What do Singaporean parents know about myopia?

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About Plano

Plano is a health technology company based in Singapore that aims to manage smart device use and eye health in people worldwide. Plano was developed in 2017 under the Singapore Eye Research Institute – Singapore National Eye Centre (SERI-SNEC) Ophthalmic Technologies Incubator Programme. The Plano team consists of experts in computer science, data analytics, ophthalmology, epidemiology and business development who are dedicated to developing innovative and scientifically backed technological applications and platforms to turn the smart device problem into the solution.

Plano's first product offering, the plano application (app), is the world's first science-based eye health and parental management app. plano runs in the background of smart devices and monitors device use by children. Through its suite of functions and features, plano helps to modify children's behaviour to reduce their exposure to environmental risk factors for the common eye condition, myopia (also known as short-sightedness or near-sightedness). Research has shown that excessive near work, including device screen time, and a lack of outdoor activity, are the major risk factors for myopia, and plano helps to empower children to develop healthier relationships with screens and to spend time outdoors to protect them from myopia.

Since Plano's inception, the company's products and offerings have diversified and enabled the creation of an ecosystem. In addition to the plano app, Plano's growing ecosystem consists of an E-commerce directory where parents and their children can redeem points earned through the rewarding of the child's healthy device use behaviours for a range of device-free activities (plano Shop), an online optometry service delivery platform (plano Eyecheck), an online platform that raises awareness about the amount of time that people are spending on smart devices (plano Time Machine), school outreach programmes (plano@school), workplace consultancy services (plano@work), a bestselling children's book series (The Plano Adventures) and big data analytics capabilities. This ecosystem provides a comprehensive solution to managing excessive device use and eye health in this digital world.

Contents

Glossary of abbreviated terms

CI	Confidence Interval
HPB	Health Promotion Board
OR	Odds Ratio
SingHealth	Singapore Health Services
TKA	The Kidz Academy
NMPP	National Myopia Prevention Programme

Executive Summary

Background and rationale

The world is currently facing a myopia epidemic, with 5 billion people, or half the world's population predicted to be myopic by the year 2050. Children are developing myopia at increasingly younger ages and their myopia is becoming more severe, resulting in an increased prevalence of high myopia which can lead to irreversible blindness.

Singapore is the myopia capital of the world, with approximately 75% of people having the condition by the time they finish secondary school. The prevalence of myopia in Singapore, as well as other developed parts of Asia, has quadrupled in the past 60 years, and although genetic factors contribute to the onset and progression of myopia, they do not account for the recent and rapid rise in myopia. Environmental factors such as excessive near work and spending insufficient time outdoors have been found to be major risk factors for myopia, and with the recent smart device and mobile internet revolution, children are engaging in more near work through their use of digital screens and are spending less time outdoors than ever before. It is therefore likely that the device dependency epidemic is a major driver of the myopia epidemic.

In order to protect their children from myopia, parents need to have an adequate level of awareness about myopia and its risk factors, as well as strategies available to reduce their children's risk of developing myopia. No studies have previously investigated the extent to which Singaporean parents are aware of myopia and the dangers of screens, hindering efforts to develop targeted awareness campaigns. This report presents a survey of awareness of myopia among Singaporean parents attending an annual educational conference in Singapore.

Objectives

This report set out to:

1.To determine the level of awareness of myopia among a group of parents residing in Singapore. Specifically, this research aimed to understand parents' awareness about:

a. The prevalence of myopia among young people in Singapore.

b. Strategies that are available to mitigate or slow the progression of myopia in children.

2. To determine Singaporean parents' knowledge about how much time children spend engaged in screen time on smart devices.

3. To determine Singaporean parents' knowledge of what constitutes healthy screen-based behavior for children.

4. To determine how recently children had undergone their last eye examination.

Protocol

A survey of parents attending the 'The Kidz Academy' (TKA) exposition at Singapore Expo was conducted from the 29th of June to the 1st of July 2018. Trained recruiters approached parents with at least one child and invited them to participate. Eligible attendees who agreed to participate provided written informed consent and completed an interviewer-administered online questionnaire. The questionnaire collected data on:

• Parents' demographics.
• Parents' awareness of the prevalence of myopia in secondary school-leavers (multiple choice).
• Parents' awareness of the amount of time 12-year-olds spend on devices daily (multiple choice).
• Parents' awareness of what constitutes a safe face-to-screen distance (multiple).
• Parents' awareness of myopia prevention strategies (multiple choice).
• Children's demographics.
• Time since children's last eye examination.

Main Findings

Data were collected from 326 parents with a mean age of 37.1 (standard deviation = 7.9) years, of whom 63.5% were women, 46.3% had at least a bachelor's degree and 87.7% had either one or two children.

Fifty-six point seven percent of parents correctly believed that the prevalence of myopia was 75% in secondary school children in Singapore. In total, 42.6% were aware that 12-year-old Singaporeans spent 6.5 hours per day on screens, while 67.5% of parents were aware that 30cm was a safe face-to-screen distance for smart devices.

Two-thirds (62.6%) of parents were aware that outdoor activity and natural light exposure, looking far into the distance, taking regular breaks from screens and annual eye checkups were all effective ways to prevent the onset and progression of myopia. Fewer than half of children (48.7%) had undergone an eye examination within the past year.

Implications of findings

Parents had a moderate level of awareness of how common myopia has become in Singaporean children and a good level of awareness of strategies to mitigate the onset and progression of myopia. However, the lack of awareness of how much time children spend on devices and the low rates of annual eye examinations among children in this study highlight that there are gaps in parents' knowledge about myopia and its risk factors that could be improved through targeted education and awareness campaigns.

Background and Rationale

The worsening global myopia crisis

The world is currently facing an intensifying myopia epidemic, with recent estimates suggesting that in the year 2020 there are approximately 2.5 billion people with myopia.[1] This is equivalent to around one-third of the world's population. The number of people with myopia is expected to increase dramatically, doubling to 5 billion within the next 30 years, which will mean that as much as half of the world's population will be myopic.[1] The global costs of myopia, just in term of lost productivity, already amount to approximately USD$328 billion,[2] and the projected worsening of the myopia epidemic represents a potentially unmanageable global public health and economic crisis.

