Dealing with Nearsightedness during Development (and Post-Development)

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By

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To the Late William Yee
who always knew that it was possible.

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FOREWORD

He has given me a great gift. A dangerous gift. The gift of knowing.
—Dr. Bennet Omalu, from the movie Concussion.

John Yee is a Canadian Optician and a long standing member of the Opticians Association of Canada (OAC). John has been a respected contributor to the OAC education lecture circuit and the presentation of his research to his fellow peers was very well received. The content, presented by John is both thoughtful and researched. His fellow Opticians are always delighted to see his name appear on the lecture schedule. John's interest in Orthoculogy as a treatment has now branched into the concept of treating early development myopia.
—Robert Dalton, Executive Director, Opticians Association of Canada

With the explosion of myopia since the 1970's and the prediction that almost 50% of the world's population will be myopic by 2050, John's continued research into controlling and reversing this "epidemic" is very welcome. John's research and new book take us to the realization that myopia control is best implemented during the development years. Eye care professionals will find that John's research and subsequent therapy will support their practice and expanding knowledge. John's dedication to this "epidemic" is an inspiration. I highly recommended it as required reading for all opticians!
—Lorne Kashin, Executive Director, Ontario Opticians Association

I have thirty years experience in the study of nearsightedness prevention. John William Yee has made a major personal effort to design preventive methods for this difficult problem, and these methods are effective. It is always difficult to pioneer an alternative treatment in a field as conservative as optometry, and it takes a bold "soul" to take these first steps. John has made a strong personal commitment to his research. He offered his findings internationally. His participants were from different countries around the world, and they have attested to the effectiveness of his system. The originality of John's work is very important, but of far greater importance is the humanitarian aspect of that work—that he continues to support certain individuals who cannot afford good vision at no cost to them.

In this book, he in turn, offers this knowledge to the general public and to professionals. Progress in this field will also require professionals to provide personal sacrifice of themselves and their time to help others. His pioneering development of "Ortho C" shows promise to effectively prevent nearsightedness at the threshold. His standard of professionalism and his commitment to support the welfare of others sets a high example for all of us.

—Otis S. Brown, Author of: How to Avoid Nearsightedness, Waynesboro, PA, United States

PREFACE

It's unbelievable how much you don't know about the game you've been playing all your life.
—Mickey Mantle

Who Is the Treatment For?

The treatment is mainly for children and adolescents. I wrote this book for parents interested in treating their children who became nearsighted and for the eye care specialist who may be interested in treating younger myopic clients. It is possible to correct myopia in the -0.50 D to -3.00 D range.

The treatment is also for adults who became nearsighted during development but decided to treat it during post-development. It also works for the few who became nearsighted during post-development and decided to treat it before other types of refractive error set in. The correctable range for adults, however, is from -0.50 D to -1.50 D (and in some cases, up to -1.75 D).

If I make reference to "you" in the following pages, I am referring to anyone interested in treating their myopia. I am also referring to a caregiver or an eye care specialist interested in treating children with myopia. I am also keeping in mind the reader interested in my research.

My definition of "correctable" is that it is possible to see line 8 (the 20/20 line) or better on the Snellen chart after the treatment. It is not always a guarantee. There are always some offsetting variables unaccounted for. But those variables are more prevalent during post-development than during development.

The correction for adults is over a lower range. Unlike children and adolescents, they are subjected to other refractive errors. Beyond -1.50 D, astigmatism and other refractive errors start to creep in to interfere with the effectiveness of ortho C. The standard drills were not designed to deal with them. You have to resort to other drills, but that is beyond the scope of this book which is about treating nearsightedness—not nearsightedness

compounded with other refractive errors. (Refer to the chapter *The Research on Myopia During Development and Post-Development* for the theory as to why adults are susceptible to other refractive errors and to the chapter *Extraneous Variables* for more information on other negative variables.)

