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The Research on the Paths of Popular Science Education about Myopia Prevention and Control among College Students in the Context of Shifting the Focus Forward

Shengpo Zeng, Yang'ai Gu*

School of Ophthalmology & Optometry, School of Biomedical Engineering, Wenzhou Medical University, Wenzhou, China
Email: *526689254@qq.com

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Abstract

Currently, the number of myopic people in China has reached as high as 600 million, and it shows a trend of "early onset, high incidence, and a high degree of severity". The issue of myopia among children and adolescents has attracted widespread attention from all sectors of society. Comprehensive myopia prevention and control efforts have been launched nationwide. Popular science education, vision screening, and improving visual environments are effective measures for preventing myopia. However, among the target audience for comprehensive myopia prevention and control, the preschool children group has been neglected, and the work of myopia prevention and control for this group has been significantly weakened and marginalized. Due to insufficient awareness of prevention and control, the hyperopia reserve in the preschool children group is being continuously depleted, leading to the early onset of myopia. In light of this situation, the focus of myopia prevention and control needs to shift forward, and it is worth exploring and pondering how college students with a background in optometry can develop entertaining and engaging popular science education materials and methods.

Keywords

Myopia Prevention and Control, Popular Science Education, Hyperopia Reserve, Eye Health, Preschool Children Group

1. Introduction

In recent years, the comprehensive myopia prevention and control has become a

*Corresponding author.

long-term and systematic project. The issue of myopia among children and adolescents has attracted social attention. Enhancing the scientific level of myopia prevention and control among children and adolescents, promoting continuous, in-depth, and effective implementation of comprehensive myopia prevention and control work, and effectively safeguarding the eye health of children and adolescents are important tasks [1]. Comprehensive myopia prevention and control includes establishing institutional mechanisms for myopia prevention and control, strengthening vision health education, promoting vision monitoring and records, enhancing physical exercise and outdoor activities, improving visual environments, implementing double reduction policy, fostering home-school collaboration, strengthening the prevention and control workforce and professional development, and conducting comprehensive intervention trials [2]. In recent years, the myopia prevention and control has achieved corresponding results, but preschool children group has been neglected. Therefore, it is urgent to shift the focus of comprehensive myopia prevention and control to this group. Against this backdrop of shifting the focus forward, it is worth exploring and pondering how to promote college students majoring in optometry to engage in popular science education of myopia prevention and control in the new era.

2. The Current Comprehensive Measures and Status of Myopia Prevention and Control

The abnormality of vision is currently the most common disease in children, which has been listed as a key disease for prevention and control by the World Health Organization worldwide. According to surveys, the condition of primary school students' vision in China is not optimistic, with a detection rate of 45.71% for poor vision, and there is a continuously increasing trend. The incidence of myopia is about 30%, and the problem of myopia in children is becoming increasingly serious with a clear trend towards younger ages, making it a major public health issue [3]. Wang Jie (2022) pointed out in the publication "Community-based Prevention and Control of Myopia in School-age Children: An Explorative Study" that myopia is an important factor leading to visual impairment and is a public health issue worldwide. Myopia has a high incidence and a trend towards younger ages in China. Therefore, it is important to achieve early detection and intervention for myopia. By establishing a visual screening alert mechanism based on community health services, and promoting the three-level prevention of myopia prevention and control for preschool children, it is expected that the joint efforts of families, schools, and medical institutions will play a positive role in the prevention and control of myopia in preschool children [4]. Chen Min (2022) published an article titled "Myopia Prevention and Control Circle to keep Children Away from Myopia", pointing out that an increasing number of "little glasses" have become a concern for us. The education department of Ningbo city has created 21 myopia prevention and control circles in the city through two years of collaboration between medical and educational

institutions, resulting in a continuous decrease in the myopia rate among primary and secondary school students and significant effectiveness. Preventing and controlling myopia in children and adolescents requires joint efforts from the government, schools, medical and health institutions, families, and students, necessitating the collective action of the whole society to protect the eyes of children [5]. In June 2022, the Development Report on Comprehensive Prevention and Control of Myopia in Children and Adolescents in China (2018-2021) was published, which pointed out that the project for the prevention and control of myopia in children and adolescents is a livelihood issue that deserves the attention of the entire nation and society. Strengthening the prevention and control of myopia in children and adolescents, and protecting the eye health of children and adolescents are the top priorities for discussion. The report combines data and summarizes experiences from various regions, providing important guidance and support for the advancement of the prevention and control of myopia in children and adolescents. The special plan for the prevention and control of myopia in children and adolescents proposes that safeguarding the bright future of children requires the combined efforts of policies, society, and industry, creating a favorable social atmosphere for the prevention of myopia and continued deepening, complementing the industrial level to meet the increasing demand for myopia prevention and correction products, and assisting the advancement of the comprehensive project for the prevention and control of myopia in children and adolescents. In 2022, the Chinese Journal of Eyeglass Technology proposed that the prevention and control of myopia has become a national policy, and the management of myopia in children is urgent. The "early-onset, accelerated, widespread, and severe" myopia has become a prominent issue facing the eye health of children in China. "The Eye Health Hut" led by the professional team of the Chinese Campus Health Action Eye Care and Brightness Project will upgrade and transform school computer rooms into dedicated spaces for managing students' eye health. Based on the hut, eye health education, screening and evaluation, and management of myopia in school communities can be carried out, thereby reducing the incidence of myopia and screened myopia to a certain extent [6].

