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Original Article

Impact of Yogic Ocular Exercises on Near Point of Convergence in Young Adults with Convergence Insufficiency: A Quasi-Experimental Study

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ABSTRACT:
This study was conducted to determine the effect of yogic ocular exercises on convergence insufficiency by measuring changes in near point of convergence (NPC) over six weeks. This quasi-experimental study was carried out at the University of Lahore Teaching Hospital from July to August 2025 after ethical approval (IRB UOL/IREB/25/0009). Forty-seven participants (31 females, 16 males) aged 18–26 years with clinically diagnosed convergence insufficiency were enrolled. NPC was assessed using a RAF ruler at baseline, three weeks, and six weeks. Participants performed daily yogic ocular exercises—including palming, blinking, sideways, rotational and diagonal viewing, nose-tip gazing, near–distant viewing, concentrated gazing, candle flame gazing, and acupressure stimulation—for 30 minutes over six weeks. Friedman and Wilcoxon signed-rank tests were used for statistical analysis. The mean age of participants was 22.55 years. Baseline NPC ranged from 11.0 to 15.5 cm with a mean of 11.55 cm. After three weeks of exercises, the NPC improved with a mean of 10.78 cm (range 7.5–15.0 cm), and after six weeks, the NPC further improved to a mean of 9.81 cm (range 7.5–13.5 cm). The reduction in NPC over time was statistically significant ($p < 0.001$). Regular practice of yogic ocular exercises significantly improved NPC and may help reduce visual discomfort associated with convergence insufficiency. These exercises could be considered an effective, low-cost, non-invasive adjunct to conventional management in young adults.

Keywords: Convergence insufficiency, near point of convergence, yogic ocular exercises, binocular vision, non-invasive therapy

INTRODUCTION

The eyes are specialized sensory organs that can be considered as living optical devices. They have complex functions and anatomy that enable them to receive visual images by constantly adjusting the amount of light entering the eye and adjusting the focus of the eye at near and far distances. These visual images are then instantly transmitted to the brain. For the visualization of these images, eyes collect light from the surrounding environment by moving in different directions and planes. These movements are carried out by the six extraocular muscles that control the movements of the eye in different directions. An abnormality in the medial rectus and lateral rectus muscles can cause convergence insufficiency (1). It is an important mechanism to achieve binocular single vision (2). Convergence can be affected by different factors such as reading and other near activities. It can also occur due to unstable conditions like bright light, constant working time, short working distance, excessive use of electronics, uncorrected refractive errors, accommodative and binocular anomalies, and mental status (3). The anomalies of convergence are convergence insufficiency, convergence paralysis, and convergence spasm. CI is a well-defined binocular vision disorder with a reported prevalence among all age groups in the United States of 2.25% to 8.30%. Convergence insufficiency can be idiopathic or can be the result of refractive errors, presbyopia, muscular imbalance, and consecutive convergence insufficiency (4).

Its symptoms include asthenopia, diplopia, nausea, headache, and blurry vision, generally associated with activities that require near vision. The normal value of near point of convergence is 7–10 cm. More than 10 cm is considered as convergence insufficiency (5). With the help of different treatments, we can relieve convergence insufficiency and its complications (6). There are multiple treatment options to treat convergence insufficiency such as optical treatment, orthoptic treatment, prismotherapy, and surgery (7).nOrthoptic treatments include many therapies such as pencil push-up exercises, which are used to improve convergence insufficiency (CI). They are also used to correct binocular visual disorders (strabismus). Other than the orthoptic exercises, another set of exercises called yogic ocular exercises are also expected to be a treatment option for the improvement of convergence insufficiency. The practice of yoga is also becoming popular in Western societies (8). Various online videos, yoga practitioners, and online websites recommend yogic ocular exercises and their multiple effects on eyes, such as reduction in ocular fatigue and improvement in the movement of eyes. These exercises are not only beneficial for the reduction of ocular fatigue and intraocular pressure (9) but also improve vergence facility, binocular accommodative facility, and fusional vergences (10). Despite the growing popularity of yogic ocular exercises, most available studies focus on general eye fatigue or intraocular pressure rather than convergence-specific outcomes. Furthermore, existing evidence is largely descriptive, with few controlled or quasi-experimental investigations evaluating their direct impact on near point of convergence. Consequently, the therapeutic potential of these exercises for patients with convergence insufficiency remains unclear

In yogic ocular exercises, extraocular muscles continuously contract and relax in different directions. This increases oxygen consumption of ocular muscles, which leads to increased intraorbital blood flow. Thus, it improves the muscular tone of extraocular muscles, resulting in improvement of convergence insufficiency. It commonly consists of a set of 10 exercises, which are front sideways viewing, sideways viewing, rotational viewing, diagonal viewing, preliminary nose-tip gazing, near and distant viewing, concentrated gazing, acupressure points on the palm, blinking, and palming (11).

