^ *and* 6^
  - o In combination, this can yield 2^, 4^, 6^ and 10^
- Filters: red/green with removable filters, and red/cobalt-blue for use with Slotnick Swirl™, binocular biofeedback.
- Loose Lenses: +1.00, -5.00
  - o Use (+) lens with intermediate/distance activities to promote release of accommodation.
  - o Use (-) lens with lens tromboning to create a range of accommodative demands. Combine focal length with back vertex distance for effective lens power. A 5D lens has 0.2m focal length:
    - ▸ Held at 50 cm (0.5m), a -5.00 lens (0.2m focal length) provides 1.42D demand:
      - ➡ 0.5m + 0.2m = 0.7m. Diopters: 1 / 0.7m = 1.42D
    - ▸ At 30 cm: 2D demand
    - ▸ At 20 cm: 2.5D
    - ▸ At 10 cm: 3.3D
    - ▸ At 5 cm: 4D
    - ▸ At 2 cm: 4.5D
    - ▸ At cornea: 5D
- Eye patch
- Brock String
- Marsden Ball

Figure 5: IQ Fit example, solution.

CONCLUSION

When continuing management for patients in an active vision therapy program, progress evaluations may incorporate the testing presented in Table 3, along with specific guidance and feedback using the equipment/ prescriptions they have available (see Recommended Remote VT Equipment).

Are their needs being met with their current Rx? Do they have multiple prescriptions? Can they explore activities through both a distance and a near or intermediate Rx to develop binocular flexibility? Can you use therapy tools (flippers or prisms) to assess the impact of power adjustments on their performance? Occlusion placement (e.g., binasals) can be modified with scotch tape, directing the patient/ assistant directly over the video interface. Specific concerns can be addressed with the addition or modification of specific vision therapy activities.

Successful management of vision therapy patients over a video interface may certainly present challenges and changes in our routine. As we face a new frontier in our relationships with people across space, curiously both separating us and yet making the world smaller through video portals, I wish to leave you with "one thing": Consider that our therapy toys and equipment are just tools which we use to illustrate a visual concept. In truth, we do not *need* all of the bells and whistles in our offices to bring value to our patients. With all of our knowledge, training and experience, by far, the most expensive, most valuable tool in each of our respective toolboxes is *ourselves*. Just consider how much richer we may be when we return to our offices with enhanced communication skills and a deeper appreciation for our ability to escort our patients to balance.

Disclosure

Dr. Slotnick provides seminars, content and materials as an optometric consultant.

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Dr. Samantha Slotnick has a diverse background in optometry and vision research. She is a graduate of SUNY College of Optometry where she completed her Residency in Vision Therapy and Rehabilitation along with advanced studies in Vision Science. She then attained Fellowship in AAO and COVD. She has conducted both functional and anatomical vision research. Her current focus is her private behavioral optometry practice in Scarsdale, NY from which she also provides educational consulting for patients and professionals through video interface, as well as on-site. She also devotes time for lecturing, and has been invited to present on five continents to date.

With the recent improved facility for global presentation, Dr. Slotnick is designing a new seminar series for an international audience. She also supports professional education as a COVD mentor, as a member of the organizational board of Eastern States Optometric Congress, on the OEP educational committee, and on the Journal Review Board of *Vision Development & Rehabilitation*, the COVD journal.

The Randolph Shuffle:

Conducted from standing position.

Limbs are extended "Front." "Side." "Front." and back to starting position.

Arms: Bring up to shoulder height, straight arm, hands flat, fingers together. Arm moves to front, to side, to front, and back, all without pivoting torso.

Legs: Point toe and touch it to the floor directly in front of resting foot location, or to the side, all without pivoting hips.

The sequence of movements is:

- right arm
- left arm
- right foot
- left foot
- both arms
- right arm – right foot
- left arm – left foot
- right arm – left foot
- left arm – right foot
- both arms – right foot
- both arms – left foot

View demonstration video below.