

Fifty Years Of Myopia Intervention: A Thematic Review Using QDAS

Anusuya Duraipandy¹ , Dr. Shanthi.S² , Dr. Malarvizhi. S.³

¹Ph.D Research Scholar, Rani Meyyammai College of Nursing, Annamalai University, Chidambaram – 608002

²Research Guide Lecturer, Rani Meyyammai College of Nursing, Annamalai University, Chidambaram – 608002

³Co-Guide Professor, College of Nursing, Pondicherry Institute of Medical Sciences, Puducherry – 605 014

Abstract

Purpose – This paper aims to review the literature on myopia interventions from 1971 to 2020 and gives approach in the field of ophthalmology.

Design/methodology/approach – Beginning with brief introductions of the key concepts, the Research discusses landmark studies on the subject in detail. The review process then begins by identifying and selecting relevant research papers from Mendeley database. Finally, 356 research papers are found suitable for the reviews and are examined to theoretically analyses the myopia interventions literature.

Findings – This study identifies that the majority of the interventions on myopia are surgical intervention, optical intervention, spectacle intervention and pharmacological intervention. But have not done much about study on outdoor activity on myopia.

Research limitations/implications – While the literature review may be incomplete, as it uses only a title-based advanced search, researchers and practitioners can still benefit from this simplified to have myopia intervention ‘study

Originality/value – The study introduces a generalized approach to myopia interventions and classification related to decade wise analysis, year wise analysis, Top 10 journals focusing on myopia interventions, word cloud tree map – themes on myopia interventions, Sunburst – Authors of articles published in 2020 and Themes on Myopia intervention. and provides a bibliography from 1971 to 2020 that can be used by academics and managers.

Keywords myopia intervention, thematic analysis, QDAS, Nvivo, nursing research

Introduction

Myopia poses a considerable personal and societal burden because of the need for correction of refractive errors to avoid visual impairment. Worldwide, it is estimated that 2.5 billion people (roughly 1/3 of the world population) are myopic. Although there is no cure yet, a number of methods have proven successful at slowing or stopping the rate of progression.

The WHO report 2015 claims that Myopia is anticipated to become a leading cause of permanent blindness worldwide and calls for better understanding the cause and finding the most effective methods to slow down the myopic progression.

The objective of this paper is to: (1) Provide a focus on review of literature in the area of myopia interventions (2) Develop a research agenda that may serve as a basis for future myopia interventions research.

In the past, collecting research articles were challengeable. Now due to technological advancement, there is huge number of articles available in software and data bases, but it takes time for the researchers to gather much, reading and analyzing the literature. The opportunities of software especially for the literature review are reference manager like mendeley, End note, Zotero and Qualitative software (QDAS) like Nvivo, Atlas. Using this software can overcome the challenges.

The investigator has used QDAS in analyzing this thematic literature review in myopic intervention.

Literature Review

This section highlights the previous literature reviews carried out in the area of myopia interventions. The reviews were searched from Science direct, Google scholar, JSTOR. Mendeley and Nvivo databases; the key word used was interventions on myopia. We have got total 820 articles, in that 356 articles are interventions on myopia.

Grzybowski (2020) conducted a review on the epidemiology of myopia in school children worldwide. Based on 80 studies from PubMed and Medline the researchers found that risk factors for myopia in school children included low outdoor time and near work, dim light exposure, the use of LED lamps for homework, low sleeping hours, reading distance less than 25 cm and living in an urban environment. Researchers also suggested that new epidemiological studies should be carried out on implementation of public health strategies to tackle and avoid myopia.

Lanca & Saw (2020) conducted a systematic review to determine the association between screen time and the risk of developing (1) prevalent or incident myopia, or (2) the risk of myopia progression in children. Based on the fifteen studies published in PubMed, ScienceDirect and the Cochrane Library, and citation lists the authors concluded that the results for screen time and myopia are mixed.

Sangvatanakul et al (2019) conducted a meta-analysis to study the influence of Chinese eye exercises on myopia control in an East Asian population. Eight articles were included in this meta-analysis where operated on the hypothesis that CEE (Chinese Eye Exercise) either increased or reduced myopia control. Researchers found that CEE afforded 28% greater control of myopia. Enabled by outlier treatment, this finding was homogeneous and consistent. Subgroup effects elevated myopia control to 62% when CEE was done up to 5 times a week. Improper CEE performance implied reduced myopia control of up to 57%.

