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Original Article

EFFECT OF OCULAR YOGA ON INTRAOCULAR PRESSURE FOLLOWING PROLONGED SCREEN TIME: A PROSPECTIVE COMPARATIVE STUDY

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ABSTRACT

Background: Prolonged digital screen exposure has become increasingly common among young adults and is associated with visual fatigue, ocular discomfort, and transient changes in intraocular pressure (IOP). Ocular yoga exercises have been proposed as a simple, non-pharmacological approach to alleviate screen-related ocular stress and improve visual function.

Objective: To evaluate and compare the effects of different ocular yoga exercises on intraocular pressure following prolonged screen exposure among healthy young adults.

Methods: A prospective comparative study was conducted among 76 healthy participants aged 18–25 years. Participants were allocated into five groups, each performing a specific combination of ocular yoga exercises after 30 minutes of continuous screen exposure. Intraocular pressure was measured using a Perkins applanation tonometer at baseline, immediately after screen exposure, and following ocular yoga intervention. Statistical analysis was performed using non-parametric tests with significance set at $p < 0.05$.

Results: A significant increase in intraocular pressure was observed in all groups following screen exposure. Subsequent ocular yoga exercises resulted in significant reductions in IOP. The greatest reduction was observed in the Sideways Viewing and Distant-Near Viewing group (2.53 mmHg), followed by Blinking and Nose-Tip Gazing (2.30 mmHg). The smallest reduction was observed in the Diagonal Viewing and Acupressure group (1.20 mmHg).

Conclusion: Ocular yoga effectively reduced screen-induced elevations in intraocular pressure. Sideways Viewing combined with Distant-Near Viewing demonstrated the greatest benefit, suggesting that ocular yoga may serve as a practical strategy for managing digital eye strain and promoting ocular health

Keywords: Ocular yoga, intraocular pressure, screen time, digital eye strain.

Introduction:

The widespread use of digital devices has transformed communication, education, and professional activities across all age groups. Smartphones, computers, tablets, and other digital screens have become indispensable components of modern life, resulting in a substantial increase in daily screen exposure. Although technological advancements have enhanced productivity and accessibility, prolonged screen use has been associated with various ocular and visual complaints collectively referred to as digital eye strain or computer vision syndrome [1].

Digital eye strain encompasses a spectrum of symptoms including ocular fatigue, dryness, irritation, blurred vision, headaches, photophobia, and visual discomfort. These symptoms arise primarily due to prolonged accommodation, sustained convergence, reduced blink frequency, and increased ocular surface evaporation during continuous screen viewing [2].

The prevalence of digital eye strain has increased significantly among students and young adults owing to extensive educational and recreational screen use. Intraocular pressure (IOP) is a critical physiological parameter responsible for maintaining the structural integrity and optical properties of the eye. Normal IOP typically ranges between 10 and 21 mmHg and is determined by the balance between aqueous humor production and outflow [3]. Elevated IOP remains the most significant modifiable risk factor for glaucoma and is influenced by numerous physiological and environmental factors including body posture, blood pressure, physical activity, medications, ocular perfusion pressure, and visual tasks [4].

Recent evidence suggests that prolonged near work and digital screen viewing can induce transient increases in IOP. Sustained accommodation and convergence during screen use may alter ciliary muscle function and extraocular muscle tension, potentially affecting aqueous humor dynamics and ocular biomechanics [5]. Furthermore, prolonged screen exposure is associated with reduced blinking and ocular surface stress, which may indirectly contribute to fluctuations in IOP [6].