With the rising prevalence of myopia there has also been a decrease in the average age at which myopia develops, which has been associated with faster rates of myopia progression.[3] The result is that, by the time myopia stabilises in teenagerhood or early adulthood, more people are experiencing myopia of greater severity, including a more severe form known as high myopia which significantly increases the risk of developing diseases such as macular degeneration, glaucoma and cataracts, which in turn can cause irreversible blindness.[4] Of those who have myopia in the year 2020, nearly 400 million have high myopia and the number of people with high myopia is expected to rise dramatically to almost 1 billion in the next 30 years.[1]

Myopia in Singapore

Singapore has been particularly hard-hit by the myopia epidemic. As with other economically and technologically developed parts of Asia such as urban centres in China and South Korea, the proportion of the population in Singapore with myopia is significantly higher than most other countries.[3] Research has shown that more than one in ten Singaporean toddlers aged 6 to 72 months has myopia,[5] with the prevalence rising to as high as 70 to 80% in those finishing secondary school or commencing tertiary education.[6] The high prevalence of myopia in Singapore is causing many negative societal effects including reducing quality of life, education and economic participation of those with myopia, greatly increasing the risk of irreversible blindness in millions of people and costing the healthcare system approximately US$755 million every year.[2]

What is driving the worsening myopia epidemic?

It has long been known that our genes play an important role in the development of myopia, with people who have myopic parents and siblings being more likely to develop myopia themselves.[7] Advances in science have resulted in almost 20 genes being implicated in myopia.[8] However, myopia is a complex condition and genetic factors only account for some of a person's risk of developing the disorder as well as how rapidly their myopia may progress and to what extent.

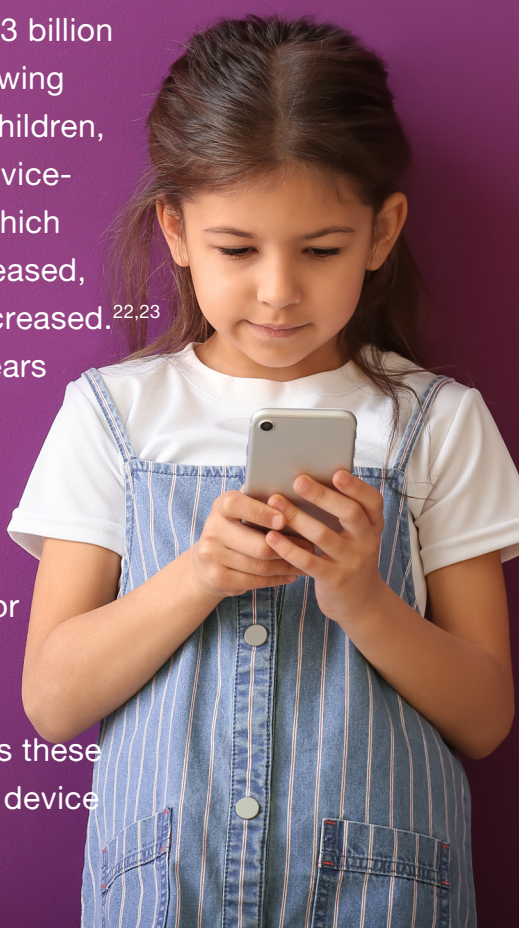
Various environmental risk factors also appear to contribute to the onset and progression of myopia. These include not spending enough time outdoors and engaging in excessive near work activities such as reading during childhood.[9-12]

Outdoor activity has been shown to be protective against myopia in multiple studies,[10,11,13] with one trial reporting that children who engaged in just one 40-minute class outdoors per day and whose parents encouraged more outdoor activity after school had a 9.1% lower incidence of myopia compared to those who did not have those exposures.[11]

There is also a growing body of evidence that has linked the myopia epidemic to the recent upsurge in the use of digital screens by young children and teenagers. Screen-based activities, particularly on mobile smart devices, constitute a new form of near work and children who use these devices tend to do so indoors for long uninterrupted periods.[14,15] Research in China,[16] Ireland,[17] Japan[18] and India[19] have found links between screen time and myopia.

Smart device use among children: one epidemic driving another

The internet and mobile smart devices such as smartphones and tablet computers have become integral components of our daily lives, with there being an estimated 4 billion internet users[20] and almost 3 billion smartphone users around the world.[21] The growing uptake of these technologies, particularly by children, has resulted in concerning trends in certain device-related behaviours, including that the age at which children commence utilising devices has decreased, while daily screen time among children has increased.[22,23] Indeed, as many as 97% of children aged 4 years and three-quarters of children as young as 1 year use devices daily.[22] One 2016 report found that 12-year-olds in Singapore were spending an average of 6.5 hours on their devices daily, usually at the expense of outdoor activity.[24] In addition, young children tend to hold their device screens closer to their faces than they would with conventional books.[15] It is these behaviours that appear to underpin the role of device screen time in driving the myopia epidemic.



Are parents aware of the myopia epidemic and myopia's risk factors?

In the face of the myopia and device dependency epidemics, parents can protect their children by helping them to do the following:

1. Increase the time that they spend outdoors exposed to natural light.
2. Look far into the distance.
3. Take regular breaks from their device screens.
4. Undergo annual eye check-ups.

In order for parents to be able to instil these protective behaviours in children, they must first be aware that there is a myopia epidemic, that unhealthy device use behaviours are likely to be contributing to the problem, and that there are behavioural changes that can be implemented to help children to make better choices to protect their eyes. In Singapore, strategies that include improved education and awareness about myopia's modifiable environmental risk factors have been successful in reducing the prevalence of myopia by 5% in primary school children[25,26] and a survey in China found that children had a lower risk of developing myopia if their parents paid attention to their vision from a young age,[27] highlighting how important parental awareness is in managing myopia.

