

**OPTOMETRISTS
CONTACT LENS PRACTITIONERS
BEHAVIOURAL OPTOMETRY
CHILDREN'S VISION**



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MYOPIA: DEVELOPMENT AND TREATMENT OPTIONS

INTRODUCTION

Myopia (or short-sightedness) has been one of the most investigated areas within vision research over many years. This is not only because myopia causes blurred distance vision - high degrees of myopia carry much higher risks of serious ocular health and vision problems, such as retinal detachment and macular myopathy because of elongation of the eyeball with associated retinal stretching and thinning.

POSSIBLE CAUSES

There is still a great deal of controversy amongst vision care professionals regarding myopia development. **It is now accepted that the genesis of most myopias involves a complex interweaving of genetic and environmental factors.** The relative influence of these two factors undoubtedly varies, but the following facts strongly indicate that **near point stress factors** play a significant role:

- There has been a marked increase in the occurrence of myopia in recent years; the prevalence among Australian 12 year olds has doubled in 6 years (2020 data) and more than 90% of students in some Asian cities are affected.
- Myopia tends to appear at younger ages than it did in earlier generations.
- The incidence of myopia among students increases with school years, and the degree of myopia increases with age.
- Myopes tend to read more and achieve at higher levels academically than non-myopes.
- Bifocal and multifocal spectacle lenses and contact lenses that provide near focus support can be effective in reducing progression of some myopias.

Recent studies indicate that **blur patterns on the peripheral retina** are very significant in myopia development. This means that certain spectacle and contact lens designs can modify the signals that trigger eyeball (or 'axial') elongation. **Sunlight exposure** and **biochemical factors** also seem to be involved.

ALTERNATIVES OF CARE

1. Visual Hygiene, Lifestyle Issues and Vision Therapy

It is well accepted that good **"visual hygiene"** can reduce near point visual stress and hence the likelihood of myopia.

This means that we should always ensure appropriate near working distance (no closer than the "knuckle-on-chin-to-elbow" distance), good lighting for all near activities, and regular, frequent focus shifts during prolonged near work, ideally looking away into the distance for a few seconds every 15 minutes, and for a few minutes every half an hour (or the 20/20 rule if you prefer – 20 seconds break every 20 minutes).

Attention should also be given to good posture for all near tasks, ensuring that the head is kept straight and book centred in line with nose (so as the focus demand on the two eyes is equal).

These "visual hygiene" factors are especially important in young children whose eyes are still growing. And of course the children of today are spending many more hours engaged in visually demanding near tasks because of computers, hand-held electronic games and phones and increasing study demands. **2 to 3 hours maximum screen time outside of school hours is recommended per day.**

Recent research (The Lancet, Volume 379, Issue 9827, pages 1739 - 1748, 5 May 2012 and IMI – Clinical Management Guidelines Report IOVS March 2019) shows that **lack of sunlight** may also influence myopia development. The exact mechanism is still unclear but seems to involve the chemical dopamine, which influences eyeball growth. Vitamin D may also play a role. **90 to 120 minutes per day of outdoor 'green' time is recommended for children (but with appropriate UV protection).**

A useful and simple **Vision Therapy** exercise is the following **"Accommodative Rock"**:

- Hold a pen at arm's length in the midline between the two eyes, just below eye level, so that your eyes are angled down slightly.
- Begin by looking at a remote and detailed distance target, then look at the fine tip of the pen, and slowly bring the pen in towards your nose until you cannot keep the pen tip clear any more. Move the pen back very slightly until the tip again appears clear, and try to hold for a count of three at this position. Then look back at the distance target, making sure that it "clears" quickly; you will have to "relax" your eyes in order to achieve this.
- Repeat the "trombone" five times, trying to clear the distance target quickly and easily each time. This exercise can be done either binocularly (both eyes together) or monocularly (with one eye covered).

2. Spectacle lenses to compensate for the distance blur

Unfortunately some vision care practitioners still approach the problem of myopia by treating the symptom and not the cause; in other words, compensating minus (single vision) lenses are prescribed to clear the distance vision with the instruction given that the lenses can be worn all the time.

This approach is *least likely* to prevent the myopia from further increasing, as wearing the minus lenses for near activities will mean that the eyes have to focus and converge (turn in) harder. This increases the near point stress and so is more likely to encourage myopia. Recent research also shows that the blur patterns created on the peripheral retina with single vision minus lenses may stimulate axial elongation and myopia progression in young myopic eyes.