Yoga is an ancient Indian system of physical, mental, and spiritual practices that has gained global recognition for its therapeutic benefits. Various yoga-based interventions have demonstrated positive effects on cardiovascular health, respiratory function, stress reduction, metabolic disorders, and psychological well-being [7]. Ocular yoga comprises a series of eye exercises specifically designed to strengthen extraocular muscles, improve accommodation, enhance ocular circulation, and relieve visual fatigue [8]. Several studies have reported beneficial effects of ocular yoga on visual performance and ocular comfort. Dimitrova and Trenceva reported that short-term ocular yoga exercises could reduce intraocular pressure in healthy individuals [9]. Similarly, Gupta and Aparna demonstrated significant reductions in IOP following ocular yoga practice, suggesting a potential role in glaucoma prevention and ocular health maintenance [10]. Various ocular yoga techniques target different components of the visual system. Palming promotes relaxation of ocular muscles, blinking restores tear film stability, rotational viewing improves extraocular muscle coordination, near-distant viewing enhances accommodative flexibility, and Trataka strengthens concentration and visual fixation [11]. Despite these proposed benefits, limited research has investigated the effects of ocular yoga specifically following prolonged screen exposure. Given the increasing prevalence of screen-related ocular complaints and the potential role of ocular yoga as a non-pharmacological intervention, further investigation is warranted. Therefore, the present study aimed to evaluate and compare the short-term effects of different ocular yoga exercises on intraocular pressure following prolonged screen time among healthy young adults.

MATERIALS AND METHODS

Study Design and Study Setting: This prospective comparative study was conducted to evaluate the effectiveness of various ocular yoga exercises in reducing intraocular pressure (IOP) following prolonged screen exposure among healthy young adults. The study was carried out at the Department of Optometry, Ahalia School of Optometry and Research Centre, Ahalia Foundation Eye Hospital, Palakkad, Kerala, India. The research was designed to investigate the short-term effects of different ocular yoga techniques on screen-induced changes in IOP and to identify the most effective exercise combination for restoring IOP toward baseline levels.

Study Participants: A total of 76 healthy participants aged between 18 and 25 years were recruited for the study. Young adults were selected because this age group represents one of the highest users of digital devices for educational, professional, and recreational purposes. All participants underwent a preliminary ophthalmic evaluation before enrollment to ensure eligibility. The examination included assessment of visual acuity, refractive status, intraocular pressure, ocular health, and general medical history. Written informed consent was obtained from all participants prior to data collection.

Inclusion and Exclusion Criteria: Participants were included if they were between 18 and 25 years of age, had emmetropic vision, demonstrated normal ocular health, and had baseline intraocular pressure values within the normal physiological range (10–21 mmHg). Individuals were excluded if they had any history of glaucoma, ocular hypertension, refractive errors requiring correction, retinal disorders, corneal abnormalities, previous ocular surgery, systemic diseases affecting ocular physiology, current use of ocular medications, or any condition that could influence intraocular pressure measurements. Participants with elevated body temperature, active ocular infection, or inability to complete the study procedures were also excluded.

Sample Size and Sampling Procedure: The study included 76 participants, contributing a total of 152 eyes for analysis. Participants were recruited using a simple random sampling method from the student population and young adults attending the institution. Following enrollment, participants were allocated into five intervention groups. Each group was assigned a specific combination of ocular yoga exercises. The allocation ensured adequate representation of participants across all intervention categories and facilitated comparison of the effectiveness of different ocular yoga techniques.

Baseline Examination: Before the commencement of the experimental procedure, all participants underwent baseline intraocular pressure measurement using a Perkins applanation tonometer. Measurements were performed under standardized environmental conditions to minimize variability. Participants were instructed to avoid caffeine intake, strenuous physical activity, and prolonged screen use for several hours before the assessment. Baseline measurements were obtained while participants were seated comfortably in a relaxed position.

Screen Exposure Protocol: Following baseline assessment, participants were exposed to digital screens continuously for 30 minutes. The screen exposure protocol was designed to simulate typical digital device use encountered during academic or occupational activities. Participants were instructed to maintain visual attention on the screen throughout the session while performing routine reading and viewing tasks. Room illumination and viewing distance were standardized to minimize external influences on visual performance and ocular physiology. At the completion of the 30-minute screen exposure period, intraocular pressure was measured again within five minutes to determine the immediate effect of prolonged screen viewing on ocular pressure. This measurement served as the post-screen exposure value and was used to evaluate screen-induced changes in IOP.