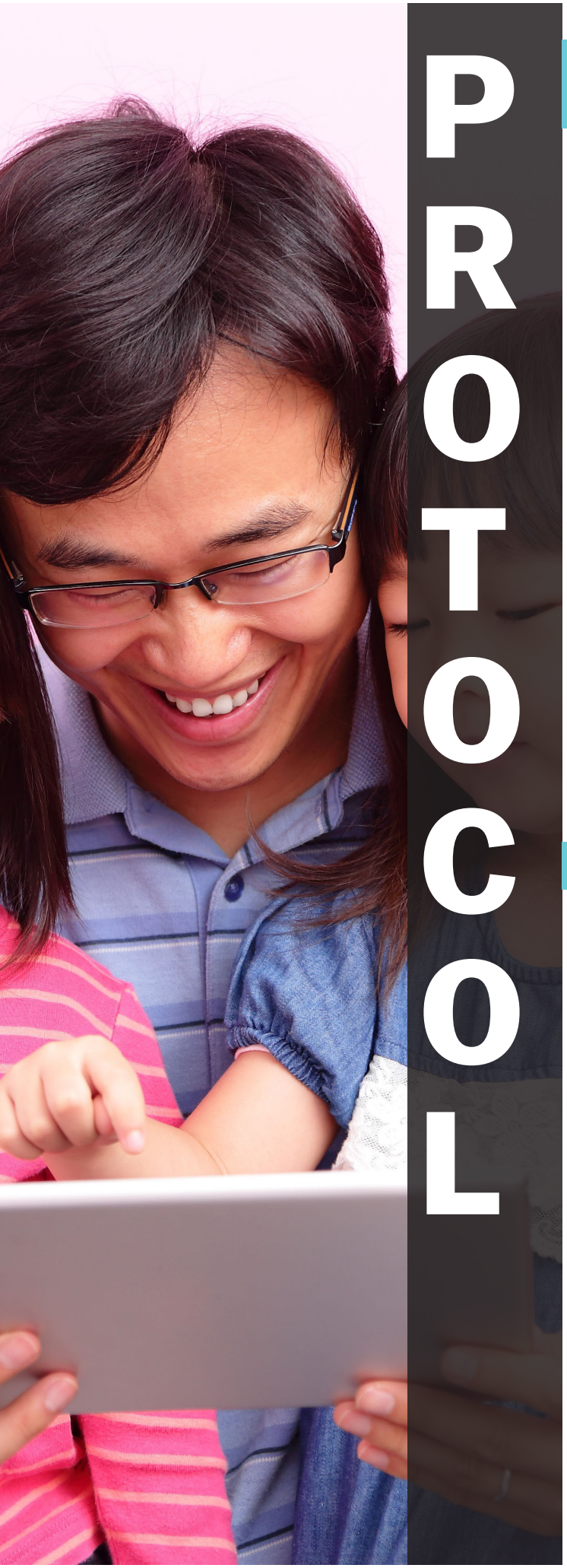
However, there has been a paucity of data investigating the awareness of myopia and its management strategies amongst parents worldwide. One survey in Ireland evaluated the awareness and attitudes of 329 parents with children aged 8 – 13 years and reported that only 46% considered myopia to be a health concern and only 14% showed concern about their children developing myopia.[28] While a separate study measured awareness and knowledge of myopia in Singaporean adults, no previous research has quantified whether Singaporean parents are aware of myopia and what proportion of them know what can be done to protect children from developing the condition.[29,30] This report presents research that gathered data on the level of awareness of myopia among a sample of Singaporean parents in order to fill that gap in knowledge.

Who will benefit from this report?

This report presents findings on the level of awareness among Singaporean parents about the myopia epidemic and strategies available to assist in protecting their children from myopia and the harmful effects of digital screens. The data presented herein will be useful to the Government of Singapore, as well as governments in other countries as similar patterns in awareness of the relevant issues are likely to be reflected in other populations. With these findings, governments will be better equipped to understand where parents tend to have gaps in knowledge and to what extent so that they can work with relevant stakeholders to design and implement educational and health promotion campaigns to increase awareness. Parents will benefit, both from the downstream effects of awareness campaigns as they will be better informed to make decisions, as well as from reading this report directly. In turn, the children of correctly informed parents will benefit from being taught to develop healthy relationships with digital device screens and their exposure to myopia risk factors will be reduced accordingly. If children are appropriately protected, then the epidemics of both myopia and screen dependency may be controlled, ultimately benefiting society.

Objectives

1. To determine the level of awareness of myopia among a group of parents residing in Singapore. Specifically, this research aimed to understand parents' awareness about:
    a. The prevalence of myopia among young people in Singapore.
    b. Strategies that are available to mitigate or slow the progression of myopia in children.
2. To determine Singaporean parents' knowledge about how much time children spend engaged in screen time on smart devices.
3. To determine Singaporean parents' knowledge of what constitutes healthy screen-based behavior for children.
4. To determine how recently children had undergone their last eye examination.



PROTOCOL

Setting and participant recruitment

This research was conducted at the annual 'The Kidz Academy' (TKA) exposition, held over three days from the 29th of June to the 1st of July 2018 at the Singapore Expo Convention and Exhibition Centre. Established in 2009, TKA is Singapore's longest-running education fair for children and provides educational activities to children aged 3 to 12 years of age. Trained recruiters approached parents with at least one child aged 16 years or younger who were attending TKA and invited them to complete a tablet-based questionnaire which was administered face-to-face by trained interviewers. Eligible attendees who agreed to participate provided written informed consent prior to participating. All participant responses were uploaded to a secure Google form server where they were only accessible to authorised personnel.

Questionnaire

Using Google Forms, the Plano research team developed an interviewer-administered online questionnaire to collect data on parents and their children. The full 13-item questionnaire can be found in Appendix 1.

Parental socio-demographic items

Parents were asked a series of five questions to capture their sociodemographic data. These questions obtained data on:

1. Parents' age
2. Parents' gender
3. Parents' race
4. Parents' highest educational qualification
5. Parents' total number of children

Myopia knowledge and awareness items

Parents were then asked a further four questions to ascertain their basic awareness of myopia and eye care management strategies. Questions consisted of three 4-option multiple choice items with one correct answer and one 4-option item with more than one correct answer. These questions obtained data on:

1. What parents believed the prevalence of myopia was in secondary school-going Singaporean children. Multiple choice options were: 30%, 50%, 75% or 90%. The correct answer of 75% was based on data from the Singapore Health Promotion Board (HPB) in 2011.[31]
2. The average amount of time that parents believed 12-year old children in Singapore spent on devices daily. Multiple choice options were: 2 hours, 4.5 hours, 6.5 hours or 8 hours. The correct answer was 6.5 hours based on a report from the DQ Institute.[24]
3. The minimum distance at which parents believed it was safe to hold device screens from the eyes. Multiple choice options were: 10cm, 20cm, 30cm or 40cm. The correct answer was 30 cm based on studies investigating the average working distance when using phones, and that closer working distances were associated with adverse eye symptoms.[15]
4. The last item which had multiple correct answers was related to participant awareness of strategies to prevent the onset and slow the progression of myopia, with the correct answer being all four of the proposed strategies, including outdoor activity and natural light exposure, looking far into the distance, taking regular breaks and undergoing annual eye check-ups.

