

Article • Adjusting Astigmatism

Steven Gallop, OD • Broomall, Pennsylvania



Steven Gallop, OD

Broomall, Pennsylvania

OD, Pennsylvania College of Optometry,
1989

Author: *A Parent Guide to Strabismus,
Eye Muscle Surgery, & Vision Therapy,* and
*Looking Differently at Nearsightedness and
Myopia: The Visual Process and the Myth of
20/20*

Fellow of COVD

prescribed in this fashion are crutches. Some crutches are more appropriate and necessary than others. There are times when some degree of compensation is necessary, but even in these cases, it may be wrong to stop there, since it is unlikely that there are no other (probably more consequential) visual deficiencies involved such as binocular, accommodative, or oculomotor deficiencies. Such visual issues are often risk factors, if not causative, for the presenting conditions, which are on the surface and easily observed, measured, and treated with compensatory measures.

ABSTRACT

All optometrists are taught how to prescribe lenses to maximize acuity, particularly distance acuity. The standard approach is to prescribe for maximum acuity based strictly on the measurements, in particular Snellen findings, keratometry, and subjective refraction. Prescribing in this way is perhaps considered most important when faced with astigmatism. There is much more to the visual process than visual acuity. In fact, visual acuity is probably the least important...certainly the least consequential aspect of the visual process. A case study describes a unique approach to managing the refractive status of a young patient with habitual cylinder lenses and a complex visual profile.

Keywords: astigmatism, visual process

One of the most important things we can do for our patients is to prescribe appropriate, meaningful lenses. Not necessarily lenses that merely make things clearer or compensate for strabismic eye postures, although doing this can be helpful. However, compensation is not the only reason to prescribe lenses. Lenses can do much more than compensate for some function the organism is presumed to be unable to manage. Lenses can be a catalyst for improved comfort, enhanced performance, and continued development of the visual process and the person.

Why do we prescribe lenses? Lenses are most commonly prescribed to compensate for undesirable refractive states, to compensate for poor eye alignment, and to compensate for presbyopic changes. Lenses

“Lenses change the orders to the system.”

A.M. Skeffington, OD¹

Are there other reasons to prescribe lenses? Lenses can be prescribed to prevent or to remediate the same undesirable refractive states for which they are typically used to compensate. They can also be used to prevent or remediate strabismus; to prevent or reduce visual stress; to enhance visual performance; and to protect, stimulate, enhance, and guide development of the visual process.

“It’s not what a lens does to a person, but what a person does with a lens that matters.”

Robert A. Kraskin, OD²

Lenses might best be thought of as medicine. Dictionary.com defines medicine as “any substance or substances used in treating disease or illness” or “the art or science of restoring or preserving health.” Most medicines have side effects, many of which require other medicines. Lenses designed solely as compensatory devices will likely have side effects of their own. Adaptation to compensating lenses often leads to an exacerbation of the condition they are treating, as well as ignoring and/or exacerbating the underlying conditions described above. Lenses are not for the eyes; whatever the reason for their application, they affect the brain, the body, and behavior, so it might be best to look differently at how and why we apply lenses to a given patient.

“We feel that our vision is like a camera, but that is utterly wrong. Our brains aren’t just seeing, they’re actively constructing the visual scene and making decisions about it.”

Dobromir Rahnev, psychologist
Georgia Institute of Technology³

A recent study found that the superior colliculus may be contributing much more to the way we process visual stimuli than previously thought. According to the study’s senior author Massimo Scanziani, PhD, a professor of physiology at UCSF and a Howard Hughes Medical Institute investigator, “It’s as if we’ve discovered a second primary visual cortex.”⁴ This sounds incredibly similar to the findings of Sir Stewart Duke Elder in the 1860s and to the teachings of A.M. Skeffington and others in the Optometric Extension Program Foundation in the middle of the twentieth century. Based on this type of information, which has been more or less known to those practicing optometry from a behavioral/developmental perspective for many decades, we can and should be treating patients with this in mind, even when we think we are simply being asked to prescribe compensating devices.