My Invention

The Alternating Drill and the Inline Drill represent the application of the multiplier effect. It induces an improvement more than the flatness of the lens. Ortho K, on the other hand, is restricted to the flatness of the lens. If the flatness of the lens is -2.00 D, it can only improve your visual acuity by 2.00 D; but the multiplier effect can improve it at a multiple of that flatness in the higher myopic range.

The Fusion Drill represents the fusion effect. It merges the "focal point draw" of each eye. It heightens the improvement in visual acuity beyond the multiplier effect. It deals with residual myopia due to astigmatism. It also evens out any imbalance due to the disparity in prescription of each eye.

Eventually the Retention Drill is performed without any contact lenses to maintain the improved visual acuity. The oblique muscles would become sufficiently relaxed to make that possible. The Retention Drill regulates the tension imposed on the ciliary muscle.

A Neurological Process

The effect of ortho C is immediate because it is a neurological process. It is not a mechanical process like ortho K. Neurologically, ortho C reinstates the neurological message to reset emmetropia. Ortho C can correct a higher degree of myopia during development. By synchronizing the crystalline lens and eyeball during the treatment, it reinstates the developmental process which was halted when the eye became myopic. Reinstating the developmental process seems to be more effective than reinstating the post-developmental process. It also attends to progressive myopia as well as myopia.

The information provided here is an extension of the existing book: *The Neurological Treatment for Nearsightedness and Related Vision Problems*. That book is mainly about treating adults with other types of refractive errors such as astigmatism and anisometropia as well as myopia. In the following pages, I will just dwell on pure myopia incurred by children and

adolescents as well as adults; but the treatment of the former is over a higher range.

The Research

My research was based on a pre-test post-test design. I measured the participant's distant vision prior to the intervention on a standard Snellen chart. Then I applied the ortho C intervention. I then took another measurement afterwards on the Snellen chart. The result was an improvement in visual acuity.

One major criticism of a pre-test post-test design is that it is not a true experimental design. It does not have an experimental group and a control group. But the outcome of an experimental design does not take into account individual differences which is relevant in the current study. The result is based on the group. Any individual differences were lost in the total aggregate when calculating the mean. Even if it screened for specific participants, such as myopia up to -1.75 D, it does not allow for any adjustment in the treatment to address a partial resistance to ortho C. The resistance does not show up at the screening stage but during the treatment.

Another criticism is that an outcome based on an individual cannot be attributed to the general population. But my contention is that a case study can be made up of hundreds of participants similar to an experimental design. If I tested a participant with pure myopia before and after ortho C and if the outcome was an improvement in visual acuity, then it is similar to the outcome of the hundreds of previous participants which I and my colleagues treated with pure myopia. My theories were not based on the outcome from a single participant but on those with similar attributes, e.g., pure myopia, that defined the case.

Another common criticism of a pre-test post-test design is history and regression to the means. History refers to the problem that there could be something else in the interim to cause the individual to lower their pre-intervention data. Regression to the means refers to the problem that the pre-intervention data could be lowered due to spontaneous remission (or lowered on its own accord). Those were valid arguments directed against experiments involving natural relaxation to correct myopia. A positive outcome does not immediately take place. To attend to the problem of history, I acquired the participants' post-interventional data minutes after the ortho C intervention. I attended to the problem of regression to the means

in the same way. I also acquired the post-intervention data immediately after the intervention.

Vision Statement

I never did intend to monopolize my findings and then charge a ridiculous price for the treatment; but I did want to patent it to prevent others from doing just that. I abide by the philosophy of the Canadian inventor Frederick Grant Banting who discovered insulin. Any invention that proposes a cure should be affordable, it should be available to everyone, it should not be inferior, and it should not be monopolized by a corporation.

INTRODUCTION

> If something is important enough, you should try even if the possible outcome is failure.
> —Elon Musk

I found that it was more difficult to treat adults than children or adolescents. The nearsightedness of children and adolescents represents pure myopia. Myopia during post-development often changes into something that does not resemble the onset of myopia during development.

