I DIDN'T KNOW WHAT I DIDN'T KNOW
... about student vision disorders.

Janice Cook, NCTM
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A "formerly clueless" veteran music teacher shares what she was never taught about hidden vision disorders in children. Hear how her vision education has impacted her students' musical and academic lives, as well as their personalities and self-esteem.

When students look at their music, do they see blurry notes, notes moving around? Students with undiagnosed vision disorders have difficulty reading music. Be the teacher they *need* by learning crucial information about music vision.

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Spring of 2023. Written by me to a colleague: "Just two weeks ago another student of mine was diagnosed: a 9-year-old boy whose progress is slowing, who is easily distracted, who blurted out, "When you ask me to concentrate, it makes my head hurt, and I feel like I am sideways." I wrote this down word for word.

Ten years ago, I would have asked him to go get a drink of water, wiggle/relax his shoulders, and get back to what we were doing. *Now* I understand that he was miraculously telling me exactly the frustrations of a vision disorder, often manifesting itself in headaches and dizziness. Kids do not know that they have a problem - they think everyone sees the way they do. It is rare that a student is able to give this kind of information, *and I thanked him for helping me understand!*

That same evening, I wrote an email to the parents, quoting their son's exact words and sharing other "red flags" I had been seeing in recent lessons. I also shared information about vision disorders and a document I made: a list of sixteen Developmental Optometrists in the Columbus area. These parents acted right away, making an appointment the very next morning. I wrote a document that they could hand to the doctor at that appointment, which prompted her to schedule a follow-up appointment dedicated to visual functioning." It is almost one year later and, after vision therapy, this boy is excelling and is a happy camper.

I keep learning more all the time. I have come to realize that most adults are clueless about hidden vision disorders, including many classroom teachers. I now have a clue and have become an advocate for children, teaching them to recognize their issues and to be brave enough to help the grown-ups understand.

Seeing is Achieving

Uncovering the Hidden Vision Problems that May Impact Student Performance

By Shane Foster, OD

Have you ever had a student that was fidgety, had difficulty concentrating or complained of headaches? Did you ever think that a vision problem might be to blame?

It goes without saying that vision plays a crucial role in the learning process. In fact, 80% of what we learn every day comes to us as visual input. However, 1 in 5 school-aged children has a vision problem that may hinder their ability to learn and succeed in the classroom. Most people are familiar with common vision disorders like nearsightedness, farsightedness and astigmatism, but these are only a few of the conditions that affect vision.

Interestingly, many of the vision problems that interfere with the learning process are much more difficult to diagnosis, and they may go unnoticed at first, which can delay intervention and interfere with childhood development. These conditions are categorized as binocular vision disorders (problems with eye muscle control) and accommodative disorders (problems with the eyes' focusing system).

Binocular vision involves the manner in which the two eyes work together as a team ("bi-" meaning two; "ocular" meaning eye). Each eye sends visual input through the optic nerve to the vision center of the brain, and the brain overlaps these images to create a single binocular view. If the eyes are misaligned, the brain may not be able to overlap the images, and the individual can see double. So, even if each eye can see "20/20," a person may still have issues with coordinating the two eyes together. The movement of each eye is controlled by six different eye muscles, which must move in unison with delicate coordination to keep both eyes pointed at the same object. If there is a slight misalignment, the brain will send signals to the eye muscles to make small adjustments to keep everything perfectly aligned.

However, some people have deficiencies in the eye coordination system that make it more difficult to overcome those minor misalignments. These conditions include:

- Convergence insufficiency (eyes have difficulty turning in/crossing)
- Convergence excess (eyes turn in or cross too much)
- Divergence insufficiency (eyes have difficulty turning out/uncrossing)
- Divergence excess (eyes turn out or uncross too much)

There are also muscles *inside* the eye that control the focusing of the internal crystalline lens, which helps us adjust our focal distance when we need to switch between viewing objects in the distance and viewing objects up close. This is called accommodation, and it is normally an automatic, thoughtless process that happens instantaneously when an individual shifts their attention from one object to another. Disorders associated with the focusing system are:

- Accommodative insufficiency (difficult focusing the eye muscles up close)
- Accommodative excess (difficulty relaxing the eye muscles for distance viewing)
- Accommodative infacility (difficulty adjusting the eyes' focus back and forth between distance and near)

Children with eye muscle disorders are often misdiagnosed with reading problems, learning disabilities, autism spectrum disorders and ADHD, since the symptoms of these conditions sometimes overlap with those of binocular vision or accommodative vision problems. These symptoms include:

- Headaches
- Eyestrain
- Fatigue
- Difficulty concentrating
- Short attention span
- Loss of place when reading
- Using a finger to follow lines when reading
- Skipping lines or re-reading lines
- Avoidance of reading/near work
- Intermittent blurred vision

Unless a proper comprehensive eye examination by a licensed eye care professional is performed, it may be difficult to discern if the child's issues stem from a behavioral issue or a vision issue. For this reason, it is recommended that all school-aged children have a comprehensive eye exam at least annually.

As educators, you may be the first to observe some of these symptoms of vision disorders in your students. As music teachers, the effects you see may be even more pronounced since reading music involves more complex visual coordination than reading text (discerning the vertical position of notes on the staff, attending to multiple staves at once, or jumping around a score due to various repeated sections).

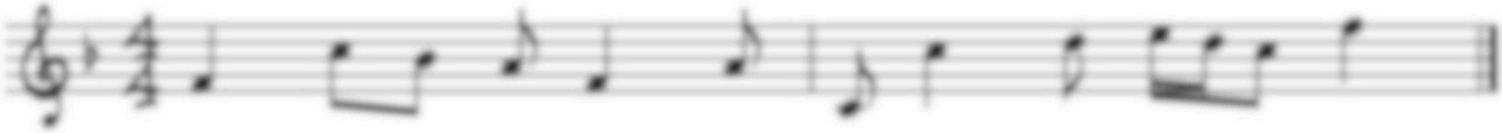
It is important to report any suspected symptoms of visual problems so that these students can be referred on for proper evaluation and management. Remember that even children who pass a vision screening and have "20/20" vision may still have an underlying "hidden" vision disorder that can interfere with their ability to learn. Keep this in mind as you observe your students, watch for the warning signs discussed previously and use your position to advocate for their well-being. The action you take by simply recommending a comprehensive eye exam may change the course of that child's educational future, finally allowing them to unlock all of the tools necessary to have the opportunity to succeed. ■

Shane Foster, *OD, is an optometrist from Athens, Ohio, who has a special interest in children's vision issues and the deep connection between vision and learning. In his roles as president of the Ohio Optometric Association and past president and board member of the Ohio Optometric Foundation, he is an advocate for children's vision issues and increasing access to eye care for the underserved.*

NORMAL VISION: Normal Acuity/Sharpness of Vision

FOCUSING PROBLEMS: Accommodation Disorders

- Students see the notes come in and out of focus
- Students move closer or further from the music looking for clearer vision



COORDINATION PROBLEMS: Deficient Binocular Skills/Eye-Teaming Abilities

- Students see the notes move, float, and double
- Headaches, tired eyes and eye rubbing may be observed

TRACKING PROBLEMS: Oculomotor (eye movement) Dysfunctions

- Students struggle moving their eyes from note to note in order
- Students will lose their place frequently, and re-read the same notes

Graphic created by Cara Frasco Lai, OD, MS, FCOVD, FAAO.

Common but Hidden Eye Conditions in Children

Many people suffer hidden vision problems because they think that good vision is the same as clear sight. But the truth is vision is so much more than being able to see the whiteboard or read an eye chart. To help you pick up on the signs of hidden vision problems, here are five common but hidden eye conditions explained.

Convergence insufficiency. Eye-Teaming. Convergence insufficiency occurs when you have difficulties maintaining how your eyes point together (converge) to focus on near work or read close. It can lead to headaches, eyestrain, double vision, blurred vision and reduced visual performance.