Grzybowski *et al.* (2020) found that the myopia rate in Asia, as the region with the highest myopia prevalence, exceeds 60%, while in Europe the myopia rate is only 40%, and the myopia prevalence among children in Africa and South America is less than 10% through a survey of global myopia patients [7]. Lin *et al.* (2004) found that in 1983, approximately 10.9% of children and adolescents in Taiwan, China, suffered from high myopia, while in 2000, 21% of children and adolescents in Taiwan, China, suffered from high myopia, representing an increase of 10.1% in just 17 years [8]. Holden *et al.* (2016) projected based on the current trend of myopia rates that by 2050, the prevalence of myopia and high myopia globally will significantly increase, with 50% of the population suffering from myopia and 10% suffering from high myopia. The myopia prevalence will

double, and the high myopia prevalence will increase fivefold [9]. American scholar Daniel Porte (2020) led the American Academy of Ophthalmology in proposing four myopia prevention and control measures in 2020 based on expert consensus, urging the government to pay attention to the prevention and control of myopia in children and adolescents. According to this consensus, multiple measures should be taken to limit the use of electronic devices to ensure that children spend more time engaged in outdoor activities. By balancing screen time and outdoor activity time, the goal is to reduce the incidence of myopia in children and protect their vision [10].

According to current myopia prevention and control measures, it can be seen that people's awareness of myopia prevention and control has gradually increased. Various regions have also continued to carry out myopia prevention and control work in combination with local characteristics and advantages. However, the true goal of comprehensive prevention and control has not been achieved, that is, there is not particularly notable emphasis on early intervention and awareness for the preschool-age group. Foreign research has shown early attention to school hygiene and student health education, and has proposed suitable myopia prevention and control models. In recent years, research on myopia prevention and control has mainly focused on Asian countries with high myopia rates, especially China. In contrast, in European and American countries, where myopia rates are relatively low, scholars have primarily focused on adjusting existing prevention and control measures and implementation paths related to the causes of myopia. This includes identifying factors that influence the visual health of children and adolescents and understanding the factors that lead to myopia in this demographic. Overall, both domestic and foreign researches have actively explored tailored implementation paths for myopia prevention and control, with strong theoretical research but relatively less practical research.

3. The Importance of Shifting the Focus Forward in the Comprehensive Prevention and Control of Myopia

The importance of shifting the focus forward in the comprehensive prevention and control of myopia lies in the fact that preschool children have gradually developed and improved eye functions, and their eye structures and functions have reversible characteristics. Early prevention and control and timely intervention are of great significance for preventing myopia. The comprehensive control of myopia through shifting the focus forward has become an effective approach to control the incidence of myopia in preschool children and maintain their hyperopia reserve. Targeted health education and promotion play a crucial role in continuously reducing the prevalence of myopia among children and adolescents. Newborns have short axial length and high refractive power, being in a state of physiological hyperopia. As they grow older, the axial length increases and the refractive power gradually decreases, typically reaching emmetropia around the age of 12. The state of physiological hyperopia before achieving em-

metropia is known as the hyperopia reserve, which also refers to the state of hyperopia in the process of visual development formalization [11]. Early depletion of hyperopia reserve is a risk factor for myopia. When the hyperopia reserve falls below the average for the same age group, it is considered to enter the early stage of myopia with accelerated axial growth. Based on the child-centered conditions, effectively reducing the incidence of myopia in children under six years old can further achieve the national target of controlling the myopia rate below 3% among children under six. The hyperopia reserve has become a key indicator for the presence of myopia, and enhancing awareness of the reserve among preschool children and parents, along with healthy dietary interventions, can effectively reduce the rate of myopia. This contributes to the integration of optometry education and myopia prevention and control in colleges and universities. Developing appropriate health education content and delivering it through methods that appeal to preschool children empower the new approach of "myopia prevention and control health education".