Ho et al (2019) conducted a systematic review and meta-analysis were conducted to evaluate the effects of outdoor light exposure on myopia. Based on research data from 13 studies of 15,081 children aged 4–14 at baseline. Authors concluded that outdoor light exposure significantly reduced myopia incidence/prevalence. This review study suggested 120 min/day of outdoor light exposure to be given to school children at school.

Sherwin et al (2012) conducted a systematic review and meta-analysis to identify association between time spent outdoors and myopia in children and adolescents. The author had used literature search from 4 databases (Medline, Embase, Web of Science, and Cochrane Central Register of Controlled Trials [CENTRAL]), and reference lists of retrieved studies. They concluded the findings that increasing time spent outdoors reduces the risk of developing myopia and its progression in children and adolescents. Therefore, the authors recommended for further RCTs are warranted to investigate the efficacy of increasing time outdoors as a possible intervention to prevent myopia and its progression.

Cao et al (2020) conducted systematic review and meta-analysis to explore the influence of outdoor time on myopia prevention. The authors have used articles from Pubmed, Science Direct, the Cochrane Library, the Chinese National Knowledge Infrastructure and the Wanfang Database. They found that the outdoor time helps slow down the change of axial length and reduce the risk of myopia.

Prousalı et al (2019) conducted an overview of systematic reviews and meta- analyses to investigate the efficacy and safety of multiple myopia interventions vs control conditions. The authors identified articles from Medical Literature Analysis and Retrieval System Online (MEDLINE), Excerpta Medica dataBASE (EMBASE), Cochrane Database of Systematic Reviews (CDSR), Database of Abstracts of Reviews of Effects (DARE) and Centre for Reviews and Dissemination (CRD) Health Technology Assessment (HTA) database. The authors concluded that the existing evidence has failed to convince doctors to uniformly embrace treatments for myopic progression control, possibly due to existence of some heterogeneity, reporting of side effects and lack of long-term follow-up. Research geared towards efficient interventions is still necessary.

Pandey et al. (2015) conducted a scoping review on eye exercise for myopia in children. The objective of the study was to provide an evidence-informed overview to highlight the role of exercises for myopia in children. Authors have said more high quality research articles are needed to prove the effect of exercise on myopia in children. This review study found that how eye exercises are effective in the treatment of myopia. But there are only three cochrane and two pubmed indexed researches are published till date. The intension of this review is focused to emphasize the research for the treatment of myopia with exercise in future days. So that myopia can be treated in a better and easy way.

Rawstron et al. (2005) a review study conducted to examine the current scientific evidence base regarding the efficacy of eye exercises as used in optometric vision therapy. The researchers used search from Allied and Complementary Medicine Database, Cochrane Database of Systematic Reviews, Cochrane Register of Controlled Trials, EMBASE, and MEDLINE. Relevant articles were reviewed and analyzed for strengths and weaknesses. Pertinent sections of classic texts were studied to provide a historical basis and to serve as a source for additional early references. They identified Forty-three refereed studies. Of these, 14 were clinical trials (10 controlled studies), 18 review articles, 2 historical articles, 1 case report, 6 editorials or letters, and 2 position statements from professional colleges. Many of the references listed by the larger reviews were unpublished or published in obscure or no refereed sources and therefore were not accessible. This review has concluded the Eye exercises have been purported to improve a wide range of conditions

Lu et al. (2019) conducted a meta-analysis to evaluate the association between Chinese eye exercises and myopia onset. They collected the articles from PubMed, Embase, and Cochrane Library databases

from inception to July 2018. The primary outcome was association between Chinese eye exercises and onset of myopia. The secondary outcome was association between high-quality Chinese eye exercises and onset of myopia. A total of five studies, including 14,590 participants, were included in this meta-analysis. They suggested that performance of Chinese eye exercises is associated with a higher risk of myopia onset because most students performed low-quality eye exercises. However, performing high-quality Chinese eye exercises significantly lowers rates of myopia onset. Therefore, students should be encouraged to perform high-quality Chinese eye exercises.