Child sociodemographic and eye examination items

Parents were then asked a series of four questions to obtain information about their children. The first two items determined in which age range the participant's first child and any subsequent children were, with categories including: 0 to 4 years old, 5 to 9 years old, 10 to 14 years old and more than 14 years old.

The remaining two items ascertained when participants' first child and any subsequent children had undergone their most recent eye examination. Parents selected from the following options: never, within the last year, between 1 to 2 years ago, between 2 to 3 years ago.

Statistical Analysis

De-identified data were downloaded from the Google form server and imported into SPSS statistics software version 25.0 (IBM Corporation, United States). Descriptive statistics were used to summarise the participants' responses and Microsoft Excel (Microsoft, United States) was used to present the summaries visually. Logistic regression was used to calculate odds ratios (OR) and 95% confidence intervals (CI) to assess the relationship between parents' demographic characteristics (age, gender and level of education) and their awareness of each of: 1) prevalence of myopia; 2) recommended eye-to-screen distance; 3) average daily time spent on devices and; 4) the effective strategies to prevent the onset and slow the progression of myopia. A P-value of .05 was used for significance testing. Figure 1 graphically presents the study protocol.

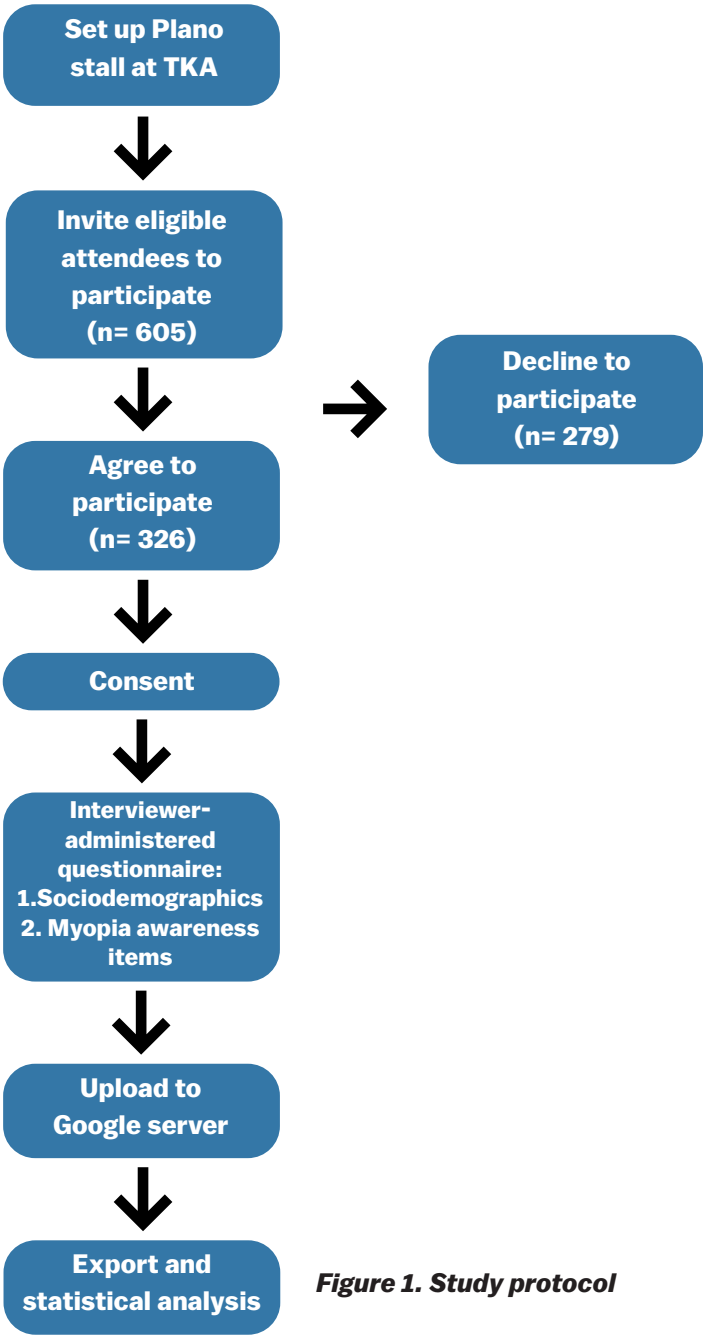


Figure 1. Study protocol

Main Findings

Participant demographics

Demographic characteristics of parents

Recruiters invited a total of 605 parents attending the TKA to participate in the study, of whom 326 (53.9%) agreed to participate (Figure 1). Parents who completed the questionnaire were aged with a mean [SD] age of 37.1 [7.9] years. More than half of parents were aged between 30 and 39 years, while younger parents (29 years and younger) constituted only 13.5% of all parents (Figure 2). Most parents were women, constituting almost two-thirds (63.5%) of those interviewed.

The majority of the participants reported that they were of Chinese ethnicity (71.8%), with the remainder identifying themselves as Indian (18.7%), Other (4.9%), Malay (2.8%) and Eurasian (1.8%) (Figure 2). Participants tended to be well-educated, with almost half (46.3%) having completed a bachelor's degree, while 20.9% had attained a master's degree or higher. The mean number of children per family was 1.7 ± 0.8, with the majority having only one (46.6%) or two (41.1%) children.

