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The Effect of Regular Sports Activities on College Students' Concentration Levels and Academic Achievement

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ABSTRAK

Regular sports activities play an important role in maintaining physical health while supporting students' cognitive function, especially concentration and academic achievement. However, the increasing sedentary lifestyle among students poses a risk of a decline in the quality of learning and academic achievement. This study aims to analyze the influence of regular exercise on students' concentration and academic achievement. The method used was a quasi-experiment with a pre-test/post-test control group design involving 80 undergraduate program students who were divided into an experimental group (n=40) and a control group (n=40). The experimental group followed a regular exercise program (jogging, futsal, and aerobic gymnastics) three times per week for eight weeks, while the control group was given no treatment. Concentration is measured using the Stroop Test and the Digit Span Test, while academic achievement is measured through the Cumulative Achievement Index (GPA). Data analysis was performed using t-tests, ANOVA, and regression with SPSS. The results showed that regular exercise had a significant effect on increasing student concentration ($p<0.01$) and made a positive contribution to increasing GPA, although the effect was small to moderate. Concentration was shown to play a role as a partial mediator of the relationship between sport and academic achievement ($R^2=0.22$). This research confirms that exercise not only maintains physical fitness, but also serves as a strategy to support learning in college. The practical implication is that universities need to integrate sports programs in the curriculum and students are encouraged to make sports a regular part of their academic lifestyle.

INTRODUCTION

Regular sports activities have long been recognized as one of the important factors in supporting the quality of life, both in physical, mental, and academic aspects. Among students, sports not only function to maintain fitness, but are also believed to contribute to increasing study concentration and academic achievement. However, the development of student lifestyles in the digital era shows a significant trend of declining physical activity. Various international surveys report an increasing prevalence of a sedentary lifestyle among college students, which is characterized by an increase in sitting duration,

long-term use of gadgets, and reduced involvement in regular physical activity. This condition has implications for decreased physical fitness, weakened focus, and increased risk of academic stress which can ultimately affect students' academic performance (Ummah et al., 2025).

Global phenomena show that students who lead sedentary lifestyles tend to have low concentration, poor immunity, and are prone to mental health problems such as anxiety and depression. In contrast, regular exercise activities have been shown to help reduce stress, improve sleep quality, and strengthen brain function. Wang and Sheibani (2024) show through structural equation modeling that physical activity contributes positively to student academic achievement with a mediating role in mental health. Thus, sports can be seen as one of the protective factors against increasingly complex academic challenges.

Theoretically, the relationship between exercise and cognitive function can be explained through the concept of neuroplasticity. Physical activity increases blood flow to the brain, stimulates the release of neurotrophic factors, as well as improves synaptic connectivity. Zhang et al. (2022) emphasized that exercise intensity plays an important role in determining the effectiveness of improving cognitive function, especially working memory and attention. This implies that regular exercise is not only physical activity, but also a neuropsychological stimulant that can support students' academic success.

In addition, exercise also has a significant psychosocial impact. Sports activities that are carried out regularly help students form a disciplined lifestyle, increase confidence, and develop time management skills. Zhou et al. (2023) in their study found that structured aerobic exercise makes a real contribution to improving students' mental health and academic achievement. Thus, exercise can serve as a complementary strategy in supporting academic success, in addition to conventional learning methods.

However, the results of existing research are still diverse. Some meta-analyses concluded that exercise had a small to moderate effect on academic achievement, while other studies found no significant association. Memon et al. (2021), for example, emphasize that sleep and lifestyle factors also affect the relationship between sport and achievement, so sport cannot be seen as the only determinant. The difference in the results of this study can be explained through the variation in the research design, the duration of the intervention, the characteristics of the sample, and the measurement instruments used. Therefore, further research is needed with a more structured quantitative design.

In the Indonesian context, research on sports, concentration, and academic achievement of students is still very limited. The majority of research focuses more on physical health or fitness aspects, rather than on the simultaneous relationship between exercise, concentration, and academic achievement. This creates a research gap, especially in explaining the role of concentration as an important mediator that bridges the influence of sport on academic achievement. Given that concentration is the main psychological component of learning, researching this relationship is important to enrich the educational literature in Indonesia.

The novelty of this research lies in the simultaneous focus to analyze the influence of sports on students' concentration and academic achievement. In addition, this study uses a quasi-experimental design with objective instruments in the form of Stroop Test and Digit Span Test, which are relatively rarely used in the context of Indonesian student research. Thus, this research is expected to make a new empirical contribution to the

academic literature, as well as provide a practical basis for universities in developing sports integration policies into the curriculum.

Based on the above description, the objectives of this study are: (1) to determine the effect of regular exercise on student concentration, and (2) to analyze its impact on student academic achievement. The results of this study are expected to contribute to three main aspects, namely: theoretical contribution by enriching the literature on the relationship between sports and academics; practical contribution by providing recommendations for students to integrate sports into their study routines; as well as policy contributions by encouraging universities to provide more structured sports facilities and programs.