The Treatment

I named the treatment orthoculogy or ortho C (to denote correcting the whole eye: ortho + oculus) to distinguish it from orthokeratology or ortho K (which just manipulates the cornea by wearing a lens overnight). You would only wear the ortho C contact lens for a few minutes to perform a specific drill. Then you take it off, and that's it. It is a tool, not a visual aid. (Refer to the chapter *Designing the Lens* for more information.)

Once your myopia is corrected, you would wear the lenses at certain intervals to maintain your improved visual acuity. Eventually you would rely less and less on them. In the case of children, for example, it is possible to perform the drill just once every 6 months to prevent progressive myopia.

The Ideal Intervention Period

If myopia occurred during development, it would be ideal to treat it before 16 years of age (although I had success treating adolescents starting at 17 years of age). It is possible to correct myopia up to -3.00 D within this period. Unlike ortho K, they do not have to perform the drill as often. The retention period is longer.

Similar to ortho K, they would initially perform the drill regularly. The intention is not just to enhance and maintain their vision but to prevent progressive myopia which is common during development. The difference

between my method and ortho K is that ortho C is a therapy. (Refer to the chapter *The Research on Myopia During Development and Post-Development* for more information.)

I am not saying that ortho C is not effective in treating adults. If their onset of myopia was during development, it is still possible to treat it in their 20's or 30's. It is possible to correct it in the -0.50 D to -1.50 D range. The correctable range is lower compared to children because adults are exposed to other offsetting variables.

Resetting the Correct Neurological Message

Ortho C is a neurological treatment. It is not a mechanical intervention. The treatment relies mainly on neurology (on resetting the correct neuromuscular message) and less on physiotherapy (such as applying relaxation exercises and massaging the eye). An incorrect neuromotor message relayed to the ciliary muscle maintains the lens and the eyeball in their myopic shape. The excess tension of the oblique muscles initiated the incorrect message. When the eye became myopic, the regulatory role switched from the ciliary muscle to the oblique muscles.

The increase in tension of the oblique muscles does not induce spasticity. Instead, it neurologically imposes a ceiling on how much the ciliary muscle can relax to allow the lens to flatten when attempting to see far away. The ciliary muscle of a mild or moderate myopic eye can still bulge some more for near focusing, and it can still flatten out to a certain extent from its bulged shape for distant focusing (up to the ceiling imposed). The rectus muscles did not lose their tensile strength when the tension of the extraocular muscle elongated the eye slightly. The rectus muscles can still retract the eyeball upon releasing the tension of the oblique muscle. (Refer to the chapter *How It Reverses Nearsightedness* for more information on the reversal process.)

The Theory Behind the Treatment

Ortho C resets the eye neurologically. First, it resets the neurological message to reinstate Helmholtz's theory. Then it synchronizes the crystalline lens and eyeball to reduce their myopic shape. It is the reverse of near-point stress. It also resets the developmental process, and that reinforces the synchronization to reduce the elongated shape of the myopic eye during development.

During post-development, ortho C can only correct myopia in the mild or moderate range (from -0.50 D to -1.50 D) in the short to medium term. (Refer to my book *The Neurological Treatment for Nearsightedness and Related Vision Problems* for more information on dealing with myopia in that range for adults.) It reduces myopia in the midrange (-2.00 D to -2.75 D) or in the severe range (-3.00 D and higher) as opposed to correcting it, but you have to apply different drills depending on the problem.

If you decide to treat myopia during development, it is possible to correct a higher myopic range. I had success correcting myopia up to -3.00 D which is considered severe myopia. The intraocular and extraocular muscles of children were not compromised even though the eyeball of a -3.00 D eye elongated proportionally more compared to the eyeball of an adult who is -3.00 D. The crystalline lens of a child is thinner, and the eyeball contributed more to myopia. (Refer to the chapter *The Research on Myopia During Development and Post-Development* for more information on why progressive myopia is more prevalent among children.)

