

# MYOPIA REDUCTION...

## A View from the Inside

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### Abstract

*Myopia means many things to many people. The diagnosis and treatment of all these entities is even more varied. This paper attempts to share the personal experiences of a nearsighted, myopic optometrist with considerable non-myopic tendencies. There are many ways to feel about myopia; this is one of them.*

### Key Words

*myopia, nearsightedness, myoping, awareness, context, compensatory lenses*

**M**Yopia reduction is a topic that should be difficult to ignore for those involved in delivering full-scope optometric care. The prevalence of myopia in the general population is staggering<sup>1</sup> and it is probably true that most will readily accept the standard opinions on their condition and its treatment options. There is, though, a considerable population desiring more personal control in their own health processes. I include myself in this category. Even before my life's path led me into optometry, I began to question the prevailing wisdom offered in my optometric/ophthalmologic care. At one point, with a prescription of over 10 diopters of myopia with astigmatism, I attempted a daring, if not seemingly insane, feat. Riding my bicycle without compensatory lenses, I experienced a surprising level of performance that changed the way I viewed myself and my condition. This led me to seriously question the care I had received over the years as well as the nature of what is called myopia.

To the best of my recollection, I was born with the complete absence of refractive headgear. While perusing my genetic endowment, however, it quickly became evident that I was the product of a union between your garden-variety myope and your standard emmetrope. Could it be that myopic genes are just dominant? So dominant, in fact, that in my heyday I was more than twice the myope my mother was? In fact, my mother says that she had the best eyesight until age 12. She was then fitted with low-power minus lenses which continually got stronger. At this point, I am defining myopia as the need to wear compensatory lenses for standard

distance acuity. This is more appropriately called nearsightedness. My sense is that it isn't so much the nearsightedness as it is a propensity for myopia that may be truly inherited. Certain avenues of adaptation become more easily followed. I hope to make a distinction between myopia and nearsightedness in what follows. Briefly, nearsightedness is the refractive condition which is typically compensated with concave lenses, while myopia is more about the tendency to shrink visual and perceptual space and to restrict the musculature (and often the emotions) while attempting to solve the problem of responding to visual stress. I will not attempt to consider concurrent conditions such as binocular or accommodative status, visual-motor integration, etc. to any great degree, though they are certainly important.

The avenue toward nearsightedness was readily available to me through genetics and was probably compounded by certain personality traits (and visual behaviors) that are commonly found with myopia. Then, at the age of 8, when the stresses of academia proved unnerving, I was taken into a dark room and forcibly administered certain drugs which would (theoretically) paralyze my accommodative mechanism. This would presumably render me unable to provide false information to the examiner—a kind of sodium-pentothal for the accommodatively deranged. As I look back—now that I have reached the pinnacle of the mountain of nearsightedness and have begun my descent down the other side—I feel certain that this initial refractive experience, at the hands of an ophthalmologist, was quite ordinary. By this I mean that I was

probably seen as a typical case of early-onset, genetically-programmed myopia (I'm not certain just when the astigmatism surfaced). By this I also mean that there is a strong likelihood that I was over-compensated, probably by no small amount. Whether overdone or not, the introduction of minus lenses is a procedure taken much too lightly in standard clinical practice. The effects of such treatment are not restricted to changes in acuity. There are frequently ignored patterns of addiction to such prescriptions, not to mention subtle, slowly increasing changes in perception and behavior.<sup>2</sup>

Once a visual system is influenced by interaction with a concave lens, a predictable process is likely to follow. This is no less true of a system that is not actually as it appears to be at first glance. When viewed in a state of accommodative spasm, the system appears to be in need of compensatory lenses, when in fact it requires something very different. In any case, once the lens is applied, what is often a transient condition becomes a lifelong situation, one likely to deteriorate with time. There are many mildly nearsighted people walking around quite happy (a little blurry, perhaps, but happy), who have never even had an eye exam. To them things just are the way they are and they would probably be surprised to find that it's not that way for everyone. Ametropes are considered to have something of a progressive disease. While compensating lenses seem to alleviate the problem, has there ever been a good controlled study to determine if the condition progresses in the same manner if such treatment is avoided? Here it must be noted that 20/20 acuity (the end-all of most lens prescribing) is merely normal. It is not perfect, nor is it generally even necessary in our mostly near-centered day-to-day world. With the intervention of a concave lens, especially in the case of a child, the system gets the message that the adaptive process it has chosen is beneficial. Due to the impact of the combined authority of the doctor, parents and teachers, the need for the glasses becomes absolutely real. The child accepts the glasses with the impression that without them failure and danger are imminent.

