Combination of sun gazing and acupuncture for myopia - A pilot randomized controlled trial

Background

Myopia, or near-sightedness, affects distance vision and quality of life. This study evaluated the combined effect of sun gazing and acupuncture on mild to moderate myopia in young adults. The objective of this study was to assess the impact of sun gazing and acupuncture on diopter measurements and distance visual acuity of young adults with myopia.

Methods

A randomized controlled trial was conducted with 60 participants (aged 18–25) at Alva's College of Naturopathy, Karnataka. Participants were divided into an experimental group (sun gazing and acupuncture) and a control group (acupuncture alone). Sun gazing sessions lasted 5–10 minutes during sunrise or sunset, and acupuncture was administered thrice weekly. Diopter measurements and visual acuity were assessed at baseline and after 30 days using an autorefractor and Snellen chart.

Results

Both groups showed significant reductions in SPH values and improvements in visual acuity ($P<0.01$). However, no significant differences were found between the groups in SPH reduction or visual acuity improvement ($P>0.26$).

Conclusion

Acupuncture improved myopic conditions, but the addition of sun gazing provided no extra benefit. Further research is needed to validate sun gazing's efficacy and investigate long-term effects.

Keywords: Myopia, Sun Gazing, Acupuncture, Visual Acuity, Diopter Measurements

Introduction

Myopia, commonly referred to as nearsightedness, is a prevalent refractive error where distant objects appear blurry while close objects are seen clearly. It affects an estimated 1.4 billion people globally and is projected to affect half of the world's population by 2050 due to environmental and lifestyle factors, such as increased screen time and decreased outdoor activities.[1]

The common symptoms of myopia includes blurred vision when looking at farther objects, head ache and eye strain. [2] Myopia can lead to serious complications like staphyloma, glaucoma, cataract, choroidal neovascularization, retinal tears, schisis, and detachment.[2] Conventionally, myopia is managed using atrophine, devices that induce relative peripheral myopia, pirenzepine, cyclopentolate and peripheral defocus modifying contact lenses.[3] Despite advances in corrective lenses and surgical options, managing and understanding the progression of myopia remains a critical focus in ophthalmology.

Complementary medicine offers various strategies that may support overall eye health and potentially influence myopia progression. Visual training techniques, which may be used to enhance visual function, are part of a holistic approach to eye care, though their efficacy in myopia control is debated.[4] Additionally, acupuncture and Traditional Chinese Medicine (TCM) offer alternative approaches, such as acupuncture and herbal remedies, to improve eye health, but scientific evidence supporting their effectiveness for myopia control is limited.[5] While complementary medicine can be beneficial for overall eye health, it is important to combine these approaches with evidence-based conventional treatments for a comprehensive strategy.

Acupuncture, a key component of Traditional Chinese Medicine (TCM), involves inserting fine needles into specific points on the body to balance the flow of energy, or Qi. This

practice has been employed for thousands of years to treat a variety of ailments, including musculoskeletal pain, migraines, and anxiety.[6] In the context of ocular health, acupuncture has gained attention as a potential complementary therapy for myopia. Studies suggest that acupuncture may improve visual acuity and reduce the progression of myopia by enhancing blood flow to the eyes and regulating autonomic nervous function.[7,8] Although clinical evidence remains limited and sometimes contradictory, the holistic approach of acupuncture presents a promising avenue for further investigation.

The therapeutic potential of acupuncture in managing myopia is attributed to several proposed mechanisms such as: (1) regulation of autonomic nervous system; (2) improvement of ocular blood flow; (3) reduction of intraocular pressure (IOP); (4) modulation of neurotransmitters and growth factors; (5) relaxation of extraocular muscles. Acupuncture may influence the autonomic nervous system, which plays a crucial role in ocular functions. By stimulating specific acupoints, acupuncture can modulate parasympathetic and sympathetic activities, potentially reducing the excessive contraction of the ciliary muscle, which is involved in the accommodation process of the eye.[9] Enhanced blood circulation to the ocular region is another proposed mechanism. Acupuncture may increase the perfusion of the choroid and retina, providing better oxygenation and nutrient supply to the eye tissues, which can help in managing the progression of myopia.[7]

High intraocular pressure is a risk factor for several ocular conditions, including myopia. Acupuncture has been shown to lower IOP, which could potentially mitigate the mechanical stress on the sclera and slow down the axial elongation of the eyeball.[10] Acupuncture may influence the release of various neurotransmitters and growth factors that play roles in ocular health. For instance, it can increase the levels of endorphins, which have analgesic properties and can reduce ocular discomfort. Additionally, acupuncture may affect the secretion of growth factors that regulate eye growth and development.[11]The relaxation effect of

acupuncture on the extraocular muscles can alleviate strain and fatigue associated with prolonged near work, a known risk factor for the development and progression of myopia.[12]

Heliotherapy is one of the important treatment modalities used in naturopathic medicine. Sun therapy, also known as heliotherapy (Helios = sun in classical Greek), was a popular modality in the early 20th century in the United States.[13] Numerous benefits has been proposed to be offered by heliotherapy such as immunomodulation, hormonal balance, promotion of wellbeing, alleviating mental health afflictions and prevents from infections.[14] Naturopathy medicine propagates sun gazing as an important regimen to replenish the pineal gland as well as the optic nerve. [15] Sun gazing has been an integral part of natural living. While remote evidences suggests the beneficial effect of spending time in sun and outdoors, there is no conventional evidence till date to validate these claims. [16] Numerous traditional texts endorse the healing benefits of sun gazing.[17]

Sun gazing, the practice of looking directly at the sun during safe periods (typically during sunrise or sunset), is rooted in various cultural and spiritual traditions. Proponents of sun gazing believe it can enhance physical and mental well-being by harnessing the sun's energy. Claims include improvements in vision, mood elevation, and overall health.[18] However, scientific research on sun gazing is sparse and contentious due to the potential risks of retinal damage and photokeratitis from UV exposure.[19,20] The potential benefits and dangers of sun gazing necessitate cautious and rigorous scientific scrutiny to understand its impact on ocular health, particularly in the context of myopia management.

