



Technology Frontier

News Bite on PolyU's Innovation

Defocus Incorporated Multiple Segments (DIMS) Spectacle Lens for Myopia Control Slowing down myopia progression among children by 60%

Research shows that 87% of young adults in Hong Kong are short-sighted and progressive myopia is in fact a health concern because moderate to high myopia is associated with increased risk of complications, such as retinal detachment and glaucoma. Thus, it is important to keep myopia progression under control, especially among developing children. Researchers from the School of Optometry developed Defocus Incorporated Multiple Segments (DIMS) Spectacle Lens for Myopia Control, which has proven to be effective in slowing down myopia progression by 60% among children while 20% of the subjects exhibited no progression at all during the two-year trial period.



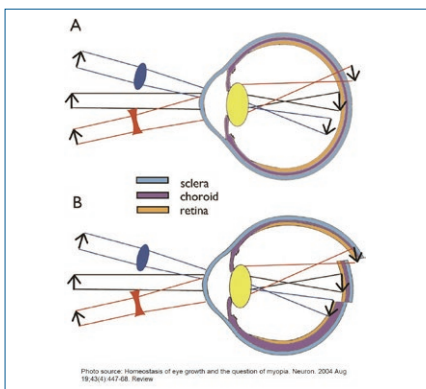
Prof. Carly S. Y. Lam (left) and Prof. Chi-ho To

Myopia, or more commonly known as short-sightedness, is the most common refractive error of the eye. It happens when the eyeball grows too big and so the axial length becomes elongated. The images thus focus in front of the retina, resulting in blurry vision. Some experts call it an epidemic and by 2050, about 50% of the world's population is expected to be myopic¹. The prevalence of myopia is even more worrisome in China and Hong Kong as statistics show that 90% of university students in the Chinese mainland and 87% of young adults in Hong Kong are myopic². Some do not think myopia is a health problem as you can still see clearly with corrective lenses. However,

this is not true. "Moderate to high myopia that requires -5.0 diopters or more for lens correction is related to increased risk for retinal degeneration, retinal detachment, cataracts, and glaucoma. Thus, it is essential to keep myopic progression under control, especially among developing children," said Prof. Carly S. Y. Lam and Prof. Chi-ho To, School of Optometry, who developed the Defocus Incorporated Multiple Segments (DIMS) Spectacle Lens for Myopia Control. In the clinical trial, DIMS lens has proven to slow down myopia progression in children by 60%, and 20% of the subjects experienced no increase in myopia at all during the trial period.



Defocus Incorporated Multiple Segments (DIMS) Spectacle Lens for Myopia Control



Ocular compensation for lens-induced defocus



DIMS Spectacle Lens for Myopia Control won the Grand Prize (overall championship), a Grand Award and a special gold medal at the 46th International Exhibition of Inventions Geneva.

Myopic defocus slows myopia progression

Ever since eyeglasses were invented in the 13th Century, lenses are so made to let the wearer see clearly. But to control myopic progression among developing children, a different approach is used. "An eye naturally tends to shape itself so that it sees focused images on the retina. By focussing the images slightly in front of the retina, or so-called myopic defocus, the eyeball tends to shape itself shorter to receive the images. Though myopia is not reversible, myopic defocus is proven to effectively slow down the eyeball from growing any longer, and hence, helps control myopia progression among children," said Prof. Lam.

But the wearers still need to see clearly to carry on with their daily life. Thus, the lens is divided into zones – the central zone is a regular concave lens for corrected vision at the centre of the retina, while the rest of the lens is made up of numerous lenses that focus light slightly in front of the retina to create peripheral myopic defocus. Wearers can see clearly and cannot feel the defocus, but the eyeball would adapt to this change. "We previously created soft contact lenses with peripheral defocus proven to be effective in slowing down myopia progression. However, the case is more complicated in spectacle lenses because the eye moves behind the lens and the whole lens needs to be covered in micro-lenses so that the eye experiences the same amount of myopic defocus no matter where the eye moves." explained Prof. To.

Clinical trial

In the clinical trial, 180 short-sighted school children aged between 8 and

13 were recruited. Half of them were randomly assigned to wear DIMS lenses and the rest of them were in the control group wearing regular single vision lenses. During the two-year trial period, they had their eyes checked every six months. By the end of the trial, those in the DIMS group showed an average myopia progression of -0.38 while the progression for the control group was -0.93 on average. In other words, DIMS lenses effectively slow down myopia progression by 60%. Within the DIMS group, 21.5% of the subjects did not have any myopia progression at all, while the figure was only 7.4% in the control group.

HOYA Vision Care is the team's research collaborator, who worked closely with them in developing their idea into the optical lens. The collaboration signifies a remarkable success in the University's knowledge transfer endeavours. The patent is of the lens is co-owned by PolyU and HOYA Vision Care .

In April 2018, DIMS Spectacle Lens for Myopia Control won the Grand Prize (overall championship), a Grand Award and a Gold Medal with the Congratulations of Jury at the 46th International Exhibition of Inventions Geneva, Switzerland.

¹ Bowden, Tracy. "Short-sightedness or myopia, a global epidemic as children spend less time outdoors." 2 Mar 2017, ABC News. Retrieved at <http://www.abc.net.au/news/2017-03-02/short-sightedness-epidemic-as-people-spend-less-time-outside/8318882>.

² Aldama, Zigor. "China's myopic epidemic: why a simple solution is being ignored." 8 Apr 2017, Post Magazine, South China Morning Post. Retrieved at <http://www.scmp.com/magazines/post-magazine/long-reads/article/2085125/chinas-myopia-epidemic-why-simple-solution-being>.