

THE LITTLE GUIDE TO MYOPIA CONTROL

Why This Is a Concern and
What Can Be Done About It



Prepared by
eyecarekids
Optometrists

Hi there! Thanks for taking the time to read this short guide about myopia.

Myopia (or short-sightedness) is fast becoming a world epidemic. Through the years, more patients come in to see us for spectacles, contact lenses and other forms of treatment for myopia. We believe the first step to good eye health is: being informed. As optometrists who are committed to put a stop or slow down myopia's progression, we've put together nuggets of valuable information on myopia into this booklet, which you can share with family and friends.

This booklet aims to provide basic information on myopia based on the latest research. It is not meant to replace advice given by your eyecare professional (optometrist or ophthalmologist). Should any of the information differ to what your eyecare professional has given you, please consult them before implementing any changes to your lifestyle.

This booklet provides information and answers to questions such as:

- what is myopia and when does it start
- why myopia is a concern
- early signs of myopia
- causes of progression and what can be done
- myopia risk scale
- treatment options for myopia
- lifestyle modifications for myopia control
- your optometrist's role in myopia control

We hope you find our myopia guide helpful. If you're looking for a local optometrist who will ensure that your child will have their best vision for life, we'll be happy to see you at our practices!



Dr Soojin Nam
Behavioural Optometrist



Dr Ali Khalife
Behavioural Optometrist



Dr Alexander Du
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CONTENTS

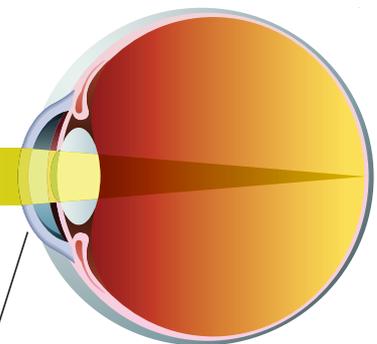
What Is Myopia?	1
Population Prevalence	2
What Causes Myopia?	3
Causes of Myopia Progression and What Can be Done	4
Classifications of Myopia Severity	5
Risk Scale for Myopia	6
Why is Myopia Bad?	7
The Long-Term Effects of Untreated Myopia	8
If That Many People Are Myopic, What Is the Concern?	9
Early Signs that Says Your Child Might Have Myopia	10
Myths about Myopia	11
Kids and Screen Time	15
Why Outdoor Time Matters	18
Why Just Getting Stronger Prescription Glasses Isn't Enough	19
Treatment Options	20
Lifestyle Modifications for Myopia Control	23
Your Optometrist's Role in Myopia Control	24
References	25
Myopia Resources	26

What Is Myopia?

Myopia, or short-sightedness, is a refractive error caused by the eyeball growing too long. This means when light enters the eye, the eye doesn't bend light correctly. The light entering the eye then fails to form a clear focus on the light-sensitive retina in the back of the eye. The result is blurry distance vision. A person with myopia may squint or frown when trying to see distant objects clearly.



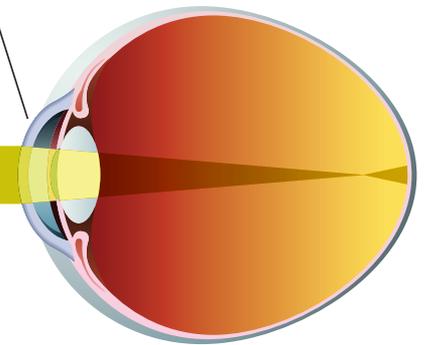
Normal Eye



Cornea

Myopic Eye

the eyeball is elongated and distant figures appear blurry



Myopia can be mild, moderate or severe.

Population Prevalence

Globally over a billion people are affected by myopia. The numbers are continuing to increase and will become an epidemic.^{1,2} In Australia, the prevalence of myopia is lower than the rest of the world at just below 30%, however research is showing an increased prevalence rate with age.³⁻⁵ In the past 6 years, myopia prevalence in Australian 12 year olds has doubled!

By 2050, it has been projected that over 50% of the world will be short-sighted and 10% of the world will be highly short-sighted.



“Globally, over a billion people are affected by myopia.”

What are some of the risk factors in developing myopia?



There are several risk factors which appear to accelerate or contribute to the progression of myopia.

