



EDITORIAL

New clinical and public health perspectives on myopia prevention and control in China

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The paper by Zhao et al. reports on a population-based survey of myopia in school-children in Shanghai, and the use of orthokeratology (OK) by suspected myopes [1]. It has two significant findings:

- There is limited use of OK at 1.3% in the general population and 3.1% amongst suspected myopes
- Just over 10% of OK users had presenting logMAR visual acuity worse than 0.3, or mild visual impairment.

Unfortunately, refraction was measured without cycloplegia, so “suspected myopes” includes pseudo-myopes [2]. In China, tropicamide is generally used for cycloplegia up to the age of about 15 years, so those with OK lenses were probably genuine myopes. This means that the level of use is somewhat higher than reported, but probably no more than double [3].

The significant percentage of OK users with inadequately corrected VA may be due to the high annual myopia progression rates (-0.8D up to -1.2D) reported for children aged 6–12 years in China [4], requiring many corrections to be up-dated at least annually. Similar observations have also been made for single vision spectacles [5]. The Shanghai paper also reported an association of low presenting VA with less sleep, and with a high correction target, which may indicate the need for some refinement of clinical practice.

These interesting results need to be seen in a much broader context. These days in China, around 80% of senior high school students are myopic. Around 10% are highly myopic, and at increased risk of pathological myopia [6]. Yet only 50 years ago, the prevalence of myopia in China was like that now seen in western schoolchildren—around 20% at the end of the high school years [7–9]. Now the prevalence of myopia rises steeply from 2–4% when children start school to around 80% by the end of 12 years of school. These high prevalence values are shared with other countries in the region, such as South Korea, Japan and Singapore, despite their different political systems [10]. As a result, prevention of the onset of myopia and control of its progression are a high priority.

Economic analysis has shown that the epidemic of myopia in young people, and an increasing number of older people needing reading glasses, could potentially cost the Chinese economy at least 1–2% of GDP [11], without adequate correction. The other countries with an epidemic of myopia have widely distributed local optometry services, which have not been well-developed in China, and this analysis has led to new programs to increase access to optometric services [12]. In addition, the Chinese eye exercises, widely used in Chinese schools, have obviously not been able to prevent the development of an epidemic, and in 2018, China’s President declared myopia a major national

challenge [12]. OK lenses and low-dose atropine [13] were already available for progression control, and effective new approaches such as contact [14] and spectacle [15, 16] lens that impose myopic defocus, and more recently red light therapy [17] have since become available. The results of a new survey would therefore be of considerable interest.

In addition, clinical trials and school-based implementation, particularly in Taiwan, have shown that time outdoors for 2 h per day markedly reduces incident myopia [18, 19]. A barrier to success for this approach has been the rigorous Chinese school routines and high parental expectations. However, since 2018, China’s State Council has adopted detailed policies giving students more access to time outdoors, while minimising homework loads, reducing competitive educational pathways in the compulsory school years, and restricting the after-school tutorial industry [12]. The latter have all been identified as potential contributors to the high prevalence of myopia [20, 21].

These changes, known as the Double Reductions [12], in some ways are an attempt to challenge attitudes to education as the only path to social security and advancement, that are based on a thousand years of Chinese history. They have not primarily been driven by concerns about myopia per se, but rather seek to take the pressure off students suffering from heavy study loads and high parental expectations, that have led to the “lying flat” (tangping), burned-out generation. In parallel, the aim is to take the pressure off parents, who carry a heavy financial and personal burden in trying to support their children through their education, which may well be a factor in the current low birth rate. But because they address many of the same factors that are implicated causally in the epidemic of myopia, these changes set the scene for effective myopia prevention as well.

These changes to the education system are taking place in an environment in which school screening for refractive error is now being put in place on a national scale, with screening at least once a year [12]. With effective clinical referral for myopia correction and myopia control, control of progression seems feasible. However, because of the mixed drivers, there is potential for conflict over appropriate school-based public health interventions. For example, Chinese schools will now systematically offer after-school care for students [12]. From an educational perspective, it might make sense to use this time for supervised homework. But from the perspective of myopia prevention, it would make much more sense to use this time to increase time outdoors, particularly in the early school years when homework loads are now low, and myopia prevention is likely to be more effective. A controlled trial of this approach would be very useful.

If China succeeds in combining clinical interventions to control myopia progression with school-based public health interventions to control myopia onset, there will be important lessons for other countries in the region with a myopia epidemic. There will also be lessons for countries that are still developing, trying to produce a better educated and more highly skilled population to support

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economic development—and hoping to avoid an epidemic of myopia. Hopefully we will see much more information on how this works out in practice over the next few years.

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AUTHOR CONTRIBUTIONS

IGM and WL both conceived or designed this analysis, drafted or revised the paper, approved the final version and take responsibility for its content.

COMPETING INTERESTS

IGM and WL both state that they have no conflicts of interest to declare.

ADDITIONAL INFORMATION

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