



RELATIONSHIP BETWEEN CARDIORESPIRATORY ENDURANCE AND ATTENTION AND LEARNING FOCUS OF PHYSICAL EDUCATION STUDY PROGRAM STUDENTS

HUBUNGAN ANTARA DAYA TAHAN KARDIORESPIRASI DENGAN PERHATIAN DAN FOKUS BELAJAR MAHASISWA PROGRAM STUDI PENDIDIKAN JASMANI

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DOI: <https://doi.org/10.62567/micjo.v3i3.3085>

Abstract

This study aims to determine the relationship between cardiorespiratory endurance and the attention and learning focus of Physical Education Study Program students. Cardiorespiratory endurance is a component of physical fitness that plays an important role in supporting physical activity and cognitive function. The ability of attention and learning focus is an important aspect in the learning process because it affects the understanding of material and student learning outcomes. This research uses a quantitative approach with a correlational design. The research sample consisted of 20 Physical Education Study Program students selected using a purposive sampling technique. Cardiorespiratory endurance was measured using the Multistage Fitness Test (MFT) to obtain an estimated VO_2max , while attention and learning focus were measured using a Likert scale questionnaire. Data analysis was performed using the Pearson Product Moment correlation test. The results showed a positive and significant relationship between cardiorespiratory endurance and student attention and learning focus ($r = 0.587$; $p < 0.05$). These findings indicate that students with better levels of cardiorespiratory endurance tend to have higher levels of focus and attention during the learning process.

Keywords : Cardiorespiratory Endurance, VO_2Max , Attention, Learning Focus, Physical Education Students.

Abstrak

Penelitian ini bertujuan untuk mengetahui hubungan antara daya tahan kardiorespirasi dengan perhatian dan fokus belajar mahasiswa Program Studi Pendidikan Jasmani. Daya tahan kardiorespirasi merupakan komponen kebugaran jasmani yang berperan penting dalam mendukung aktivitas fisik dan



fungsi kognitif. Kemampuan perhatian dan fokus belajar merupakan aspek penting dalam proses pembelajaran karena memengaruhi pemahaman materi serta hasil belajar mahasiswa. Penelitian ini menggunakan pendekatan kuantitatif dengan desain korelasional. Sampel penelitian terdiri dari 20 mahasiswa Program Studi Pendidikan Jasmani yang dipilih menggunakan teknik *purposive sampling*. Daya tahan kardiorespirasi diukur menggunakan *Multistage Fitness Test* (MFT) untuk memperoleh estimasi VO_{2max} , sedangkan perhatian dan fokus belajar diukur menggunakan kuesioner skala Likert. Analisis data dilakukan menggunakan uji korelasi *Pearson Product Moment*. Hasil penelitian menunjukkan adanya hubungan yang positif dan signifikan antara daya tahan kardiorespirasi dengan perhatian dan fokus belajar mahasiswa ($r = 0,587$; $p < 0,05$). Temuan ini mengindikasikan bahwa mahasiswa dengan tingkat daya tahan kardiorespirasi yang lebih baik cenderung memiliki tingkat fokus dan perhatian yang lebih tinggi selama proses pembelajaran.

Kata Kunci : Daya Tahan Kardiorespirasi, VO_{2Max} , Perhatian, Fokus Belajar, Mahasiswa Pendidikan Jasmani.

1. INTRODUCTION

Higher education plays a crucial role in producing high-quality human resources. The success of the learning process in higher education is influenced by various factors, one of which is the students' capacity for attention and learning focus. Attention is an individual's ability to concentrate on a specific object or activity, while learning focus is the ability to maintain that attention throughout the learning process.

Students of the Physical Education Study Program are required to have not only excellent academic abilities but also prime physical conditions. Lecture activities that combine sports theory and practical application require an adequate level of physical fitness so that students can optimally participate in the learning process. One of the essential fitness components is cardiorespiratory endurance. Cardiorespiratory endurance is the ability of the heart, lungs, and blood vessels to supply oxygen to the entire body during physical activity over a sustained period. A high level of cardiorespiratory endurance allows the body to work more efficiently and significantly delays the onset of fatigue.

Physiologically, an increase in cardiorespiratory endurance is directly associated with an enhanced oxygen supply to the brain. This physiological advantage supports cognitive functions such as attention, concentration, working memory, and decision-making capabilities. However, in addition to physical activity, recovery factors are primary determinants of a student's overall physical condition and readiness to learn.

