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THE EFFECT OF WIRELESS HEADPHONES ON THE CENTRAL NERVOUS SYSTEM

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Abstract
In recent years, wireless headphones have become an integral part of everyday life, greatly simplifying the use of audio devices and providing mobility. However, the growing popularity of these devices raises questions about the possible impact of their operation on the central nervous system (CNS). Research shows that radio frequency radiation and prolonged use of headphones can cause cognitive, emotional and physiological changes. In this regard, studying the impact of wireless headphones on the CNS is becoming an urgent scientific task that is important for health care and the prevention of possible risks.

Keywords: Wireless headphones, electromagnetic radiation, Bluetooth headphones, central nervous system.

Introduction

The article examines the impact of wireless headphones on the human central nervous system. It analyzes scientific studies on the effects of electromagnetic radiation, long-term use of audio devices, and their possible impact on cognitive functions, emotional state, and physiological processes. Particular attention is paid to the mechanisms of interaction of radio frequency radiation with biological tissues and the impact on neural processes. The main risks are identified and recommendations for minimizing potential negative health effects are offered. The work emphasizes the need for further research to better understand the interaction of technology and human health.

Wireless headphones have become an integral part of everyday life for millions of people in recent years, providing mobility and convenience when listening to audio information. However, such widespread use of this gadget raises concerns among medical and neurophysiology experts regarding its potential impact on human health, especially on the central nervous system (CNS).Using headphones has a negative effect on the central nervous system. Irritability, nervousness, emotional instability, lack of sleep, headaches and migraines are not a complete list of symptoms of CNS dysfunction. All of them are caused by prolonged exposure to noise in the range of 60 to 90 decibels."A safe volume level is considered to be 85 decibels for listening to

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sound for no more than eight hours. However, many people - especially young people - prefer the sound "at full volume", which can lead to serious hearing damage,"

Using wireless headphones at volumes above recommended levels is scientifically proven to be dangerous.Some Western researchers claim that the accepted safety standards for such devices are insufficient. Headphones are a source of low-frequency electromagnetic field (EMF), which over time can lead to negative reactions of the body associated with the functioning of the brain

Using TWS headphones can lead to serious medical problems, as they actually “fry” the brain, a team of independent researchers from the Institute of Biomedicine in Tokyo has announced. Scientists conducted research on 120 volunteers, divided into three groups of 40 people. Members of group "A" did not use TWS headphones at all, members of group "B" did it occasionally or recently, and members of group "C" had been using such technology for a long time and constantly. As it turned out, it was the latter who had a critically low number of surviving nerve cells, and the white matter was in an "exhausted" state in all three key parameters. "During a series of practical tests, our early theoretical guesses were fully confirmed," says Doctor of Sciences Yatoshi Kenzo. - Two such devices in the ears create the infamous Kleiwitz resonance, which slowly "fries" the brain, located just between them. In wired headphones, this effect is mainly absorbed by the metal core of the wire, so they do not cause serious harm. The safest models are those with a headband with a metal arc - it takes all the harmful effects on itself. Unfortunately, things are much worse when using wireless headphones. The most dangerous models of TWS headphones are those that support instant recharging. As the study showed, the user often spends four or five hours in such headphones, then quickly recharges them and uses them almost without interruption. As a result, the brain degrades much faster - by the age of 30, these people may develop early dementia, which initially manifests itself in the loss of the ability to perceive large amounts of information and work focused for at least 3-3.5 hours in a row," the Institute of Biomedicine said in a press release.

Key concerns relate to the constant exposure to electromagnetic radiation (EMR) generated by Bluetooth signal transmission. Although the radiation levels of most devices comply with established health standards, prolonged and regular exposure can have a cumulative effect on neural structures. Research is underway to determine the effects of low-intensity EMR on synaptic transmission, neuroplasticity, and the brain's electroencephalographic activity.

Another important aspect is the acoustic impact on the hearing organs. Using headphones at high volume, especially in background noise, can lead to sensorineural hearing loss caused by damage to the hair cells of the organ of Corti. Chronic sound overstrain can also contribute to the development of audio stress and disruption of central auditory processing.

Finally, the potential impact of wireless headphones on cognitive functions, including attention, working memory, and response to sensory stimuli, is discussed. Some studies indicate possible correlations between long-term use of such devices and changes in neurocognitive performance, but causal relationships require further study using functional neuroimaging and cognitive testing.

1. Electromagnetic radiation:

Bluetooth headphones emit radio frequencies in the 2.4 GHz range, which raises concerns about their impact on the brain. According to the International Agency for Research on Cancer (IARC), such emissions are classified as "possibly carcinogenic". The radiation levels of headphones,

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however, are tens of times lower than those of mobile phones and are about 0.2-0.3 W/kg, which is within the permissible limits.

2. Hearing and cognitive problems:

Research shows that prolonged listening to music at volumes above 85 dB increases the risk of hearing loss. For example, a WHO report states that more than 1.1 billion young people aged 12 to 35 are at risk of hearing damage due to the use of headphones at high volumes. This can indirectly affect the central nervous system, causing stress and cognitive overstrain.

3. Epidemiology:

About 50% of headphone users use their devices daily for more than three hours. Among them, about 20% complain of headaches and fatigue, which is associated with prolonged exposure to EMF and loud sounds.

Although modern statistical and epidemiological data indicate the presence of certain risks associated with the use of wireless headphones, most of the potentially negative consequences can be effectively minimized by observing the principles of rational and hygienically sound use. The use of preventive measures can reduce the likelihood of developing hearing impairments, as well as functional disorders of the central nervous system.

These measures include regularly limiting the time of continuous use of devices, reducing volume to safe levels (no more than 60% of maximum), and using alternative forms of listening, especially in conditions of high background noise, when a person tends to intuitively increase the volume. It is also important to avoid using headphones while sleeping, to avoid prolonged passive exposure of the brain to sound and electromagnetic waves.

Healthcare professionals, especially otolaryngologists, neurologists, and family physicians, play a key role in health education. They are encouraged to actively educate patients about the principles of safe use of wireless technologies, explain potential audiological and neurophysiological consequences, and include relevant topics in preventive examinations. Educational activities can be supplemented by information materials and recommendations based on evidence-based medicine.

Raising public awareness, especially among adolescents and young adults — the main users of wireless devices — is an important area of prevention. Including thematic modules in school curricula on the basics of health and hygiene, as well as using digital platforms to disseminate scientifically based information, can significantly increase the level of understanding of potential risks and form responsible behavior when handling mobile audio devices.

Conclusion:

Thus, despite the obvious advantages of wireless headphones, their regular use should be accompanied by observing hearing hygiene, limiting the time of wearing and controlling the volume level. Further multidisciplinary studies are needed to comprehensively assess their impact on human health.Although statistics show certain risks, most negative consequences can be prevented by following simple rules. Doctors should inform patients about the moderation of wireless technology use and keep them aware of the possible consequences.

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Recommendations

1. Limit daily headphone use to two hours.
2. Use devices at a volume no higher than 60–70 dB.
3. Choose certified low EMI headphones.

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