



HYGIENIC DETERMINANTS OF MENTAL FUNCTIONING AND COGNITIVE EFFICIENCY AMONG UNIVERSITY STUDENTS: AN INTEGRATED ANALYSIS WITH REFERENCE TO SANITARY REGULATIONS OF UZBEKISTAN

Abdusalomov Abdulhay Abdumalik ogli
Fergana Medical Institute of Public Health
Fergana, Uzbekistan

Abstract: University students represent a population group exposed to high academic workloads, irregular sleep patterns, psychosocial pressure and environmental disturbances, all of which influence cognitive functioning and mental stability. Contemporary research demonstrates that sleep hygiene, physical activity, environmental ergonomics, psychosocial support and behavioral hygiene collectively determine cognitive efficiency. In Uzbekistan, national sanitary rules and norms—including the SanQvaM system, hygienic standards for indoor microclimate, lighting, noise, daily routines and educational environments—are critically important for protecting mental performance and preventing cognitive decline among young adults.

This extended scientific article integrates global research with Uzbekistan’s hygienic norms to construct a multidimensional cognitive-hygiene assessment model for university students. Evidence shows that insufficient sleep, prolonged screen exposure, academic overload, inadequate hydration, poor nutrition and non-compliance with sanitary requirements (microclimate, ventilation, lighting, seating ergonomics) significantly reduce attention, memory consolidation, executive functioning and emotional resilience. The paper emphasizes the necessity of incorporating national hygienic regulations into student environments and outlines detailed methodological recommendations for future studies.

Keywords: cognition, sleep hygiene, mental health, university students, Uzbekistan SanQvaM , microclimate standards, environmental hygiene, academic stress, psychophysiology.

INTRODUCTION

Mental functioning in university students is shaped by a combination of behavioral, environmental, psychological and physiological determinants. During higher education, academic workloads intensify, daily routines become unstable and stress levels increase, contributing to cognitive fatigue, reduced concentration, weakened memory and lower academic efficiency. Mental hygiene therefore emerges as a core element of public health practice.

In Uzbekistan, the sanitary-epidemiological system places strong emphasis on maintaining hygienic conditions in educational institutions. National sanitary regulations—including the Law of the Republic of Uzbekistan “On Sanitary and Epidemiological Well-Being of the Population.”, State Sanitary Norms and Standards., SanQvaM 0293-11 (Educational Institutions), GOST 12.1.005-88 (Microclimate Standards) and SanQvaM 0172-05 (Lighting Standards)—establish mandatory requirements for temperature, ventilation, lighting, noise exposure, furniture ergonomics and daily schedules in learning environments.

These hygienic norms directly influence students’ mental performance. Scientific evidence confirms that non-compliance with microclimate standards (such as high indoor temperature and poor ventilation) reduces attention, slows information processing and increases irritability. Poor sleep hygiene, physical inactivity and psychological stress also interact with these environmental factors, producing cognitive overload and diminished learning capacity.



Given these challenges, this article provides an expanded, 10-page scholarly assessment of hygiene-related determinants of cognition, integrating international research with Uzbekistan's sanitary norms.

LITERATURE REVIEW

Sleep Hygiene

Sleep quality is one of the strongest predictors of cognitive functioning. Insufficient sleep duration and irregular sleep-wake patterns reduce concentration, memory consolidation, executive functioning and emotional stability. Students who sleep less than 7 hours display poorer academic performance and slower reaction speeds.

Studies (Saunamäki & Jehkonen, 2020; Buxton & Marcelli, 2021) show:

- Sleep deprivation impairs the prefrontal cortex
- Circadian rhythm disruption increases anxiety and irritability
- Excessive night-time gadget use reduces melatonin production
- Poor sleep leads to oxidative stress and neuroinflammation

In Uzbekistan, SanQvaM regulations for hostels and dormitories establish requirements for noise limits ($\leq 30\text{--}35$ dB), ventilation rates and nighttime lighting—critical for sleep hygiene.

Physical Activity

Regular movement enhances neuroplasticity, improves cerebral blood flow and promotes emotional stability. Moderate physical activity improves working memory, decision-making and mood regulation. Sedentary behavior increases risks of depression, cognitive rigidity and lower mental alertness.

Ahrari et al. (2024) and López-Sánchez et al. (2021) show that:

- Aerobic exercise increases hippocampal volume
- Physical activity moderates stress pathways (HPA axis)
- Light activity reduces rumination and mental fatigue

Academic Stress

High academic pressure increases cortisol levels, disrupts synaptic plasticity and impairs memory. Chronic stress correlates with burnout, cognitive inflexibility and sleep disturbances.

In Uzbekistan, SanQvaM 0293-11 prescribes requirements for lesson duration, breaks and study load, yet universities often exceed these limits, contributing to mental strain.

Environmental and Behavioral Hygiene

Environmental factors such as:

- inadequate lighting
 - high CO₂ concentration
 - excessive indoor temperature
 - poor ventilation
 - low hydration and irregular meals
 - improper seating posture
- all contribute to cognitive decline.

Uzbekistan's sanitary norms specify:

- **Classroom temperature:** 18–22°C
- **Relative humidity:** 40–60%
- **CO₂ concentration limit:** ≤ 1000 ppm
- **Illumination standards:** $\geq 300\text{--}500$ lx for reading/writing
- **Ergonomic seating:** seat–desk height ratio per SanQvaM standards



Non-compliance reduces mental alertness and accelerates cognitive fatigue.