Yazdani et al. (2020) have done a Comprehensive Meta-Analysis to compare the effect of full-correction versus under-correction on myopia progression. The authors used literature search in PubMed, Scopus, Science Direct, Ovid, Web of Science and Cochrane library. Methodological quality assessment of the literature was evaluated according to the Critical Appraisal Skills Program. This review suggested that, myopic eyes which are fully corrected with non-cycloplegic refraction with maximum plus sphere are less prone to myopia progression, in comparison to those which were under corrected. However, regarding cycloplegic refraction, further studies are needed to better understand these trends.

J. Huang et al. (2016) done a Network Meta-analysis review to determine the effectiveness of different interventions to slow down the progression of myopia in children. They performed literature search from MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials, World Health Organization International Clinical Trials Registry Platform, and ClinicalTrials.gov from inception to August 2014. We selected randomized controlled trials (RCTs) involving interventions for controlling the progression of myopia in children with a treatment duration of at least 1 year for analysis. The network analysis review study concluded that a range of interventions can significantly reduce myopia progression when compared with single vision spectacle lenses or placebo. In terms of refraction, atropine, pirenzepine, and progressive addition spectacle lenses were effective. In terms of axial length, atropine, orthokeratology, peripheral defocus modifying contact lenses, pirenzepine, and progressive addition spectacle lenses were effective. The most effective interventions were pharmacologic, that is, muscarinic antagonists such as atropine and pirenzepine. Certain specially designed contact lenses, including orthokeratology and peripheral defocus modifying contact lenses, had moderate effects, whereas specially designed spectacle lenses showed minimal effect.

H. M. Huang et al. (2015) have done a Systematic Review and Meta-Analysis to quantify the effect of near work activities on myopia in children. Relevant articles identified were published between 1989 and 2014 in MEDLINE, Embase, and the Cochrane Library, and the citation lists were reviewed. Twelve cohort studies and 15 cross-sectional studies were included (25,025 children aged between 6 and 18 years). They found that more time spent on near work activities was associated with higher odds of myopia. This review study suggested the development of a strategy to reduce the impact of near work on myopia would be important for preventing myopia in children.

Xiong et al. (2017) have conducted a systematic review followed by a meta-analysis to evaluate the evidence for association between time outdoors and (1) risk of onset of myopia (incident/prevalent myopia); (2) risk of a myopic shift in refractive error and c) risk of progression in myopes only. Authors were used PubMed, EMBASE and the Cochrane Library were searched for relevant papers. Of the 51 articles with relevant data, 25 were included in the meta-analysis and dose-response analysis. Twenty-three of the 25 articles involved children. They concluded that increased time outdoors is effective in preventing the onset of myopia as well as in slowing the myopic shift in refractive error. But paradoxically, outdoor time was not effective in slowing progression in eyes that were already myopic. This review study has recommended that further studies evaluate the effect of outdoor in various doses and objective measurements of time outdoors may help improve our understanding of the role played by outdoors in onset and management of myopia.

Akerman (2020) have conducted a Cochrane Systematic Review to assess the effects of interventions, including spectacles, contact lenses and pharmaceutical agents in slowing myopia progression in children. The authors searched articles from CENTRAL, Ovid MEDLINE, Embase.com, PubMed, the LILACS Database; and two trial registrations up to February 2018. A top-up search was done in February 2019. They included randomized controlled trials and excluded studies when most participants were older than 18 years at baseline, also excluded studies when participants had less than -0.25D spherical equivalent myopia by followed standard Cochrane methods. They have suggested that Antimuscarinic topical medication is effective in slowing myopia progression in children.

Smaldone (2015) have conducted a systematic review to review the scientific literature about the relationship between computer use and onset of myopia in children. The author used search from Medline and Scopus databases. They used word themes are "Children AND Myopia AND Computer". 15

observational studies were considered suitable: 11 cross-sectional studies, 3 cohort studies and one longitudinal study. They found that there is no significant evidence in scientific literature about the association between computer use and juvenile myopia. This review have concluded that more comprehensive and multicenter studies would be opportune, given the importance of computer use as a risk factor in the development of juvenile myopia.