It seems that ortho C is more effective when it resets the neurological message to synchronize the lens and eyeball of children. It is more effective than resetting the neurological message to synchronize the lens and eyeball of adults. In the former, it also resets the developmental process while in the latter it also resets the post-developmental process. It seems that ortho C is more effective when it resets the developmental process. The crystalline lens of a myopic child is thinner than the lens of a myopic adult. Ortho C does not have to make it much "flatter". Ortho C mainly targets the elongated eyeball instead of splitting the stimulation to correct the myopic shape of the lens and eyeball. (Refer to the chapter *Why Treat Myopia During Development* for more information.)

The Lens' Flatness

An ortho C lens is not as flat as an ortho k lens. The flatness of an ortho K lens can be up to 6.0 D. The flatness of an ortho C lens is 2.00 D to treat midrange myopia (from -2.00 D to -2.75 D). Its maximum flatness is 2.25 D to address severe myopia (from -3.00 D onwards). To treat mild or moderate myopia, the lens' flatness is equivalent to the absolute value of the prescription. If your prescription is -0.50 D, for example, the flatness is 0.50 D. If it is -1.00 D, the flatness is 1.00 D. (Refer to the *Specifications* for more information.)

Cannot Alter the Cornea Curvature

You cannot change the curvature of the cornea. You want the lens to wrap around the cornea, not the other way around. You do not want to flatten the cornea as in ortho K. There is no muscle controlling its altered shape. There is the tendency to relapse back to its original curvature. The intention is to modify the lens and eyeball neurologically—not the cornea. (Refer to the chapter *The Theory Behind the Treatment* for more information.)

The cornea must maintain its curvature while wearing the lens. Otherwise, ortho C will not work. The "contact lens draw" due to a flatter lens needs to be consistent. The lens is a flexible lens. It does not push against the cornea. It draws against it. One of the ways to achieve that is to make the centre thickness .15 mm instead of the conventional thickness of .18 mm or .19 mm for a plain lens. (Refer to the chapter *Designing the Lens* for more information.)

Duration of Wear

With ortho K, you wear the lens overnight. With ortho C, the duration is shorter. You just wear it for about 5 minutes: the time it takes to insert the lens, perform the drill, and remove the lens. In some cases, you would wear one lens at a time; and sometimes you would wear both lenses together.

Frequency of Wear

You do not have to wear the lens that often. With ortho K, you wear it every night. With ortho C, the wearing frequency is over a longer period. It depends on your prescription, the onset of myopia, and when you decided to treat it. After treating children, theoretically, they do not have to wear the lenses again. But to prevent progressive myopia, they would follow a maintenance schedule.

The retention of the improved shape of the lens and sclera for distant focusing is longer than ortho K. Ortho C did not attempt to reverse the curvature of the crystalline lens or eyeball directly but indirectly—by stimulating the muscles that control them. Your improved visual acuity after being treated by ortho K is shorter because the shape of the cornea is not controlled by any muscle.

Why Adhere to a Maintenance Schedule?

Although ortho C is not ortho K, there are some common features: an ortho C lens is also a "flat" lens, and it is worn at certain intervals. In that sense, the treatment can be categorized as an enhanced version of ortho K. The main difference is that the treatment is also therapeutic. If you missed a schedule, the eye does not relapse back to its original myopic shape. (Refer to the chapter *Extending the Retention Period* for more information.)

The reasons for adhering to a maintenance schedule is different from ortho K. Children are more susceptible to progressive myopia. You need to address it as well as myopia. The crystalline lens is affected differently when it became myopic. Its neutral shape does not bulge as much. The eyeball has to compensate for the effort imposed on the ciliary during prolonged near work. (Refer to the chapter *Why Treat Myopia During Development* for more information on resetting the correct neurological message.)

The myopic lens of an adult is thicker when it became myopic. It tends to fluctuate more compared to children and adolescents during the initial stages of the treatment. The maintenance schedule for adults is more frequent. The goal is to perform the drill once a month. Children can eventually perform the drill once every 3 to 6 months.

Who Qualifies for the Treatment?

