

# Chapter 16

## Myopia Management

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### ABSTRACT

*Myopia is already the most common ocular disorder in the world, and its prevalence continues to increase worldwide. Higher myopic refractive errors are associated with an increased risk of vision-threatening complications, which has led to many investigations into the underlying cause of myopia and the mechanisms of myopia progression in order to prevent or delay the onset of myopia and slow its progression. This chapter briefly reviews ocular development and emmetropization, summarizes the known risk factors for myopia onset and myopia progression, reviews current clinical interventions for controlling myopia, and provides practice management recommendations. Finally, instances of syndromic myopia, which have not been shown to be responsive to myopia control treatments, are reviewed.*

### INTRODUCTION

Myopia is a visual condition in which light is focused in front of the retina, causing distant objects to appear blurred. It is already the most common ocular disorder in the world and is still increasing in prevalence worldwide (Holden et al., 2016), with the onset of myopia occurring earlier in life (Lin et al., 2004).

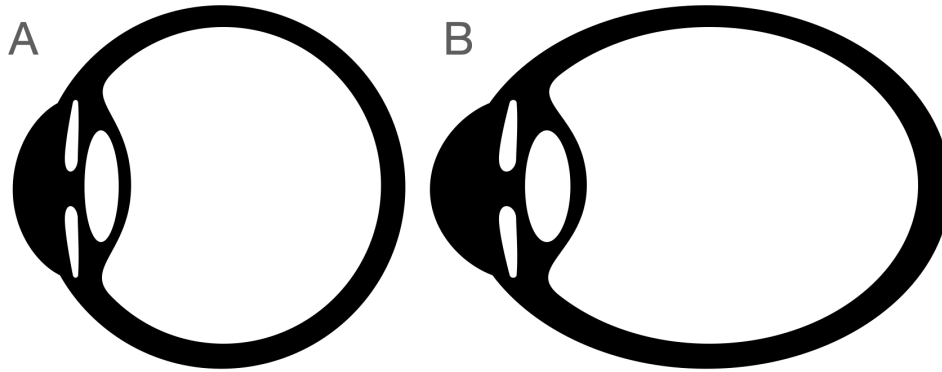
Myopia most commonly occurs during school-age years when the eyeball grows too long, as shown in Figure 1.

Historically, myopia has been seen as more of an inconvenience than a disease. However, the anatomical changes associated with myopia, which worsen with higher levels of myopia, are not eliminated with refractive error corrections, and any amount of myopia increases the risk of retinal detachment, myopic maculopathy, glaucoma, and other vision-threatening complications (Flitcroft, 2012). High myopia, defined as refraction greater than -6.00D, is now a leading cause of preventable blindness (Wu et al., 2015).

The myopia epidemic has prompted a renewed interest in efforts to prevent or reduce the progression of myopia, and methods of controlling eye growth are constantly evolving. Current information from the peer-reviewed literature about clinically applicable myopia control is reviewed here along with practical tips for treating children with current effective myopia control options.

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*Figure 1. Compared to the emmetropic eye shown in A, a myopic eye, shown in B, is elongated along the sagittal axis of the globe. This leads to a longer vitreous chamber depth and axial length*



## BACKGROUND

### Clinical Studies

#### Risk Factors for Myopia Onset and Progression

The mechanisms and risk factors for myopia onset and progression are important but challenging to study. Myopia is caused by a complex mixture of genetic and environmental risk factors such as less outdoor time and more near work. It is important to be able to identify those at risk of becoming highly myopic to target early interventions. Age of myopia onset was found to be the strongest predictor of high myopia among children in Singapore (Chua et al., 2016), and a large observational cohort study in the United States found that hyperopia lower than expected at a young age was the best predictor of myopia in subsequent years (Zadnik et al., 2015). Therefore, care should be taken to counsel young children, schoolteachers, nurses, parents, and pediatricians on the consequences of myopia and the importance of early interventions with myopia controlling treatments, which are reviewed in the following sections. The earlier the onset of myopia, the faster the progression (Sankaridurg and Holden, 2014), therefore, the earlier treatment should be initiated.

**Clinical Pearl:** *The earlier the onset of myopia, the faster myopia progresses. Therefore, the earlier the onset of myopia, the more urgently a myopia-controlling treatment should be initiated.*

#### Time Outdoors

To date, the most influential and consistent environmental, modifiable factor associated with the onset of myopia is time spent outdoors (French et al., 2013; Xiong et al., 2017). It is unclear whether the benefit is due to increased light exposure, environmental colors and/or textures, viewing distances, the stimulation of retinal dopamine release by brighter light outdoors, or simply that when children are outdoors, they're often doing something other than near work (Hua et al., 2015; Read et al., 2014). However, increasing

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