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DAILY CHANGES IN RESPIRATORY RATE AND HEART RATE AMONG STUDENTS

Abstract: This article examines daily variations in respiratory rate and heart rate among university students, their interrelationships, and factors affecting these indicators through literature analysis. Research findings suggest that students' daily activities, physical and mental exertion, eating patterns, and sleep schedules significantly influence these physiological parameters.

Keywords: respiratory rate, heart rate, students, biorhythm, daily variations, physiological parameters

Annotatsiya: Ushbu maqolada talabalarda nafas olish tezligi va puls chastotasining kunlik o'zgarishlari, ularning o'zaro bog'liqligi hamda bu ko'rsatkichlarga ta'sir etuvchi omillar adabiyotlar tahlili asosida o'rganilgan. Tadqiqot natijalariga ko'ra, talabalarning kundalik faoliyati, jismoniy va aqliy zo'riqishlari, ovqatlanish tartibi hamda uyqu rejimi ushbu fiziologik ko'rsatkichlarga sezilarli ta'sir ko'rsatishi aniqlangan.

Kalit so'zlar: nafas olish tezligi, puls chastotasi, talabalar, bioritm, kunlik o'zgarishlar, fiziologik ko'rsatkichlar

Аннотация: В данной статье изучены суточные изменения частоты дыхания и частоты пульса у студентов, их взаимосвязь, а также факторы, влияющие на эти показатели, на основе анализа литературы. По результатам исследования установлено, что на эти физиологические показатели существенное влияние оказывает повседневная деятельность учащихся, их физическая и умственная нагрузка, режим питания и сна.

Ключевые слова: частота дыхания, частота пульса, студенты, биоритм, суточные изменения, физиологические показатели

INTRODUCTION

The human body operates on complex physiological rhythms that regulate various vital functions, with respiratory rate and heart rate being among the most critical indicators of overall health and well-being. These physiological parameters demonstrate distinct daily (circadian) variations that are fundamental to the body's adaptive mechanisms and optimal functioning [1]. Understanding these variations is particularly crucial in the context of university students, who face unique challenges in maintaining physiological homeostasis due to their distinctive lifestyle patterns and academic demands.

The significance of studying respiratory and heart rate variations in students extends beyond mere physiological interest. These vital signs serve as windows into the body's response to various stressors, including academic pressure, irregular sleep patterns, dietary habits, and physical activity levels [2]. Research has shown that the daily fluctuations in these parameters

are not random but follow specific patterns that can be influenced by both internal biological rhythms and external environmental factors.

In the academic environment, students are regularly exposed to situations that can significantly impact their physiological parameters. The combination of intensive mental activity, varying levels of physical exertion, and often irregular lifestyle patterns creates a unique physiological profile that warrants careful investigation. Moreover, understanding these variations becomes particularly relevant when considering the increasing prevalence of stress-related health issues among university students globally.

METHODOLOGY AND LITERATURE REVIEW

The research methodology employs a systematic analysis of existing scientific literature. Scientific articles, monographs, and educational materials in English and other languages were reviewed.

According to research by Thompson et al. [3], students' respiratory and heart rates show significant variations at different times of the day. These indicators are relatively low from 6:00 to 8:00 AM, while reaching their peak in the afternoon (2:00-4:00 PM).

Williams and Brown [4] analyzed students' physiological indicators during learning processes. Results showed increased respiratory and heart rates during complex subject comprehension.

RESULTS AND DISCUSSION

The systematic analysis of literature reveals comprehensive insights into the daily variations of respiratory rate and heart rate among university students. These physiological parameters demonstrate distinct patterns that are influenced by multiple factors and have significant implications for student health and academic performance.

The most fundamental finding from the literature analysis indicates that both respiratory and heart rates follow predictable circadian patterns throughout the day. These variations are not random fluctuations but rather organized biological rhythms that serve important adaptive functions [5]. The research consistently shows that these physiological parameters are lowest in the early morning hours, peak during mid-afternoon, and gradually decline toward evening hours. This pattern aligns with the general circadian rhythm of human physiological functioning and suggests an intrinsic connection to the body's natural regulatory mechanisms.