(1) Becoming myopic at a young age

Children who develop short-sightedness at a young age tend to progress faster than children who develop myopia when they are older. This is why it is important to intervene early and receive the appropriate treatment

(2) Having myopic parents

Having one or two myopic parents increases risk, along with less time spent outdoors and more time spent reading.

(3) Asian ethnicity

Ethnic background also plays a role in myopia susceptibility, with a greater prevalence in those with Asian ethnicity.

(4) Binocular vision disorders

Children with eye teaming or eye focusing issues (binocular vision disorders) may be at risk of developing shortsightedness.

(3) Visual environment

Children who are shortsighted appear to spend less time outdoors compared to children who are not shortsighted. There is an increased risk of myopia development and progression in children who read at very close distances (<20cm) for continuous periods of time (>45 mins). This can refer to reading in print or digitally.

Causes of Myopia Progression and What Can be Done

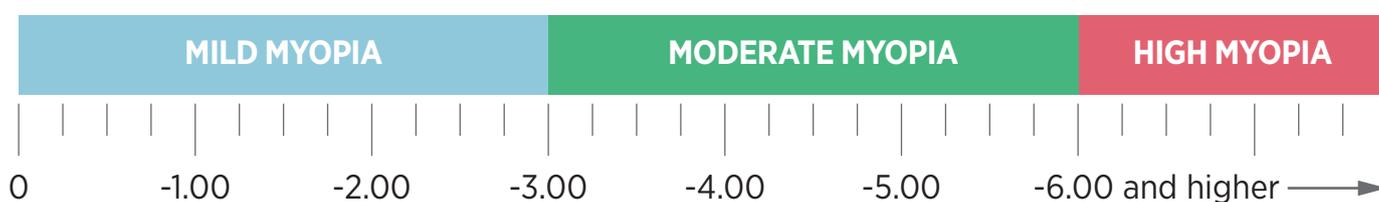
Causes	Can you help & how?
 <p>Family history¹³</p>	<p>No</p> <p>Children with one or two myopic parents have a 2 or 6x increased risk of myopia development respectively.</p> <p>Prevalence rate in children with no myopic parent is 7.6% compared to 43.6% with both parents myopic.¹⁴</p>
 <p>Inaccurate eye teaming and focussing¹⁵⁻¹⁷</p>	<p>No</p> <p>Those who have the tendency to cross their eyes when reading (convergence) and those who over or under focus when reading will usually strain in order to maintain clear single vision. Consequently the ability to relax the eyes is reduced, which may lead to myopia and its progression.</p> <p>A lag in focus may stimulate eye growth and myopia progression.</p> <p>Fun fact: SOMETIMES Ipad and near games do not cause myopia progression but rather identify those with focussing problem.</p> <p>Early detection is key. Children should get their eyes tested yearly.</p> <p>Spectacles may be prescribed to stimulate accurate and comfortable eye teaming and focussing.</p> <p>Vision therapy can be carried out to improve eye teaming and focussing.</p>
 <p>Environment¹⁸</p>	<p>Yes</p> <p>Light intensity experienced outdoors may increase depth of focus, less image blur, reduced accommodation and, therefore, decreased elongation of the eyeball or myopia progression.^{7,19}</p> <p>Increased dopamine from high intensity light may prevent myopia development.²⁰</p> <p>Take regular breaks from near work and spend time outdoors</p>

Classifications of Myopia Severity

Myopia is measured in dioptres (D), which are also the units used when measuring optical power of spectacles and contact lenses.

Lens powers that correct myopia are preceded by a minus sign (-) and are usually measured in 0.25 D increments.

Severity of short-sightedness is often categorised as:



**Values measured in DS (dioptr sphere)*

Mild myopia typically does not increase a person's risk for eye health problems. However, moderate and high myopia are associated with serious, sight-threatening side effects.

Risk Scale for Myopia

LOW	MODERATE	HIGH
Diagnosed with myopia at adult ages	Diagnosed with myopia at teen years	Diagnosed with myopia under 10
No Family History	One parent Myopia	Both parents myopic
Less than 2 hours near work	Less than 2 hours near work	Greater than 2 hours near work
Normal eye teaming	Slight over-convergence	Excess convergence
Caucasian heritage	Other heritage	Asian heritage
More Time Spent Outdoors can prevent myopia		Less time outdoors can cause myopia

If there are two or more moderate risks identified, the child should be reviewed by an optometrist every 6-12 months.