Methodology

According to decade wise analysis, the researcher has found the articles on myopia intervention studies, reports and also considered all the articles (820) initially which is taken from different data bases. The majority of the articles were there in the year between 2011- 2020 (221 articles) (62%).

Reference Manager: Mendeley. Why? Open source.

Database: Mendeley Literature search. Why? Corpus based on user libraries.

Keyword: Intervention on myopia (date-17th Oct. 2020)

No. of references/articles: 820

Exclusion/inclusion criteria?

Final number of articles: 354 Abstracts

Year wise, journal wise, etc.,

Nvivo. Why? Most widely used with more qualitative data analysis and data visualization capabilities.

Sequence/steps suggested by: base paper 2 and 3

Nvivo outputs.

Word frequency query

Word cloud

Text search query: intervention

Auto-coding using the memos (abstracts).

List of themes.

Themes on intervention

Findings: research gap identification

Scope for future research

Conclusion

Table 1. Trend wise articles

Decade	No. of articles	Percentage
1971-1980	3	0.84
1981-1990	2	0.56
1991-2000	41	11.52
2001-2010	89	25.00
2011-2020	221	62.08
Total	356	100

Table 1 shows the trend wise split up of the articles on myopia intervention. It is observed that in the initial period, i.e. in 70's only 0.84% of the interventions were on myopia. It was around 12 per cent in the 90s. A tremendous increase in the number 62% of myopia intervention studies is seen in the period from 2011 to 2020. More than 62 per cent of the articles identified were from this period. During the year 1981 to 1990 there were least number of articles 2 (0.56%) and after 1991-2000 the studies were gradually increased (41 articles), (11.52%) then 2001-2010 there were 89 articles (25%).

A split up of the number of myopia intervention studies during the period from 2011-2020 is shown in table 2.

Table Year wise articles

Year	No. of articles	Percentage
1971 to 2010	135	37.92
2011	19	5.34
2012	10	2.81
2013	21	5.90
2014	10	2.81
2015	18	5.06
2016	11	3.09
2017	47	13.20
2018	31	8.71

2019	38	10.67
2020	16	4.49
Total	356	100

With regard to table 2. Nearly 40 % of the articles together belong to four decades from 1971 to 2010. Remaining 60% of the studies belong to the current decade from 2011 to 2020. Among these, the highest number of intervention studies were in 2017 (13%) followed by close to 11 % of the studies in 2019. In spite of Pandemic NOVEL –CORONA, 16 intervention studies were published on myopia interventions.

Top 10 journals

Sl. No	Journal	No. of articles
1	Ophthalmology	67
2	International Eye Science	9
3	Optometry and Vision Science	8
4	International Journal of Ophthalmology	7
5	American Journal of Ophthalmology	6
6	Investigative ophthalmology & visual science	6
7	PLoS ONE	4
8	Journal of Cataract and Refractive Surgery	4
9	Chinese Journal of Experimental Ophthalmology	4
10	Ophthalmic and Physiological Optics	4

With regard to Table 3 journals appear to be the most preferred among researchers: Journal of Ophthalmology(67), Journal of International Eye science (9), Journal of Optometry and vision science (8). It is inferred that Ophthalmology is one of the most preferred journal by researchers to publish their intervention studies. There are other least number of journals also there regarding ophthalmology like American Journal of ophthalmology, Investigative ophthalmology, PLoS ONE, Journal of Cataract and Refractive Surgery, Chinese Journal of Experimental Ophthalmology and Ophthalmic and Physiological Optics. Comparing to India, the more number of myopia interventions are published in Europe, America, china and Singapore & other eastern countries.