Therefore, the present study intends to explore the combined effect of sun gazing and acupuncture among young adults with mild to moderate myopia.

Methodology

Study Design

This study was conducted as a pilot randomized controlled trial (RCT) to explore the combined effect of sun gazing and acupuncture on young adults with mild to moderate myopia.

Study setting

The study was conducted at Alva's College of Naturopathy & Yogic Science, located in Moodbidri, Karnataka. This institution is well-equipped with facilities for conducting both sun gazing and acupuncture interventions. Participants were recruited from the educational institutes under Alva's Educational Foundation, Moodbidri, Karnataka, ensuring a consistent and accessible study population.

Study participants

Participants were students from educational institutes under Alva's Educational Foundation. The target population included young adults aged 18 to 25 years who had been diagnosed with mild to moderate myopia. This age group was selected due to the common onset and progression of myopia during these years.

Inclusion Criteria

- Subjects with a pre-diagnosed mild to moderate myopia (0 D to −6.0 D).
- Both male and female subjects were eligible.
- Subjects aged between 18 to 25 years.
- Subjects who were willing to participate and sign an informed consent form.

Exclusion Criteria

- Subjects with a history of using psychiatric lenses.
- Subjects with known allergic reactions to sun exposure.
- Subjects with diopter measurements less than −0.6 D.

- Subjects with pathological myopia-related fundus changes and/or significant vision loss.
- Subjects with any other eye diseases besides myopia.

Study Sample Size

An arbitrary sample size of 60 participants was selected for this pilot study due to the absence of preliminary data on the combined effect of sun gazing and acupuncture on myopia. Each group consisted of 30 participants.

Grouping and Randomization

Participants were randomized into two groups: the experimental group, which received both sun gazing and acupuncture treatments, and the control group, which received only acupuncture. Randomization was conducted using an online random number generator (www.randomizer.org) to ensure equal distribution between the groups, maintaining a 1:1 allocation ratio.

Intervention

Sun Gazing

Participants in the experimental group practiced sun gazing daily during safe periods (sunrise or sunset) to minimize the risk of retinal damage. Each session lasted for 5 to 10 minutes. Participants were provided with detailed instructions on safe sun gazing techniques, including:

Ensuring they only looked at the sun during the first hour after sunrise or the last hour before sunset. Gradually increasing the duration of sun gazing from a few seconds to the full session time to avoid discomfort. Avoiding sun gazing during midday or in conditions where the sun is too bright to prevent eye damage.

Acupuncture

Acupuncture was administered by a certified practitioner following a standardized protocol. Participants received acupuncture sessions three times a week for the duration of the study. Each session targeted specific acupoints known for their benefits in eye health and vision improvement, such as BL2 (Zanzhu), GB20 (Fengchi), and ST2 (Sibai). Each acupuncture session lasted for approximately 20 minutes, and disposable sterile needles were used to prevent infection.

Control Group

Participants in the control group received acupuncture sessions three times a week for the duration of the study similar to that of interventional group. They did not practice the sun gazing. The following points BL2 (Zanzhu), GB20 (Fengchi), and ST2 (Sibai) were used similar to that of the interventional group. Each acupuncture session lasted for approximately 20 minutes, and disposable sterile needles were used to prevent infection.

Outcome Measures

Primary Outcome

Diopter Measurement

Diopter measurement is a critical parameter in assessing the degree of refractive error in individuals with myopia. A diopter (D) is a unit of measurement that quantifies the optical power of a lens or curved mirror. It is the reciprocal of the focal length measured in meters. In the context of myopia, a negative diopter value indicates the extent to which the eye's optical system is too strong, causing light to focus in front of the retina rather than directly on it.

An autorefractor is commonly used to measure diopters. This device provides an objective assessment of the eye's refractive error by measuring how light changes as it enters the eye. The autorefractor shines light into the eye and then measures the light's reflection off the retina. By analyzing these reflections, the device calculates the refractive error and displays it in diopters. This method is quick, non-invasive, and provides accurate results, making it a preferred choice in both clinical and research settings.

Accurate diopter measurements are essential for diagnosing the severity of myopia and for monitoring changes over time. This information is crucial for developing and evaluating interventions aimed at managing myopia. Studies have shown that consistent and precise diopter measurements are fundamental in research trials, such as those investigating the effects of sun gazing and acupuncture on myopia, to ensure reliable and valid outcomes.[41,42]

Refractive error among the participants was measured using an autorefractor at baseline and at the end of the 30-day intervention period. The autorefractor provided an objective measurement of the eye's refractive error, offering precise data for analysis.

Secondary Outcome

Distance Visual Acuity:

Visual acuity is a measure of the clarity or sharpness of vision, reflecting the eye's ability to discern fine details. It is typically assessed using a standardized eye chart, such as the Snellen chart, which displays letters or symbols of varying sizes. During a visual acuity test, individuals are asked to read the smallest line of text they can see from a fixed distance, usually 20 feet (6 meters). The results are expressed as a fraction, with the standard being 20/20 vision. This means that a person can see at 20 feet what a person with normal vision can see at the same distance.

In myopia (nearsightedness), the eye's optical power is too strong, causing light rays to focus in front of the retina rather than directly on it. This results in blurry vision for distant objects while near vision remains relatively unaffected. Visual acuity tests are crucial for quantifying the impact of myopia on distance vision and for monitoring changes over time.

The Snellen chart is the most widely used tool for measuring visual acuity. The chart features rows of letters decreasing in size, with the largest letters at the top. Each row corresponds to a specific visual acuity level. The test is performed monocularly (one eye at a time) and then binocularly (both eyes together), and the smallest line that can be read accurately determines the visual acuity score.

Another tool used in visual acuity testing is the LogMAR chart, which stands for Logarithm of the Minimum Angle of Resolution. This chart provides a more precise measurement of visual acuity, particularly useful in research and clinical trials. The LogMAR chart has an equal number of letters on each line and consistent spacing, which reduces variability in the measurement.