Why Is Myopia Bad?

Optometrist Dr Ali Khalife states, “*Myopia may not sound like much. Many people believe the worst part about myopia is the number that their eyes are, or that there is the expense of spectacles needing to be purchased every year. To us, as optometrists, that is not the concern and not why we worry so much.*”

Dr Khalife went on to say the reason why optometrists worry about myopia is because of the increased risk of developing ocular complications later on in life such as

- retinal detachment
- cataracts
- glaucoma
- myopic macular degeneration

It's never too early for an eye test. An eye examination should be carried out at least once before the age of 5 or kindergarten.



The Long-Term Effects of Untreated Myopia

The earlier the onset of myopia, the higher the risk and rate of progression and final degree of myopia.

USE THIS APP TO ASSESS YOUR CHILD'S RISK OF DEVELOPING MYOPIA FOR FREE

The MyAppia app by Dr. Thomas Aller. Also known as the Myopia Progression Calculator. You can add current and previous prescription.

Link: https://www.myopia.care/public_myappia

Let's talk about the risks of the 4 eye diseases that may develop from untreated myopia.

1

RETINAL DETACHMENT

- The retina pulls away from the eye's supportive tissue
- Can cause permanent vision loss.

2

CATARACTS

- Typically associated with the aging process
- Tend to develop sooner in nearsighted eyes

3

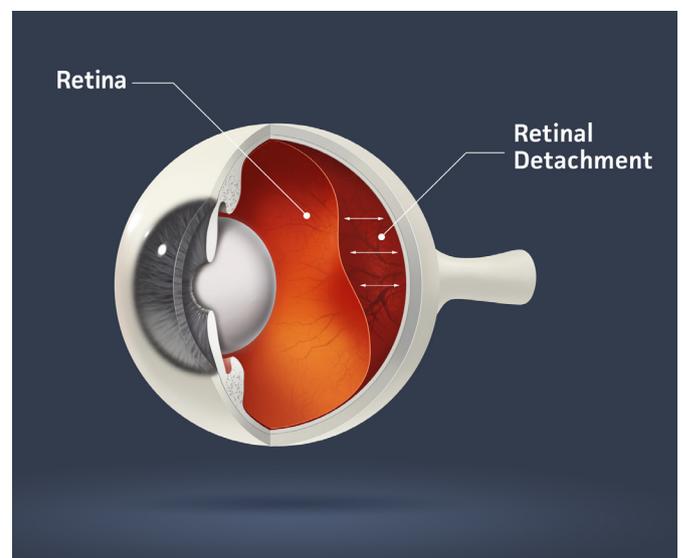
GLAUCOMA

- Typically associated with higher pressure in the eye
- Damages the optic nerve and causes vision loss

4

MYOPIC MACULAR DEGENERATION

- The most common complication of high myopia
- A slowly progressive and sight threatening condition in which visual loss develops from atrophy of the retinal pigment epithelium and/or secondary complications such as sub-retinal neovascularization
- The only disease amongst the top five causes of blindness that remains entirely untreatable



The increased risk of developing the above ocular complications is not linear. The risk of developing these complications is almost exponential. With -1.00DS to -3.00DS of myopia, there is a 4x risk of developing a retinal detachment, which goes up to a 15x risk with -3.00DS or higher.

If That Many People Are Myopic, What Is The Concern?

Once myopia develops, the changes are usually **permanent**. It cannot be undone. It is also **highly** likely that once the eye becomes myopic, it will continue to get worse.

Myopia is currently one of the most significant causes of blindness.^{6,7} The higher the myopia, the higher the risk of developing eye diseases such as retinal detachment, glaucoma, cataract and myopic maculopathy.⁸⁻¹¹

People with high myopia (generally classified as greater than -6.00 diopters) have a longer eye length and a resultant thinning of the inner parts of the eye. Research shows that they are at risk of retinal detachment, cataracts, glaucoma and blindness. Half of university aged people with high myopia are expected to develop irreversible vision loss. What a devastating thought!