A review-based study was carried out in 2021 by *Ayunda Puteri Rizanti* to ascertain the effects of yogic ocular exercises on reducing eye fatigue and boosting ocular health. Through a review of eight articles that were selected, they discovered that yogic ocular exercises can help glaucoma patients by lowering their intraocular pressure, reducing eye strain, calming the mind, preventing asthenopic symptoms, and improving binocular vision. The author concluded that yoga and trataka exercises have no negative side effects and can be utilized as an intervention to preserve eye health in the modern age (12).

Senthil Kumar carried out another scriptural and academic evaluation study in 2022. The study showed a beneficial effect on the regulation of autonomic functions, improvement of cognitive functions, reduction of eye-related discomfort, and enhancement of joy and mental peace (13). In 2022, another study was conducted by Tommaso Bianchi and Raffaella Bellen to find out whether eye yoga activities have immediate effects on morphoscopic visual acuity. The average improvement in visual acuity was 2.28%, indicating that yogic exercises were effective in improving vision (14). This study will aid eye care practitioners in exploring a novel technique in the treatment of convergence insufficiency. It will help eye care practitioners to discover non-pharmacological and therapeutic treatments to relieve convergence-insufficiency-related anomalies of binocular vision function.

METHODS

A quasi-experimental study was carried out at the University of Lahore Teaching Hospital, Lahore, Pakistan, from July to August 2025. Forty-seven participants aged 18–26 years diagnosed with convergence insufficiency (NPC > 10 cm and symptomatic exophoria at near) were enrolled. Exclusion criteria included hyperopia > +1.00 D, astigmatism, strabismic anomalies, systemic medications affecting vision, or prior orthoptic therapy. Ethical approval was obtained from the University of Lahore Ethics Committee (UOL/IREB/25/0009). Informed consent was secured from all participants.

Participants performed 10 yogic ocular exercises daily for 30 minutes over six weeks, including palming, blinking, sideways viewing, rotational viewing, diagonal viewing, front and sideways viewing, preliminary nose-tip gazing, near-distant viewing, concentrated gazing, and acupressure stimulation. Exercises were supervised weekly. NPC was measured using the RAF ruler at baseline, after three weeks, and after six weeks. Symptom frequency (headache, eye strain, diplopia, blurred vision) was recorded via a structured questionnaire.

Statistical analysis was conducted using SPSS v25. The Friedman test was used to assess within-group changes, and the Wilcoxon signed-rank test compared pre- and post-intervention outcomes. A p-value < 0.05 was considered statistically significant.

RESULTS

Forty-seven participants completed the study evaluating near point of convergence (NPC) improvements using the RAF ruler over 6 weeks. No participants were lost to follow-up, ensuring complete data for primary (NPC measurements) and secondary (symptom frequency) outcomes. The study population was predominantly female (31/47, 66.0%), with 16 males (34.0%). The mean age was 22.0 ± 2.5 years (range not specified in data), reflecting a young adult cohort suitable for convergence insufficiency assessment.

Primary Outcome: NPC Measurements
At baseline, mean NPC was 11.5 ± 1.5 cm, with a range of 8.0–15.5 cm, indicating initial convergence deficits consistent with study inclusion criteria. Following 3 weeks of intervention, mean NPC decreased to 10.8 ± 1.6 cm (range: 7.5–15.0 cm), representing an absolute reduction of 0.7 cm. By 6 weeks, further improvement occurred, with mean NPC at 9.8 ± 1.5 cm (range: 7.5–13.5 cm), a total reduction of 1.7 cm from baseline. These temporal changes are summarized in Table 1, and baseline normality is depicted in the Q-Q plot (Figure 1).
Statistical Significance of NPC Changes
Non-parametric analysis was applied due to data distribution. The Friedman test across all time points yielded a p-value of <0.001, indicating significant overall change. Pairwise Wilcoxon signed-rank tests revealed highly significant improvements: baseline versus 3 weeks (Z = -5.311, p = 0.001), baseline versus 6 weeks (Z = -5.877, p = 0.001), and 3 weeks versus 6 weeks (Z = -5.786, p = 0.001). Effect sizes were large (Z > 5 in absolute value), supporting robust intervention effects, as shown in Table 2 and Figure 2-3.
Secondary Outcome: Convergence Insufficiency Symptoms
Pre-intervention symptom frequencies were assessed across eight domains using a 5-point scale (none of the time to all of the time). Baseline means ranged from 0.94 ± 1.187 (redness) to 2.02 ± 1.132 (blurry vision or headache), with most participants reporting symptoms "some" to "most" of the time. Post-intervention (6 weeks), all domains showed reduced frequencies and means; for instance, headache improved from 2.02 ± 1.032 to 1.09 ± 0.905, with "none of the time" increasing from 2 to 14 participants. Eyestrain and redness exhibited the largest proportional shifts, with "none" rising to 25/47 and 33/47, respectively. Tired eyes, irritation, burning, and double vision also trended toward less frequent reporting, though blurry vision showed milder change (mean 2.02 to 1.28). Comprehensive frequencies and means are presented in Table 3.