Visual acuity measurement is essential in both clinical and research settings. Clinically, it helps in diagnosing and monitoring eye conditions, prescribing corrective lenses, and evaluating the effectiveness of treatments. In research, visual acuity is a critical outcome measure for studies investigating interventions for myopia and other refractive errors.[43,44] The present study visual acuity was measured using a Snellen chart at baseline and after the intervention.

Data Collection

Baseline data, including demographic information (age, gender, academic background) and refractive error measurements, were collected before randomization. Follow-up measurements of refractive error and visual acuity were taken at the end of the 30-day period.

Data collection was conducted by trained research assistants who were blinded to the group assignments to minimize bias.

Statistical Analysis

Data were analyzed using SPSS statistical software. Descriptive statistics summarized the baseline characteristics of the participants. Paired t-tests were used to compare pre- and post-intervention measurements within each group, while independent t-tests compared the differences between the experimental and control groups. A p-value of less than 0.05 was considered statistically significant, indicating a meaningful difference between the groups. The normality of the data was assessed using Shapiro-Wilks test.

Ethical Considerations

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Informed consent was obtained from all participants, ensuring they understood the study procedures, potential risks, and benefits. The study protocol was reviewed and approved by the Institutional Ethics Committee of Alva's College of Naturopathy & Yogic Science. Participants were assured of their right to withdraw from the study at any time without any repercussions.

The study was registered as a clinical trial in clinical trial registry of India CTRI no: CTRI/2024/02/063276. The detailed trial profile is depicted in figure 1.

Results

The study involved 60 participants, evenly divided between the interventional and control groups, with an equal gender distribution of 50% males and 50% females. The mean age of participants in the interventional group was 22.26 years with a standard deviation of ±2.55

years, while the control group had a mean age of 21.50 years with a standard deviation of ±2.50 years.

Changes in the sphere (SPH) value

SPH right

The SPH value of the right eye has shown a significant reduction in the interventional group when compared the values before and after the intervention (P<0.001). Similarly, in control group, when compared before and after the acupuncture sessions, there was a significant reduction in the SPH values (P<0.001) of the right eye. Since the data were not distributed normally a Wilcoxon signed rank test was used to perform the analysis. The detail result is tabulated in table 1. Figure 2 and figure 3 depicts the comparison of the mean changes before and after intervention in the interventional and control group.

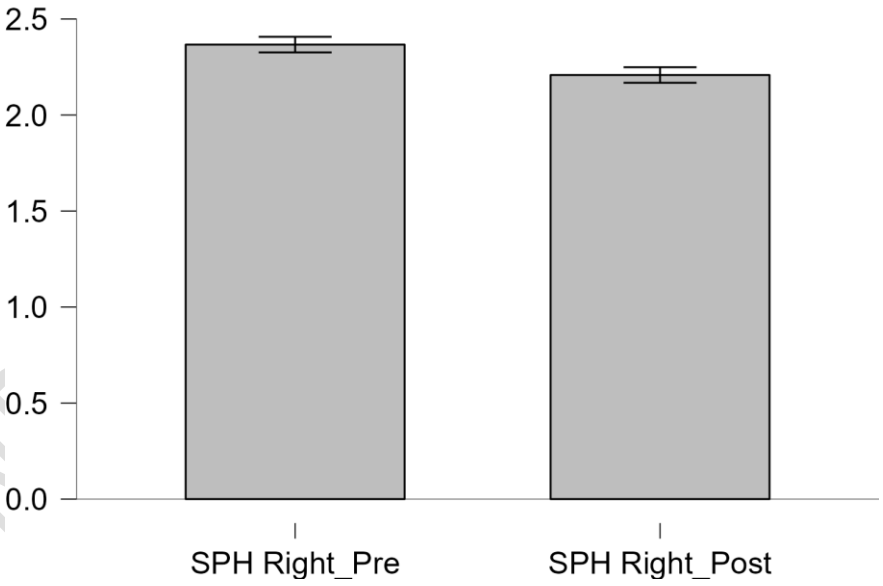


Figure 2: Changes in the SPH in the right eye of the interventional group

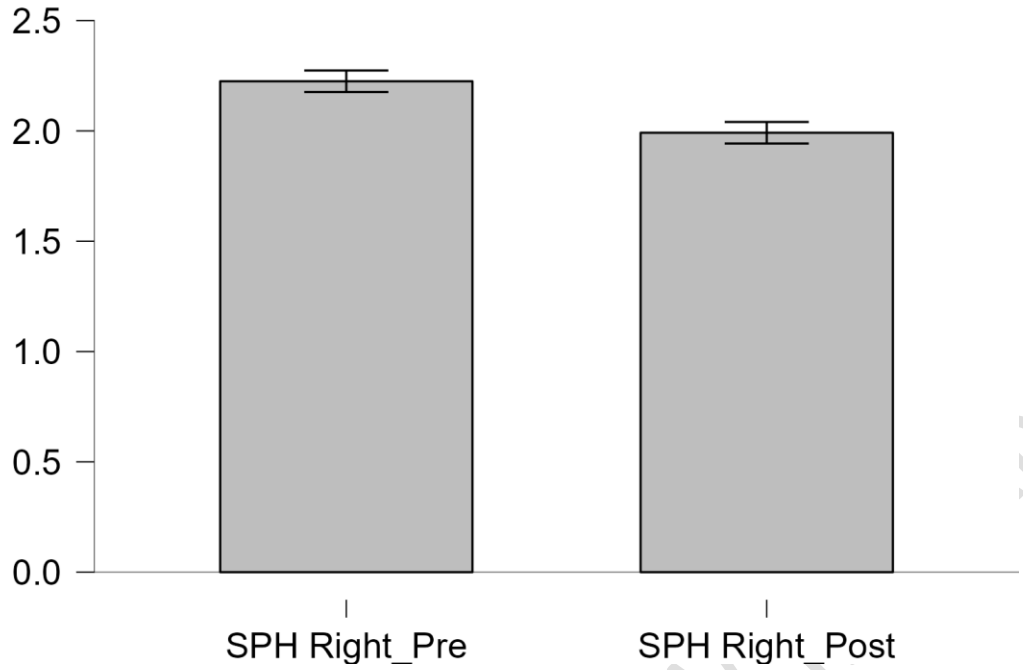


Figure 3: Changes in the SPH in the right eye of the control group

SPH left

The SPH value of the left eye has shown a significant reduction in the interventional group when compared the values before and after the intervention (P<0.001). Similarly, in control group, when compared before and after the acupuncture sessions, there was a significant reduction in the SPH values (P<0.001) of the left eye.