Myopic macular degeneration (Vonghant et al 2002)

Prescription range	Increased likelihood of MMD
-1.00 to -2.99	2.2 times more likely
-3.00 to -4.99	2.2 times more likely
-5.00 to -6.99	40.6 times more likely
-7.00 to -8.99	126.8 times more likely
-9.00 and above	348.6 times more likely

Retinal detachment (Ogawa & Tanaka 1998)

Prescription range	Increased likelihood of retinal detachment
-0.75 to -2.75	3.1 times more likely
-3.00 to -5.75	9.9 times more likely
-6.00 to -8.75	21.5 times more likely
-9.00 to -14.75	44.2 times more likely
-15.00 and above	88.2 times more likely

Posterior subcapsular cataract (Vonghant et al 2002)

Prescription range	Increased likelihood of cataract
	2.1 times more likely
-1.00 to -3.50	3.1 times more likely
-6.00 and above	5.5 times more likely

Glaucoma (Marcus et al 2011)

Prescription range	Increased likelihood of glaucoma
-1.00 to -3.00	1.4 times more likely
Greater than -3.00	2.5 times more likely

If That Many People Are Myopic, What Is The Concern?

Blurred vision is the main symptom, so if your child has myopia they might:

- squint or frown when looking at distant objects
- hold their book too close to their face
- prefer to sit at the front of the classroom
- prefer to sit very close to the TV or movie screen
- show decreased interest in learning, sports or other activities requiring good distance vision



“At times, some children do not have any symptoms. This is actually common as they do not know what they should be able to see. One child cannot see through another child’s eye, so they just assume what they see is normal.”

Optometrist Dr Soojin Nam states, *“At times, some children do not have any symptoms. This is actually common as they do not know what they should be able to see. One child cannot see through another child’s eye, so they just assume what they see is normal.”*

“A routine eye exam lets your optometrist know if your child has myopia or other problems with their vision. When you suspect your child might have vision problems, have them checked straight away. Vision and learning always come together. If your child’s vision suffers, everything else will.”

Myths about Myopia

Here are some common misconceptions about myopia and the likely explanation why some people believe them.

1. LOOKING AT GREEN THINGS CAN HELP LESSEN OR PREVENT MYOPIA.

Looking at green trees in itself does not help to lessen or reverse myopia. This however forces us to take a vision break from near work to look into the far distance and may prevent the development of myopia.

Experts think that intense prolonged work done up close may cause myopia in kids. The eye needs to focus (accommodate) harder in order to see up close, and experts believe this accommodative effort causes the eyeball to grow longer, which causes myopia.



Increasing outdoor activity and exposure to sunlight has been found in recent research studies to be protective against myopia. Whether you are looking at green items does not matter.

2. LYING DOWN WHILE READING, READING IN THE DARK, READING IN MOVING VEHICLES AND WATCHING TOO MUCH TV WILL CAUSE MYOPIA.

All these activities usually mean that your child is focussing at near objects for a prolonged period, which increases the likelihood of them developing childhood myopia.

Experts believe that as long as proper distance is maintained and vision breaks are taken, these activities do not cause myopia to increase.

If you find your child is holding their books very near or likes to sit very close to the TV, schedule them for an eye test to exclude a refractive error.

3. SLEEP EARLY TO PREVENT MYOPIA.

No scientific evidence has been found to show that sleeping early can help prevent myopia. Many kids today spend much time looking at digital devices and, in turn, may end up sleeping late.

Looking at digital devices intensely at a near distance for long periods can worsen myopia.



4. EYE EXERCISES LIKE ROLLING YOUR EYES, MASSAGING THEM AND USING ACUPRESSURE TECHNIQUES CAN HELP PREVENT MYOPIA.

No conclusive scientific evidence shows that these work. Experts warn that chronic vigorous rubbing of the eyes in children (for example, in children with allergic conjunctivitis) can cause astigmatism, another type of refractive error that is often seen with myopia.

5. EAT CARROTS OR OTHER SUPPLEMENTS HIGH IN VITAMIN A TO PREVENT MYOPIA.

Diet with adequate Vitamin A is good for your kid's health and especially eye health. However, it has not been proven to prevent myopia.



6. WEARING FULLY CORRECTED SPECTACLES WILL WORSEN YOUR MYOPIA, SO BETTER WEAR UNDER-CORRECTED ONES.

Your child could actually strain their eyes if their spectacle lenses are under or overcorrected.