Interestingly enough, not everyone with convergence insufficiency experiences obvious symptoms, and many people can still pass the 20/20 eye chart test. There are many performance related issues that can occur with convergence insufficiency including loss of place with reading, reading avoidance, and reduced concentration. The following is a summary of some of the signs and symptoms that can occur while you're reading or doing other close work and may include:

- Eyestrain (particularly after computer work or reading)
- Difficulty reading (words blur or move on page)
- Difficulty concentrating
- Short attention span
- Frequently lose their place reading
- Squint or close one eye
- Poor comprehension
- Double vision
- Headaches
- Not completing school work or homework

Accommodative Dysfunction. Focusing We often take it for granted that we can shift our focus from near to distance and back again without experiencing blurry vision. This ability to change focus is called accommodation. When accommodation works well, we are blissfully unaware of the process.

For people with Accommodative Dysfunction, holding focus at near distances, and being able to shift focus becomes more difficult. Sometimes this results in obvious symptoms like an intermittent blur, or noticing things take a while to come clear, but other times like with convergence insufficiency, the symptoms are not as obvious. This is because a child can bring things into focus with a lot of concentration so it can go unnoticed, but doing this does put a lot of strain on the eyes and on the ability to concentrate.

Symptoms of Accommodative Dysfunction can include:

- Reading avoidance
- Red or sore eyes
- Headaches

• Difficulty in copying from a board or screen then down on paper
• A diagnosed learning problem

JC: ** **Piano Students** can have difficulty when glancing down at their hands. Their eyes may cross (Convergence Excess) while looking at the hands and then take time to uncross when changing focus back to the music.

Oculomotor Dysfunction We learn to use vision. Part of that process is developing skill in holding fixation and also shifting fixation as part of directing ourselves in our environment. This action helps us to read and write, cross a road, and even hit a ball.

Young children naturally have poorer fixation skills, but like fine motor skills, it is expected that this will improve with development and age. A child who hasn't developed the fixation and tracking skills expected for their age is considered to have oculomotor dysfunction.

Symptoms to watch out for include:

• Inaccurate hand-eye coordination
• Poor visual memory
• Can lose their place when doing close work
• Losing words or even lines of work when copying
• Difficulty copying words from a board
• Difficulty concentrating
• Difficulty in finding things if there are a lot of things around (like toys on the floor)

Amblyopia (lazy eye) Amblyopia, or lazy eye as it is more commonly known, occurs when the eyes don't work in unison. It often occurs with a difference in prescription between the two eyes or when an eye turn is present (see below). When the brain has difficulty making sense of the input from one eye, it favors the eye that can, by actively suppressing or "tuning out" the conflicting information from the other.

Amblyopia can also occur with Strabismus, where one eye crosses and is no longer aligned with the fellow eye. The eye can cross in (esotropia) or turn out (exotropia). It's important to pick this up early in children as their vision can deteriorate in the eye that can't focus. Because the eyes aren't working in harmony, it can also cause issues with depth perception, fine motor skills and clumsiness.

Symptoms of lazy eye include:

• An eye that appears to wander either inward or outward
• Squinting, or closing one eye so they can see better
• Complaints about things looking blurry
• Sensitive to sunlight
• Head tilting to try and focus better
• Poor vision
• Bumping into things because they find it difficult to judge distances particularly between objects

Paul Graham
Harmony Vision, Australia

SIGNS OF VISION PROBLEMS

In the Piano Lesson

Janice Cook MTNA 2024

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#1. The student has trouble differentiating between a step and skip after a year of lessons or by the age of seven. Older student confuses 4ths and 5ths. ("I cannot tell whether the note is on the third line or the fourth line.") Ask the student to say, "fourth line D, or second space A."

#2. The student is uncertain if notes on the page are going higher or lower. Ask a student to say what the notes are doing: "Start on C, up a third to E, down a fourth to B, up an octave to B."

#3. The student cocks his head at an angle or leans way in to see the music, or even stands up to get closer to the music. "When I concentrate, my head hurts and I feel like I am sideways - a little dizzy. I want to shake my head and close my eyes."