Since the data were not distributed normally a Wilcoxon signed rank test was used to perform the analysis. The detail result is tabulated in table 1. Figure 4 and figure 5 depicts the comparison of the mean changes before and after intervention in the interventional and control group.

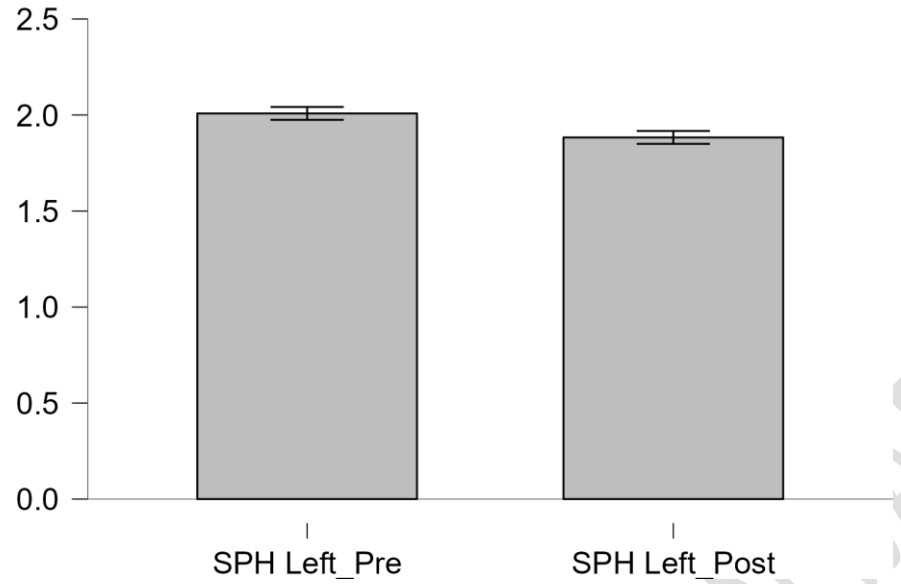


Figure 4: Changes in the SPH in the left eye of the interventional group

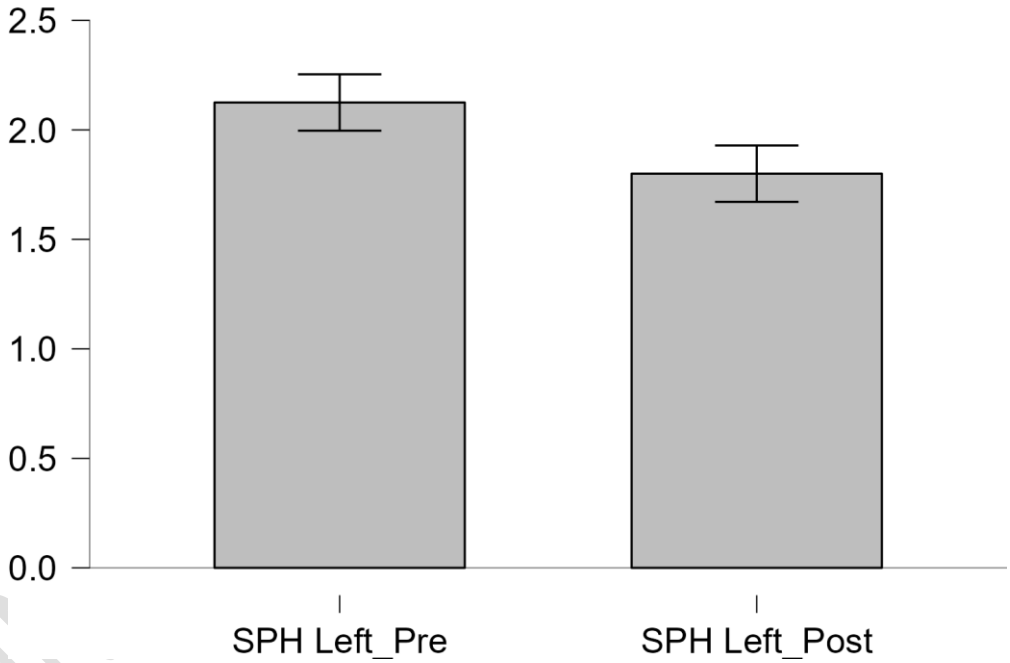


Figure 5: Changes in the SPH in the left eye of the icontrol group

Comparison of the changes between the interventional and control group

The changes between the interventional and control group was analysed using Mann-Whitney U test.

SPH right

Unlike within group analysis where both intervention and control groups has shown significant changes after intervention, when compared between the interventional and control group, there were no significant change observed in the SPH values of right eye. The results are tabulated in table 1. Figure 6 illustrates the changes associated with the SPH value of the intervention and control group.

