INTERNATIONAL MULTI DISCIPLINARY JOURNAL FOR RESEARCH & DEVELOPMENT
eISSN 2394-6334 Impact factor: 8.854 Volume 13, issue 04 (2026)

ASSESSMENT OF VISUAL FUNCTIONAL STATE IN DENTAL PRACTITIONERS UNDER OCCUPATIONAL CONDITIONS

Nargiz Samigova

PhD, Associate professor

Tashkent State Medical University

Tashkent, Uzbekistan

nargiz.samigova@gmail.com

https://orcid.org/0000-0003-0123-0599

ABSTRACT: Dental professionals are exposed to multiple occupational factors, among which visual strain plays a dominant role. This study evaluates the functional condition of the visual analyzer in dentists under real working conditions, considering lighting parameters and workload intensity. The findings indicate a progressive decline in visual performance indicators throughout the workday, reflecting the development of occupational fatigue. The results emphasize the importance of optimizing workplace lighting and microclimatic conditions.

Keywords: occupational health, dentistry, visual analyzer, visual fatigue, critical flicker fusion frequency, information processing capacity.

ОЦЕНКА ФУНКЦИОНАЛЬНОГО СОСТОЯНИЯ ЗРИТЕЛЬНОГО АНАЛИЗАТОРА В УСЛОВИЯХ ПРОФЕССИОНАЛЬНОЙ ДЕЯТЕЛЬНОСТИ СТОМАТОЛОГОВ

Самигова Н.Р.
К.м.н., доцент
Ташкентский государственный медицинский университет
Ташкент, Республика Узбекистан
nargiz.samigova@gmail.com
https://orcid.org/0000-0003-0123-0599

АННОТАЦИЯ: Стоматологи подвергаются воздействию множества профессиональных факторов, среди которых доминирующую роль играет зрительное напряжение. В данном исследовании оценивается функциональное состояние зрительного анализатора у стоматологов в реальных условиях работы с учетом параметров освещения и интенсивности рабочей нагрузки. Результаты указывают на прогрессирующее снижение показателей зрительной работоспособности в течение рабочего дня, отражающее развитие профессиональной усталости. Результаты подчеркивают важность оптимизации освещения рабочего места и микроклиматических условий.

Ключевые слова: гигиена труда, стоматология, визуальный анализатор, зрительная усталость, критическая частота слияния мерцания, способность к обработке информации.

Introduction

Dentistry remains one of the most widespread medical specialties, characterized by high demands on precision, concentration, and visual acuity. The professional activity of dentists is

associated with prolonged visual fixation on small anatomical structures, often under suboptimal lighting conditions. The integration of modern dental technologies, including high-speed instruments and optical systems, has significantly increased the cognitive and sensory load on practitioners. Despite technological advancements, the effectiveness of dental work largely depends not only on equipment and qualifications but also on the functional state of the clinician's visual system [2, 3, 4].

Visual fatigue, resulting from continuous accommodation and focusing efforts, is considered a leading occupational risk factor in dentistry. Therefore, studying the functional dynamics of the visual analyzer during the work shift is essential for preventing occupational disorders and maintaining work efficiency [2, 3, 4].

Materials and Methods

During functional observation of the visual analyzer, the eye's ability to distinguish the highest frequency of light flickers was studied. The critical frequency for merging wire light flickers was determined using a KFFM device. The higher the critical frequency, the better the functional state of the visual analyzer. Another method for mastering the visual analyzer's bandwidth was the use of Landolt ring charts.

Results and Discussion

When studying the functional state of the visual analyzer, the eye's ability to distinguish the highest frequency of light flickers was examined. The critical flicker fusion frequency was determined using a KFFM device. Moreover, the higher the critical flicker frequency, the better the functional state of the visual analyzer. Another method for assessing the visual analyzer's bandwidth was the use of Landolt ring charts.

The throughput of the visual analyzer was evaluated using Landolt ring tables. The assessment considered: number of missed symbols, time required to complete the task and total information loss per unit time. The results of the study were assessed by the number of missed rings and the time spent viewing the entire table, and the total amount of lost information per unit of time:

The processing capacity was calculated using the formula:

$$S = \frac{358{,}8 - L^{*} n}{T}.$$

Where:

S - visual processing capacity (bits/sec);

358,8 бит – total information content of the table;

L - information loss per missed symbol;

n - number of missed symbols;

T - time (seconds).

Results and Discussion

In order to determine the influence of industrial lighting on the functional state of the visual analyzer of dentists, studies were conducted in the dynamics of the work shift (before work, during work and after the working day), in cold and warm periods of the year.

During the warm season, CFFF values decreased by approximately 26% by the end of the shift, indicating reduced visual sensitivity and increased fatigue. In contrast, during colder periods, baseline values were moderately higher (by 0.4–3.2 Hz), suggesting seasonal influence

on visual performance. Changes in visual processing capacity were also pronounced: increased number of errors (missed Landolt rings), longer task completion time and overall reduction in information processing efficiency. At the beginning of the workday, the average value was 1.35 ± 0.025 bits/sec in the warm season. By the end of the shift, a statistically significant deterioration was observed, with changes reaching up to 28%.

In colder conditions, baseline values were slightly lower; however, the relative increase in workload effects during the day was about 19%, confirming progressive fatigue development. The results of the research allowed us to conclude that during the course of work, workers experience a deterioration in their visual acuity indicators, which can be regarded as a manifestation of industrial fatigue, the cause of which in the warm season (hot months) is an unfavorable microclimate, which has a negative impact on the entire body as a whole, including the visual analyzer.

Conclusion

Working in conditions of insufficient and uneven illumination leads to a measurable decline in the functional state of the visual analyzer in dental practitioners throughout the working day. This highlights the necessity for preventive interventions aimed at reducing visual strain and improving occupational safety. Thus, performing work in conditions of insufficient and uneven illumination at the workplaces of dentists can cause a decrease in the functional state of the visual analyzer throughout the working day.

References:

1. Blehm, C., et al. (2017). Computer vision syndrome: a review. Survey of Ophthalmology, 62(3), 318–334.
2. Gupta, N., et al. (2020). Ergonomics in dentistry: a systematic review. Journal of Clinical and Diagnostic Research, 14(6).
3. Hayes, M. J., et al. (2019). Musculoskeletal disorders and visual strain in dental professionals. International Journal of Dental Hygiene, 17(2), 111–121.
4. International Labour Organization (ILO). (2023). Occupational safety and health in the healthcare sector. Geneva.
5. ISO 9241-5:2017. Ergonomic requirements for office work with visual display terminals.
6. Portello, J. K., et al. (2019). The role of lighting in visual fatigue. Journal of Optometry, 12(4), 221–228.
7. Rosenfield, M. (2016). Computer vision syndrome: a review. Ophthalmic and Physiological Optics, 36(5), 502–515.
8. Sheppard, A. L., & Wolffsohn, J. S. (2018). Digital eye strain: prevalence, measurement and amelioration. BMJ Open Ophthalmology, 3(1).
9. Wang, Y., et al. (2022). Impact of occupational lighting on visual performance and fatigue. International Journal of Environmental Research and Public Health.
10. World Health Organization (WHO). (2021). Occupational health: stress at the workplace.