Treating myopia depends on several factors. The main consideration is whether or not it complies with the myopic model. (Refer to the chapter *The Myopic Model* for more information.) It is within the myopic model if the nearsightedness was mainly due to near-point stress. If it was strictly due to near-point stress, then it would increase the chances of success since ortho C was designed to reverse near-point stress.

If there is a partial resistance after conducting a resistance test, then there is another problem on top of near-point stress—or a problem on top of a problem. In research, these offsetting factors are called extraneous variables. (Refer to the chapter *Extraneous Variables* for more information.) If the eye is responsive, then you can assume that the problem was due to near-point stress. If the eye is not responsive to ortho C, it does not mean the method is ineffective in treating myopia. Instead, it is ineffective in treating a specific form of myopia that inherited other problems on top of pure myopia.

The eye is exposed to less extraneous variables when myopia occurred during development. It was mainly due to near-point stress. It tends to become compounded with other problems as the individual becomes older. Some of them are treatable by ortho C while others are not.

Benefit Children and Adolescents More

Ortho C tends to benefit children and adolescents more than adults. There are two types of development. There is the physical development of the eye which is completed around the age of 10, and then there is the neurological development which takes a longer time to complete. Ortho C seems to reinstate the neurological development in relation to synchronizing the crystalline lens and eyeball. By reactivating the developmental process, it accelerates and amplifies the multiplier effect.

WHAT TO DO
(AN OVERVIEW)

The following is an outline of how to treat nearsightedness in the different ranges from mild to severe. The treatment proposed for adults is from -0.50 D to -1.50 D. The procedure for treating adults in that range is the same for children and adolescents.

The treatment proposed for children and adolescents, however, covers a broader range. The procedure for treating midrange myopia and severe myopia only applies to children and adolescents. I have successfully treated children and adolescents with myopia as high as -7.25 D.

For information on the steps of drills and their effects on the specific degree of myopia, refer to the chapter on the treatment for that range of myopia. For example, if you want more information on treating a prescription of -0.50 D, go to the chapter *Treating Mild Myopia*. For information on setting up the apparatus before you do the drills, designing the lens, and collecting the pretest posttest data, go to the chapter *The Overall Procedure*. Read the other chapters for answers to other questions you may have.

To maintain the visual acuity and enhance the improvement, refer to the chapter *Extending the Retention Period*. You would rely less and less on the lenses. You would eventually perform the Retention Drill which does not rely on any lenses.

The following are the different drills you would perform:

Treating Mild Myopia from -0.50 D to -0.75 D

Treating -0.50 D for Both Eyes

Perform the following drills:

- Perform the Preliminary Drill 2 times a week for 2 weeks.
- Perform the Alternating Drill 1 time a week for 4 weeks.
- Perform the Inline Drill 1 time a week for 4 weeks.
- Extend the retention period by adhering to a maintenance schedule.

Treating -0.75 D for Both Eyes

Perform the following drills:
- Perform the Preliminary Drill 2 times a week for 2 weeks.
- Perform the Alternating Drill 1 time a week for 4 weeks.
- Perform the Inline Drill 1 time a week for 4 weeks.
- Extend the retention period by adhering to a maintenance schedule.

Treating a Disparity of -0.25 D

Perform the following drills:
- Perform the Preliminary Drill 2 times a week for 2 weeks.
- Perform the Alternating Drill 1 time a week for 4 weeks.
- Perform the Inline Drill 1 time a week for 4 weeks.
- Extend the retention period by adhering to a maintenance schedule.

Treating Moderate Myopia from -1.00 D to -1.75 D (For Adults: from -1.00 D to -1.50 D)

Perform the following drills:
- Perform the Preliminary Drill 2 times a week for 2 weeks.
- Perform the First Alternating Drill 1 time a week for 2 weeks.
- Perform the Second Alternating Drill 1 time a week for 2 weeks.
- Perform the Inline Drill 1 time a week for 4 weeks.
- Extend the retention period by adhering to a maintenance schedule.