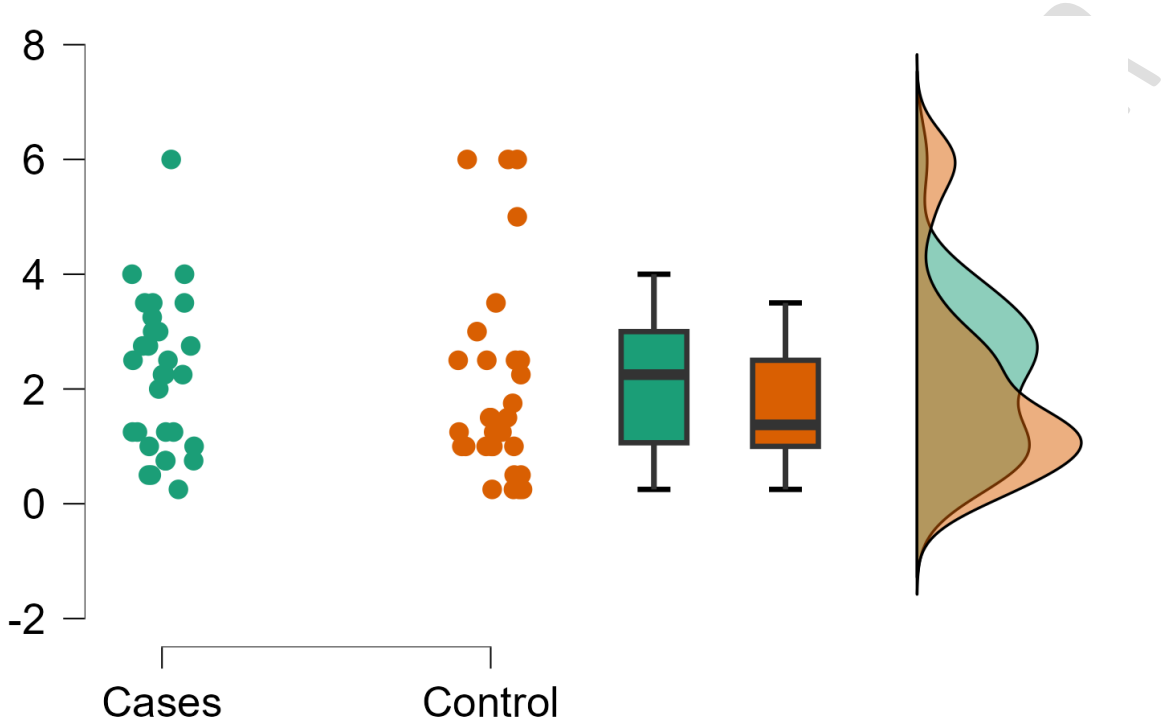
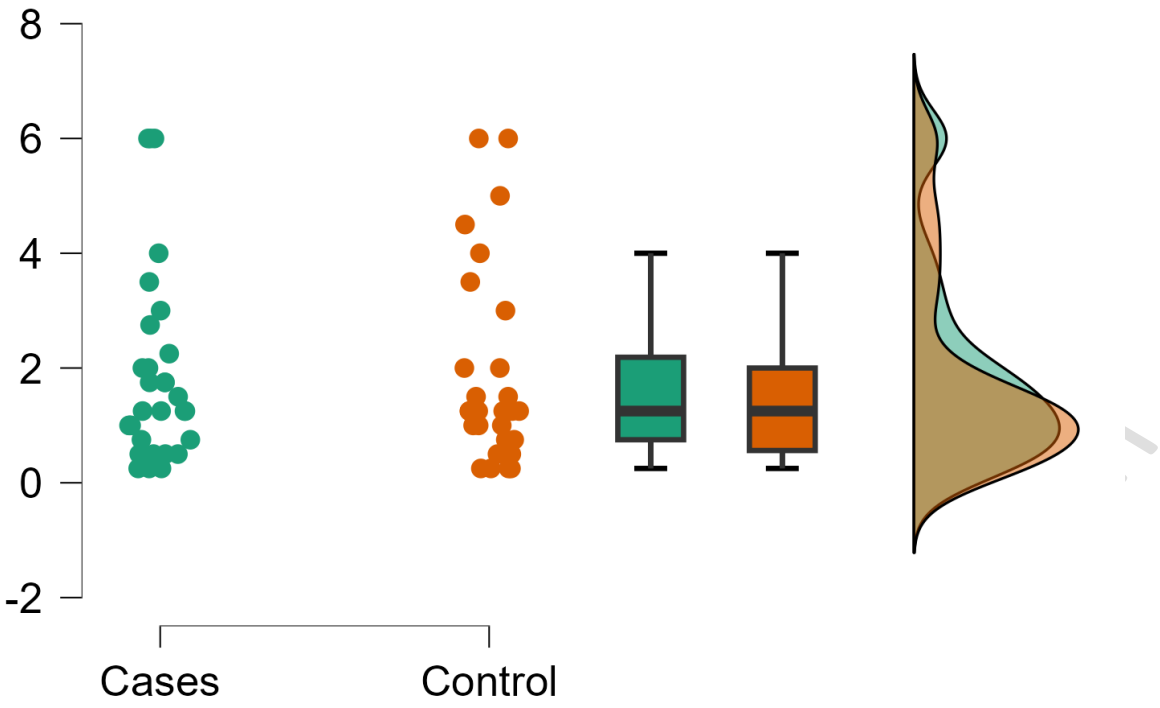


Figure 6: Comparison between the changes in the SPH values of the right eye between the interventional and control group.

SPH left

In contrast to the within-group analysis, where both the intervention and control groups demonstrated significant changes post-intervention, the between-group comparison revealed no significant differences in the SPH values of the left eye. The detailed results can be found in Table 1, and the changes in SPH values for both groups are illustrated in Figure 7.



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282 **Figure 7: Comparison between the changes in the SPH values of the left eye between the**

283 **interventional and control group.**

Variable	Interventional group		Control group		P value	95% CI for Rank-Biserial Correlation	Effect size
	Pre (Mean ± SD)	Post (Mean ± SD)	Pre (Mean ± SD)	Post (Mean ± SD)			
Sphere (SPH) Right	-2.36±1.28	-2.20± 1.33**	-2.22± 1.67	-1.99±1.72**	0.26	-0.12, 0.43	0.170
Sphere (SPH) Left	-2.00±1.63	-1.88± 1.68**	-2.12±1.67	-1.80±1.70**	0.66	-0.22, 0.34	0.067

284 **P<0.001

285 **Table 1: Summary of the statistical outcomes in the intervention and control group**

286 **Changes in the visual acuity (VA)**

The secondary outcome measure was to assess the impact of sun gazing integrated with acupuncture on the visual acuity of the study participants.