Table 1. Near Point of Convergence (NPC) Measurements (n = 47)

Measurement	Mean ± SD (cm)	Range (cm)
Baseline	11.5 ± 1.5	8.0 – 15.5
3 weeks	10.8 ± 1.6	7.5 – 15.0
6 weeks	9.8 ± 1.5	7.5 – 13.5

Table 2. Pairwise Comparisons of NPC Measurements (Wilcoxon Signed-Rank Test)

Comparison	Test Statistic	*p*-value
Baseline vs. 3 weeks	Wilcoxon Z = -5.311	<0.001
Baseline vs. 6 weeks	Wilcoxon Z = -5.877	<0.001
3 weeks vs. 6 weeks	Wilcoxon Z = -5.786	<0.001

Table 3. Symptom Frequencies and Means Pre- and Post-Intervention (n=47)

Pre- Intervention							**Post Intervention**					
	None of time	**Some of time**	**Half of time**	**Most of time**	**All of time**	**Mean**	**None of time**	**Some of time**	**Half of time**	**Most of time**	**All of time**	**Mean**
Headache	2	16	10	17	2	2.02 ± 1.032	14	18	12	3	0	1.09± 0.905
Tired eyes	1	20	8	15	3	1.98±0.153	14	17	12	4	0	1.13± 0.947
Eyestrain	19	15	6	6	1	1.04±1.122	25	15	4	2	1	0.70±0.954
Irritation	5	21	9	12	0	1.60±0.993	15	20	11	1	0	0.96±0.806
Blurry	3	16	9	15	4	2.02±1.132	11	18	13	4	1	1.28±0.994
Burning	16	17	8	5	1	1.11±1.068	25	18	3	1	0	0.57±0.715
Redness	25	8	7	6	1	0.94±1.187	33	9	4	1	0	0.43±0.744
Double	9	13	10	12	3	1.72±1.228	15	16	12	3	1	1.13±1.013

DISCUSSION
The present study evaluated the effect of yogic ocular exercises on convergence insufficiency among young adults attending the University of Lahore Teaching Hospital. A total of 47 participants, including both male and female emmetropes aged 18–26 years with asthenopic symptoms and convergence insufficiency primarily due to muscular imbalance, were included. Participants with systemic disease, prior ocular treatment, or strabismus were excluded to minimize confounding factors. Near point of convergence (NPC) was assessed using a RAF ruler at baseline, three weeks, and six weeks following a structured yogic ocular exercise regimen.

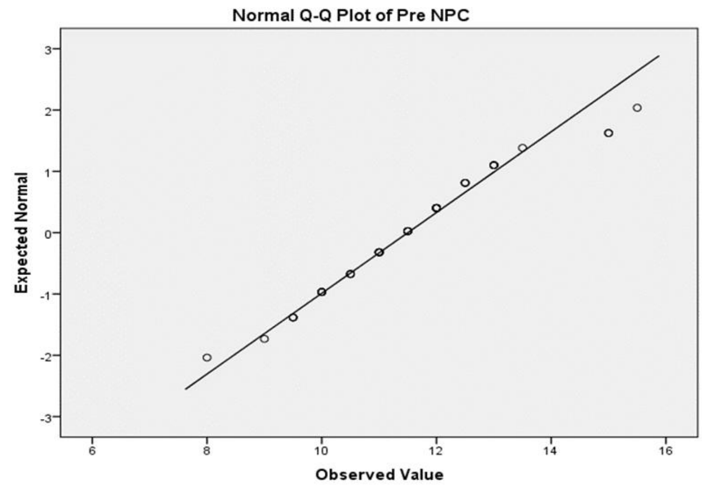

Figure 1: Q-Q Plot of Pre near point of convergence (NPC)