Ocular Yoga Intervention: After completion of the post-screen measurement, participants performed assigned ocular yoga exercises under supervision. The intervention consisted of five different combinations of ocular yoga techniques.

Group:1 performed Palming and Rotational Viewing exercises. Palming involved covering the closed eyes with the palms to induce relaxation and reduce ocular strain, while rotational viewing consisted of controlled circular eye movements intended to improve extraocular muscle flexibility.

Group:2 performed Blinking exercises combined with Preliminary Nose-Tip Gazing. Blinking exercises were designed to restore tear film stability and reduce ocular surface stress, whereas nose-tip gazing promoted accommodative control and visual concentration.

Group:3 performed Sideways Viewing and Distant-Near Viewing exercises. Sideways viewing involved horizontal eye movements to strengthen extraocular muscle coordination, while distant-near viewing required repeated shifting of focus between distant and near targets to improve accommodative flexibility.

Group:4 performed Front and Sideways Viewing along with Trataka. Trataka is a yogic visual concentration technique involving steady fixation on a specific target, intended to improve concentration and visual endurance.

Group:5 performed Diagonal Viewing exercises combined with Acupressure Point stimulation around the ocular region. These exercises were intended to improve ocular circulation and relieve visual fatigue.

Each exercise was performed repeatedly according to a standardized protocol. The complete ocular yoga session lasted approximately 10 minutes for each participant.

Outcome Measure: The primary outcome measure was the change in intraocular pressure following ocular yoga intervention. Intraocular pressure was assessed at three distinct time points: baseline, after screen exposure, and immediately following completion of ocular yoga exercises. The magnitude of IOP reduction following ocular yoga was calculated by comparing post-screen exposure measurements with post-intervention measurements.

Intraocular Pressure Measurement: Intraocular pressure was measured using a Perkins applanation tonometer, which is considered a reliable and widely accepted instrument for clinical IOP assessment. Measurements were obtained by the same trained examiner throughout the study to minimize inter-observer variability. Standardized measurement procedures were followed for all participants. Multiple readings were obtained when necessary, and the average value was recorded for statistical analysis.

Statistical Analysis

All collected data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics Version 20. Descriptive statistics were used to summarize participant characteristics and intraocular pressure measurements. Continuous variables were expressed as mean ± standard deviation. Data normality was assessed using the Kolmogorov–Smirnov test. Since the distribution was non-normal, non-parametric statistical methods were employed.

The Wilcoxon signed-rank test was used to evaluate within-group changes in intraocular pressure between different time points, while the Mann–Whitney U test was applied for between-group comparisons. Statistical significance was set at a p-value of less than 0.05.

RESULTS

Demographic Characteristics

A total of 76 healthy young adults participated in the study, contributing 152 eyes for analysis. All participants completed the study protocol without any adverse events or protocol deviations. The study population consisted primarily of university students and young adults who routinely used digital devices for educational and recreational activities. Baseline intraocular pressure measurements were within normal physiological limits for all participants, confirming the absence of ocular hypertension or glaucoma-related abnormalities (Table-1).

Group	Baseline IOP (mmHg)	Post-Screen IOP (mmHg)	Post-Yoga IOP (mmHg)
Palming + Rotational Viewing	12.40 ± 2.01	14.63 ± 2.42	12.37 ± 2.18
Blinking + Nose-Tip Gazing	12.13 ± 1.84	14.30 ± 2.11	12.00 ± 1.95
Sideways + Distant-Near Viewing	12.87 ± 2.14	15.13 ± 2.36	12.60 ± 2.01
Front-Sideways + Trataka	12.87 ± 2.08	14.77 ± 2.25	12.73 ± 2.10
Diagonal + Acupressure	13.17 ± 2.22	14.70 ± 2.29	13.17 ± 2.17

Table 1. Mean Intraocular Pressure Before Screen Exposure, After Screen Exposure, and After Ocular Yoga

Effect of Screen Exposure on Intraocular Pressure:

Across all intervention groups, a consistent increase in intraocular pressure was observed following 30 minutes of continuous screen exposure. Mean IOP values increased by approximately 1.5–2.5 mmHg compared to baseline measurements. This finding suggests that prolonged screen viewing induces transient elevations in intraocular pressure, likely due to sustained accommodation, convergence effort, reduced blink frequency, and increased ocular muscle activity during near visual tasks.