VA right eye

The interventional group has shown a significant increase in the visual acuity when compared before and after the intervention (P<0.01) in the right eye. Similarly, there was a significant increase in the visual acuity of the right eye in the control group as well (P<0.01). The detailed results can be found in Table 2. Figure 8 and 9 show the changes in the visual acquity of both the intervention and control group.

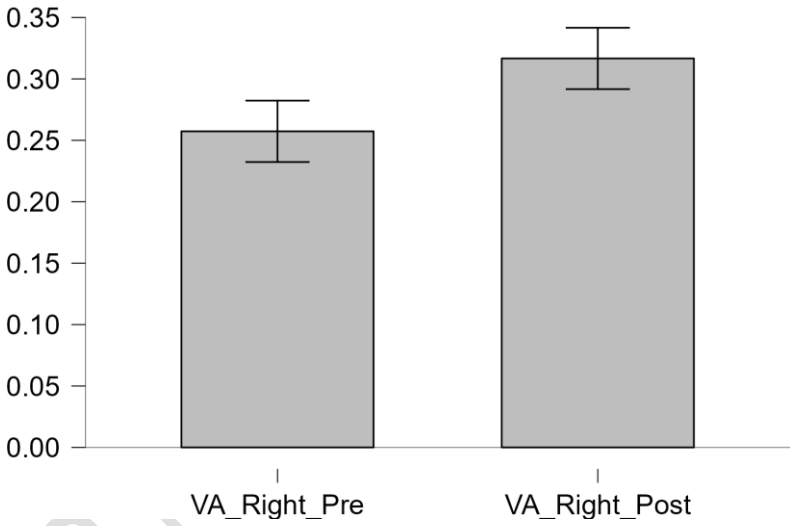

Figure 8: Changes in the VA in the right eye of the interventional group

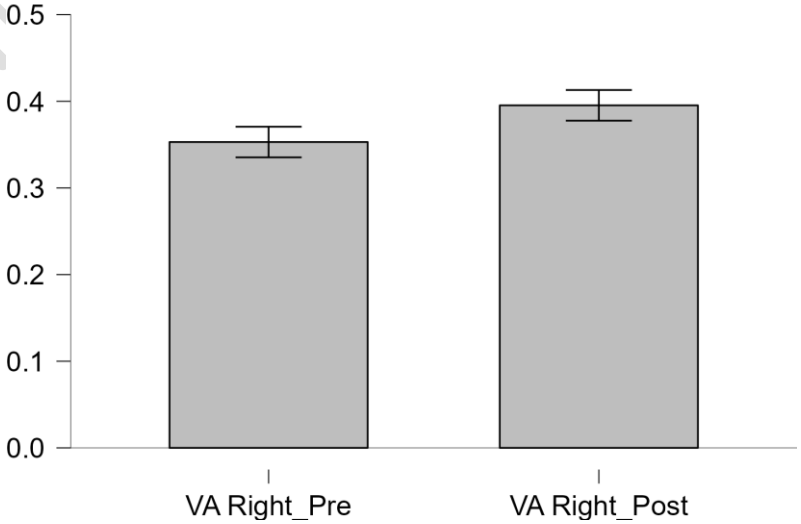

Figure 9: Changes in the VA in the right eye of the control group

VA left eye

The interventional group experienced a marked enhancement in visual acuity in the left eye after the intervention (P<0.01). Likewise, the control group showed a significant improvement in the visual acuity of the left eye (P<0.01). Table 2 provides a detailed account of these results, and Figures 10 and 11 depict the visual acuity changes in both the interventional and control groups.