Treating Midrange Myopia from -2.00 D to -2.75 D

Perform the following drills if there is no resistance:
- Perform the Preliminary Drill 2 times a week for 4 weeks.
- Perform the Alternating Drill 2 times a week for 2 weeks.
- Perform the Inline Drill 2 time a week for 2 weeks.
- Perform the Fusion Drill 2 times a week for 2 weeks.
- Extend the retention period by adhering to a maintenance schedule.

Perform the following drills if there is a partial resistance:
- Perform the Modified Preliminary Drill 2 times a week for 4 weeks.
- Perform the Fusion Drill 2 times a week for 2 weeks.
- Extend the retention period by adhering to a maintenance schedule.

Treating Severe Myopia -3.00 D and Higher

Perform the following drills if there is no resistance:

- Perform the Preliminary Drill: 2 times a week for 4 weeks.
- Perform the Modified Alternating Drill 2 times a week for 2 weeks.
- Perform the Regular Alternating Drill 2 times a week for 2 weeks.
- Perform the Inline Drill 2 times a week for 2 weeks.
- Perform the Fusion Drill 2 times a week for 2 weeks.
- Extend the retention period by adhering to a maintenance schedule.

Perform the following drills if there is a partial resistance:

- Perform the Modified Preliminary Drill 2 times a week for 4 weeks.
- Perform the Fusion Drill 2 times a week for 2 weeks.
- Extend the retention period by adhering to a maintenance schedule.

1

WHY TREAT MYOPIA DURING DEVELOPMENT?

The Multiplier Effect Becomes More Effective

The standard drills (the Alternating Drill and the Inline Drill) apply the multiplier effect to correct myopia. Before it can work effectively on adults, the disparity between the right and left eye must be no more than -0.25 D in the mild and moderate myopic range, and any astigmatism present must be no more than -0.50 D in the mild range or -1.00 D in the moderate range. Your myopia also needs to be within the myopic model. (Refer to the chapter *The Myopic Model* for more information.) When treating children and adolescents, the presence of pure myopia is more prevalent.

The Best Time to Treat Myopia

The Onset During Development and the Treatment During Development

The best time to treat myopia is when its onset was during development and the decision to treat it was also during development. It is possible to correct myopia up to -3.00 D within this time frame. Similar to ortho K, children and adolescents would still wear the ortho C lenses at certain intervals. Unlike ortho K, it is spread out over a longer period, and the indicators to wear the lenses and perform the drill again are not as harsh.

They would still perform the drill regularly even after I corrected their myopia. The intention is not necessarily to enhance their vision but to prevent progressive myopia which is common during development. (Refer to the chapter *The Theory Behind the Treatment* for more information on progressive Myopia.)

The developmental period of the eye is approximately from 1 to 16 years of age (when account for its neurological as well as physical makeup). If a child had myopia during 8 years of age, for example, it is very effective if the decision to treat it was made from 8 to 15 years of age. If it was treated later from around 16 to 18 years of age, it becomes more challenging in the sense that the noticeable improvement becomes more gradual. That time frame is a transition period when the eye gradually changes from development to post-development. It seems that the development of the eye assists in the treatment.

The Onset During Development and the Treatment During Post-Development

Another treatment option is when the onset of myopia was during development, and the decision to treat it was during post-development when you are in your 20's or 30's. It is possible to correct myopia in the -0.50 D to -1.50 D range. The correctable range is lower compared to children and adolescents. Adults are more susceptible to other types of refractive errors such as astigmatism and anisometropia in the higher myopic range. In addition, the muscles seem to be compromised if the myopia is higher than -1.50 D. (Refer to the section *No Other Refractive Errors* below and to the chapters *Extraneous Variables* and *The Research on Myopia During Development and Post-Development* for more information.)

In order for the standard drills to be effective, the same tolerance applies. The disparity between the right and left eye must be no more than -0.25 D. Any astigmatism present must be no more than -0.50 D in the mild range or -1.00 D in the moderate range.