Another danger of the influence of minus lenses has to do with what I call the "sponge aspect" of the progression of nearsightedness. When a sponge is com-

pletely dried out it will not pick up much water, but once it starts to get wet it will absorb much more quickly until it reaches its capacity. The visual system is quite similar, as is the human child. This seems especially true of the "myoping"<sup>3</sup> child. The preferred avenue of adaptation has been acknowledged as acceptable and has been encouraged by the lens application. This creates the conditions for continuation of the process. The sponge is just starting to get wet.

There are several complicating factors I would like to address. One is a psychological dilemma. The child in school is slowly but surely shown that seeing at great distances isn't very important to getting along in school. Since so much time is spent and so much importance is placed on school performance, the subconscious begins to problem solve. Since one is being asked to perform so much at near and since this is so important, it would seem a good idea to tune oneself into this small-distance attitude; this is part of the process of "myoping." This a good approach as far as social acceptance and academic achievement, but it is a poor response to the visual environment. It sets the stage for perpetual mismatches between internal and external perception, cognition and learning. The majority of our time is spent indoors and in the school setting, working with distances well within so-called optical infinity. It obviously doesn't matter if we can see across the football field as long as we can focus on the desk and occasionally make that great leap out to the chalkboard. But sometimes that leap to the board doesn't happen as fast as it used to, or maybe doesn't happen at all. Then there is great concern because you can't see far away. Then what happens? An eye exam is performed that evaluates nothing but distance acuity! The child is then overcorrected into sensory paralysis and told that these glasses will be a permanent fixture, like arms and legs. Then the sponge starts absorbing.

Just as an aside, this brings us to Skeffington's tremendous insight into the adverse affects of "socially compulsive, visually near-centered tasks of the culture."<sup>4</sup> What truly seems biologically unacceptable is the fact that these tasks are two-dimensional and, perhaps more importantly, do not include adequate motor involvement. Primal/natural peoples did considerable near work, but all their activ-

ities were in three-dimensional space and had considerable motor involvement (not to mention the different psychological/emotional and social context within which work was being done; perhaps this speaks to Skeffington's use of the terms "socially compulsive" and "of the culture" in order to precisely define the "near-centered tasks" which are most problematic). It has been well documented that there is a correlation between increased academic achievement and increased myopic progression.<sup>5-9</sup> It has also been well documented that societies that were not tied to the written word showed considerably less nearsightedness.<sup>10,11</sup> Another problem is the fact that modern near work is done within small surroundings;<sup>12,13,14</sup> there is usually no opportunity to "stretch" the visual system periodically. There is no chance to gaze easily off in the distance due to (culturally imposed) job pressures and time constraints and/or lack of sufficient visual space. While this cramped visual space environment places continuous demands on the binocular/accommodative mechanisms, it also continuously reduces the availability of and, in some respects, the need for peripheral awareness, which tends to diminish due to inactivity.

When considering the whole person or even the whole visual system, spectacle lenses can create their own problems. One must look directly through the optical centers of spectacle lenses to get the truest optics and least distortion. This is especially true of higher power lenses, but, as it is said, "The journey of a thousand miles begins with a single step." Because of the optical mechanics of spectacle lenses, when viewing off-center there will be increased chromatic, spatial and prismatic disturbances. In higher prescriptions the prismatic effects can induce diplopia and hence the need to learn to suppress. Because of this, one will also develop the tendency to move the head, neck and upper body instead of using eye movements only. This is a giant leap backwards in the process of visual development where it is hoped that one learns to move the eyes independently of the rest of the body.<sup>15</sup>