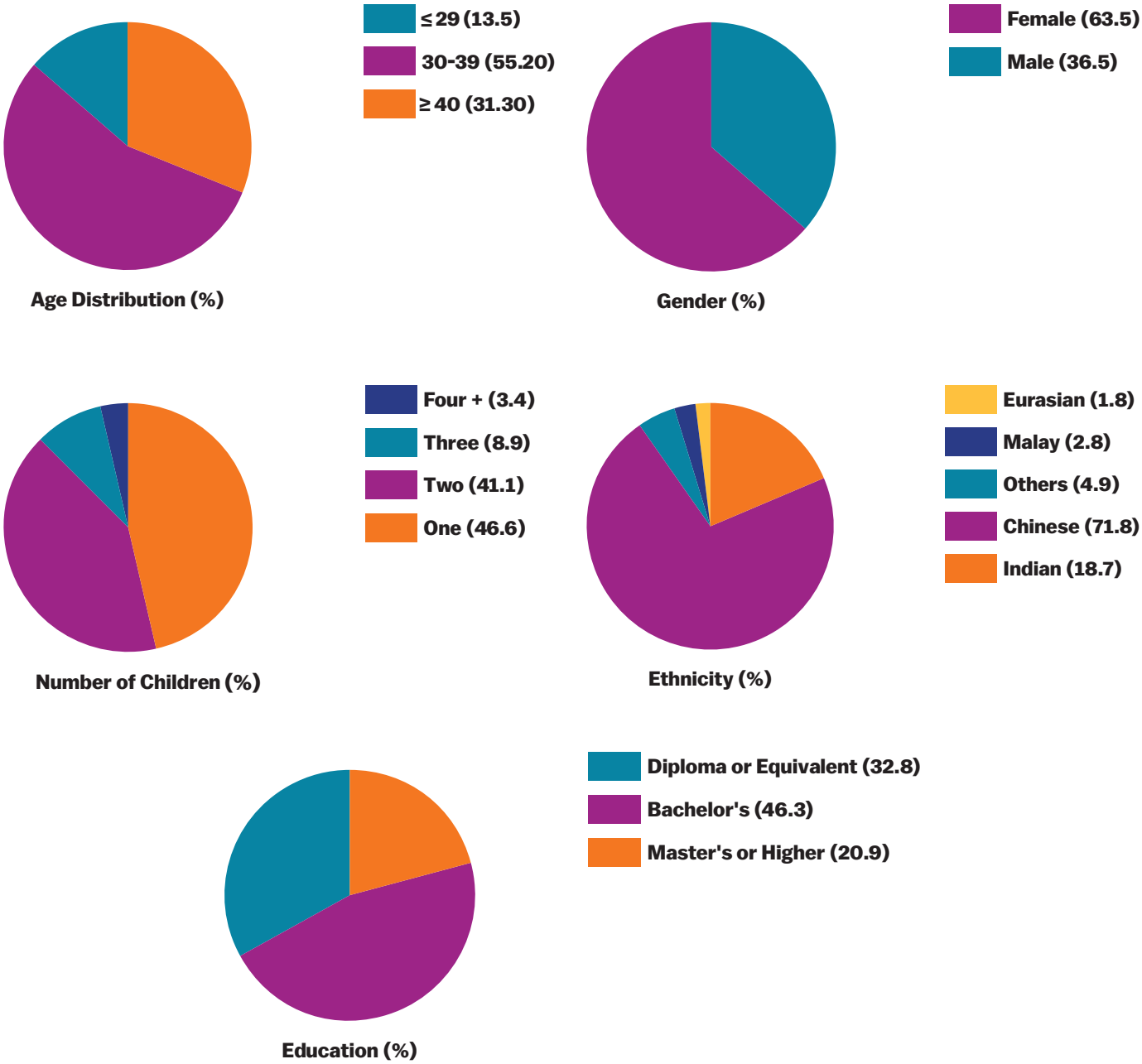


Figure 2. Participant sociodemographic characteristics

Parents' answers to questions about knowledge and awareness of myopia

Question 1. In Singapore, by the time children reach secondary school, what is the prevalence of myopia?

When asked what they believed the prevalence of myopia was among secondary school children in Singapore, just over half of participants (56.7%) correctly answered that the prevalence was 75%, while more than one-third underestimated and one in twenty participants over-estimated the prevalence (Figure 3).

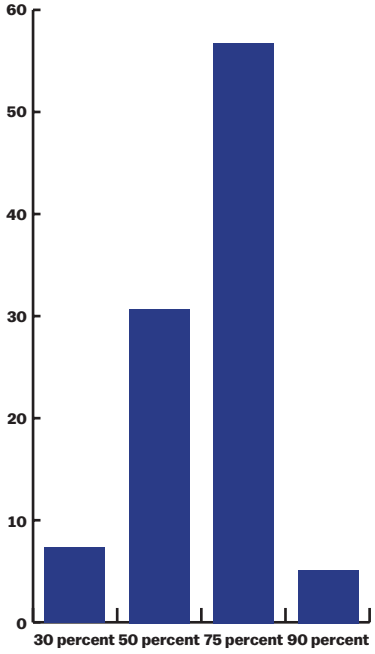


Figure 3. Parents' estimates of the prevalence of myopia in Singaporean children reaching secondary school

Question 2. On average, how much time do 12-year children spend on devices daily?

Fewer than half (42.6%) of parents correctly estimated that 12-year-olds in Singapore spent an average of 6.5 hours per day on smart devices, with the majority of the remaining parents (53.4%) underestimating the amount of time spent on devices (Figure 4).

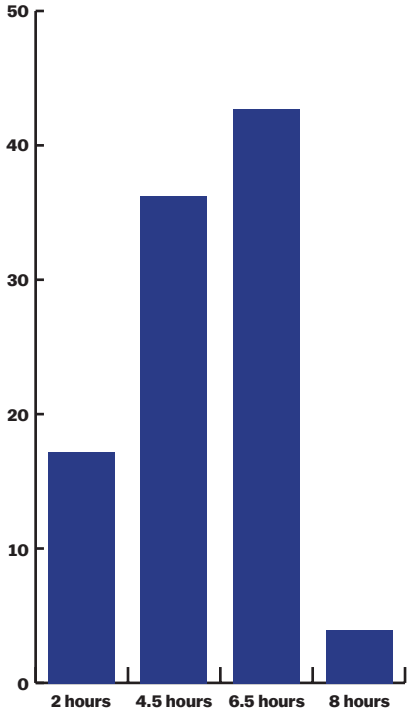


Figure 4. Parents' estimates of time spent on devices by 12-year-olds

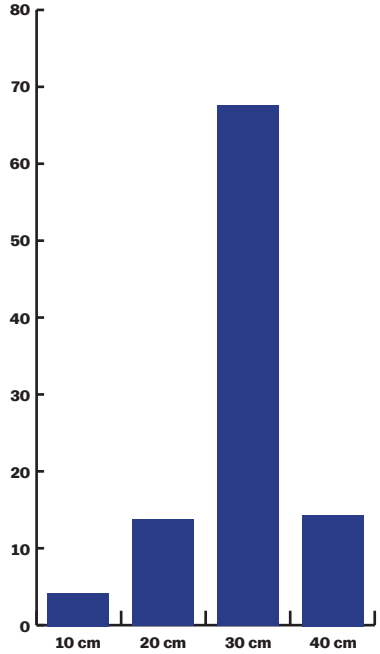


Figure 5. Parents' reports of what they considered safe face-to-screen distance during mobile device use

Question 3. What is considered a minimum 'safe distance' from the eyes to the screen of mobile devices?