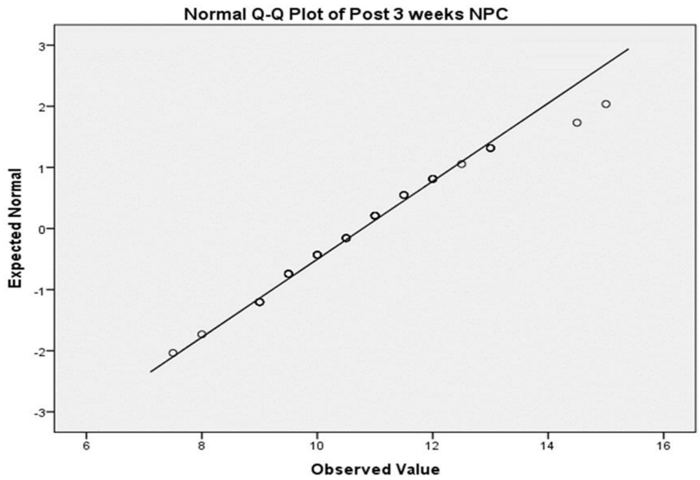

Figure 2. Q-Q plot of 3-week near point of convergence (NPC) measurements.

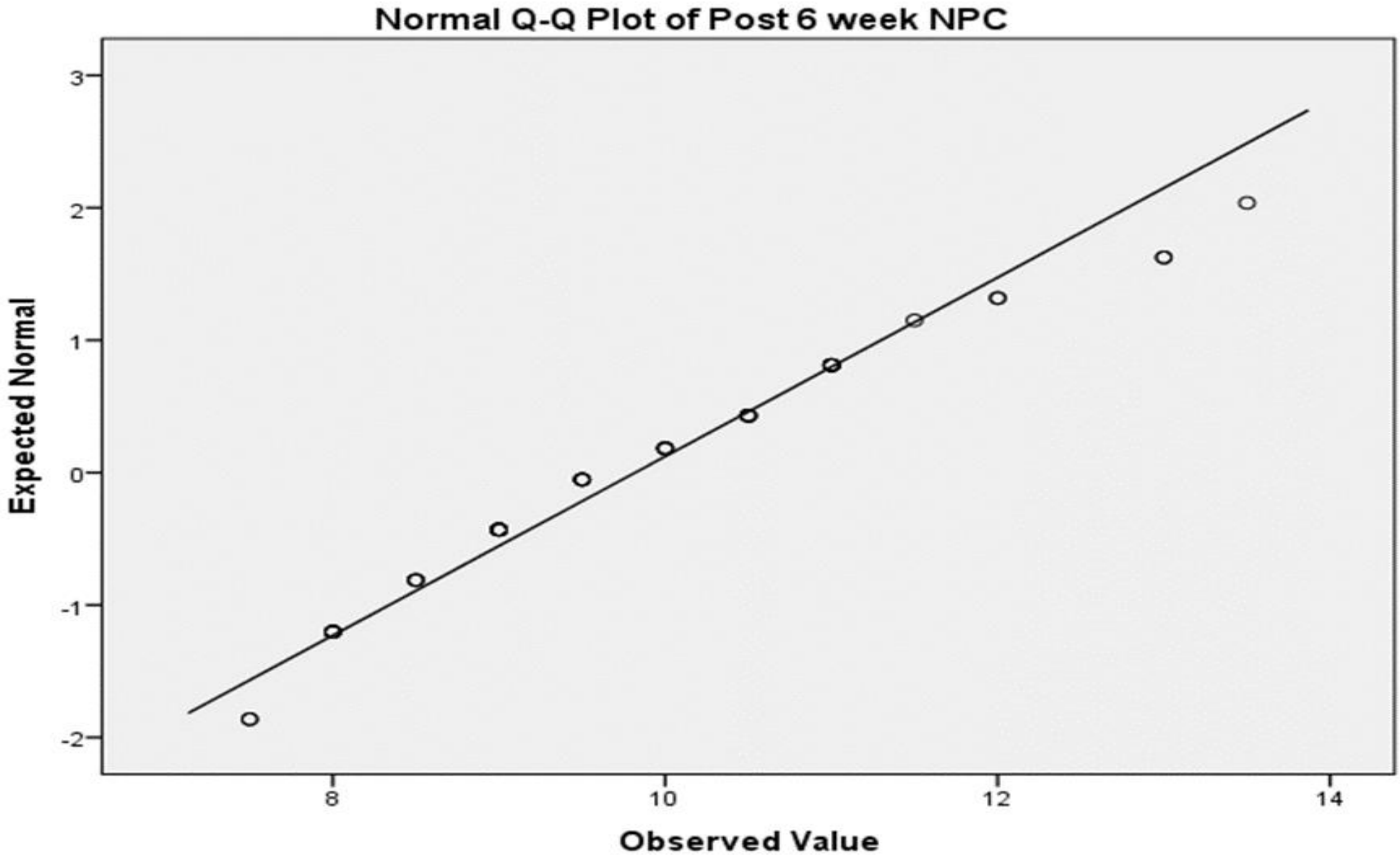

Figure 3. Q-Q plot of 6-week near point of convergence (NPC) measurements.

The findings of this study demonstrated a statistically significant improvement in NPC following six weeks of yogic ocular exercises. The mean NPC reduced from 11.55 cm at baseline to 9.81 cm at the final follow-up, indicating enhanced convergence ability. Statistical analysis using the Friedman and Wilcoxon signed-rank tests confirmed that these improvements were highly significant ($p < 0.001$). Additionally, a reduction in asthenopic symptoms was observed, suggesting that yogic ocular exercises not only improve convergence mechanics but also alleviate functional discomfort associated with convergence insufficiency. These results support the hypothesis that regular activation and relaxation of extraocular muscles through yogic practices may improve muscular tone and coordination, thereby correcting convergence deficits.

The findings of the present study are consistent with previously published literature. Sang-Dol Kim (2016) reported significant improvements in NPC, AC/A ratio, and fusional convergence among nursing students following six weeks of yoga-based eye exercises, highlighting the role of such exercises in reducing ocular fatigue and improving binocular vision parameters (15). Similarly, Kumar and Asif (2017) demonstrated significant improvements in visual performance measures among school-aged children after six weeks of yoga eye workouts, reinforcing the beneficial role of yogic practices across different age groups (16).

Pandey et al. (2017) further supported the effectiveness of eye exercises by reporting a significant reduction in Convergence Insufficiency Symptom Survey (CISS) scores in children with myopia who performed structured ocular exercises, compared with controls who relied solely on optical correction (17). Although their primary outcome differed, the observed reduction in symptoms aligns with the symptom improvement noted in the current study. Bianchi et al. (2020) also demonstrated short-term improvements in morphoscopic visual acuity following brief yoga eye exercise sessions, suggesting that even short-duration interventions may positively influence visual function (18).