The highest post-screen exposure IOP was observed in the Sideways Viewing and Distant-Near Viewing group, where mean pressure increased from 12.87 ± 2.14 mmHg to 15.13 ± 2.36 mmHg. Similar increases were observed in all other groups, indicating that prolonged screen use exerted a measurable physiological effect on ocular pressure.

Effect of Ocular Yoga on Intraocular Pressure Following Screen Exposure:

Following the completion of the ocular yoga intervention, a significant reduction in intraocular pressure was observed in all study groups. The post-yoga IOP values approached baseline measurements, indicating the effectiveness of ocular yoga in reversing screen-induced ocular stress. The magnitude of IOP reduction varied among the intervention groups, suggesting differences in the effectiveness of specific ocular yoga techniques. Participants who performed Sideways Viewing combined with Distant-Near Viewing demonstrated the greatest reduction in intraocular pressure. Mean IOP decreased from 15.13 ± 2.36 mmHg immediately after screen exposure to 12.60 ± 2.01 mmHg following ocular yoga, representing a mean reduction of 2.53 mmHg. In contrast, participants performing Diagonal Viewing combined with Acupressure Point stimulation exhibited the smallest reduction in IOP, with a mean decrease of 1.20 mmHg. These findings indicate that ocular yoga exercises involving accommodative flexibility and extraocular muscle coordination may be more effective in reducing transient elevations in intraocular pressure induced by prolonged screen viewing (Table-2).

Group	Reduction in IOP (mmHg)
Palming + Rotational Viewing	2.26 ± 1.18
Blinking + Nose-Tip Gazing	2.30 ± 1.21
Sideways Viewing + Distant-Near Viewing	2.53 ± 1.27
Front-Sideways Viewing + Trataka	2.03 ± 1.15
Diagonal Viewing + Acupressure Points	1.20 ± 1.32

Table 2. Mean Reduction in Intraocular Pressure Following Ocular Yoga

Comparison Between Ocular Yoga Techniques:

Comparison of the five intervention groups revealed differences in the magnitude of intraocular pressure reduction. Sideways Viewing and Distant-Near Viewing produced the most favorable outcome, followed by Blinking with Nose-Tip Gazing and Palming with Rotational Viewing. These techniques involve repetitive changes in visual fixation, accommodative relaxation, and coordinated extraocular muscle movements, which may facilitate restoration of normal ocular physiology following prolonged near work.

Front-Sideways Viewing combined with Trataka also demonstrated a significant reduction in IOP, although the magnitude of change was slightly lower than that observed in the leading groups. While Trataka is traditionally believed to improve concentration and visual endurance, its direct effect on IOP regulation appears less pronounced compared to exercises involving accommodative shifts. The lowest reduction was observed in the Diagonal Viewing and Acupressure group.

Although participants in this group experienced improvement following intervention, the change was smaller compared to other ocular yoga techniques. This finding suggests that diagonal eye movements and acupressure alone may have a limited influence on screen-induced IOP fluctuations.

Rank	Ocular Yoga Technique	Mean IOP Reduction (mmHg)
1	Sideways Viewing + Distant-Near Viewing	2.53
2	Blinking + Nose-Tip Gazing	2.30
3	Palming + Rotational Viewing	2.26
4	Front-Sideways Viewing + Trataka	2.03
5	Diagonal Viewing + Acupressure Points	1.20

Table 3. Ranking of Ocular Yoga Techniques Based on IOP Reduction

DISCUSSION

The present study evaluated the short-term effects of various ocular yoga exercises on intraocular pressure (IOP) following prolonged screen exposure among healthy young adults. The findings demonstrated that continuous screen viewing for 30 minutes resulted in a measurable increase in intraocular pressure across all study groups. Furthermore, the performance of ocular yoga exercises significantly reduced IOP values, bringing them closer to baseline levels. These results suggest that ocular yoga may serve as an effective, non-pharmacological intervention for managing screen-induced ocular stress and transient elevations in intraocular pressure.