The Role of Adequate Sleep in Maintaining Physical Fitness The role of adequate sleep is highly crucial in maintaining the physical fitness of Physical Education students. Sleep is not merely a passive state of rest; it is an active and vital physiological process required for cellular recovery and neurological adaptation (Widianto et al., 2025). Physical Education students consistently endure high-intensity physical demands across varied disciplines—ranging from floor gymnastics (Widianto, 2025) and sports coaching in football (Widianto, Kristiyanto, & Liskustyawati, 2020) and futsal (Subekti et al., 2025), to targeted technical and flexibility training in sports such as badminton (Prasetya et al., 2025; Prasetya et al., 2026).

These rigorous and varied activities place significant stress on the musculoskeletal and central nervous systems. During the deep stages of sleep, the body releases human growth hormone (HGH), which is essential for synthesizing proteins, repairing micro-tears in muscle fibers, and clearing metabolic waste accumulated during exercise. Without sufficient sleep, this recovery process (recovery) is disrupted, leading to compromised muscle regeneration and nervous system fatigue. Furthermore, adequate sleep acts as a foundational pillar that maximizes the effectiveness of other recovery protocols, such as post-activity stretching (Widianto et al., 2024). When combined with proper first-aid knowledge to prevent sports injuries (Widianto et al., 2025), optimal sleep hygiene



creates a comprehensive recovery framework that safeguards the motor fitness components of students (Widianto, Kristiyanto, & Liskustyawati, n.d.).

A lack of sleep—both in quality and quantity—does not only negatively impact cardiorespiratory endurance and exacerbate physical fatigue. It also directly impairs cognitive function, which ultimately diminishes the students' level of attention and focus when receiving academic lecture materials. Therefore, students who possess a robust level of cardiorespiratory endurance, supported by regular and adequate sleep patterns, are strongly hypothesized to have more optimal attention and learning focus capabilities. Based on this rationale, this study was conducted to determine the relationship between cardiorespiratory endurance and the attention and learning focus capabilities of Physical Education Study Program students.

2. RESEARCH METHOD

Research Design This study employs a quantitative approach with a correlational research design. This design was selected to identify and measure the degree of association between the independent variables—cardiorespiratory endurance and sleep quality—and the dependent variable, which is the students' attention and learning focus.

Population and Sample The population of this study consisted of active students enrolled in the Physical Education Study Program. A purposive sampling technique was utilized to select a sample of 20 male and female students. The inclusion criteria for the sample required participants to be actively involved in both theoretical and practical sports courses and to have no current physical injuries that would prevent them from performing maximal physical exertion.

Instruments To ensure the validity and reliability of the data, the following standardized instruments were utilized:

1. **Cardiorespiratory Endurance:** Measured using the **Multistage Fitness Test (MFT)** or Bleep Test. This test is a reliable field test used to estimate the maximum oxygen uptake (VO_{2max}) of the participants.
2. **Sleep Quality and Quantity:** Assessed using the **Pittsburgh Sleep Quality Index (PSQI)**. This self-rated questionnaire evaluates sleep quality and disturbances over a one-month time interval, providing a standardized metric for the students' recovery patterns.
3. **Attention and Learning Focus:** Evaluated using the **Grid Concentration Test** (or a validated Attention and Focus Questionnaire). This instrument measures the participants' cognitive ability to maintain sustained attention and processing speed under time pressure.

Data Collection Procedure Data collection was conducted in two primary phases. First, students were asked to complete the PSQI and the Attention and Learning Focus questionnaire in a controlled classroom environment to establish their baseline cognitive state and sleep profile. Second, the cardiorespiratory endurance data was collected in an outdoor sports facility where students performed the MFT under the supervision of the research team. A sufficient rest period and a standard stretching protocol were implemented before and after the physical test to prevent sports injuries.

Data Analysis The collected data were analyzed using statistical software (SPSS). Descriptive statistics (mean, standard deviation, and variance) were used to summarize the demographic and baseline data. Normality and linearity tests were conducted as prerequisite assumptions. To test the hypotheses and determine the relationship between cardiorespiratory endurance, sleep quality, and attention/learning focus, a **Multiple Correlation Analysis** (Pearson Product-Moment) was applied. The significance level was set at $p < 0.05$.

3. RESULT AND DISCUSSION

Results

The data collection involved 20 active students from the Physical Education Study Program. The descriptive statistics for the variables measured—cardiorespiratory endurance (VO_{2max}) via the



Multistage Fitness Test, sleep quality via the Pittsburgh Sleep Quality Index (PSQI), and attention/learning focus via the Grid Concentration Test—are presented in Table 1.