The Onset During Post-Development and the Treatment During Post-Development

Another possible treatment is when the onset of myopia was during post-development, and the decision to treat it was also during post-development. It is also possible to correct myopia in the -0.50 D to -1.50 D range. Again, the same tolerance applies before the standard drills are effective. The disparity between the right and left eye must be no more than -0.25 D. Any astigmatism present must be no more than -0.50 D in the mild range or -1.00 D in the moderate range.

Another post-development problem is that presbyopia may start to creep in when you are in your 40's. If there are traces of it, it should be less than your myopia. It is possible to treat presbyopia that is higher than your myopia, but the topic is too broad to discuss here. It will be dealt with more effectively in another publication.

No Other Refractive Errors

During development, pure myopia (or myopia with no other refractive errors) is more prevalent. Ortho C is effective during this stage because other types of refractive errors such as astigmatism (an uneven cornea) and anisometropia (a disparity in prescription between the right and left eye of -1.00 D or more) do not set in until later. Ortho C can deal with other types of refractive errors such as astigmatism or anisometropia on top of myopia during post-development, but the results are not as clean as pure myopia—in the sense that there is likely to be some residual myopia.

According to the National Institutes of Health, about 23% of children from 6 months to 1 year of age have astigmatism, but they tend to grow out of it by the time they reach school age around 5 or 6 years of age. Larsson and Holmstrom (2001) examined 198 children and found that the prevalence of astigmatism 1 D or more fell significantly between 6 months and 2 ½ years of age and then became stable. Those with astigmatism greater than 1 D declined slightly between 2 ½ to 10 years. Of the 8 children with anisometropia of 1 D or more and less than 2 D at 6 months of age, 7 no longer had it at 2 ½ years of age. Of the 6 children with anisometropia of 1 D or more and less than 2 D at 2 ½ years, only 1 child was anisometropic at 10 years of age. Of the 7 children with high anisometropia of 2 D or more at 6 months of age, 6 continued to have high anisometropia greater than 2 D.

Therefore, in the decades of treating children and adolescents, I rarely encountered a child with high astigmatism and myopia. I did, however, came across a child with hyperopia and high astigmatism and another with a disparity of -0.75 D between the right and left eye. According to Ahmed et al. (2016) children with hyperopia have a higher risk factor to develop astigmatism. High hyperopia leads to squinting, and it contributes to astigmatism.

It is possible, however, to correct children and adolescents with high astigmatism and hyperopia. The intraocular and extraocular muscles are

flexible and are not easily compromised. For example, I treated a child with midrange hyperopia and high astigmatism that never stabilized when she was 5 years of age. Her prescription for both eyes was +2.00 -1.50 x 175. Her parents felt uncomfortable inserting the lenses and removing them for her, so I met her regularly to insert the lenses and perform a specific drill. When she started, she could only see up to line 5 (the 20/40 line) on the Snellen distant chart. At present, she is 11 years of age and could see line 11 (the 20/10 line) on the standard Snellen distant chart. It is better than the 20/20 line which is line 8. She could also read the 20/20 line on the Rosenbaum near chart at 14 inches away.

Treating a Higher Degree of Myopia

When treating adults, I can only correct myopia up to -1.50 (and sometimes -1.75 D especially if the other eye is -1.50 D), and I can only reduce midrange (-2.00 D to -2.75 D) or severe myopia (from -3.00 D) in the short and medium term. When treating children and adolescents, it is possible to correct a higher degree of myopia—as high as -3.00 D. Their intraocular and extraocular muscles were not compromised even though their eyes elongated more compared to an adult. The crystalline lens of a child is “thinner” when myopia sets in, and the eyeball contributes more to myopia.

Wearing Frequency and Duration

One of the features of Ortho K retained by ortho C is the wearing frequency. Ortho C’s wearing schedule has a longer interval. The indicators to perform the drill again are more subtle. (Refer to the chapter *Extending the Retention Period* for more information.)

Children and adolescents would still perform the drill regularly even if I corrected their myopia. The intention is not just to maintain their improvement in vision but also to prevent progressive myopia which is prevalent during development.

