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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. There are clearly different types of myopia, which may be broadly grouped into the following categories:

- i. genetic or hereditary
- ii. environmental (near point stress)
- iii. pathological (disease process)
- iv. emotional/psychogenic.

There is still a great deal of controversy amongst vision care professionals regarding myopia. However, 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. Approximately 36% of the US population is now myopic and up to 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.
- Bifocals and drug agents that paralyse the eye's focusing mechanism (cycloplegics), can be effective in controlling or reducing progression of some myopias.

POSSIBLE CAUSES

There have been several theories advanced but as yet there is no clear understanding of the mechanism that creates the changes in myopia. For myopia to develop, either the eyeball has to become longer (axial length change) or the power of the eyeball has to become stronger (lens or corneal shape changes).

There have been theories suggesting that near focusing creates increased pressure in the rear chamber of the eye and that this increased pressure may eventually force an enlargement of the chamber which makes the eye longer, creating myopia and causing distance blur.

There have also been theories suggesting that prolonged near work causes a change in the ciliary muscle tone and lens curvature, thereby increasing the power of the eye and causing distance blur.

Recent animal and contact lens studies indicate that sunlight exposure, biochemical factors and blur patterns on the *peripheral* retina may also be involved.

ALTERNATIVES OF CARE

1. Visual Hygiene, Lifestyle Issues and Vision Therapy

It is well accepted that good "visual hygiene" can reduce near visual stress and hence the likelihood of adverse adaptations such as 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 15 seconds every 15 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.

Recent research (The Lancet, Volume 379, Issue 9827, pages 1739 - 1748, 5 May 2012) shows that lack of sunlight may also influence myopia development because sunlight is believed to stimulate production of the chemical dopamine, which influences eyeball growth. So encourage your children to engage in daily outdoor activities - as well as potentially helping vision, the more time spent outside will help in developing co-ordination and fitness and maintaining normal weight.

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).

Other appropriate Vision Therapy activities can sometimes be helpful with adequately motivated myopes who wish to minimise the strength of their minus lenses. This involves relaxation strategies such as are outlined in Jacob Liberman's book "Take Off Your Glasses and See".

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 lenses are prescribed to clear the distance vision with the advice 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 work will mean that the eyes have to focus and converge harder. This increases the near point stress and hence is more likely to encourage myopic adaptations to develop further.

Of course in cases where the myopia is already advanced to a degree where distance vision is significantly blurred, then compensatory minus lenses must be utilised for distance viewing. This distance prescription should NOT be worn for prolonged near work (reading, computer, school work etc). This then presents the obvious problem in the classroom where the student would have to be continuously taking their glasses "on and off".

For this reason a bifocal or multifocal lens (see 3. below) is a much better alternative for students until the myopic prescription stabilizes.

3. Stress relieving lenses

Single Vision Reading Lenses:- Using plus lenses (or a near "add") for close work has the effect of reducing the focusing (accommodative) demand and making the world appear slightly further away. This means that the visual system is under less stress with prolonged near work. Plus lenses, however, may make the distance vision blurry, particularly if there is already a refractive shift towards myopia. Wearing such glasses would obviously be impractical for a student who has to look up and down from book to board.

In these cases a bifocal or variable focus ('multifocal') lens is a better alternative.

Recent research shows that *aspheric single vision lenses* like the "MyoVision" lens may also be helpful in reducing myopic progression by modifying the blur pattern on the peripheral retina, as well as by providing near focus support.

Variable Focus ('Multifocal') Lenses:- With variable focus lenses a compensatory minus lens can be used to provide clear distance vision, whilst a weaker minus or plus lens in the lower reading portion can be used to reduce or eliminate the stresses of prolonged near viewing.

In some cases of very early or incipient myopia, where testing shows significant accommodative 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 helpful in some types of myopia where factors other than near point stress may be more dominant eg. in families where there are very high myopias from a very 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 "Myopia Control" and "Access" cosmesis is not a problem.

Our detailed testing will indicate whether your child is likely to benefit from multifocals or an aspheric single vision lens and this will be discussed with you.

4. Drug control

Research has shown that the highest rate of successfully controlling myopia has been accomplished with drugs which paralyse the focusing system (eg. atropine 1%). Unfortunately this treatment requires long term use for several years and there can be significant issues with glare due to the associated pupil dilation. Also, whilst the drops are used the individual is very much dependent on reading glasses or multifocals.

Latest 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 minimal side effects, however these drops need to be made up by a compounding pharmacist (with additional cost).

5. Contact lenses

- *Orthokeratology* involves the wearing of hard contact lenses whilst sleeping overnight to temporarily reshape the cornea with the aim being to have good enough vision to manage without glasses or contact lenses during the day. This is an expensive and time-consuming treatment; results can be variable and there is no guarantee that the myopia will stabilize, although recent research indicates that myopic progression is reduced with orthokeratology.

- *Disposable soft contact lenses* can be used to compensate for the distance blur of myopia with reading glasses being worn over the top for prolonged near vision in students who show significant signs of near point stress. Soft contact lenses can be a great option for students who are involved in sports or who find the cosmetics of spectacles unacceptable.

Multifocal soft contact lenses are now available in a disposable format and these may be another alternative for students who are keen to wear contact lenses but who show significant signs of near point stress. Recent research indicates that myopic progression is reduced with certain designs of multifocal soft contact lenses.

6. Surgical techniques

Excimer laser surgery is now available which involves permanent remoulding or resculpturing of the front surface of the eye (cornea) to compensate for the myopia. The long term effects of these procedures is not yet fully understood but results are promising for certain pre-operative levels of myopia.

A handout on excimer laser procedures is available on request, but laser surgery is not an option until the myopic prescription has stabilized. Most laser surgery facilities have a minimum age of about 21 years.

Please feel free to contact us if you would like to discuss these options further or if you would like more detailed information.