Another aspect of compensatory prescriptions is astigmatism, which appears to be present in most people. This is easily measured objectively, especially with autorefractors. It also seems that often a monocular measurement will reveal sig-

nificant astigmatism, which seems to lose its subjective importance when both eyes are used simultaneously. I believe it is important to be stingy with astigmatic compensations because they tend to be very restricting. These prescriptions are optically highly structured and rigid and may cause added rigidity in the individual. In the presence of typical nearsightedness, the individual, upon awakening each day, must agree to deny some part of herself. Without refractive appliances, the world appears very blurred to me. As a result of the culturally imposed necessities of everyday life, it is made very difficult to function in this manner. I must use artificial lenses in order to play along and see "clearly" that I might fit in properly. With compensations for simple nearsightedness, besides this "to thine own self be untrue" aspect, there is a shrinking of visual space which is all but unavoidable due to the physical limitations of the frame and the changes in light distribution caused by concave lenses. While this is basically undesirable, at least it occurs in a fairly uniform manner. In the case of astigmatism, there is even more of a unique natural visual experience which, when compensated, shrinks in an unbalanced manner.

The next issue is that of overcompensation. Here I am merely trying to look at a fairly mechanical understanding of the situation. I am not yet going into the idea that concave lenses contract and constrict available stimuli, leading to a diminution of safe and usable visual, emotional and psychological space. A nearsighted individual has an overabundance of refractive power (or "plus") in the optical system. This would seem to explain the use of opposite lens power (or "minus") to compensate. With over-compensation doesn't this simulate farsightedness and a constant need to overaccommodate? This would seem to be very confusing for someone working so hard to create a workable adaptive mechanism. While this approach might work as a therapeutic strategy, it is disastrous as a compensatory approach.

Another problem with an overcompensating lens is that it functions to eliminate sensitivity. It has been my experience that the typical compensatory prescription is stronger than necessary. This tends to overpower and fatigue the visual system in various ways. The wearer is unable to be aware of normal fluctuations in visual

function, especially the most easily detected, which is focus. Vision is not a static entity. There are fluctuations all throughout the process. Compensating lenses not only shrink the appearance of the external but shrink the levels of flexibility and sensitivity internally. The resultant dulling of sensitivity is one of the catalysts leading to mismatches in perceiving both the external and internal environments. This was undoubtedly a factor in my case.

Having been assured early on that I would need to wear glasses for all activities other than sleeping, I soon became one with my new appendages. One teenage morning, for some unknown reason, I decided to perform my first function of the day before slipping into my lenses. The door to my room was not in its usual position and I met it head-on. I can remember at that moment, after experiencing an array of entoptic phenomena, thinking that there must be more to this vision thing than just glasses. A mere 15 years later this became even more evident and I started on my way to become my own optometrist. Sometimes I tend to do things in an extreme manner. A good example of this is my previously mentioned first experiment with the myopic condition.

To preface this story, I must say that at that time it was my sincere impression that my nearsightedness was out of control. My prescription was made perpetually stronger and no alternatives had been presented (until I came across the works of Bates<sup>16</sup> and Huxley<sup>17</sup>). I was absolutely convinced that I would either end up blind or would need to hire someone to hold my head up under the weight of these ever-expanding lenses. There was no doubt in my mind that I needed to have these glasses on to do everything. Certainly, there had never been any advice to the contrary up to this point and the door in the forehead reinforced this.

So, one day I decided to try something. I mounted my bicycle, glasses clutched tightly in hand, and proceeded to ride through Philadelphia rush-hour traffic. I was shocked to find that I could navigate quite well without harming myself or others. No flat tires, no collisions, no glasses! This did not fit in at all with any of my perceptions of my situation. Something was very wrong out there (or was it in here?). At this time I was only months away from beginning optometry school. Needless to

say, I had a somewhat different agenda than most of my classmates.

This experience led me to question many things. First it caused me to rethink my lifelong situation. I had always felt helpless and dependent on my glasses. Now it was obvious that I had much more ability, more power to control my own destiny, than I had thought. This was the first step to a new attitude. Other questions came up concerning myopia itself: What is it? Where is it? Why is it?

