

Effect of cranial base release technique on blink rate among university students with digital eye strain - an experimental study

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Abstract—Background: Digital Eye Strain (DES) is increasingly prevalent among university students due to prolonged exposure to digital screens. Reduced blink rate during screen use contributes significantly to ocular discomfort, tear film instability, and visual fatigue. Cranial Base Release (CBR) is a manual therapy technique that may influence neuromuscular and autonomic mechanisms associated with ocular function. **Objective:** To determine the effect of Cranial Base Release technique on blink rate and Computer Vision Syndrome Questionnaire (CVS-Q) scores among university students with Digital Eye Strain. **Methods:** A single-group pre-post experimental study was conducted among 25 university students aged 18–36 years with screen exposure greater than four hours daily and symptoms of Digital Eye Strain. Participants received Cranial Base Release therapy four sessions per week for four weeks (16 sessions). Blink rate was assessed through video recording and symptom severity was measured using the CVS-Q. Data were analyzed using paired t-test with significance level set at $p < 0.05$. **Results:** Mean blink rate increased significantly from 7.43 ± 0.85 blinks/min to 8.70 ± 1.03 blinks/min following intervention ($t = -6.00$, $p < 0.001$). CVS-Q score showed significant reduction from 8.96 ± 2.26 to 5.56 ± 1.78 ($t = 8.50$, $p < 0.001$). Large effect sizes were observed for both blink rate (Cohen's $d = 1.20$) and CVS-Q score (Cohen's $d = 1.70$). **Conclusion:** Cranial Base Release technique significantly improved blink rate and reduced Digital Eye Strain symptoms among university students. The technique may serve as a safe, non-invasive adjunct intervention for managing DES in populations with prolonged digital device exposure.

Index Terms—Cranial Base Release, Digital Eye Strain, Computer Vision Syndrome, Blink Rate, Manual Therapy.

I. INTRODUCTION

The rapid integration of digital technology into education has substantially increased screen exposure among university students. Prolonged use of computers, tablets, and smartphones has led to a growing prevalence of Digital Eye Strain (DES), also known as Computer Vision Syndrome. Common manifestations include eye fatigue, dryness, blurred vision, headaches, and reduced visual comfort.

One of the major physiological contributors to DES is a reduction in spontaneous blink rate during screen viewing. Under normal conditions individuals blink approximately 15–20 times per minute; however, prolonged digital engagement significantly suppresses blink frequency, resulting in tear-film instability and ocular discomfort.

Conventional management strategies such as artificial tears, ergonomic modifications, and periodic visual breaks often provide temporary symptom relief and depend heavily on patient compliance. Therefore, there is growing interest in non-pharmacological interventions addressing the underlying physiological mechanisms responsible for DES.

Cranial Base Release (CBR) is a gentle manual therapy directed toward the suboccipital and cranial base regions. It is proposed to influence autonomic regulation, cranial nerve function, and musculoskeletal relaxation, which may positively affect blinking behavior and ocular comfort. Despite its potential, evidence regarding its use in Digital Eye Strain remains limited.

Therefore, the present study was undertaken to evaluate the effectiveness of Cranial Base Release technique on blink rate and Digital Eye Strain symptoms among university students.

II. MATERIALS AND METHODS

Study Design

Experimental single-group pre-post study.

Study Population

University students with Digital Eye Strain.

Sample Size

Twenty-five participants meeting eligibility criteria were included.

Inclusion Criteria

- Age 18–36 years
- Screen exposure >4 hours/day
- Blink rate less than 15 blinks/minute
- Moderate myopia not exceeding –6.0 D

Exclusion Criteria

- Recent ocular surgery
- Severe ocular pathology
- Active ophthalmic medication
- Skin allergy over suboccipital region
- Traumatic eye injury or blindness

Outcome Measures

Blink Rate Test

Computer Vision Syndrome Questionnaire (CVS-Q)

Procedure

Eligible participants underwent baseline assessment including demographic data, blink rate recording, and CVS-Q evaluation. Participants then received Cranial Base Release therapy for four weeks, four sessions per week, totaling sixteen sessions. Post-intervention assessments were performed using the same outcome measures under standardized conditions.

Statistical Analysis

Data were analyzed using SPSS Version 22. Descriptive statistics were calculated as mean and standard deviation. Normality was assessed using the Shapiro-Wilk test. Pre- and post-intervention comparisons were performed using paired t-test, with significance set at $p < 0.05$.

III. RESULTS

A total of 25 participants completed the study. The mean age of participants was 22.40 ± 2.68 years.

Blink Rate

The mean blink rate increased from 7.43 ± 0.85 blinks/min at baseline to 8.70 ± 1.03 blinks/min following four weeks of Cranial Base Release therapy. The mean change was 1.26 ± 1.05 blinks/min, which was statistically significant ($t = -6.00$, $p < 0.001$). A large effect size was observed (Cohen's $d = 1.20$).

Computer Vision Syndrome Questionnaire (CVS-Q)

The mean CVS-Q score decreased significantly from 8.96 ± 2.26 to 5.56 ± 1.78 following intervention. The mean reduction was 3.40 ± 2.00 points ($t = 8.50$, $p < 0.001$), demonstrating a large treatment effect (Cohen's $d = 1.70$).

Clinical Interpretation

The findings indicate that Cranial Base Release produced measurable improvements in both physiological and symptom-based outcomes. Increased blink rate suggests improved ocular lubrication dynamics, while reduced CVS-Q scores indicate decreased symptom burden associated with prolonged screen exposure.

IV. DISCUSSION

The present study evaluated the effectiveness of Cranial Base Release on blink rate and Digital Eye Strain symptoms among university students. Following four weeks of intervention, significant improvements were observed in both blink rate and CVS-Q scores.

Reduced blink frequency is a well-established mechanism contributing to Digital Eye Strain. Sustained attention to digital screens suppresses blinking, leading to accelerated tear film evaporation and ocular discomfort. The improvement in blink rate observed in this study suggests that Cranial Base Release may positively influence neuromuscular mechanisms involved in blink regulation.

A significant reduction in CVS-Q score further demonstrates the therapeutic potential of Cranial Base Release. Earlier interventions for DES largely relied on behavioral modifications and ergonomic adjustments, whereas the current results indicate that a manual therapy approach may provide meaningful symptom reduction without requiring extensive lifestyle changes.

The physiological mechanism may involve relaxation of suboccipital musculature, modulation of autonomic nervous system activity, and improved cranial nerve function. Although additional research is necessary to clarify these effects, the large effect sizes observed support the clinical relevance of the findings.

The study was limited by the absence of a control group, relatively small sample size, and short follow-up duration. Future randomized controlled trials with larger samples are recommended.

V. CONCLUSION

Cranial Base Release technique significantly improved blink rate and reduced Computer Vision Syndrome Questionnaire scores among university students with Digital Eye Strain. The findings support rejection of the null hypothesis and suggest that Cranial Base Release may be an effective, safe, and non-invasive intervention for managing Digital Eye Strain in individuals with prolonged screen exposure.

VI. CONFLICT OF INTEREST

The author declares that there is no conflict of interest related to this study.

VII. FUNDING

No external funding was received for this study.

VIII. REFERENCES

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