Some foundational concepts for managing astigmatism differently:

- The primary purpose of the visual process is to direct action.
- The visual process is a holistic mind/body process.
- The visual process is pervasive in human behavior.
- There is rarely a single “correct” Rx; there is typically a range of lenses that provide appropriate assistance.
- Most standard (compensating) prescriptions are stronger than necessary for their proposed use.
- Most standard prescriptions are inappropriate for the majority of the activities for which they are worn.
- The primary purpose of optometry is (or should be) to protect, support, and direct development of the visual process.
- When confronted with any given individual, statistics are, at best, useless.

Basic concepts for a “new” prescribing paradigm:

- Prescribe for the person, not for the measurements or the eye.
- Start at near and work from there.

- Prioritize prescribing for comfort, performance, and development, not acuity.
- Use balanced lenses whenever possible.
- Avoid prescribing or reduce cylinder whenever possible.
- Lenses derived strictly on distance acuity “needs” are likely to have undesired consequences.
- Consider a lens that allows the person to observe the natural fluctuations in acuity.
- One Rx is rarely good for all tasks.
- Avoid prescribing only one Rx unless it’s strictly therapeutic and therefore intended as a task-specific device.
- Compensating lenses should not be a first resort.
- If a person needs to adapt to the lenses, it might be best to reconsider the Rx.

For the moment, let us consider the pre-presbyopic patient wearing single-vision, distance-compensating lenses. The common perception—common both to the public and to the profession—is that if a person can do all of their daily activities with a single pair of lenses, then that is all that is required. I often explain to patients that the lenses they are wearing were designed for viewing at 20 feet and beyond. Anything closer than 20 feet requires more effort to override those lenses. The closer the task, the less appropriate those distance-only lenses are. The chronic inappropriate use of lenses, which is pervasive in those who wear compensating lenses, creates undue stress on the visual system and the person. This dynamic is probably no small contributor to myopic progression, among other undesirable visual adaptations to visual-motor, binocular, and accommodative function and visual development. In order to mitigate these issues, to at least some degree, I prefer to adhere to the above concepts. Following these “rules” helps to maximize the therapeutic value of the lenses while minimizing the compensatory aspects, thereby reducing any unwanted effects such lenses tend to have on the overall visual process.

“The specific cause of astigmatism is unknown. It can be hereditary and is usually present from birth. It can change as a child grows and may decrease or worsen over time.”⁵ My translation: We barely know why there is astigmatism, and we really do not know what to do about it other than put a lens in front of the eye and cross our fingers. And really, we would prefer not to talk about it if that is okay with you.

“Astigmatism is very difficult to define.”

“Astigmatism is difficult to understand.”

A.M. Skeffington, OD⁶

In my experience...

- Almost everyone has some amount of astigmatism.
- Some people seem to need compensation.
- Many have compensating lenses but seem not to need them.
- Most have astigmatism and are asymptomatic.
- Astigmatism is easy to measure and prescribe.
- Doctors prefer to prescribe without talking about it.

Keep the following in mind as we go through the subsequent case. When determining criteria for a myopia study, Gwiazda suggested allowing up to 1.5D of astigmatism.⁷ Mutti noted that the BLINK study allowed only up to 1D of astigmatism. “I regretted that decision a bit, because in recruitment we saw children not qualify with 1.03D of astigmatism,” he said. “We had to turn away subjects eager to participate. I would say past 1.5D of astigmatism you’re probably highly unlikely to get acceptable acuity,” he continued.⁷

As you will see below, I did not find it necessary to “turn away subjects” with greater than 1.5D of astigmatism. I prefer to deal with each patient as a unique individual. I would prefer to remake a pair of lenses knowing that I tried to provide the most substantive, forward-looking care possible, rather than being overly cautious and missing out on an opportunity to be creative. Naturally, any change in prescription is based on the patient’s needs, preferences, and sometimes courage to try something completely different than what they had previously known.