### **What is it?**

Is myopia a condition that deals with focusing concrete, discreet images that exist outside the individual? Are there other things to see out/in there?

Myopia is typically defined as the inability to produce clear retinal images from distant objects—what I have been calling nearsightedness. This may be caused by a variety of ocular, optical or functional difficulties manifested while visually interacting with the external environment. However, there is probably an equal distance to be traveled going within as going outside ourselves. While it is true on the surface that myopes (since they are usually nearsighted) cannot clearly define distant external objects, concern should also be directed at the ability to see within clearly. While it is often felt that myopes tend to be withdrawn, introverted individuals, this does not address the true nature of the condition. Myopes may tend to inwardize feelings, but this inwardization will probably be found to be just as "blurry" as the distance acuity. There is often a tendency to emphasize and depend on external cues as a basis for decision making rather than trusting the inner voice. This causes a continually expanding gap between inner perception and external reality and damages self esteem.<sup>18</sup> One reason for this can be seen in the previously mentioned statement that when a myope awakens she must put on her glasses to become an acceptable member of society. This says that it is not okay to truly be yourself and join in with the others. While it is important to have reasonable acuity for activities such as driving, where safety is crucial, the child typically receives an official pronouncement, which leads to an internal program, that this clear sight is a must. This, however, is not the true reality for the myope in her natural state. Things do look blurry with-

out compensatory lenses. A person needs time to deal with this internally and come to an understanding of how things are before just accepting external judgments on her condition. With the unconditional acceptance of prescribed lenses, unaccompanied as they usually are by any discussion of the nature of the condition or treatment options, the myope must constantly ignore her true nature and just go along with the program. There is little identification with who she really is and how she really SEES things. All she knows for sure is that this is bad, at least according to the "authorities."

### Where is it?

Is myopia in the eyes? Is it in the mind? Is it in the body?

If it is in the eyes, how can different practitioners come up with different prescriptions? Perhaps much myopia is actually in the doctor or in the phoropter (there sure seems to be quite a bit in the autorefractor). Why cannot this incredible brain recalibrate a certain amount of blur into a clear, meaningful image? Actually, a study was done where "they recorded from cells in the frontal cortex of the brain while stimulating the retina, and showed that the patterns in which stimuli are received, even on the retina itself, can be re-programmed from moment to moment, and this ability can be demonstrated physiologically. ...The motor-output system of the brain (efference) has an effect on the input (afference): the brain 'selects its input'."<sup>19</sup> This has been demonstrated on both the psychological and physiological levels.

It is not hard to accept that the body may induce some myopia. Sitting in a classroom with no ergonomic design, the child must often malalign her body to achieve the best position for dealing with classroom activities.<sup>20</sup> This disturbs the relationship between the visual apparatus and the rest of the body. The visual physiology must now adapt to come back into balance with the rest of the body in order to best achieve a self-consistent system. This system may now be aligned within itself but it is now out of alignment with its environment and with its original understanding of its own balanced state. Once the myopia begins it becomes a powerful influence unto itself. It causes contractions of the body, of the mind, and of the spirit. Physiologically, the problems stem-

ing from spectacle lenses have been previously discussed. The "freezing" of the refractive status and of the eyes in the head can easily permeate the organism, causing rigidity and suppression in the realms of feeling, thought and behavior. If these issues are not addressed early on, the condition goes quickly out of control or, more accurately, goes into over-control. This leads directly into stasis and various levels of paralysis, psychologically and/or physically.

### Why is it?

Does myopia stem from the requirements of near performance?

Is it related to fear and the need to hide from the unknown?

There are certainly different causes of different peoples' myopia. Some are fairly concrete, others may not be strictly optometric. Each individual is likely to be affected by some combination of these. There is usually some degree of fear associated with the condition. There is fear of the unknown, fear of blur which is associated with fear of not being in control. This issue can usually be dealt with initially by allowing people to think differently about their situation by giving them some empowerment. This can be done by something along the lines of my own bicycle story.

Part of the overall problem lies in our culture, which is highly myopic. Our culture is more than willing to shut out awareness of the whole in favor of zeroing in on tiny details. We are forever squinting through pinholes at a world that begs to be viewed through a wide angle lens.