Additional evidence from Gupta and Aparna (2020) showed a significant reduction in eye fatigue severity among students practicing yogic ocular exercises, while fatigue worsened in the control group (19). Muzahid (2020) similarly reported reduced ocular fatigue in school-going children following yogic ocular exercises combined with ergonomic advice during prolonged online learning periods (20). These findings collectively support the role of yogic ocular exercises in relieving visual discomfort and improving ocular efficiency.

Moreover, studies exploring the physiological effects of yogic ocular exercises provide plausible mechanisms for the observed improvements. Sankalp et al. (2017) reported reduced intraocular pressure in glaucoma patients following Trataka-based yogic practices, attributing the effect to improved ciliary muscle function and enhanced aqueous humor outflow (21). Gupta and Aparna (2019) further suggested that yogic ocular exercises increase metabolic activity and intraorbital blood circulation, contributing to improved ocular muscle performance and reduced intraocular pressure (22). These mechanisms may also explain the improved convergence observed in the present study through enhanced extraocular muscle perfusion and coordination.

Overall, the results of this study indicate that yogic ocular exercises are an effective, non-invasive, and low-cost intervention for improving convergence insufficiency and associated symptoms. Given their ease of implementation and minimal risk, these exercises may serve as a valuable adjunct to conventional orthoptic therapy, particularly in young adults.

CONCLUSION

The findings of this study indicate that yogic ocular exercises are effective in improving convergence insufficiency by enhancing the near point of convergence and reducing associated symptoms such as headache, eye strain, and visual discomfort. The observed improvement suggests better coordination and balance of the extraocular muscles involved in near vision tasks. Overall, yogic ocular exercises may serve as a simple, non-invasive, and cost-effective therapeutic approach for the management of convergence insufficiency.

Conflict of Interest

Authors declare no conflict of interest.

Ethical consideration

The study was approved by local research ethics committee.

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