More than two-thirds (67.5%) of participants correctly indicated that 30cm was the distance from the face at which it is considered safe to hold devices during use, while as many as 18.1% believed that it was acceptable and safe to hold devices closer than 30cm (Figure 5).

Question 4. What are effective ways of preventing the onset or progression of myopia? (you may select more than one)

Almost 9 in 10 participants were aware that outdoor activity and natural light exposure are effective strategies in preventing the onset and progression of myopia, while 75.2% and 82.5%, respectively, indicated that looking into the distance and taking regular breaks from device use were important strategies in managing myopia onset and progression (Figure 6). Nearly three-quarters of participants reported that regular eye check-ups were important for children. Overall, 62.6% of participants thought that all four management strategies were effective in mitigating myopia.

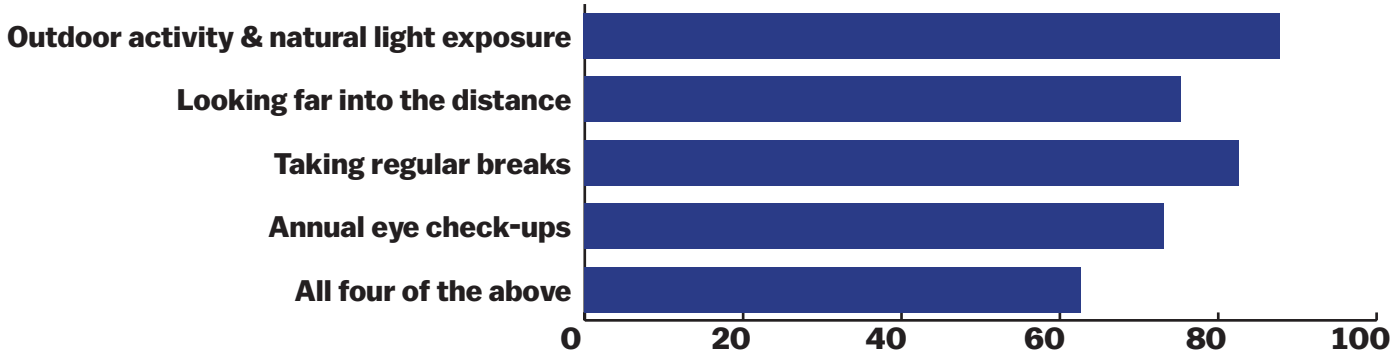


Figure 6. Proportion of parents that were aware of each strategy for the mitigation of myopia onset and progression

Children demographics

Among the 326 parents, data were captured from 524 children. The average [SD] age of children was 6.1 ± 3.9 years, with approximately 80% of children being 9 years or younger. Only 2.1% of children were older than 14 years old (Figure 7).

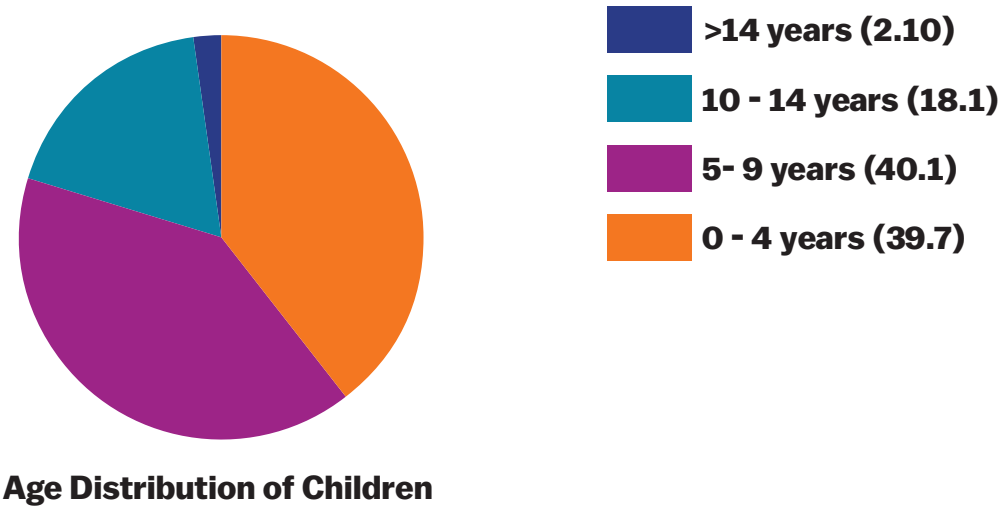
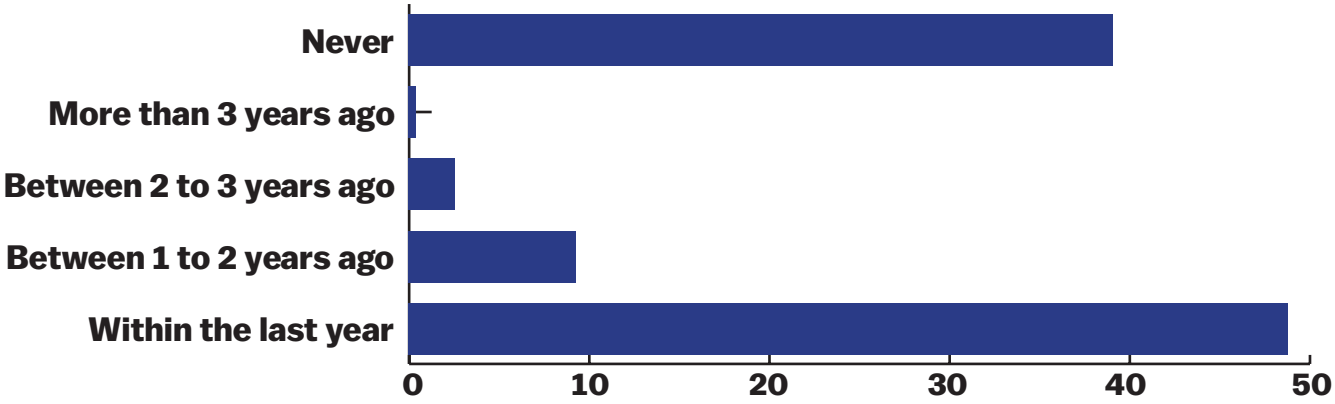