It is known that 20% of retinal fibers, representing approximately 80% of the area of the retina, do not go to so-called higher visual centers.<sup>21</sup> This says that most incoming energy is interacting with this portion of the neurophysiology and not with the tiny foveae. These fibers go to areas such as the superior colliculus where they transmit information about balance, orientation and space volume.

This ties in with two of Skeffington's<sup>22</sup> four circles: anti-gravity and localization. These concepts represent the organism's coming to terms with the physical world and understanding its relationship within the visual environment. To this add the fact that peripheral vision develops in advance of central vision in the organism. All this implies that

vision is a primarily peripheral process with central vision added in as a bonus to grasp desirable objects/moments that we find enjoyable.

It appears more likely that vision is really about balance, movement, relationships, interaction and awareness. All of this may be included in a broad category of CONTEXT. Context is what gives true meaning to the particulars within the whole. These concepts are, in general, more fully experienced and utilized within the subconscious, at least initially, until we need or want to bring them into conscious awareness. They usually just work automatically to whatever degree they may be developed. Balance, movement, understanding relationships, quality of interaction and awareness are all developed and are all malleable. But they are also deeply rooted, emotionally charged and, therefore, sensitive when it comes to change.

This begins to paint a more accurate picture of what we are dealing with in understanding the true situation for someone involved in the process of "myoping." There is so much more at work and at stake for such an individual. "Myopic individuals are dependent upon 'corrective lenses.' Myopic children may experience social and psychological problems due to negative peer influence as well as limitations in participating in contact (team) sports. Due to exclusion from these sports, myopes may become loners."<sup>2</sup> "Myopia is also a concern due to the high incidence of ocular pathology. ...It has been estimated that myopia is the sixth leading cause of blindness."<sup>23</sup> Therefore, the process of prevention or enhancement is no simple matter.

Now we get to the so-called reduction of the so-called myopia. Initially, it was unclear to me just what myopia reduction meant. It now appears to be a combination of many factors, including changes in prescription, attitude, awareness and processing. It is important to address issues of fear and control when considering change for myopes (and most of us for that matter). The first sign of blur often triggers something of a panic attack unless it is accompanied by an acceptable explanation and a sound plan. Much time has been spent building this nice, tight system and any attempt to loosen it up will not be taken lightly. I have found it useful with myself and my patients to reduce the prescription

gradually in cases of higher prescriptions and/or to modify wearing schedules with weaker prescriptions.

The initial change is aimed at effortless near and mid-range acuity since this is where most of the action takes place in our daily lives. This also gets the prescription into a range where sensitivity is restored to the system. By changing from an overpowering prescription to one that allows an individual to experience her visual system and herself more easily, she is now able to become more aware of what she is doing while being visual. This method of lens application differs greatly from most studies on the use of plus lenses to prevent myopia.<sup>24</sup> These studies typically hand out a randomly selected plus lens to the experimental group. Such a procedure is like trying to put size seven shoes on every adult; this would quickly lead to the assertion that shoes are inappropriate for all adult human beings. The careful modification of the present prescription creates an opportunity to function more appropriately and efficiently, which in turn often leads to a reduction in stress and an increase in self-trust. Part of this increase in self-trust is due to the nature of many vision therapy (VT) activities. Many procedures require individuals to trust themselves and their perceptions. There are unique opportunities to rely on internal information rather than external influences in the decision making process. A good example of this comes with procedures that involve "SILO," where feeling tone is so important, as is immediate perception, and where logic and prior conditioning tend to interfere with true perception. The importance of increased self-trust, especially within the context of the visual process, should not be surprising given the dominance of vision as a means of interacting with our world. Another important factor in reducing the prescription in this fashion is its tendency to allow accommodation to be less strained during most daily activities, for which standard prescriptions are not designed.