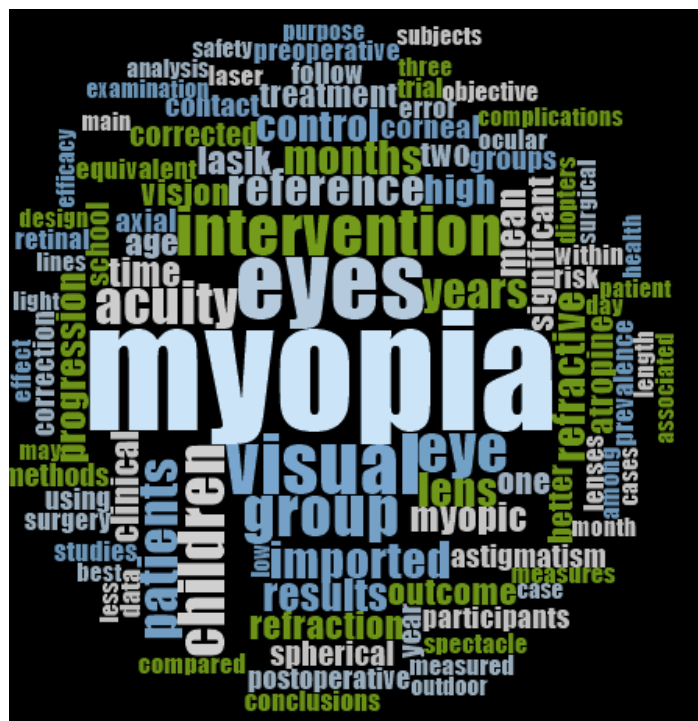


Figure 4 WordCloud - Myopia Intervention studies

Figure 4 shows that the word cloud based on the frequency of occurrence of the words in the selected articles. Higher the frequency of the word larger is the size of the word in the word cloud. It is observed that the most frequent words in the selected 356 articles are myopia, eyes, visual, intervention, children, and patients. The smaller size of the words in the word cloud is light, outdoor, laser, etc. Therefore it is inferred that there is strong evidence that numerous articles are available for interventions on myopia.

