



## THE EFFECT OF COMPUTER GAMES AND DIGITAL ACTIVITIES ON ADOLESCENT ACCELERATION PROCESSES

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### Abstract

This research is devoted to the study of the effect of computer games and digital activities on the physical and psychological development of adolescents and youth, in particular on the acceleration process from the point of view of hygienic norms. The study was conducted among 187 18–21-year-old students and adolescents using an online and traditional anonymous questionnaire. At present, due to the fact that digital technologies have become an integral part of education and everyday life, the assessment of their health effects from a hygienic point has become urgent. The study examined hygienic factors such as screen time, lighting, physical activity and sleep patterns among young people and analyzed the effects of digital activities on physiological and psychological stability. Based on the data obtained, hygienic recommendations for the formation of healthy digital environment have been developed.

**Keywords:** Digital activities, computer games, adolescents, acceleration, hygienic norms, sleep, physical activity.





## Introduction

In modern life, digital devices – computers, smartphones and tablets – play a central role in adolescents' daily activities. These devices include factors such as screen radiation, electromagnetic field, physical inactivity, and lighting conditions. Hygienic norms have been developed with the aim of minimizing the negative impact of these factors and fostering healthy digital environments through which it is possible to protect the physical and psychological health of adolescents.

Acceleration – an acceleration of adolescent physical and mental development – was widely observed in the second half of the 20th century. However, extreme exposure to the digital environment can slow down this process. It is caused by lack of sleep, eye strain, decreased physical activity and increased stress levels.

Foreign studies provide statistical evidence of this correlation. Twenge and Campbell (2018) in a study of more than 1 million adolescents in the United States found that those with more than 6 hours of screen time per day had a 2.3-fold increased risk of depression and a 1.8-fold increase in sleep disorders. Similarly, a meta-analysis of Liu et al. (2021) among 120,000 adolescents aged 12–18 in China found that with more than 4 hours of screen time per day, the risk of developing myopia was 45% higher, while the duration of sleep was reduced by an average of 1.2 hours. A longitudinal study in Australia (Houghton et al., 2019) found a 20% reduction in physical activity among teens who played digital games for more than 38 hours per week, leading to decreased bone density and stunted height growth. According to the EU Kids Online (2020) study conducted in the European Union, eye fatigue was observed in 5% of cases with a daily screen time of more than 5 hours, and headache was observed in 55% of cases. These indicators are significantly higher than the hygienic norm recommended by the World Health Organization (WHO) - no more than 2 hours of screen time per day.

*According to the hygienic standards of the Republic of Uzbekistan:*

- SSV 0382-2020: Continuous screen time for adolescents aged 14–18 should not exceed 2 hours, with a break of 10–15 minutes every 45 minutes;
- SSV 0302-2018: duration of sleep per day should be 8–10 hours, and physical activity should be at least 60 minutes;
- SSV 0292-2017 : the illumination of the educational rooms is 300-500 lux.

**The purpose of the study:** to evaluate the impact of digital activity on adolescents' acceleration through the eyes of hygienic standards.





### **Methodology:**

The study was conducted among 187 students aged 18–22 years of age of Tashkent State Medical University in 2025. The study was conducted in the form of an anonymous online questionnaire (Google Forms, 17 questions). The questions were about screen time, physical activity, sleep, eye strain and psychological state. The results were evaluated against the SSV standards of the Republic of Uzbekistan – SSV 0382-2020, SSV 0302-2018, SSV 0292-2017 – and recommendations of the World Health Organization (WHO, 2019). Statistical analysis was performed using the  $\chi^2$  test and Spearman correlation ( $p < 0.05$ ). The study was conducted anonymously, voluntarily, and in accordance with bioethical requirements.

### **Results and Discussion**

The results of the survey are based on responses from 187 students. Of these, 59.9% are women and 40.1% are men. By age breakdown: 67.4% of those aged 18–19, 27.8% of those aged 20–21, and 4.8% of those aged 22 and over. This group covers the final stage of adolescence, when the acceleration processes are not fully completed.

The highest indicator in terms of time spent on digital devices occurred in the period of 4–6 hours – 51.3% of students spend the same amount of time a day. This is 2-3 times the 2-hour limit established by the regulation of the Ministry of Health of the Republic of Uzbekistan No. 0382-2020. Also, 25.1 percent of students reported using 1–3 hours, 18.7 percent less than 1 hour, 4.3 percent 7–9 hours, and 0.5 percent more than 10 hours. As a result of the  $\chi^2$  test, this difference was found to be statistically significant at  $p < 0.001$ . Normative disorders lead to eye strain, sleep disorders, and decreased melatonin production when exposed to blue light.