There is much discussion about blur acceptance because once the fear dissipates and a little blur can be tolerated, the benefits of this change become possible. A prescription aimed solely at sharp distance acuity demands that a price be paid in terms of stress and muscular tension. This often leads to a reduced tendency to be flexible in thinking, feeling and prob-

lem solving. Usually, once a person feels safe about the process and realizes the possibilities, the blur will cease to be as important an issue and will diminish. Once the individual is given freedom from excessive acuity dependence and has some understanding of her internal and external visual world the original level of acuity can be restored. This will almost certainly be achieved with a reduced prescription from that originally worn. The real change, however, has taken place in behavior. The prescription can now be a tool, used at the discretion of the wearer, instead of a crutch. Again, as with my bicycle episode, once I was made aware of my true abilities I became able to control the use of my lenses instead of the other way around.

It should also be noted that improved peripheral awareness is critical as it creates a stronger foundation on which to build all other areas of visual information processing, including acuity. Improved unaided acuity is practically guaranteed by good, solid peripheral visual function.<sup>18</sup> This ties in with the importance of context. As the whole becomes better understood and, therefore, more usable, the parts become more meaningful and more easily grasped.

One comment I have received in every case (including my own) is that after wearing a reduced prescription for even a short time, any attempt at wearing the old one results in discomfort. Initially, each person reports that while things might be a little clearer with the old prescription, this is accompanied by tension around the eyes and head. This response to the old prescription persists. My response is that this was how they were feeling on a constant basis before, without even knowing it. This is another result of the sensitivity issue previously mentioned. A side note: my preference has been to prescribe contact lenses for near, along with low minus spectacles for distance needs. There is a relatively small percentage of the normal day that truly requires a full distance prescription be worn. When we are not viewing at "optical infinity" such a prescription is inappropriate. Wearing a prescription that is more in line with the majority of one's visual demands throughout the day provides greater opportunity to stay in that zone of sensitivity and reduces visual tension. This was the first method I used to reduce my own prescrip-

tion. Initially I reduced my contact lenses by 1 diopter and kept a pair of -1.00 spheres in my car for those special occasions when extra acuity would be helpful. Those occasions were rare at first, then became nonexistent. I found this to be an excellent starting point, opening the door for a good, solid VT program to help me truly begin to understand vision for myself.

Better efficiency is not created. If it existed at some point, which in most cases it did, it can only be coaxed back to the surface. This must be done gently and slowly with an attitude of "not-doing," that is, without forcing the issue and without attachment to the outcome. In my case, when I finally let go of the perceived need to reduce my prescription and decided just to work on vision, the emergent, I was able to restore balance to my visual system and the prescription reduced. My feeling is that, in most cases, a state of balance once existed and was lost owing to some event(s) or circumstance(s) which created the need to SEE differently. Under such circumstances, context is lost in favor of inappropriate attachment to some part of the whole. Unfortunately, once this stimulus was removed, the individual forgot or was unable to return to balance.<sup>25</sup> Often the stimulus is unrelenting, as in the case of academic demands, and the perceived need to maintain the adaptation remains. This adaptation is a filter through which everything must now pass. While it may have been a useful response to the situation, it is now a hindrance to optimal function over the long haul.

One of the reasons that myopia reduction has such a bad reputation outside behavioral optometry is measurement. It is easy to measure refractive error, axial length and corneal curvature. It is not so easy to measure comfort, awareness, thinking or behavior. Many people seem to change little in their refractions after a program of myopia reduction. However, with these same people, better acuity is achieved with less compensation. It seems that once the physiology has changed it is difficult to change it back. It also seems that this is unnecessary. We live in a subjective world; therefore it is the subjective changes which I feel are most important and most gratifying to achieve.

When visual information processing is enhanced and self-acceptance and awareness are rebuilt, the system works more smoothly. In clinical practice, I have ob-

served close to 90% of my “myoping” VT patients to have improved unaided visual acuities whether they began with 20/20 or 20/400, no matter what reason they chose to begin VT. True myopia reduction comprises reduction of the significant signs and symptoms of the myopic condition. These include constricted awareness and perception, inefficient information processing and problem solving, inappropriate relationships to self and environment and the like. Through the visual system we have the ability to guide people, enabling them to observe some of these behaviors and make informed decisions as to possible changes available. According to neuroscientist Eric Kandel, “The very fine structure of our brains and the degree of sensitivity in delicate interconnections between the nerves are not fixed ... but can actually be changed by learning. This means that when new contexts come along, the structure of our brains can respond to them. Meaning can actually modify the structure of the human brain.”<sup>26</sup> Perhaps there is some recalibration of the neurophysiology which enables a once blurry retinal image to be interpreted as clear. Perhaps the improvements in efficiency of visual information processing that result from vision therapy make everything work more smoothly. Whatever the mechanisms, the refractive, visual and overall functional and behavioral changes available through vision enhancement therapy are of great benefit to those who seek them.