In recent years, the rapid growth in digital device usage has substantially increased the prevalence of screen-related ocular complaints among students and young adults. Extended periods of screen viewing require continuous accommodative effort and convergence, which place additional demands on the visual system. Several studies have reported that prolonged near work and digital screen exposure can lead to temporary increases in intraocular pressure, visual fatigue, ocular discomfort, and symptoms associated with digital eye strain [12,13]. The findings of the present study support these observations, as all participants demonstrated elevated IOP values following the screen exposure period. This increase may be attributed to sustained contraction of the ciliary muscles, prolonged convergence activity, reduced blink frequency, and alterations in aqueous humor dynamics during near visual tasks [12].

The physiological relationship between screen use and intraocular pressure remains an area of active investigation. Previous researchers have suggested that sustained accommodation may increase resistance to aqueous outflow by altering ciliary body tension and trabecular meshwork function [13]. Additionally, prolonged fixation on digital screens may induce extraocular muscle fatigue and autonomic nervous system changes that contribute to transient fluctuations in IOP. Although these elevations are generally temporary in healthy individuals, repeated exposure over prolonged periods may have implications for individuals with ocular hypertension, glaucoma, or other ocular conditions sensitive to pressure changes.

A major finding of the present study was the significant reduction in intraocular pressure following ocular yoga exercises. All intervention groups demonstrated improvements, indicating that ocular yoga may effectively reverse screen-induced physiological stress within the visual system. These findings are consistent with previous studies that have reported beneficial effects of ocular yoga on ocular comfort, visual function, and intraocular pressure regulation [14,15]. Ocular yoga is believed to promote relaxation of the extraocular muscles, improve accommodative flexibility, enhance ocular circulation, and reduce mental stress, all of which may contribute to the observed reduction in IOP.

Among the five intervention groups, Sideways Viewing combined with Distant-Near Viewing produced the greatest reduction in intraocular pressure. Participants in this group exhibited a mean reduction of 2.53 mmHg following the intervention. The effectiveness of this exercise combination may be explained by its direct influence on accommodative and vergence mechanisms. Distant-near viewing requires repeated shifts of focus between distant and near objects, thereby reducing accommodative spasm and improving flexibility of the ciliary muscle. Simultaneously, sideways viewing exercises promote coordinated movement of the extraocular muscles and may enhance blood circulation around the orbit. Together, these effects may facilitate normalization of ocular physiology following prolonged screen exposure [16]. Blinking combined with Preliminary Nose-Tip Gazing also demonstrated a substantial reduction in intraocular pressure. Blinking plays a critical role in maintaining tear film integrity and ocular surface health. Previous studies have shown that blink frequency decreases significantly during digital device use, leading to tear film instability, ocular dryness, and visual discomfort [17,18]. By encouraging conscious blinking, participants may have restored tear film stability and reduced ocular surface stress. Nose-tip gazing, a traditional yogic visual concentration exercise, may further contribute to accommodative relaxation and improved visual focus. The combined effect of these mechanisms likely explains the favorable outcomes observed in this group. Palming combined with Rotational Viewing was similarly effective in reducing intraocular pressure. Palming is widely used in ocular yoga as a relaxation technique and is believed to reduce ocular fatigue by temporarily eliminating visual stimulation and promoting muscular relaxation.

Rotational viewing exercises improve ocular motility and may reduce extraocular muscle tension associated with prolonged fixation. The significant reduction in IOP observed in this group suggests that relaxation-based ocular yoga techniques can effectively alleviate screen-induced visual stress [14]. Front-Sideways Viewing combined with Trataka also produced meaningful reductions in intraocular pressure. Trataka is a yogic concentration technique involving sustained visual fixation on a target. Traditionally, it is believed to enhance concentration, visual endurance, and mental focus. Although the reduction in IOP observed in this group was slightly lower than that of the leading intervention groups, the results indicate that Trataka may still provide beneficial effects on ocular physiology when combined with dynamic eye movement exercises. Previous investigations have reported improvements in visual attention and ocular comfort following Trataka practice, supporting its potential role in eye health promotion [15].