Experts say that some people mistake this eye discomfort to mean that myopia may be worsened by wearing spectacles. Have a refraction done by an optometrist to help ascertain the correct power for your lens and soon get you feeling comfortable with your lenses.

Experts believe wearing spectacles that are under-corrected may lead to amblyopia (lazy eye) in young children. Studies have shown that the bigger the under-correction, the more your child's myopia could worsen.

7. CHILDHOOD MYOPIA USUALLY GETS BETTER WITH AGE.

There is a deceptive impression that myopia gets better with age. The reason could be that a young child's eyes can accommodate (focus) more strongly. When kids focus on a vision chart, this sometimes causes the amount of myopia measured to be erroneously high.

As the child gets older, their eye accommodates less, and this often leads to a lower measurement of the degree of myopia.

8. PINHOLE DEVICES CAN HELP IMPROVE MYOPIA.

Pinhole glasses come with many small holes. They work by letting in a small number of light rays which forms a sharp image on the retina.

However, pinhole glasses can only give temporary good clarity, not actually correct myopia. Letting your kids wear them may also result to them falling down or bumping into things as their visual field is narrowed.



9. LASIK CAN CURE AND PERMANENTLY REVERSE MYOPIA WHEN KIDS ARE OLDER.

Lasik surgery can correct your child's myopia later on when they're old enough, eliminating their need to wear spectacles and contact lenses. However, since the root cause of childhood myopia is an elongated eyeball, the fact is their eyeball length cannot be shrunk back even after surgery.



This means that the risks associated with high myopia such as retinal detachment, glaucoma, early cataract and myopic macular degeneration remain with them for life.

This is why it's very important to prevent your child from developing high myopia while they are still young.

10. ATROPINE EYE DROPS CAN REVERSE MYOPIA.

If used daily, atropine eye drops can slow down childhood myopia. A low-dose concentration atropine has been found to be beneficial as this has minimal side effects. The effects are also reversible once you stop using the drops.

However, no scientific evidence proves that atropine eye drops can reverse myopia.

Kids and Screen Time

Back then, the only screen parents mostly have to worry about is the television.

“Don’t sit too close to the TV!”

“No telly before you finish homework.”

Now it’s a whole new world of digital devices and apps that our kids are exposed to—and they’re loving it. Welcome the Internet age.

Behavioural optometrist Dr SooJin Nam states, “These days it is common to come across children who spend half of their waking hours on iPads.”

Any modern-day parent will agree that kids and devices such as iPads, computers and gaming consoles are inseparable. With children spending a considerable amount of time every day on such devices, it is important for parents to understand the effect this can have on their child’s eyes.



THREE MAIN RISKS OF EXCESS COMPUTER/IPAD USE IN CHILDREN ARE:



Exposure to harmful blue light emitted from the digital screens



Progression of short-sightedness due to eye strain resulting from excess near tasks



Posture-related problems due to poor ergonomics from digital screen use

However, it may be unwise to totally ban gadgets from our kids. Technology connects us like never before and literacy isn't anymore limited to just being able to read, write or do arithmetic but being able to navigate technology with ease as more and more automation takes place and more and more entities rely on the Internet for efficiency and convenience. We don't want our kids to be left behind.

Recent research has also shown that children who use computers and iPads at home perform better at school than those who do not.

With computers and iPads becoming an integral part of our lives, it is important to weigh the risks and benefits of our children using these devices. Remember that giving an excess of anything to a human body will result in compromised health.

Soojin Nam states, "Although we are not against computer/iPad use in children, we emphasise on parent education and making them aware of the risks involved in excess use of computers and iPads in children. We encourage moderate and healthy use of digital devices in children."

HOW MUCH VIDEO GAME TIME SHOULD YOU ALLOW YOUR CHILD?

There is no rigid rule one can impose on how you raise your children—it is something quite personal and involves many factors, e.g, family traditions, culture, income, etc., and can vary from parent to parent. However, good judgment will tell you that in everything, like food or studying, moderation is key.