Specific temporal patterns emerge from the data, showing distinctive variations across different times of the day. During early morning hours (6:00-8:00 AM), students typically exhibit lower physiological parameters, with respiratory rates averaging 14-16 breaths per minute and heart rates ranging from 60-70 beats per minute [6]. These lower values likely reflect the residual effects of sleep and reduced physical activity. The afternoon period (2:00-4:00 PM) marks the peak of physiological activity, with respiratory rates increasing to 16-20 breaths per minute and heart rates elevating to 72-85 beats per minute. This afternoon peak coincides with heightened mental and physical activity levels typical of academic schedules. Evening measurements (8:00-10:00 PM) show a moderate decline, with respiratory rates settling at 15-18 breaths per minute and heart rates returning to 65-75 beats per minute, indicating a natural wind-down of physiological activity.

The research identifies several key factors that influence these physiological parameters. Physical activity emerges as a primary modifier of both respiratory and heart rates, with even

moderate exercise causing significant temporary elevations in these values [7]. Mental exertion, particularly during intensive study sessions or examinations, demonstrates a notable impact on these physiological markers. The literature consistently shows that challenging academic tasks can lead to temporary increases in both respiratory and heart rates, reflecting the body's response to cognitive demands.

Dietary patterns show a significant relationship with physiological parameters, with meal timing and composition affecting both respiratory and heart rates. Research indicates that heavy meals can temporarily increase these values, while proper nutrition and regular eating patterns contribute to more stable physiological rhythms [8]. Sleep quality and duration emerge as crucial factors, with studies demonstrating that inadequate sleep can lead to irregular patterns in both respiratory and heart rates during waking hours.

Environmental factors also play a significant role in these physiological variations. Ambient temperature has been shown to affect both respiratory and heart rates, with higher temperatures generally associated with increased values. The emotional state of students, particularly stress levels during academic pressure periods, demonstrates a clear influence on these physiological parameters. Research indicates that stress management techniques can effectively moderate these effects, suggesting potential interventions for maintaining physiological stability [9].

Recent studies have established important correlations between these physiological parameters and academic performance. Students who maintain more regular physiological rhythms tend to demonstrate better academic outcomes, suggesting a potential link between physiological stability and cognitive function. This finding has important implications for educational planning and student support services.

The literature also highlights the importance of regular physical activity in maintaining healthy physiological patterns [10]. Students who engage in regular exercise show more stable daily variations in both respiratory and heart rates, demonstrating better adaptive responses to academic and personal stressors. This finding supports the integration of physical activity programs into academic schedules.

Particularly noteworthy is the growing evidence suggesting that modern lifestyle factors, including increased screen time and irregular sleep patterns, can disrupt natural physiological rhythms. This disruption may have broader implications for student health and academic performance, pointing to the need for lifestyle modification strategies in student health programs.

These findings collectively emphasize the complex interplay between physiological parameters and various aspects of student life, highlighting the importance of a holistic approach to student health management. The research suggests that understanding and working with these natural rhythms, rather than against them, may lead to improved outcomes in both health and academic performance.

CONCLUSION

The comprehensive analysis of literature regarding daily variations in students' respiratory and heart rates reveals complex patterns that significantly impact their physiological well-being and academic performance. These variations are not merely passive responses to environmental changes but represent sophisticated adaptive mechanisms that help students cope with the demands of university life. The research clearly demonstrates that these physiological parameters follow predictable patterns that can be influenced by various controllable factors.

Understanding these patterns has important implications for both individual student health management and institutional policy development. The evidence suggests that proper alignment of daily activities with natural physiological rhythms can lead to improved academic performance and better overall health outcomes. This includes considerations for class scheduling, study periods, physical activity programs, and rest intervals.

The impact of lifestyle factors on these physiological parameters cannot be overstated. Regular physical activity, proper sleep hygiene, balanced nutrition, and effective stress management techniques have been shown to play crucial roles in maintaining healthy physiological rhythms. These findings emphasize the importance of promoting comprehensive wellness programs that address multiple aspects of student life.

Furthermore, the research highlights the need for individualized approaches to student health management, recognizing that while general patterns exist, personal variations and specific circumstances must be considered. This understanding can guide the development of more effective health interventions and support systems within educational institutions.

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