The smallest reduction in intraocular pressure was observed in the Diagonal Viewing and Acupressure Point group. Although a reduction in IOP was achieved, the magnitude of change was lower than that observed in other intervention groups. This finding suggests that diagonal eye movements and periocular acupressure may have a more limited influence on accommodative stress and aqueous humor dynamics compared to exercises involving repeated changes in fixation distance. Nevertheless, the observed improvement indicates that these techniques may still contribute to overall ocular relaxation and visual comfort. The present findings have important clinical and public health implications. Digital device use has become unavoidable in modern educational and occupational environments, particularly among young adults. Consequently, symptoms of digital eye strain and visual fatigue have become increasingly prevalent. Ocular yoga offers a simple, inexpensive, and easily accessible intervention that can be performed without specialized equipment or medical supervision. Incorporating short ocular yoga sessions into daily routines may help reduce visual fatigue, improve ocular comfort, and minimize transient increases in intraocular pressure associated with prolonged screen use [19].

Another important implication of the study relates to preventive eye care. Although the participants in this investigation were healthy individuals with normal intraocular pressure, the demonstrated reduction in IOP following ocular yoga suggests potential benefits for individuals at risk of ocular hypertension or glaucoma.

Since elevated intraocular pressure remains the most significant modifiable risk factor for glaucoma progression, non-pharmacological interventions capable of reducing IOP may complement conventional treatment strategies. However, additional research involving glaucoma patients and long-term follow-up is necessary before clinical recommendations can be made.

The strengths of the present study include its prospective design, standardized measurement protocol, and comparison of multiple ocular yoga techniques within the same experimental framework. The use of Perkins applanation tonometry provided reliable intraocular pressure measurements, and the inclusion of several intervention groups enabled identification of the most effective exercise combination. Furthermore, the study addressed an emerging public health concern by investigating practical interventions for screen-induced ocular stress among young adults. Despite these strengths, certain limitations should be acknowledged. The study included a relatively small sample of healthy young adults, limiting the generalizability of findings to other age groups and clinical populations. The investigation evaluated only the immediate effects of ocular yoga and did not assess long-term outcomes. Additionally, factors such as tear film stability, accommodative function, ocular perfusion pressure, and subjective symptoms of digital eye strain were not evaluated. Future studies incorporating these parameters may provide a more comprehensive understanding of the mechanisms underlying the observed effects. Overall, the findings of this study indicate that ocular yoga is effective in reducing screen-induced elevations in intraocular pressure. Among the techniques evaluated, Sideways Viewing combined with Distant-Near Viewing demonstrated the greatest effectiveness, suggesting that exercises targeting accommodative flexibility and extraocular muscle coordination may provide superior benefits. Given the increasing prevalence of digital device use worldwide, ocular yoga may represent a valuable adjunctive strategy for promoting ocular health, reducing visual fatigue, and mitigating the physiological effects of prolonged screen exposure [14,19].

Limitations: The study included a relatively small sample size and evaluated only short-term effects of ocular yoga. Participants were limited to healthy young adults, which may restrict the generalizability of findings to older populations or individuals with ocular disease. Long-term follow-up was not performed.

Recommendations: Future studies should evaluate the long-term effects of ocular yoga on intraocular pressure and visual function using larger and more diverse populations. Randomized controlled trials involving patients with ocular hypertension, glaucoma, and digital eye strain are recommended

Conclusion: Prolonged screen exposure resulted in a significant increase in intraocular pressure among healthy young adults. Ocular yoga exercises effectively reduced these screen-induced elevations and restored intraocular pressure toward baseline levels. Among the techniques evaluated, Sideways Viewing combined with Distant-Near Viewing demonstrated the greatest effectiveness. Ocular yoga may serve as a practical, non-pharmacological approach for managing screen-related ocular stress and promoting visual well-being

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