Some recommendations for parents:

- Allow your kids to play up to 30 minutes and then encourage them to take a break—do a few errands or stare at scenery—as long as their eyes are allowed to rest and re-adjust to something else.
- Encourage your child to play at a distance from the computer or any consoles. The recommended distance between the eyes and the screen of consoles (Playstation, Wii, X-box) is 2 metres.
- For computer viewing, ensure that your child has good posture and is at least 50 cm away from the screen.
- Let your child wear protective lenses with special coating that helps protect the eyes from blue light.

Why Outdoor Time Matters



Studies show that one way to reduce the risk of becoming myopic may be as simple as spending more time outdoors.

Randomized clinical trials have shown that increased time outdoors appears to be effective in preventing the onset of myopia and slowing myopic shift in refractive error.

Time outdoors has been shown to be a factor at play, especially for preventing onset, but its role in slowing progression is still not entirely clear. There are a number of factors at play, with one being the stimulation of our peripheral vision with moving objects around us.

Other theories include the intensity of sunlight, vitamin D levels and reduced near eye strain as our eyes are fixated on distance rather than at near. The evidence shows that spending at least 10 hours outdoors per week (or more than 1.5 to 2 hours outdoors per day) will help in preventing myopia.

Other research shows that if you spend less time outdoors and do more near activities including reading, phones, tablets and computers, then you are 2-3 times at higher risk of developing myopia.

Regardless of the reason, there is overwhelming evidence that spending more time outdoors can prevent you or your child from becoming myopic or slow down its progression.

So go outside with your kids and have some fun!

Why Just Getting Stronger Prescription Glasses Isn't Enough

Spectacles are easily the first choice of many for myopia correction. However, it may get frustrating for some parents that everytime they take their child to the optometrist for a vision check, their prescription gets higher. Parents are worried how high it may go.

Single-vision spectacles may give your child sharp vision, but this does nothing to slow down or stop their myopia from getting worse.

The good news is many studies have been performed which demonstrate statistically which methods have the best chance of stabilising changing vision due to progressive myopia. It is important to realise that there are many methods to proactively treat myopia and we should not be contented with just changing spectacles every time prescription increases when there is a better way.

Don't settle for a bare minimum when it comes to your children's health. Read about promising treatment options for myopia which we'll discuss in the next section.



Treatment Options

WILL UNDER CORRECTION OF MYOPIA SLOW DOWN THE PROGRESSION?

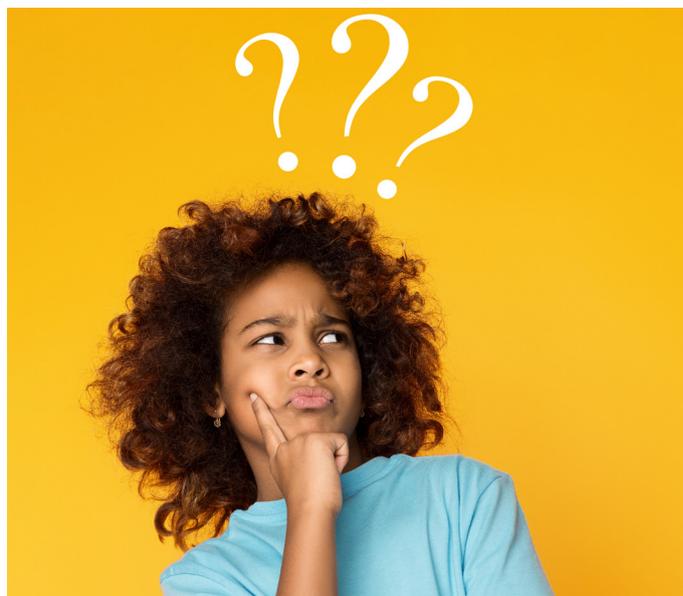
Optometrist Dr Alexander Du states, “This is the most common question we get asked as optometrists. Many people believe that if you are prescribed your full prescription, you will get worse. Unfortunately, studies have shown that regardless of what prescription you have, if you develop myopia from childhood, it will usually get worse.”

Clinical researchers have even concluded that under correction of myopia (+0.75 or 6/12) as well as over correction, increases the rate in which myopia progresses.