3. Stress relieving lenses

Bifocals or variable focus ('progressive' or 'multifocal') lenses are a better alternative than single vision lenses for young myopes since a compensatory minus lens can be used to provide clear distance vision, whilst a weaker minus lens or a plus lens in the lower reading portion can be used to reduce the stresses of prolonged near viewing. They also provide slightly better blur patterns on the peripheral retina, but much better blur patterns can be achieved with DIMS spectacle lenses and some contact lenses (see below).

In some cases of very early or incipient myopia, where testing shows significant near point stress, a multifocal or bifocal lens with no distance prescription may be recommended to try to stop myopia from developing. However, variable focus lenses may not be as helpful in some types of myopia where factors other than near point stress may be far more dominant eg. in families where there are very high myopias from an early age.

Children generally do not have difficulties adapting to bifocals or multifocals, and with modern lens designs such as round segment bifocals and multifocal lenses like the "MyoKids Pro", "MyoVision" and "Access", cosmesis is not a problem.

4. MiyoSmart DIMS spectacle lenses

In 2020 a revolutionary new spectacle lens was released by leading international lens manufacturer HOYA, the **MiyoSmart**. This lens utilizes DIMS technology – Defocus Incorporated Multiple Segments – to create similar blur patterns on the peripheral retina as do OrthoK contact lenses and some multifocal soft contact lenses. **These blur patterns signal to the brain that the eyeball is already long enough.** *Recent research indicates that axial elongation and myopic progression can be significantly reduced with MiyoSmart spectacles, by up to 50 to 60% compared to single vision spectacle lenses.*

5. Contact lenses

- **Disposable soft contact lenses** can be used to compensate for the distance blur of myopia but reading glasses should be worn over the top for prolonged near vision in students who show signs of near point stress.

Multifocal soft contact lenses are now available in a disposable format and these may be a better alternative for students who are keen to wear contact lenses but who show significant signs of near point stress and myopia progression. *Recent research indicates that myopic progression can be significantly reduced with certain designs of multifocal soft contact lenses by up to 50 to 60% due to the specific blur patterns created on the peripheral retina.*

- **Orthokeratology (or OrthoK)** involves the wearing of hard contact lenses whilst sleeping overnight to temporarily reshape the cornea with the aim of having good enough vision to manage without glasses or contact lenses during the day. Although this is an expensive and time-consuming treatment, *recent research indicates that myopic progression can be significantly reduced with orthokeratology, by up to 50 to 60%.* Again, this seems to relate to the blur patterns created on the peripheral retina by the OrthoK contact lenses.

6. Atropine drug control

- Research has shown that *myopia progression can be significantly reduced by up to 50 to 60% with atropine 1% eye drops* which paralyse the focusing system. There also seems to be a mechanism involving the retina. This treatment requires long term use for several years and there can be significant issues with side effects and glare due to the associated pupil dilation. Also, whilst atropine 1% drops are used, the individual is very much dependent on reading glasses or multifocals.

However, recent research (A. Chia et al "Atropine for the Treatment of Childhood Myopia: Safety and Efficacy of 0.5%, 0.1% and 0.01% Doses" in American Academy of Ophthalmology 2011.07.031) shows that lower doses of atropine are nearly as effective as 1% but with lower side effects. These drops need to be made up by a compounding pharmacist (with additional cost).

7. Surgical techniques

Excimer laser surgery involves permanent reshaping (thinning) of the front surface of the eye (cornea) to compensate for the myopia. Laser surgery does not slow myopia progression and so is not an option until the myopic prescription has stabilized. Most laser surgery facilities have a minimum age of about 21 years.

The long term effects of these laser procedures is not yet fully understood and all surgery carries risk, but most importantly, the long-term ocular health risks associated with an elongated myopic eyeball are still exactly the same after laser surgery.

In summary, orthokeratology (overnight wear) contact lenses, some soft multifocal (daily wear) contact lenses, atropine eye drops and the MiyoSmart spectacle lenses are currently the most effective treatments for slowing myopia progression but there is no guaranteed 'silver bullet' that works for everyone.

Myopia control is best started early as young children tend to progress more quickly and become more myopic.

Please feel free to contact us if you would like to discuss these options further. More detailed information can be supplied about OrthoK, multifocal soft contact lenses, atropine eye drops and the MiyoSmart spectacle lenses, and can also be found at mykidsvision.org and myopiaprofile.com