MATERIALS AND METHODS

A future empirical study aiming to objectively assess hygienic determinants of cognition in Uzbek universities should apply the following methodology:

Study Design

Cross-sectional or longitudinal model evaluating relationships among hygiene factors and cognitive outcomes.

Participants

Minimum 300 students from various faculties (medicine, engineering, humanities).

Measurement Tools

Sleep: Pittsburgh Sleep Quality Index

Physical Activity: IPAQ

Mental Health: DASS-21

Cognition: Trail Making Test, Stroop Test, Digit Span, Verbal Memory Tasks

Environment: SanQvaM -based environmental assessment checklist

Environmental Indicators (Per Uzbekistan Norms)

Temperature: thermometer readings per GOST 30494-2011

Humidity: hygrometer

CO₂ concentration: gas analyzer

Lighting: lux meter per SanQvaM 0172-05

Noise: decibel meter

Statistical Analysis

Multivariate regression

Path analysis

Structural equation modeling

Correlation matrices

This methodology integrates international standards with Uzbekistan's hygienic requirements.

RESULTS (INTEGRATED EVIDENCE)

1. Sleep as a Core Determinant of Cognition

Students experiencing chronic sleep restriction exhibit:

- reduced attention span
- impaired memory consolidation
- slower mental processing
- increased emotional instability

2. Physical Activity as a Protective Factor

Students performing regular physical activity show:

- improved cognitive flexibility
- enhanced stress resistance
- reduced symptoms of anxiety

3. Academic Stress as a Suppressor of Cognitive Efficiency

High academic load correlates with:



- chronic fatigue
- executive dysfunction
- impaired problem-solving skills

4. Environmental Non-Compliance and Cognitive Decline

Violations of Uzbekistan's SanQvaM norms lead to:

- overheating → irritability, slow thinking
- poor ventilation → headache, reduced alertness
- insufficient lighting → visual fatigue, memory errors

5. Behavioral Hygiene and Cognitive Stability

Irregular eating, dehydration and excessive screen exposure impair:

- working memory
- visuospatial attention
- decision-making

DISCUSSION

This review confirms that hygienic determinants—including sleep, physical activity, environmental conditions, nutrition and psychosocial stability—play decisive roles in shaping cognitive performance among university students.

In Uzbekistan, where national sanitary norms establish strict requirements for microclimate, lighting, noise, ventilation and student daily routines, adherence to these standards becomes a central protective factor for mental functioning.

Students often violate these hygienic norms unintentionally:

- studying at night
- prolonged phone use
- irregular meals
- staying in poorly ventilated rooms

Universities likewise may violate environmental norms through:

- overcrowded classrooms
- insufficient natural light
- inadequate ventilation systems
- outdated furniture

A public-health hygiene approach grounded in Uzbekistan's sanitary framework should focus on:

- educational interventions
- environmental monitoring
- behavioral restructuring
- sleep hygiene programs
- ergonomic modernization

CONCLUSION

Cognitive efficiency in university students is deeply influenced by hygienic, environmental and behavioral determinants. Integrating Uzbekistan's sanitary requirements into preventive programs can dramatically improve mental performance, reduce academic stress and support healthier learning environments.

A multidimensional hygienic assessment system that includes sleep quality, physical activity, environmental measurements and behavioral patterns is essential.



Future research must use objective environmental sensors, wearable sleep trackers and long-term digital monitoring to fully understand the complex interaction of cognitive hygiene determinants.

References :

1. Ahrari, S., Amani, M., & Heydari, H. (2024). Impact of physical exercise on sleep quality among college students: Chain mediation between rumination and depression levels. *Frontiers in Psychology*, 15, 1384211.
<https://doi.org/10.3389/fpsyg.2024.1384211>
2. Buxton, O. M., & Marcelli, E. (2021). Short and long sleep durations are associated with poor cognitive performance in U.S. adults. *Sleep Health*, 7(1), 62–69.
<https://doi.org/10.1016/j.sleh.2020.09.003>
3. Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., & Zheng, J. (2020). The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Research*, 287, 112934.
<https://doi.org/10.1016/j.psychres.2020.112934>
4. Абдусаломов, А. (2025). FAMILIARIZE YOURSELF WITH THE MAIN DOCUMENTS IN THE FIELD OF HYGIENE AND MEDICAL ECOLOGY. *Международный мультидисциплинарный журнал исследований и разработок*, 1(4), 298-303.
5. Fang, K., Ma, Y., Mo, Z., & Huang, T. (2024). Cross-sectional associations of physical activity and sleep with mental health among Chinese university students. *Scientific Reports*, 14, 21020.
<https://doi.org/10.1038/s41598-024-80034-9>
6. Gomes, A. A., Tavares, J., & Azevedo, M. H. (2023). Sleep hygiene and executive functioning among university students. *Journal of American College Health*, 71(2), 489–497.
<https://doi.org/10.1080/07448481.2021.1937084>
7. Guo, X., Zhang, J., & Xu, H. (2022). Effects of academic stress and sleep disturbance on cognitive functioning among college students. *Behavioral Sciences*, 12(9), 345.
<https://doi.org/10.3390/bs1209034>