reference

## References

1. Sperduto RD, Seigel D, Roberts J, Rowland M. Prevalence of myopia in the United States. *Arch Ophthalmol*, 1983; 101:405-407.
2. Sherman A. Myopia can often be prevented, controlled or eliminated. *Optom Extension Prog, JBO*, 1993, Vol.4, No.1:15-23.
3. Thanks to Dr. Donald Getz for the term “myoping.”
4. Skeffington AM. Practical applied optometry. *Optom Extension Prog*, 1950.
5. Hynes EA. Refractive changes in normal young men. *Arch Ophthalmol*, 1956; 56:761-67.
6. Hayden R. Development and prevention of myopia at the U.S. Naval Academy. *Arch Ophthalmol*, 1941; 25(4):539-47.
7. O’Neal MR, Connon TR. Refractive error changes at the U.S. Air Force Academy, class of 1985. *Am J OPom Physiol Opt*, 1987; 64(5):344-54.
8. Dunphy E, Stoll M, King S. Myopia among American male graduate students. *Am J Ophthalmol*, 1968; 65:518-21.
9. Grosvenor T, Flom M. *Refractive anomalies. Research and clinical application.* Boston: Butterworth-Heinemann, 1991.
10. Young FA, Leary GA, Baldwin WR, West DC, Box RA, Harris E, Johnson C. The transmissions of refractive errors within Eskimo families. *Am J Optom Arch Am Acad Optom*, 1969; 49:676-85.
11. Alsbirk PH. Refraction in adult West Greenland Eskimos. A population study of spherical refractive errors, including oculometric and familiar correlations. *Acta Ophthalmol*, 1979; 57:84-95.
12. Young FA. The effect of restricted visual space on the primate eye. *Am J Ophthalmol*, 1961; 52:799-806.
13. Young FA. The effect of atropine in the development of myopia in monkeys. *Am J Optom Arch Am Acad Optom*, 1965; 42:439-49.
14. Young FA. The effect of restricted visual space on the refractive error of the young monkey eye. *Invest Ophthalmol*, 1963; 2:571-77.
15. Getman GN. *How to develop your child’s intelligence.* White Plains, MD: Research Publications, 1962, 1984.
16. Bates WH. *Perfect sight without glasses.* New York: Central Fixation Publishing, 1920.
17. Huxley A. *The art of seeing.* New York: Harper Brothers, 1942.
18. Wiener H. *Eyes OK I’m OK.* San Rafael CA: Academic Therapy Publications, 1977.
19. Ornstein RE. *The psychology of consciousness.* Harmondsworth, England: Penguin Books, 1972.
20. Harmon DB. *Notes on a dynamic theory of vision.* Austin, Texas: Research Press, 1959.
21. Duke Elder SW. *The text book of ophthalmology.* St. Louis: C. V. Mosby, 1942; Vol. 1:248.
22. Wiener H, Wiener M. *Personal communications.*
23. Curtin BJ. *The myopias. Basic science and clinical management.* Philadelphia: Harper and Row, 1985.
24. Grosvenor T, Perrigin DM, Perrigin J, Maslovitz B. Houston Myopia Control Study, a randomized clinical trial, Part 2. Final report of the patient care team. *Am J Optom Physiol Opt*, 1987; 64:482-98.
25. Ebenholtz SM. Accommodative hysteresis: a precursor for induced myopia? *Invest Ophthalm Vis Sci*, 1983; 24:513-15.
26. Peat FD. *The philosopher’s stone: chaos, synchronicity, and the hidden order of the world.* New York: Bantam Books, 1991:117.

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