Figure 7. Age distribution of children

Eye check-ups

Of the 524 children from whom data were collected, information about how recently they had undergone their most recent eye check-up was obtained from 462 (88.2%) (Figure 8). Of these, nearly half (48.7%) had undergone an eye examination within the last 12 months. In contrast, 39% of children had never had a previous eye examination according to their parents.



Factors associated with getting the right answer

Younger parents (those aged 29 or younger) were 1.92 times more likely to have reported the correct safe face-to-screen viewing distance compared to parents aged 30 years or older. Women were 2.11 times more likely than men to have been aware that outdoor activity and natural light exposure are effective myopia mitigation strategies (Table 1). Whether parents provided the correct responses for the remaining questions was not affected by their age, gender or level of education.

Table 1. Factors associated with parents providing the correct answers based on multivariable logistic regression analysis

Item	Age		Gender		Education	
	OR (95% CI)	***P-value***	***OR (95% CI)***	***P-value***	***OR (95% CI)***	***P-value***
Prevalence of childhood myopia	0.60 (0.29-1.17)	0.28	1.15 (0.73-1.81)	0.56	0.94 (0.56-1.54)	0.95
Daily time spent by children on devices	0.75 (0.38-1.46)	0.48	0.80 (0.50-1.26)	0.32	1.07 (0.65-1.77)	0.25
Eye to screen distance1	.92 (0.97-3.76)	**0.04**	1.15 (0.71-1.85)	0.57	1.16 (0.68-1.97)	0.74
Effective myopia mitigation strategies						
Outdoor activity & natural light exposure	0.67 (0.18-1.87)	0.73	2.11 (1.08-4.17)	**0.03**	1.95 (0.94-4.11)	0.1
Looking far into the distance	0.83 (0.37-1.72)	0.11	0.62 (0.35-1.06)	0.08	0.97 (0.54-1.71)	0.83
Taking regular breaks0	.86 (0.32-2.00)0	.9	0.70 (0.37-1.28)	0.25	2.11 (1.09-4.13)	0.07
Annual eye check-ups	1.47 (0.71-2.95)	0.52	1.06 (0.63-1.76)	0.82	0.77 (0.44-1.34)	0.38

*Reference groups: Age: 29 years old; Gender: Male; Education: Diploma

The Implications

This survey evaluated the level of awareness of childhood myopia and its management strategies amongst a group of Singaporean parents. A moderate overall level of awareness was observed amongst the participants, with almost 60% being aware of the high prevalence of myopia amongst Singaporean children and approximately two-thirds being aware of all four of the myopia prevention strategies included in the questionnaire. While a moderate level of awareness was also observed regarding what constitutes a safe face-to-screen distance (with two-thirds of parents providing the correct answer), more than half of parents underestimated the amount of time children spent on screens.

Awareness of myopia and myopia management strategies

With 56.7% of parents being aware that the prevalence of myopia among secondary school children was 75%, this report has revealed a moderate level of awareness of the severity of Singapore's myopia crisis and these findings may reflect the positive impact of Singapore's National Myopia Prevention Programme (NMPP) as well as other efforts in Singapore that have aimed to raise awareness of myopia. However, more than one in three parents underestimated the prevalence of myopia, signifying that there remains a notable lack of awareness of the extent to which myopia has become a public health problem among a notable proportion of parents of children in that age group.

Due to their lack of awareness about how commonplace myopia has become, these parents may be at risk of lacking the vigilance required to detect when their children may be having vision problems, to implement protective strategies and to seek eye care for their children.

The capacity for parents to protect their children from myopia requires that they are first aware of its risk factors as well as the strategies that are available to them to mitigate their children's risk. Indeed, previous surveys conducted in China[27] and Ireland[28] have highlighted the importance of parental awareness of myopia risk factors in the control of the condition. One study conducted in 2017 reported that positive parental attitudes and behaviours towards children's vision, such as ensuring sufficient sleep and monitoring device usage, were associated with a delayed onset and reduced progression of myopia among Chinese children.[27]

Almost two-thirds of parents in the current study were aware that all four of the strategies included in the questionnaire were effective tools for mitigating the onset and progression of myopia. Levels of awareness were higher for each individual strategy, particularly outdoor activity and natural light exposure and the effect of taking regular breaks from near work activities. Given that a lack of outdoor and natural light exposure and excessive near work are myopia's most important modifiable risk factors, the finding that most parents were aware of these strategies is encouraging. However, awareness of the effectiveness of regular eye examinations and looking far into the distance was lower. Parents would benefit from having a more comprehensive understanding of how to mitigate myopia's onset and progression so that they can implement the most effective strategies at home.