There are no guarantees that any specific treatment will work for an individual person, but treatments are usually more beneficial when started early. Some treatment options, including their effect on slowing myopic progression, are listed below:

Orthokeratology

Orthokeratology, known simply as “Ortho-K”, is a revolutionary treatment that safely and comfortably corrects your vision whilst you sleep. It consists of a contact lens that gently reshapes the front of the eye. The Ortho-K is worn nightly to correct for day-time vision. This way, you have the benefit of not needing spectacles or contact lenses during the day! This is a great option for many children, especially active children who play sport or don’t enjoy wearing glasses.



Studies show that ortho-k can slow myopia progression by up to 55% compared to single vision spectacles.

*Values are based off the latest peer-reviewed evidence from the Brien Holden Vision Institute figures January 2019. These values represent an average. The results of the myopia control will vary between individuals. These figures have been provided to give a guideline of what you may be able to expect.

Multifocal Soft Contact Lenses

A 'multifocal' soft contact lens is a single lens that provides a range of powers in the same lens. In doing so, the eye focuses through different powers depending on how close or far they are looking. These are offered as daily or monthly disposable contact lenses. It is a great alternative to regular contact lenses as they offer myopia control.



Progressive/Bifocal Lens Glasses (with reading power)

This is a similar principle to the multifocal soft contact lenses but in spectacle form. It provides a range of powers in the same lens. In doing so, the eye focuses through different powers depending on how close or far they are looking in a natural way.

A bifocal lens has a line that divides the top portion from the bottom portion of the spectacles. When you are doing distance tasks, like watching television, you will look through the top part of the lens. When you are doing near tasks, like reading, you will look through the bottom part of the lens.



MiyoSmart Spectacle lenses (D.I.M.S)

MiyoSmart with D.I.M.S. technology is comprised of a central optical zone for correcting refractive error and multiple defocus segments evenly surrounding the central zone (extending to the mid-periphery) of the lens to control myopia progression. This provides clear vision and myopic defocus simultaneously at all viewing distances.



Low-dose Atropine Eye Drops

Atropine eye drops are another treatment. Atropine is a drug that dates back centuries. In fact, Cleopatra was purported to use the drop to dilate her eyes as it was considered beautiful then. In higher doses (>1%), atropine will cause blurry near vision and dilated pupils. However, in its low-strength version (0.01-0.05%), the side effects are virtually non-existent.



This is what the treatment entails—one eyedrop is placed in each eye before bedtime each night. It's as simple as that. These low-dose atropine eye drops have to be specially made up by a chemist. With this treatment, you will still require glasses or contact lenses to see clearly during the day.

Lifestyle Modifications for Myopia Control

- **Take a 5-minute break for every 30 minutes of near work** (reading, studying, iPad, etc.)
Children who read continuously for more than 30 minutes without taking a break tend to develop myopia more than children who take breaks every 30 minutes.
- Use the distance **from your shoulder to your elbow as a guide to how far you should be from your book when you are reading and writing**, or the computer screen.
Children who read close to their work (30cm or less) have a 2.5X greater chance of becoming myopic than those who sit further from their work.
- Make sure you **spend equivalent time reading and spending time outdoors** (e.g., if you spend 1 hour reading a book, spend 1 hour outside). Children who read 2 or more books per week have a greater chance of becoming highly myopic than those who do less reading.
- **Read and study in a well lit room** and have plenty of light on your page. Having a dark environment is more likely to make you become myopic.
- **Increase daily time spent outdoors** (e.g., walk to school, walk the dog, sit outside at lunch) as this can help reduce the chances of developing myopia.



Your Optometrist's Role in Myopia Control

Dr Du states, “We as optometrists have an obligation to provide the most comprehensive treatment options possible for our patients. We believe that if a child has developed myopia and they are given single-vision lenses, then it is a form of negligence given the amount of evidence for all the different options for slowing down myopia. The treatment options will be individualised for the patient and based on a risk profile assessment to determine the risk of myopic progression.”

“We will closely monitor your child’s eyes for any vision problems, leaving no stone unturned to ensure that your child will have the best vision possible.”

Eyecare Kids optometrists will take the time to provide timely advice on several possible treatment options for slowing or stopping the progression of myopia.

Book an appointment today at
www.eyecarekids.com.au



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Myopia Resources

1. www.managemyopia.org
2. www.treehouseeyes.com
3. www.allaboutvision.com
4. www.eyecareassociates.com
5. www.aoa.org
6. www.myopiainstitute.com