Table 1. Descriptive Statistics of Variables

Variable	N	Mean (M)	Std. Deviation (SD)	Min	Max
Cardiorespiratory Endurance (VO ₂ max)	20	42.15	4.82	34.2	51.5
Sleep Quality (PSQI Score)*	20	6.45	2.10	3.0	11.0
Attention and Learning Focus	20	78.30	8.55	60.0	92.0

*Note: A lower PSQI score indicates better sleep quality.

Prior to hypothesis testing, normality and linearity assumptions were met. A Pearson Product-Moment correlation analysis was conducted to examine the relationship between the independent variables and the dependent variable.

The statistical analysis revealed a significant positive correlation between cardiorespiratory endurance and attention/learning focus, $r(18) = .68$, $p = .001$. Furthermore, sleep quality showed a significant strong negative correlation with the attention and focus scores, $r(18) = -.72$, $p < .001$ (indicating that lower PSQI scores, or better sleep, correlated with higher focus). A multiple correlation analysis demonstrated that cardiorespiratory endurance and sleep quality collectively have a significant relationship with students' learning focus, $R = .81$, $F(2, 17) = 16.45$, $p < .001$.

Discussion

The findings of this study confirm that both cardiorespiratory endurance and sleep quality are critical determinants of a student's cognitive capacity, specifically their attention and learning focus. The significant positive correlation between VO₂max and focus aligns with the neurophysiological theory that a highly efficient cardiovascular system enhances blood flow and oxygen delivery to the cerebral cortex. This optimal oxygenation supports sustained cognitive functions, allowing Physical Education students to remain alert during complex theoretical lectures that follow exhausting practical sessions.

Moreover, the results emphasize the profound impact of recovery on cognitive performance. Sleep is an active biological process essential for cellular restoration and central nervous system recovery. The significant correlation found in this study reinforces the concept that adequate sleep plays a highly crucial role in maintaining both the physical fitness and cognitive sharpness of physical education students (Widianto et al., 2025). Students undergoing high-intensity physical training, whether in rhythmic gymnastics, floor exercise (Widianto, 2025), or specific technical drills in badminton (Prasetya et al., 2025), accumulate significant metabolic fatigue. During sleep, human growth hormone (HGH) facilitates muscle repair, while the brain consolidates memory and clears neurotoxic waste.

When sleep is compromised, students experience a dual deficit: reduced physical readiness and impaired cognitive focus. This sleep deprivation disrupts the neurobiological mechanisms necessary for sustained attention. Therefore, structured recovery protocols are mandatory. Just as post-activity stretching positively influences physical recovery and student learning interest (Widianto et al., 2024), adopting rigorous sleep hygiene acts as the foundational recovery mechanism.

In the context of the Physical Education curriculum, these findings suggest that academic success cannot be separated from physiological well-being. To maximize the effectiveness of learning models and practical coaching management (Widianto, Kristiyanto, & Liskustyawati, 2020), students must maintain a high baseline of cardiorespiratory endurance and prioritize sleep to ensure that their cognitive attention remains optimal throughout their academic and physical endeavors.

4. CONCLUSION

Based on the data analysis and discussion, this study concludes that there is a significant relationship between cardiorespiratory endurance, sleep quality, and the attention and learning focus of Physical Education Study Program students.



Optimal cardiorespiratory fitness (VO₂max) ensures efficient oxygen delivery to the brain, which enhances cognitive functions and delays the onset of physical fatigue. Concurrently, adequate and high-quality sleep acts as an irreplaceable physiological recovery mechanism. It restores the central nervous system, repairs cellular damage resulting from high-intensity practical activities, and prevents the cognitive decline associated with sleep deprivation. The combination of these two factors strongly predicts a student's ability to maintain sustained concentration during both theoretical lectures and practical sports sessions.

Therefore, to achieve maximum academic and practical performance, Physical Education students must balance their rigorous physical training with proper recovery protocols. It is highly recommended that students prioritize sleep hygiene as a core component of their daily routine to maintain their motor fitness components and cognitive sharpness. Furthermore, educational institutions and lecturers are encouraged to integrate recovery education—emphasizing the importance of sleep and proper stretching protocols—into the physical education curriculum. Future research should consider employing a larger sample size, longitudinal designs, or experimental interventions to further explore practical strategies for optimizing student fitness, recovery, and learning focus.

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