Awareness of screen time and healthy device use behaviour

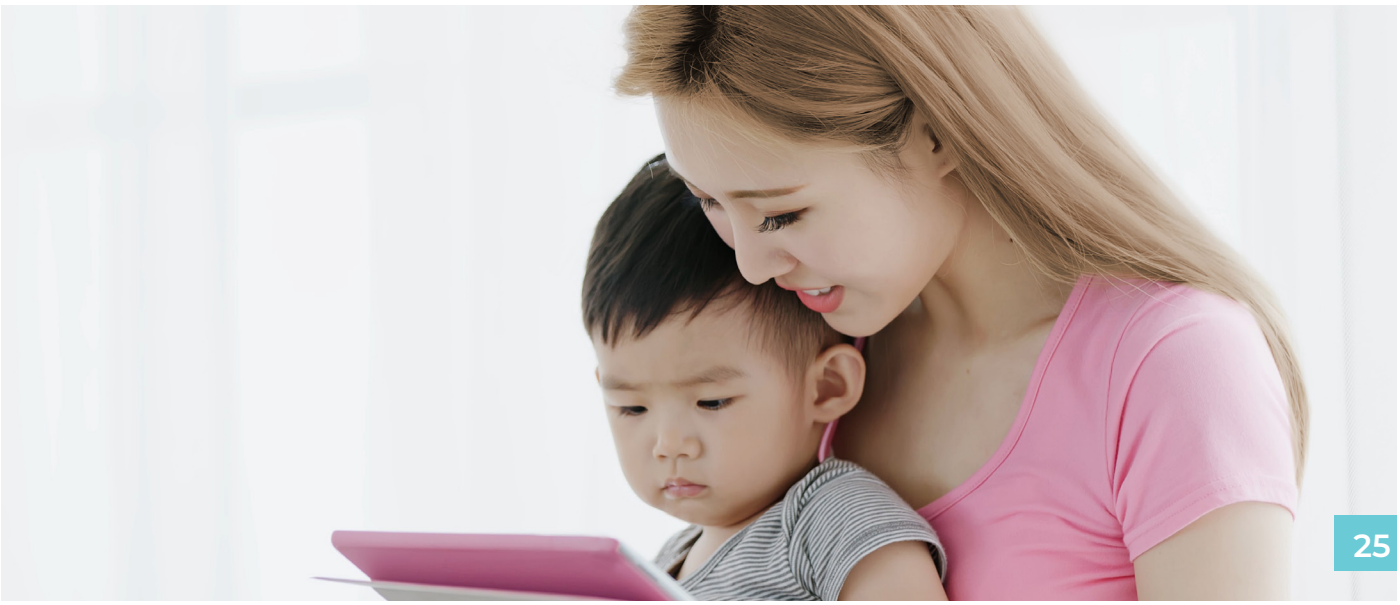
The epidemic of device dependency is a relatively new phenomenon, and it is perhaps not surprising then that well over half of parents were not aware of how much time children in Singapore are spending on their devices. The fact that parents of 12-year-olds are not typically able to monitor their children's screen time while their children are at school, with friends or alone, probably contributes further to their unawareness of the fact that children spend an average of 6.5 hours on their devices per day. The establishment of an association between screen time and the onset and progression of myopia is also a recent occurrence, and many parents are still unaware of the need to monitor and limit screen time among children. Further still, they are likely to be unaware that excessive screen time also places children at risk of an array of other adverse health outcomes including depression, anxiety, obesity, diabetes and neck and hand pain. As parents may be unaware of the risks, they may consequently be unaware of the need to be aware of their children's screen time, with the result being that many children will continue to spend unhealthy amounts of time on their devices, putting them at risk for myopia and other health problems.

Lack of awareness of the importance of timely and regular eye examinations

In Singapore, almost half of 7-year-olds who do not have myopia will go on to develop the condition by the age of 10 years, and their myopia will progress so quickly that their prescription will increase, on average, from negligible to almost -2.50 dioptres in that three-year period.32 Considering the high incidence and rapid progression of myopia in Singaporean children, the finding here that more than half of children had not undergone an eye examination within the past year, that 39% had never been examined and that more than a quarter of parents did not know that regular eye check-ups are protective against myopia suggests that the vision of a large proportion of young Singaporean children is deteriorating undetected due to a lack of awareness among their parents.

Regular eye examinations are important because they allow optometrists to potentially slow the progression of myopia with a number of different treatments including special lenses such as bifocal, multifocal and progressive lenses, drug treatments such as atropine or pirenzepine eye drops and orthokeratology.[33-36] For those in whom the progression of myopia cannot be slowed, regular eye checks also allow optometrists to change the prescription of the lenses in a child's glasses as their myopia progresses. In just one year, myopia can progress enough to cause difficulty in seeing the board in class or playing sports even among children who previously had their vision corrected. Therefore, the remaining unexamined half of Singaporean children should undergo regular and timely eye examinations to ensure that they can participate fully in educational and social activities.

The lack of regular engagement with optometry services by Singaporean parents should be addressed at a national scale if Singapore wishes to tackle its myopia epidemic, and targeted awareness campaigns about the importance of eye examinations must be developed. In Singapore, the NMPP promotes myopia screening in preschool to secondary school students, assisting in the early detection of myopia and raising parental awareness. The NMPP was shown to reduce the prevalence of myopia among Singaporean primary school children by 5% between 2005-2011, highlighting the effectiveness of the initiative.[31] Although the NMPP has made significant strides, Singapore Health Services (SingHealth) recommends that all children under 16 years receive an eye examination every 1 to 2 years,[37] and improved efforts are required to address key barriers, both real and perceived, to increase eye examination rates.



Limitations

The limitations in the current survey include the relatively small and unevenly distributed sample size with respect to age, gender and educational qualification. Non-response bias may also be present, given that 46.1% (279/605) of parents who were invited to participate decided not to participate and/or did not complete the questionnaire. Sufficient information from all the non-responders was not available to quantify bias. In addition, the setting of participant recruitment could also be a potential source of bias. That is, it could be speculated that parents attending an education exhibition may be more engaged in their children's health and education, thus more likely to be aware of myopia and its risk factors. An additional potential source of bias may have been that survey responses were obtained via self-report, with the result being that recall bias could not be discounted. Finally, the questionnaire may not have included a sufficiently varied range of questions to collect data on parental knowledge and attitudes to myopia. For example, additional questions that might have benefitted the study would have interrogated whether parents were aware of myopia's classification as a disease, or whether they were aware of available myopia control methods such as contact lenses or atropine treatment. However, owing to the setting of this study and the likelihood that parents would not spend a long period of time answering many questions, only a small set of questions was asked.

Conclusion

This survey provides insights into knowledge and awareness of myopia amongst a group of Singapore-based parents. The results suggest a generally moderate degree of myopia awareness, however awareness campaigns to further improve eye care utilisation amongst Singaporean children are warranted. Given that parents play a prominent role in myopia management, additional research exploring awareness of myopia-related risk factors amongst a larger population of Singaporean parents may assist in guiding more targeted public awareness campaigns.

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