Among the purposes of using digital devices, education (teaching, research) is in the first place - 87.2 percent. It shows the deep integration of digital platforms into the education process. The next places were recorded by social networks (48.7 percent) and watching films/TV series (26.2 percent). While computer games were found to be the primary target in only 4.3 percent of students, follow-up surveys found that 71.1 percent of students play games regularly – indicating that games are being used as a means of "recreation."

On the frequency of playing computer games, 71.1% answered "regularly", 28.3% answered "sometimes" and 0.5% answered "no". According to the weekly playtime analysis, it showed that while 50.3 percent reported "not playing," the majority of those who play spend 1–3 hours (33.2 percent) or 4–6 hours (9.6 percent) per week. Those who play for more than 10 hours make up just 0.5 percent – indicating a low level of gambling addiction. Among game types, "other" (PUBG, FIFA, Call of Duty,





etc.) was in the lead with 47.1 percent. Strategy and intellectual games accounted for 39 percent and simulators accounted for 14.4 percent. These results indicate a high level of interest in competitive and dynamic gaming among students.

On the physical and psychological impact of digital activities, the following indicators were recorded: eye fatigue – 51.3%, headache – 50.8%, sleep rhythm disturbance – 42.8%, decreased attention – 31.6%, irritability or fatigue – 48.1%. As a result of the Spearman correlation, a mean positive relationship ( $r = 0.42$ ;  $p < 0.01$ ) was found between screen time and sleep disorders. This is explained by the non-observance of the break and lighting requirements established by regulations SSV 0382-2020 and SSV 0292-2017. In terms of sleep duration, 6–7 hours – 57.2 percent, 8 hours – 21.4 percent, and 4–5 hours – 17.6 percent. This is below the 8–10 hours of sleep recommended by the SSV 0302-2018 norm, and 74.8% of students do not comply with the norm of sleep. This condition reduces the production of melatonin, decreases the secretion of growth hormones, and disrupts the overall biological rhythms. In terms of physical activity, 34.8 percent of students engaged 1-2 times a week and those who engage daily (28.9 percent). Meanwhile, 60.4 percent of students do not comply with the requirement of 60 minutes of physical activity per day as set out in the World Health Organization (WHO, 2019) and SSV 0302-2018. It slows down the development of the musculoskeletal system and slows down acceleration processes. For signs of acceleration, students rated themselves as follows: above average (acceleration) – 11.3 percent, average – 81.8 percent, low (retardation) – 6.9 percent. This indicator is much lower than the 25–30% acceleration rate recorded in Uzbekistan in the 1980s (Turaev, 2018). This shows the negative impact of the modern digital lifestyle and inactivity on the growth rate. Regarding the impact of digital activities on attention and learning effectiveness, 44.4 percent of students answered positively (concentration improved), while 29.4 percent answered negative (quickly distracted). As an emotional state after games, 31 percent reported fatigue and 25.7 percent reported mental refreshment.

The most important indicator is on question 17: "How do long-term computer games affect biological development?" 64.7 percent of students answered "slows down," 8.0 percent "speeds up," and 23.0 percent "doesn't affect." While these thoughts are subjective, they can be linked to violations of hygienic norms: lack of sleep, physical inactivity, stress, and excessive screen exposure.

In general, excessive use of digital technology has a significant impact on the physiological and psychological state of students. A 2–3-fold increase in the norm of screen time (51.3%) reduces melatonin production, disrupts sleep hygiene (SSV 0302-2018). Decreased physical activity (60.4%) causes bone mineralization and muscle





activity to slow down. Eye fatigue (51.3%) is associated with non-observance of the break mode and improper lighting (SSV 0292-2017). While the retention of the 11.3 percent acceleration mark indicates some beneficial aspects of the digital environment, the overall trend indicates that biological development is slowing.

## Conclusion

According to the results of the study, a general violation of standards for digital hygiene was observed among the students of the Tashkent State Medical University. In particular, 55.1% of respondents had screen time exceeding the hygienic norm, 74.8% had insufficient sleep, and 60.4% had low levels of physical activity. These conditions have exacerbated negative symptoms such as eye fatigue, headaches, sleep disturbances. Still, 44.4 percent of participants noted positive changes, such as focus and quick thinking. And acceleration processes have slowed down, and digital activity has a negative impact on the rate of biological development.

## Recommendations

In order to minimize the negative consequences of digital activities and ensure healthy development of adolescents and youth, the following hygienic measures are recommended:

Factor	Recommendation	Me'oriy hujjat
Screen time	Taking a break of 45 minutes every 10 minutes, not exceeding 2 hours a day	SSV 0382-2020
Sleep	Sleep 8-10 hours a day, no later than 22:00	SSV 0302-2018
Physical activity	Be moderately physically active for at least 60 minutes every day	WHO, 2019
Brighten	Work at work 300–500 lux, screen brightness in the range of 50–70%	SSV 0292-2017
Ko'z gymnastics	Exercise to look 20 meters away for 20 seconds every 6 minutes	WHO tavpolitik

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