#4. The student immediately tries to memorize. Eyes go to the hands rather than to the music. "I couldn't really read what was on the board so I memorized it as fast as I could."

#5. The student is afraid to start learning a piece on his/her own. Mom: "He has a full-on meltdown when presented with a new, easy piece of music where he knows all the notes."

#6. The student asks you (or a parent) to play the piece and then tries to memorize it. Should we model for the students? Of course. When ? AFTER we have helped them decode the music.

#7. The students lacks confidence even when he knows flash cards, intervals, etc. When sight-reading, the student plays many incorrect intervals or cannot keep a steady beat. This is a sign of a tracking or eye-teaming issue. Does he do better when you track the notes with your pencil?

#8. When the student loses his place, he is unable to start again where he stopped. When you ask her to play the problem spot, the student will go back to the beginning or elsewhere (because it is too hard to read.) "I can't start there!"

#9. The student does not want to read words aloud or has difficulty doing so. Occasionally ask a student to read the information on the method book page *to you*, instead of you reading it to them.

#10. The student cannot read charts or calendars or plaques on your walls. Do not assume the student can do so, like I did for years. This is a sign of Accommodative Disorder.

#11. The student changes the subject frequently, or loses focus, or becomes irritable, because he/she cannot sustain the muscular control to bring the eyes into sharp focus.

The student is most likely experiencing EYE STRAIN. Can you tell?

Blurred vision - or double vision; Ask the student if the notes look blurry. Often they do not know. They think everyone sees the way they do.

The student says the notes "move around."

Headaches are common

Neck, shoulder or back pain; the student rubbing his neck, complaining of being tired at every lesson.

Dry eyes, painful or irritated eyes. Student puts his head down, or rubs his eyes. Take an "eye break" and get the student to blink ten times. (We blink less frequently when concentrating at near.)

Student does not recall what he just learned – does not recognize the return of repeated material. The eyes are working so hard to focus that there is little "cognitive reserve" left to actually understand and internalize what was seen. Eye strain causes lack of "visual memory."

Nausea or dizziness; "When I concentrate, my head hurts and I feel like I am sideways – a little dizzy. I want to shake my head and close my eyes." (8-year-old) "When you asked me to read ahead, the notes were blurry and I could not bring them into focus. And when I looked back to where I was now, the notes were blurry. And then when you asked me again to look ahead, I started to get felt dizzy, like things were spinning. I would get nauseous." (Explained to me at age 20 after the student understood the nature of his three disorders: Astigmatism, Convergence Insufficiency, Far-Sightedness. He could not articulate these thoughts when he was younger.)

Anxiety, Low Self-Esteem, Frustration, Suffering

"If my children ever want me to read out loud, my wife is going to have to do it for me. Maybe I shouldn't even *have* children! I'll never be a robotics engineer if I can't read." (boy, age 8, with pent-up frustration before being diagnosed with Convergence Insufficiency, Accommodative Infacility and Saccadic Deficiency.)

"I failed miserably at piano lessons. I could not read the music. I stopped attending lessons because it was so frustrating, but I hid that from my mother. When she found out, when I was eight, she beat me… severely." The woman telling me this went on to say that she had suffered from low self-esteem as a result and now, at age 60, told me that I was the first person in her life who truly understood what she had gone through. We both shed a lot of tears together. (Dinner partner on a cruise ship.)

"We found Sam does have a problem with his eyes. It's called accommodative insufficiency. He has trouble focusing on things as they come closer. The result is that his brain either over-compensates and things are a little out of focus, or he uses only one eye to get around the double vision. He has to work very (the doctor used about *10 verys* when she was talking to us) hard to get by." (Mother of a student.)

"After four months of vision therapy for Convergency Insufficiency, he is doing *so much better* in school and has a new lease on life, knowing that there was a REASON for his troubles. He says, 'I'm not dumb! It's just that my eyes were not working together.' Vision therapy has changed his life and our family dynamic." (Mother of a 12-year-old boy who wanted to quit school.)

"I feel devastating guilt that I did not realize sooner that my son had vision problems. He got in trouble at school and was a behavior problem. No one figured out it was because of vision problems until he was in eighth grade." (Music professor dad.)