2

NEAR-POINT STRESS

The Problem

You need to know the problem before you can treat it. The treatment I am proposing for nearsightedness is related to its etiology: near-point stress. There is a strong correlation between near-point stress and myopia (Dirani et al., 2008a).

During post-development, near-point stress forces the crystalline lens to adopt a rounded or bulged shape to bring a near object into focus. The ciliary muscle continues to tighten up to maintain that shape when engaging in near work for an extended period. The eyeball tends to elongate to relieve the tension by repositioning the retina closer to the focal point. Once the oblique muscles' excessive tension sets in, however, the regulatory role changes.

Helmholtz's theory no longer applies. The ciliary muscle no longer has exclusive control of the crystalline lens to bring an object into focus. It is handed over to the oblique muscles. The excess tension of the oblique muscles neurologically placed a restriction on how much the ciliary muscle can relax for distant focusing. The ciliary muscle did not seize up. Spasticity did not set in. The lens can still bulge some more for near focusing, and it can still flatten slightly for the distance—within the restriction imposed by the oblique muscles.

Near-Point Stress

How does near-point stress contribute to myopia? Let's first consider what takes place when you see something far away. The rays of light from a distant object beyond 20 feet are parallel. The crystalline lens of a normal or emmetropic eye assumes a flat shape to bring it into focus. The ciliary muscle needs to relax before it can flatten out. Therefore, distant focusing is said to be relaxed focusing. See Figure 1.

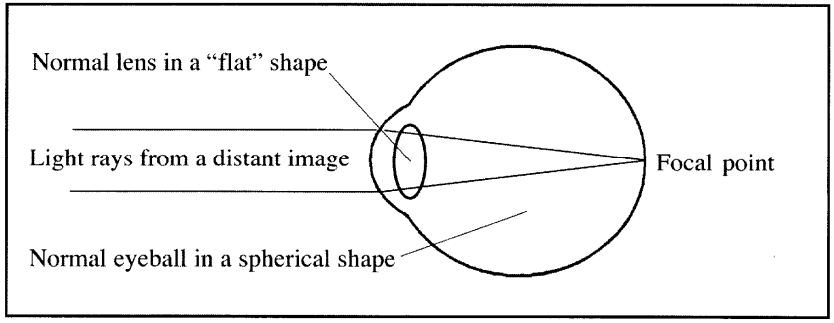

Figure 1 The normal shape of the crystalline lens for distant focusing.

The rays of light from a near object are divergent. The crystalline lens cannot remain in its neutral flat shape to bring it into focus. The focal point would end up behind the retina due to the divergent rays of light. The lens needs to become more rounded or bulged to converge the rays to bring the focal point back onto the retina. See Figure 2.

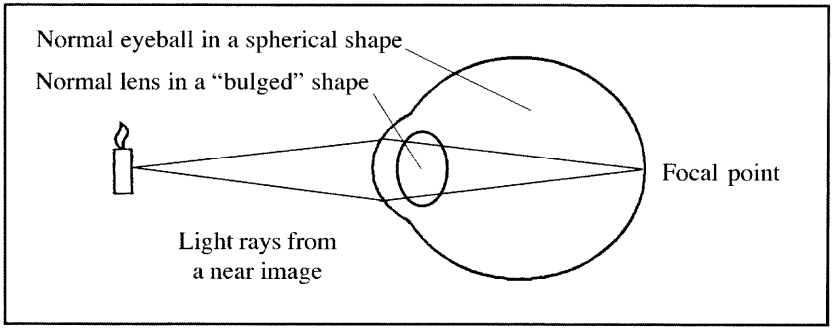

Figure 2 The normal shape of the crystalline lens for near focusing.

The ciliary muscle tightens up in order for the lens to bulge. The tension enlarges the muscle in the same way as how your biceps bulges when you flex it. The reduction in the space between the lens and the ciliary muscle ring allows the zonule fibres to become slack. The lens becomes thicker when the fibres are not pulling on it.

The recommended range for reading is 16 in or 40 cm. The "effort to see" increases when attempting to bring an object closer than 16 inches into