These researchers clearly have not read Skeffington:

Why does the person accepting only +0.25 spheres often find it more difficult to go without his lenses than does another person who is wearing +2.25 spheres? One person with 0.37D astigmatism shows immediate results from the prescribing of that amount of cylinder. Why, then, does another with many times that amount maintain perfectly good acuity without a lens, and reject the cylinder if given as a lens formula? How does it happen that one myope with 20/100 acuity will attain 20/20 with a -0.50 and another will require -1.50 before 20/20 is possible? These are the problems which have plagued optometrists. The attempt to solve them by ignoring them, or to avoid them by

attributing these reports to a neurosis or psychotic condition, is a failure.¹

This is why, after removing a new patient’s glasses from my lensometer at the start of an initial encounter, I prefer to tell them that their glasses have astigmatism. I think this is a better description of the situation, at least until we can determine the degree and nature of the situation as it regards the totality of their visual profile and how that relates to their everyday needs.

“The optimal lens is not covariant with the refractive status of the eye but is determined by the clinical understanding of the problem.”

A.M. Skeffington, OD¹

“The number of patients who come because they lack acuity is relatively small. It would be interesting to have a percentage-wise study made by a few optometrists in practice as to how many of their patients come with a complaint of inadequate acuity, whose greatest need is cylinders.

It is true that patients come with complaints of discomfort. The discovery is made that cylinders restore standard acuity. The prescription is written for the purpose of restoring acuity on the basis of cylinders, when the referring complaint is more often either that of discomfort or disability to complete work. The two are not the same thing...”

A.M. Skeffington, OD¹

Prescribing lenses based solely on acuity often has less to do with the person who will be wearing the lenses than with the doctor prescribing them. Most lenses are designed to answer extremely myopic, if not astigmatic, testing, and not to maximize performance of activities of daily living—unless the patient is a professional eye chart reader.

“The value of the lens to the wearer is the change made in the output. True, there is a change in the input. However, this change brings about altered responses within the organism and so affects changes in the output. These output changes are the ones that lend significance to the use of lenses.”

A.M. Skeffington, OD⁶

Sometimes a prescription is a means to an end and not an end unto itself. Lenses can promote a person’s access to their brain’s inherent plasticity.

However, they can, all too often, do the exact opposite. While attending to these issues might be generally impractical in a so-called primary care setting, it is still something to keep in mind, especially when faced with complaints that are more than decreased acuity.

When I first began presenting cases like this, colleagues would ask about the keratometry findings for patients like Ranya, the case I am presenting in the next section. I was not always in the habit of taking these findings. One reason, I suppose, was not wanting to let what I had been taught was an immutable, structural measurement interfere with my ability to entertain creative options for treatment. As you will see—and I hope believe—in this case, K readings should not be taken as dogma. That is, just because the astigmatism appears to be structural in nature does not mean that it is etched in stone...or collagen, as the case may be. I have since made it a point to measure K readings, now that I know that they will not dissuade me from my mission.

A Case In Point

Seven-year-old Ranya was referred by another optometrist, who told Ranya's parents that she had left eye amblyopia and esotropia. Her chief complaint was losing her place when reading. However, that is not why I want to discuss this case. This is about lenses: more specifically, astigmatism.

Ranya had gotten her first pair of glasses 18 months before coming to see me (September 2018). That prescription (January 2017) was:

+5.00 -1.00 x 180 OD
+7.25 -0.75 x 180 OS

The prescription was changed (December 2017) to the following less than a year later:

+5.25 -1.25 x 180 OD
+7.50 -1.25 x 180 OS

Four months before I saw her (May 2018), she got a new prescription:

+5.75 -2.00 x 180 OD
+7.00 -1.75 x 180 OS

*DVA at end of eval:

OU 20/30-1 w/ Plano
OU 20/25-1 w/ Rx

Side note: For some reason, which now escapes me, I began re-taking distance acuity (usually OU) at the end of initial evaluations from time to time. In the vast majority of instances, there was improvement relative to the entering acuity. The explanation I came up with was that the evaluation I do involves some level of "exercising" and "massaging" the visual system, which allows for greater relaxation and improved acuity (the chart is not visible during most of the evaluation, so it is unlikely they are memorizing). I now do this routinely and have found that this does not happen as routinely as it did when I was subconsciously cherry-picking patients with whom I did this. This tells me there is likely good potential for improved acuity with modified lenses.