"I was never much of a student." (Said in hushed tones by the dad of a 17-year-old transfer student finally diagnosed with Suppression – the brain accepting the signal from only one eye in order to avoid double-vision– when realizing that he suffers from the same disorder.)

Janice Cook, NCTM MTNA 2024

FINDING THE RIGHT EYE DOCTOR

Janice Cook, NCTM 2024

When you tell a parent or a student that you suspect an eyesight or vision disorder, you need to educate them to seek an optometrist who conducts the "Comprehensive Eye Exam." You can search at: https://locate.covd.org Unless a disease is suspected, needing the help of an ophthalmologist, you should be recommending an optometrist. Understand the difference: an ophthalmologist is a medical doctor who treats eye diseases and does surgery on the eyes; an optometrist is the primary care doctor for your eyes, checking eye health, checking for refractory errors in eyesight and, hopefully, screening for hidden vision disorders.

I have found out the hard way that not every optometrist tests for vision disorders. Most ODs have taken a course or two in Vision Disorders and Vision Development in Children during their four years in Optometry School. Maybe their practice then becomes focused on glasses, or contact lenses, or specific types of refractory issues - meaning eyesight.

There are, however, optometrists who go on to study more and earn accreditation or advanced degrees in Vision Disorders. They probably love working with children. In retrospect, I should have been counseling parents to find a *Pediatric Optometrist* with a specialty in Vision Development or vision disorders. This kind of doctor is sometimes called a *Developmental Optometrist* or a *Behavioral Optometrist*. *Improving how the child performs visually is the Pediatric Optometrist's top priority.*

Credentials:

O.D. is the professional abbreviation for Doctor of Optometry, but look for more initials.
MS means Master of Science degree in Vision Science.

FCOVD means that the OD has earned a Fellowship as a Certified Optometric Vision Therapist. It can take one to three years to earn this designation. You can go online at https://www.covd.org (College of Optometrists in Vision Development,) click on "Find a Doctor" and enter your zip code. How I wish I had known this years ago! "COVD" may mean membership in the organization but not yet a Fellow.

FAAO means the OD has earned the designation of Fellow of the American Academy of Optometry, with special study and peer review.

When looking for the right eye doctor, the parent should take a detailed look at the doctor's website and speak with the receptionist. Ask: "Will the doctor conduct a Comprehensive Eye and Vision Exam which includes checking for eye teaming problems, eye tracking, and focusing problems?" "Does the optometrist offer vision therapy or refer patients frequently for vision therapy?"

This is from the website of the specialist who has diagnosed and treated several of my students:
OD, FCOVD, MS, FAAO. Diplomate in Binocular Vision, Perception & Pediatric Optometry.

"The doctor earned her doctoral degree from the Ohio State University College of Optometry, where she graduated first in her class. She concurrently completed a Master of Science degree in Vision Science, through her study of eye movement in children with learning problems. She then elected to complete an additional year of Residency training in Pediatric Optometry at the University of Houston in Texas." This is the kind of eye doctor I hope you can find in your area.

Help the parent and doctor by providing specific information about "red flags" you see in the lesson.

Your Students with Vision Disorders Need to Find the Right Eye Doctor

Advice for Teachers and Parents

By Janice Cook, NCTM

Jennifer Aschenbener, OD, was in optometry school when she had a revelation: she realized why she threw weekly temper tantrums over piano lessons as a child.

"Convergence excess and accommodative excess," she learned, "made it challenging and frustrating to read music. [But] rather than struggle and get a headache, I asked my mom to play so that I could listen, memorize and then play by ear."

She recalled this technique years later when talking with an 8-year-old patient (one of my students) and his mother about his struggles with piano due to his convergence insufficiency, accommodative insufficiency and oculomotor dysfunction.

"While reading in school or practicing his piano music, he may have seen double because his eyes crossed or blurred. His eyes struggled to create clarity when he looked from his hands to the music and they did not track well to maintain fixation on the notes," says Aschenbener, who is now an optometrist at Professional VisionCare in Westerville, Ohio. "In addition, his eyes did not track well to maintain fixation on the notes. Vision therapy helped to improve the symptoms of all these conditions and gave him the skills necessary to enjoy piano and perform better in school."