4. The Specific Measures for Comprehensive Prevention and Control of Myopia through Popular Science Education under the Condition of Shifting the Focus Forward

Currently, there is a lack of eye care knowledge and limited diversity in the methods of health education in schools. Apart from the mandatory biannual vision screening, schools rarely implement additional interventions for myopia prevention and control. Teachers in schools have limited knowledge about eye health, with only a few medical teachers having a weak understanding of eye health. Vision health management requires not only routine vision tests but also the stimulation of children's self-awareness and preventing myopia. This calls for regular myopia prevention and eye health popular science education in schools. However, daily myopia prevention and eye health popular science education are often oversimplified and formalized, and due to conflicts with outpatient services, professional ophthalmologists are unable to conduct regular and effective eye health popular science education. On the other hand, university students majoring in optometry can address this issue by regularly providing myopia prevention and eye health popular science education, ensuring long-term and effective dissemination of eye health knowledge.

Under the background of shifting the focus forward, the hyperopia reserve plays a fundamental role in enhancing the understanding of hyperopia reserve knowledge among preschool children and parents. On the one hand, having a certain amount of hyperopia reserve can effectively reduce the probability of developing myopia, showing significant prevention and control effects. On the other hand, most parents of 0 - 6 year-old children are not familiar with hyperopia reserve and its special significance during this age. Targeted popular science education materials of myopia prevention and control are crucial. Besides routine visual acuity tests, student vision health management needs to stimulate

preschool children's autonomous self-prevention awareness. At the same time, parental intervention in myopia prevention and control for preschool children cannot be ignored. For the preschool children group who "have not developed myopia", popular science education can be used to guide and educate them, forming good eye habits and protecting their hyperopia reserve; for the preschool children who "have already developed myopia", medical and educational collaboration can work together to ensure that their vision does not further decline. Moving the myopia prevention and control shifting the focus forward, is an innovative implementation plan. At present, the hyperopia reserve of low-grade primary school students has significantly decreased, and most first-graders' hyperopia reserves have already become negative. Therefore, college students with a background in optometry play a particularly important and critical role in promoting myopia prevention and control among preschool children. This article focuses on the effectiveness of popular science education on prevention and control of myopia under the condition of shifting the focus forward. The accuracy of understanding and mastery of relevant questionnaire content before and after the popular science education was analyzed for the same group. Through the comparison before and after the popular science education, the college students discussed and analyzed the effectiveness of popular science education pathways for targeted myopia prevention and control for preschoolers under the shifting the focus forward, and innovative suggestions and strategies were provided for college students participating in myopia prevention and control popular science education lectures.

5. The Development of Popular Science Education Materials under the Condition of Shifting the Focus Forward

Currently, there are issues with the disorganized process and repetitive content in myopia prevention and control popular science education lectures, which results in low efficiency and a lack of awareness regarding eye health among children. In order to address this, it is proposed to focus on college students as key contributors to myopia prevention and control popular science education lectures, with an emphasis on promoting hyperopia reserve. To alleviate the impact of the significant decrease in daily outdoor activities, lack of outdoor activities, and long sightedness among young children during the closure period, which led to increased pressure on the development of long eye axis and greatly depleted reserves of farsightedness, resulting in a sharp increase in myopia rates among lower primary school students (6 - 10 years old). By effectively disseminating targeted popular science education materials, we aim to raise awareness about the importance of maintaining a certain level of hyperopia reserve, thus reducing the likelihood of developing myopia. The college students majoring in optometry will leverage their expertise to play a vital role in delivering informative lectures. In age-appropriate popular science education materials for preschool children, the concept of hyperopia reserve can be introduced, likening it

to a "vision bank" where each child possesses a certain amount of hyperopia reserve. Every child has a certain amount of foresight reserve, and children with low hyperopia reserve are at a higher risk of developing myopia in the future, it should be emphasized that having a low hyperopia reserve does not necessarily mean developing myopia in the future. The popular science education should be conducted in an engaging and easily understandable manner for preschool children. Furthermore, incorporating healthy dietary habits into the educational program, along with the concept of hyperopia reserve, can help maximize the transmission of eye protection and eye health awareness to preschool children through enjoyable and educational popular science education methods.

6. Conclusion

In summary, the current development of myopia is characterized by three main aspects: early onset, high incidence, and high degree of severity. The visual development of preschool children is crucial, and their awareness of myopia prevention and control is fundamental. Early prevention, early detection, and early treatment, along with targeted popular science education, can effectively prevent the occurrence and progression of myopia, as well as promptly correct visual abnormalities. Therefore, myopia prevention and control are manageable and preventable through shifting the focus forward and the integration of effective popular science education. Additionally, engaging college students with a background in optometry to conduct entertaining popular science education for preschool children can shift the focus of myopia prevention and control forward, expand the implementation of comprehensive prevention and control measures, and enrich educational strategies. Thus, preschool children can fully understand the importance of vision protection and maintenance, improve daily eye health and enhance the overall efficiency of myopia prevention and control to some extent.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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