The following were my initial findings:
All testing done with the habitual prescription
(4 mos old)

K readings: OD -2.50 x 180 OS -2.50 x 180

DVA

PL: OU 20/50^{-1*} OD 20/40⁻² OS 20/70^{**}
w/ Rx: OU 20/30 OD 20/30⁻¹ OS 20/50

(**Right off the bat, I was suspicious of her prescription since there was so little improvement in VA relative to the strength of the lenses.)

NVA

w/ Rx: OU 20/16 @ 8"
OD 20/30 @ 16"
OS 20/40 @ 16"

Pursuits: (time in contact with the target)

30% OU, OD, OS

Saccades: 90%, mostly undershoots; Z-axis messy

NPC: TN

Retinoscopy

Distance: OD +1.50

OS fluctuates

Near: OD +1.00, fluctuates

OS +1.00, fluctuates

Cover test:

w/ Rx: D/N 4/2

w/ PL: D/N 12/12 ET

Stereo: (+) GF 0" 0" Randot (-) Sup

6^ prism OD @ distance: Sup, except with BU OD

Red lens NPC: R=OD – sup OS

R=OS – sup OD

Maddox rod (near):

MR OD 3 R hyper 5eso

MR OS 2 R hyper 1eso

Again, all of this may or may not be particularly pertinent to what I want to get across, but perhaps the findings will help you get a better picture of Ranya.

My primary goal was to eliminate the presenting complaints and to maximize Ranya's ability to use the visual process at the highest level possible. I have the

luxury, in this case, to have Ranya as a visual training patient. However, it is important to look at her lenses as an integral part of the therapy process, and it is unlikely that her current lenses will have any positive influence on the desired outcome; it is more likely that the opposite is the case.

Lens prescribing should always be a negotiation between doctor and patient. I prefer to make my case rather than impose my will, especially when considering what would typically be considered an unusual, if not drastic, modification of a habitual prescription.

My experience has been that changing the habitual prescription is usually an important first step in any visual enhancement program. Since most prescriptions are based on acuity alone, they not only ignore any possible causes of reduced acuity, they also generally exacerbate any underlying visual conditions. Compensating lenses are based on what has happened in the past and are unlikely to catalyze positive change going forward; in fact, they are likely to do just the opposite. It is better to provide lenses that promote improved infrastructure on which to strengthen the visual process and set the stage for continued growth and development.

In this case, the idea was to get Ranya out of her current lenses and into something that would be more likely to contribute to what is described above. She simply would not tolerate any change despite a number of attempts over several weeks. My preference would have been to go to equal spheres. Unfortunately, even a slight decrease in the cylinder was unacceptable to Ranya at her first visit and several weeks later. I had it in my mind that I wanted to get her into +5.00 spheres OU, but due to her response to any modification, I decided to hold my breath (and my tongue) for a while.

Ranya's parents were fully on board with what I was trying to do and brought in a new frame at her second VT session. The frame sat in my training room for several weeks. During that time, I trial framed various modified lenses, to no avail. Any change got an immediate two thumbs down from Ranya. At week 6, I decided I could not wait any longer. I called off the negotiations and dispensed a pair of +5.00 lenses. The initial plan was for Ranya to wear the new glasses whenever she could, knowing that she really did not like the way she saw with them. I was hoping she might ease into the new lenses, but I was unsure how this would play out.

As an aside, when I shared this case with a colleague, it was suggested that the +5.00 was simply

a spherical equivalent, and proof that such a formulaic approach works. While this may have been more or less true for the right lens, this was strictly unintentional, as I have never purposely relied on spherical equivalence when modifying prescriptions.