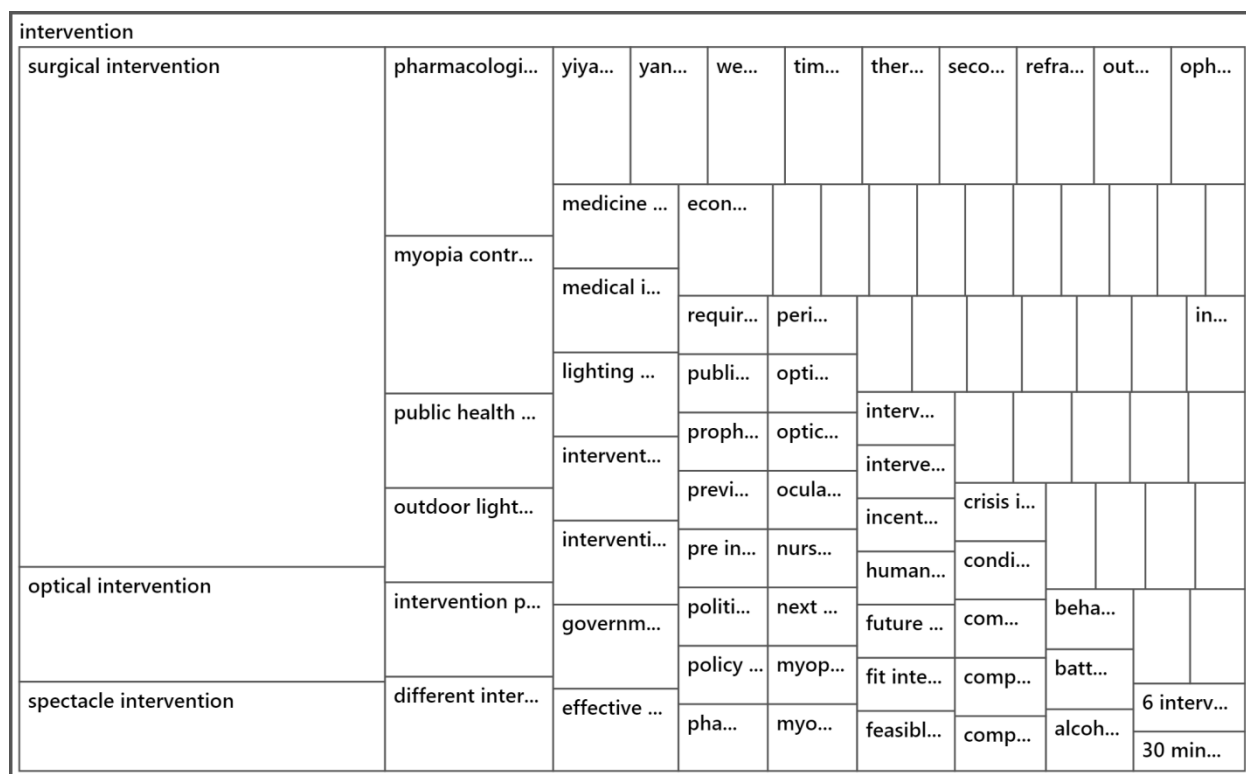


Figure 5 Tree Map - Themes on Myopia intervention studies

Figure 5 shows the more occurrence of the word, i.e., larger space is allocated for the word in tree map on myopia intervention studies. The more space occupied word is surgical intervention, optical intervention, and spectacle intervention. It is inferred that there are less studies on outdoor play/outer light/eye exercises.



Figure 6 Sunburst – Authors of articles published in 2020

Figure 6 shows the Authors of articles on Myopia interventions published during the year 2020 even during Pandemic NOVEL –CORONA, lockdown. Around 16 papers were published on myopia interventions and it shows that there are larger number of cases on myopia and many interventions carried on for it..

Table : 7 Themes on Myopia intervention

Sl. No	Theme	No. of articles
1	Surgical intervention	32
2	Optical intervention	7
3	Pharmacological intervention	6
4	Public health intervention	3
5	Spectacle intervention	3
6	Lighting intervention	2
7	Medical interventions	2
8	Ophthalmic intervention	2
9	Outdoor activity intervention	2

10	Refractive intervention	2
11	School-based intervention program	2
12	Therapeutic intervention	2

Table 7 shows that themes used in myopia interventions. There are 32 articles were there regarding surgical intervention on myopia. 7 articles were specified on optical intervention, 6 articles on pharmacological intervention. Among all the interventions the outdoor activity intervention on myopia was noted in 2 articles. It clearly exhibits that outdoor activity intervention on myopia studies are very few, however it also play a major role on myopia.

Sherwin et al. (2012) performed and published a meta-analysis of seven cross-sectional studies (published up until September 2011) on the association between time outdoors and myopia and reported that an one-hour increase in the time spent outdoors each day would reduce the risk of prevalent myopia by 13.3%.

AllonBarsam (2012)conducted a review study on surgical treatment on high myopia. He found that Refractive lens exchange (RLE) may increase the risk of retinal detachment and generally is not consideredpatients with myopia. Phakic IOLs represent an alternative surgical treatment for moderate to high myopia. Many lenses with different designs have been implanted worldwide, and one benefit of this procedure is its reversibility. Their insertion requires intraocular surgery, and the associated risks include endophthalmitis, surgically induced astigmatism, the loss of corneal endothelial cells, chronic uveitis, pupillary block glaucoma, pigment dispersion syndrome, and cataract formation. Longer follow-up is required for a balanced evaluation of safety and to establish the ideal myopic range for excimer laser and phakic IOL treatments.

Ju-Xiang Jin et al. (2012) had done a study on effect of outdoor activity on myopia onset and progression in school-aged children in northeast china. They found that increasing outdoor activities prevented myopia onset and development, as well as axial growth and elevated IOP in children.

Pei-Chang Wu(2013) had done Prospective, comparative, consecutive, interventional study to find out the effect of outdoor activity during class recess on myopia changes among elementary school students in a suburban area of Taiwan. The authors concluded that Outdoor activities during class recess in school

have a significant effect on myopia onset and myopic shift. Such activities have a prominent effect on the control of myopia shift, especially in nonmyopic children.

In this review of literature study, the author feels among all interventions, out light,outdoor play and eye exercises are not used much for myopia.

Conclusion

The researcher what she has selected for the intervention in this paper is cost effective,convenient to the school children and also more effective for myopia, can be seen their progress in the mid of the period of intervention.

Myopia among school children are commonly affected approximately from 7 to 17 years of age and stabilities by the late teens or early twenties. Currently there has been an increase in the prevalence of myopia in some populations, leading to growing concern among the public and the scientific community. (Suresh.B.Hittalamani 2015). There is no well established or universally accepted treatment for the prevention of myopia onset or progression.

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