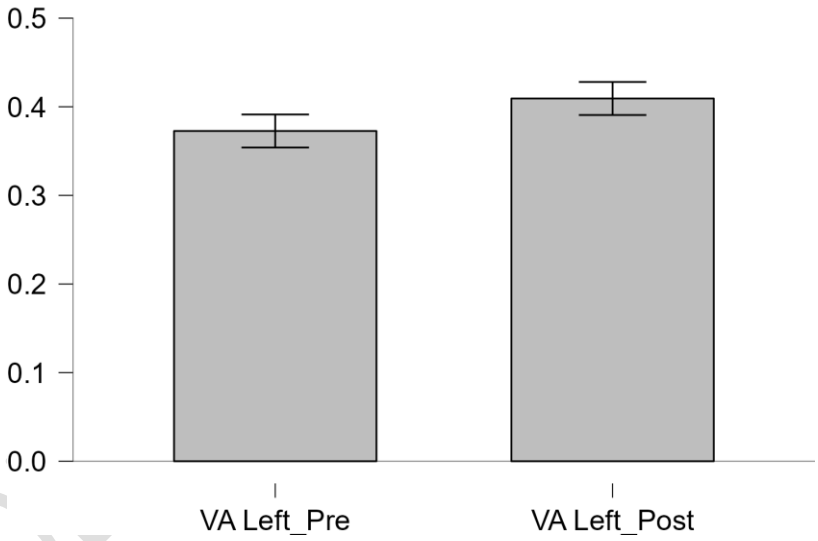

Figure 10: Changes in the VA in the left eye of the intervention group

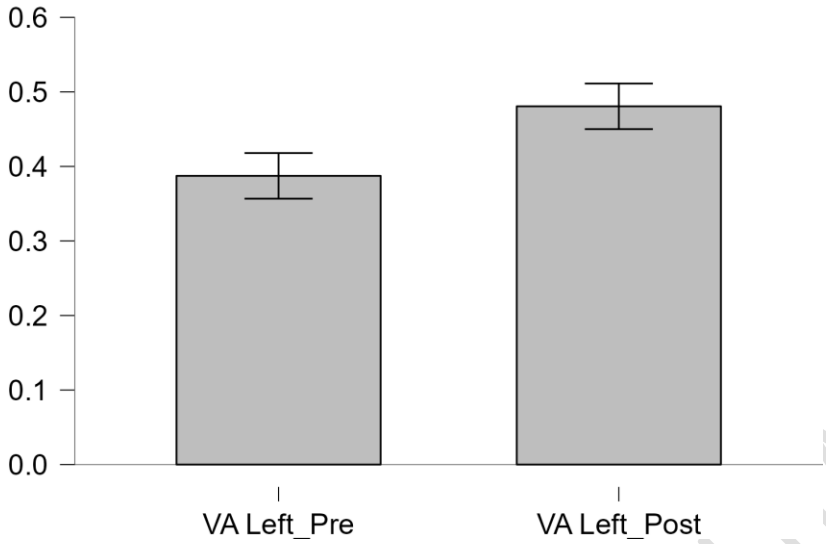

Figure 11: Changes in the VA in the left eye of the control group

Comparison of the changes between the interventional and control group

The changes between the interventional and control group was analysed using Mann-Whitney U test.

Variable	Interventional group		Control group		P value	95% CI for Rank-Biserial Correlation	Effect size
	Pre (Mean±SD)	Post (Mean ± SD)	Pre (Mean ±SD)	Post (Mean ± SD)			
VA Right	0.26±0.35	0.32±0.31*	0.35±0.03	0.40±0.10*	0.275	-0.430, 0.129	0.163
VA Left	0.37±0.67	0.41± 0.67*	0.39±0.53	0.48±0.53*	0.393	-0.400, 0.165	0.128

P<0.01

VA right eye

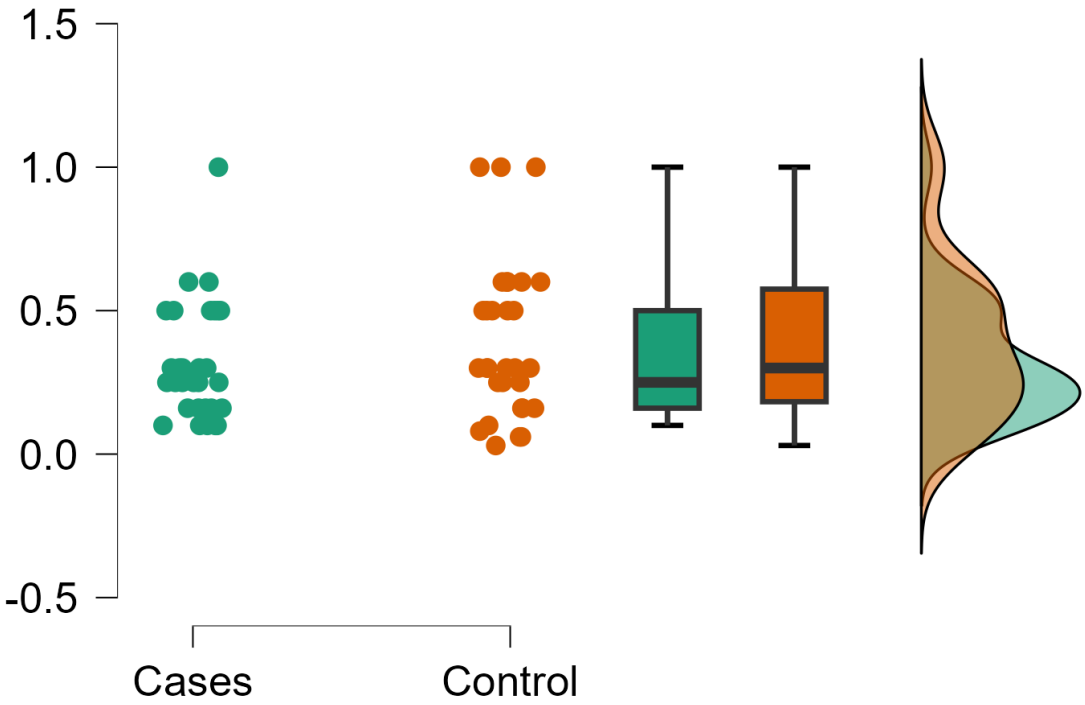

Figure 12: Comparison between the changes in the VA of the right eye between the interventional and control group.

Even though both the interventional and control group has shown significant increase in the visual acuity of the right eye, there were no significant difference between the control group and the interventional group (P= 0.275). Table 2 show the detailed results of the changes between interventional and control group. Figure 12 illustrates the summary of comparison between the interventional and control group.