Ranya returned the following week for VT, wearing her new glasses. Her father reported that she had worn them most of the previous week. We measured the following:

DVA

w/ +5.00: OU 20/25⁻³ OD 20/25⁻³ OS 20/40⁻³

I only bring up acuities because this continues to be a major obstacle in my quest to inspire people to try something different when it comes to lenses. We are taught that maximizing acuity is a critical first step to a visual training program. I have not found this to be the case, as a rule.

Perhaps optimal acuity should be thought of as a result of a well-functioning visual process, not a prerequisite. I have found that vision therapy often leads to improved distance acuity. I think this is because the person becomes able to make better use of the available information as the visual process becomes more sophisticated and effective as a result of visual training and/or a more strategic, dynamic use of lenses.

Lenses should, whenever possible, be used to help arrange conditions and provide opportunities for the system to change for the better. Lenses are not living up to their potential when all they are intended to do is carry out tasks that the organism is deemed unable to manage on its own.

We may be selling ourselves and our patients short by the continued insistence on prescribing lenses based strictly on acuity. Wearing lenses based solely on maximum distance acuity on a full-time basis is like wearing an insulated parka all year round because it gets very cold during certain times of the year.

In Closing

Always try to provide the greatest benefit with the least amount of interference. Maximize the therapeutic aspects and minimize the compensatory aspects of any lens prescription. Try to impinge on the natural state as little as possible when compensating. Prescribe with an eye to the future, not the past.

I hope you will try this for yourself. Just hearing about it from someone else is not the same as trying it yourself and seeing what happens. And then seeing it happen again. There is nothing wrong with letting

the patient/parent know that you are not certain what will happen and that you will make it right if things do not go exactly as planned/hoped. Nothing works all the time. Also, do not be afraid to admit that you do not know everything.

Obviously, a prescription change of this magnitude is most likely to succeed if vision therapy is part of the program. However, I have also had patients who were unable to do therapy yet responded very well to significant changes in their lenses. It all depends on the individual and their particular complaints and needs.

Very likely, most of you reading this will think that what was tried in this case seems ridiculous, if not impossible. Be assured, it is not. This case is not particularly unusual in my practice.

“It is by logic that we prove, but by intuition that we discover.”

Henri Poincaré⁸

“[W]e have to remember that what we observe is not nature in itself but nature exposed to our method of questioning.”

Werner Heisenberg⁹

References

1. Skeffington AM. Practical Applied Optometry. Santa Ana, CA: OEPF,1991.
2. Kraskin RA. Personal conversation.
3. Science Daily. Out of mind, out of sight: Brain's frontal cortex controls vision. Last Accessed 4/27/20, <https://www.sciencedaily.com/releases/2016/05/160510124822.htm>
4. Weiler N, Bai N, Smith D. Surprise discovery reveals second visual system in mouse cerebral cortex. Last Accessed 4/47/20, <https://www.ucsf.edu/news/2018/12/412926/surprise-discovery-reveals-second-visual-system-mouse-cerebral-cortex>
5. Wavefront Eye Care & Optical. <http://www.wavefronteyecare.com/eye-dictionary>, Last Accessed 3/27/20.
6. Skeffington AM. Introduction to Clinical Optometry. Santa Ana, CA: OEPF, 1988.
7. PCON Reports. Experts debate, reach consensus on parameters for myopia control trials . Last Accessed 4/27/20, <https://www.healio.com/optometry/pediatrics/news/print/primary-care-optometry-news/%7B6dcfdae6-f561-43a4-b96d-134aed913d96%7D/experts-debate-reach-consensus-on-parameters-for-myopia-control-trials>
8. Poincaré H. Science and Method. New York: Cosimo Classics, 2017.
9. Heisenberg W. Physics and Philosophy. George Allen and Unwin Edition, 1959.

Correspondence regarding this article should be emailed to Steven Gallop, OD, at gallopintovision@comcast.net. 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 2020 Optometric Extension Program Foundation. Online access is available at www.oepf.org and www.ovpjournal.org.

Gallop S. Adjusting astigmatism. *Optom Vis Perf* 2020;8(2):64-9.