When you tell parents you suspect a vision disorder, encourage them to seek an optometrist who conducts a comprehensive eye exam. Why an optometrist instead of an ophthalmologist? An ophthalmologist is a medical doctor who treats eye diseases and performs surgery on the eyes, while an optometrist is the primary care doctor for eye health, checking for refractive errors in eyesight and, hopefully, screening for hidden vision disorders.

But not every optometrist tests for vision disorders. Some continue to study after optometry school and earn advanced degrees in vision disorders. Counsel parents to find a pediatric (sometimes called a developmental or behavioral) optometrist. Improving how the child performs visually is the pediatric optometrist's top priority. These doctors love working with children.

OD is the professional abbreviation for Doctor of Optometry but look for more initials: MS means Master of Science degree in Vision Science. FCOVD means that the OD earned Fellowship and is Board Certified in Vision

Therapy, a designation awarded by COVD: College of Optometrists in Vision Development. A COVD Fellow has demonstrated advanced competency in vision development, binocular vision and vision therapy. The process requires many hours of continuing education, years providing vision therapy and peer reviewed case reports as well as written and oral examinations.

I suggest parents take a detailed look at the doctor's website and ask, "Will the doctor test for convergence insufficiency/excess, eye tracking and eye focusing problems?"

Cara Lai, OD, a developmental optometrist at Dublin (Ohio) Vision Development has treated five of my students.

"Reading music presents an even greater demand for an optimally functioning visual system," she says. "As a result, the private music teacher may identify vision problems long before they manifest themselves in the classroom."

By third grade, Lai explains, children are expected to read chapter books with smaller print. Students with vision problems may complain that their eyes hurt or are tired, or may cover one eye, fidget or say the words move when reading; reading comprehension is also reduced because of the cognitive drain caused by these symptoms.

"Visual attention and visual precision are required to discriminate the location of notes on a staff quickly," she adds. "When notes appear to blur or move, students play the wrong notes or play them at the wrong time. Students may move closer [to or] farther from the music, rub their eyes, or complain they have headaches or are tired at the end of a piece."

Studies (Sheridan and Kleinsmith 2022, 1643–1652; Huovinen, Ylitalo and Puurtinen 2018) show that when professional musicians read music, their eyes dart around the score, making many more eye movements than simply reading note-to-note. The eyes of skilled musicians frequently look ahead and back to the current measure, all while maintaining the proper rhythm and time. "Music students with undiagnosed vision problems use up their brain power seeing the notes, and they do not have the cognitive reserves necessary for coordinating their hands, foot and ear," says Lai.

"At least 20% of students have binocular vision problems, and these conditions respond well to treatment with lenses, prisms, and vision therapy," she continues. "The Convergence Insufficiency Treatment Trial found nearly 80% of patients reduced symptoms and signs of the condition with 16 weeks of office-based vision therapy. (CITT 2008) Like piano lessons, optometric vision therapy requires a commitment from the patient and family for success. Early identification is beneficial so treatment can be initiated before learning, performance or self-esteem is impacted."

Use fresh insight to observe how each student learns. Know the red flags—headaches, eyestrain, trouble focusing, trouble tracking,

visual fatigue—and then try your best to educate the parent to seek help from an expert in vision development.

■

Thanks to:

Jennifer M. Aschenbener, OD; COVD Fellowship Candidate. Westerville Ohio.

Cara Frasco Lai, OD, MS, FCOVD, FAAO, Diplomate Binocular Vision, Perception and Pediatric Optometry. Dublin, Ohio.

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Janice Cook, *NCTM, teaches in Columbus, Ohio.*

She will give a session on vision disorders at the 2024 MTNA National Conference in Atlanta. In October 2023, the American Optometric Association wrote: "The AOA extends a heartfelt thanks to Janice for her unwavering dedication to bringing the eye care and music communities together."