VA left eye

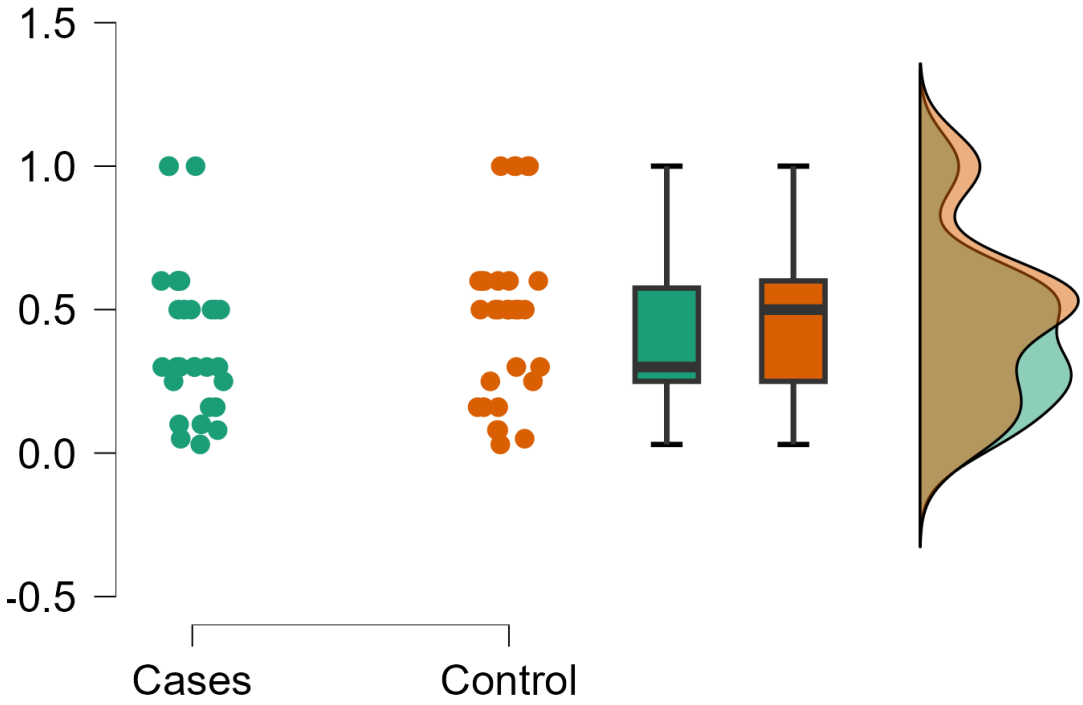

Figure 13: Comparison between the changes in the VA of the left eye between the interventional and control group.

Similar to the findings for the right eye, both the interventional and control groups exhibited significant improvements in visual acuity for the left eye. However, there was no significant difference between the groups (P=0.661). Table 2 provides detailed results of the changes observed between the interventional and control groups, while Figure 13 summarizes the comparison between these groups.

Discussion

The present study aimed to explore the combined effect of sun gazing and acupuncture on myopia in young adults. Our findings indicated significant improvements in visual acuity and sphere (SPH) values in both the interventional and control groups, demonstrating the potential benefits of these interventions. However, there were no significant differences between the interventional and control groups, suggesting that while both interventions are effective, their combined effect does not offer additional benefits over individual treatments.

Myopia, or nearsightedness, can have significant adverse effects on young adolescents beyond just impaired distant vision. In addition to the immediate impact on academic performance and daily activities, myopia is associated with several long-term health risks. Adolescents with myopia are at a higher risk for developing more severe visual impairments as they age, including an increased likelihood of high myopia, which can lead to complications such as retinal detachment, glaucoma, and cataracts.[45] The progression of myopia during the adolescent years can significantly affect quality of life, including difficulties in performing tasks that require clear distance vision, such as driving and participating in sports. Furthermore, the psychological impact of worsening vision can affect self-esteem and social interactions.[46] Addressing myopia early and effectively is crucial to mitigate these negative outcomes and improve overall quality of life for affected individuals.

Acupuncture is a traditional Chinese medicine technique that involves inserting thin needles into specific points on the body. It is proposed that acupuncture may influence ocular health and potentially slow the progression of myopia by improving circulation and balancing the energy (Qi) in the body. Some studies suggest that acupuncture could help alleviate symptoms associated with eye strain and fatigue, which are common in individuals with myopia.[47,48] However, evidence regarding the efficacy of acupuncture in significantly altering

visual acuity or sphere in myopia remains limited and requires further research to establish its clinical benefits.

Heliotherapy, or sunlight therapy, involves exposure to natural sunlight and is based on the principle that light has therapeutic effects. In the context of myopia, there is interest in how outdoor light exposure might influence the development and progression of the condition. Research indicates that increased exposure to natural light, particularly during childhood, may have a protective effect against myopia. This is thought to be related to the regulation of eye growth and the prevention of excessive elongation of the eyeball.[28] Heliotherapy's role in myopia management involves encouraging more time spent outdoors to potentially slow down the progression of the condition.

The significant reduction in SPH values and improvement in visual acuity in the interventional group are consistent with existing literature on acupuncture's efficacy in ocular health. Acupuncture has been shown to enhance ocular blood flow, regulate autonomic nervous function, and reduce intraocular pressure (IOP).[31,49]Studies have demonstrated that acupuncture can improve visual acuity and slow myopia progression by enhancing blood flow to the eyes and regulating autonomic nervous function.[14] Our findings support these mechanisms, as significant improvements were noted in the SPH values and visual acuity for both eyes post-intervention.

The integration of sun gazing with acupuncture did not show additional benefits in our study, which aligns with the limited scientific evidence supporting sun gazing for myopia control. Sun gazing, though rooted in various cultural and spiritual traditions, lacks robust scientific validation and is associated with potential risks such as retinal damage and photokeratitis from UV exposure. While proponents claim benefits such as improved vision and overall health, these claims remain largely anecdotal and require rigorous scientific scrutiny. The

results of our study emphasize the need for caution and further research to substantiate the therapeutic claims associated with sun gazing. However, considering the present study limitations like small sample size and variation in the severity of disease may have role to play in the outcomes of the present study.

Despite significant within-group improvements in SPH values and visual acuity, the between-group analysis revealed no significant differences between the interventional and control groups (P=0.275 for the right eye and P=0.661 for the left eye). This suggests that while both sun gazing and acupuncture are effective in improving myopic conditions, their combined use does not provide additional benefits over acupuncture alone. This finding is consistent with existing literature, which highlights the efficacy of acupuncture but remains inconclusive regarding the benefits of sun gazing for myopia control.

However, the study also has several limitations. The relatively small sample size of 30 participants in each group may restrict the generalizability of the results to larger populations. Additionally, if the study was conducted over a short duration, it might not fully capture the long-term effects of the intervention. The narrow age range and potential lack of diversity in other demographic factors may limit the applicability of the findings to a broader audience. Lastly, there could be potential confounding variables, such as diet, lifestyle, or adherence to the intervention, which might influence the outcomes and may not have been fully controlled in the study design.

Implications for Future Research

The findings of this study highlight several implications for future research. There is a need for larger-scale studies with extended follow-up periods to better understand the long-term effects of combined complementary therapies on myopia. Additionally, further investigation into the mechanisms through which acupuncture and sun gazing affect ocular health is

407 warranted. Rigorous scientific studies are necessary to validate the therapeutic claims of sun
408 gazing and to explore its potential risks and benefits comprehensively.

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