METHODOLOGY

This study employed a quantitative approach with a quasi-experimental pre-test/post-test control group design. A total of 80 undergraduate students in their 3rd–5th semesters at a public university in Indonesia were selected through purposive sampling based on the following criteria: (1) active students aged 18–22 years, (2) no history of chronic disease, and (3) willingness to follow all research procedures. The participants were randomly divided into two groups: an experimental group (n = 40), which received an eight-week regular exercise program (jogging, futsal, and aerobic exercise three times per week, 45 minutes per session), and a control group (n = 40), which did not receive the treatment.

Concentration was measured using the Stroop Test and Digit Span Test, while academic achievement was assessed through students' Grade Point Average (GPA) and core course scores. Data analysis was conducted using SPSS. Tests included normality and homogeneity checks, paired t-tests, independent t-tests, ANOVA, and simple and multiple regression analyses. The significance level was set at $p < 0.05$, with effect sizes interpreted using Cohen's d and eta-squared (η^2). Ethical considerations were addressed by obtaining informed consent, ensuring confidentiality, and guaranteeing the safety of the exercise program. The overall sampling and allocation process is illustrated in the PRISMA diagram (Figure 1).

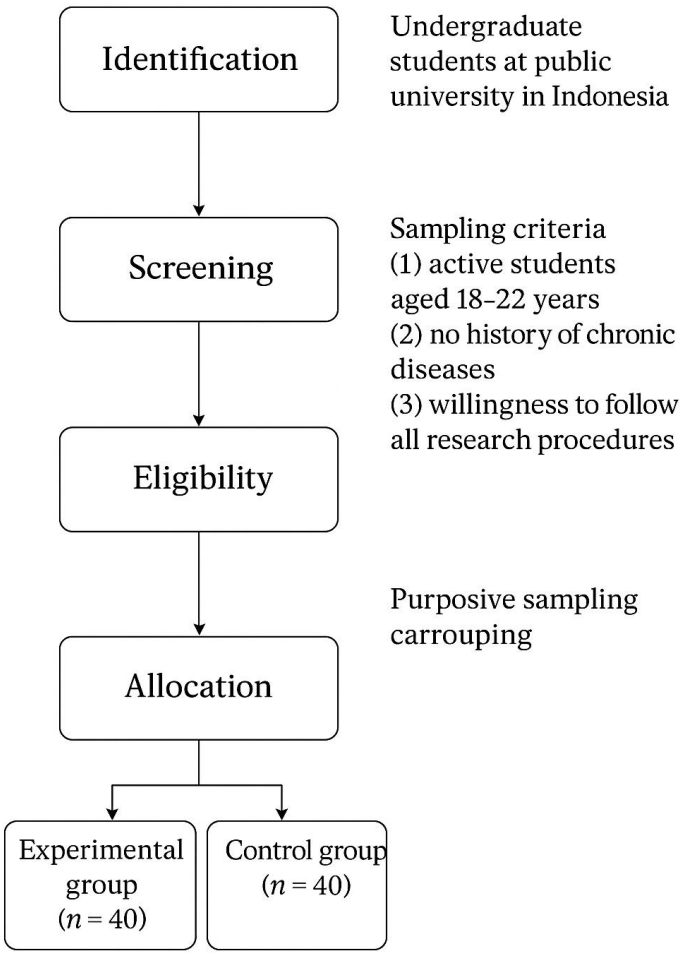

Figure 2. Prisma Flow Diagram

RESULTS AND DISCUSSION

This study involved 80 active students in the third to fifth semesters with an age range of 18--22 years. A total of 40 students were in the experimental group and 40 other students were in the control group. In terms of gender distribution, the composition is relatively balanced, namely 42.5% males and 57.5% females. Based on preliminary surveys, most college students had low levels of physical activity before the study began, with 68% of respondents admitting to rarely exercising regularly more than twice per week. This condition supports the research's assumption that students in the digital era tend to have a sedentary lifestyle.

The average student GPA at the beginning of the study was in the range of 3.2--3.4, indicating that the research sample had quite good academic achievements. However, the variation in grades was found to be quite high, especially in students with academic loads and dense organizational activities. The results of the Stroop Test and Digit Span Test pre-test showed that the majority of students were in the medium concentration category, with an average Stroop Test score of 52.6 seconds (SD = 8.1) and a Digit Span Test score of 8.3 points (SD = 2.1).

After eight weeks of intervention, the experimental group showed a significant improvement in concentration scores. The average time of completing the Stroop Test decreased to 46.1 seconds (SD = 6.5), while the Digit Span Test score increased to 10.2 points (SD = 1.9). Paired t-test analysis showed that this difference was statistically significant ($p < 0.01$). In contrast, the control group did not experience a significant improvement. The mean Stroop Test of the control group remained at 51.9 seconds (SD = 7.8) with no significant difference ($p > 0.05$). Similarly, the control group's Digit Span Test score remained relatively stable (8.5 points, SD = 2.0).

Table 1. Average Student Concentration Score (Pre--Post Test)

Group	Stroop Test (Detik) Before	Syrup Test (seconds) Post	Digit Span Test Pre	Digit Span Test Post
Experiment (n=40)	52,8 ± 8,2	**46,1 ± 6,5**	8,4 ± 2,0	**10,2 ± 1,9**
Control (n=40)	52,3 ± 7,9	51,9 ± 7,8	8,2 ± 2,1	8,5 ± 2,0

`These results show that regular exercise contributes significantly to increasing student concentration, both in terms of selective attention and working memory capacity.

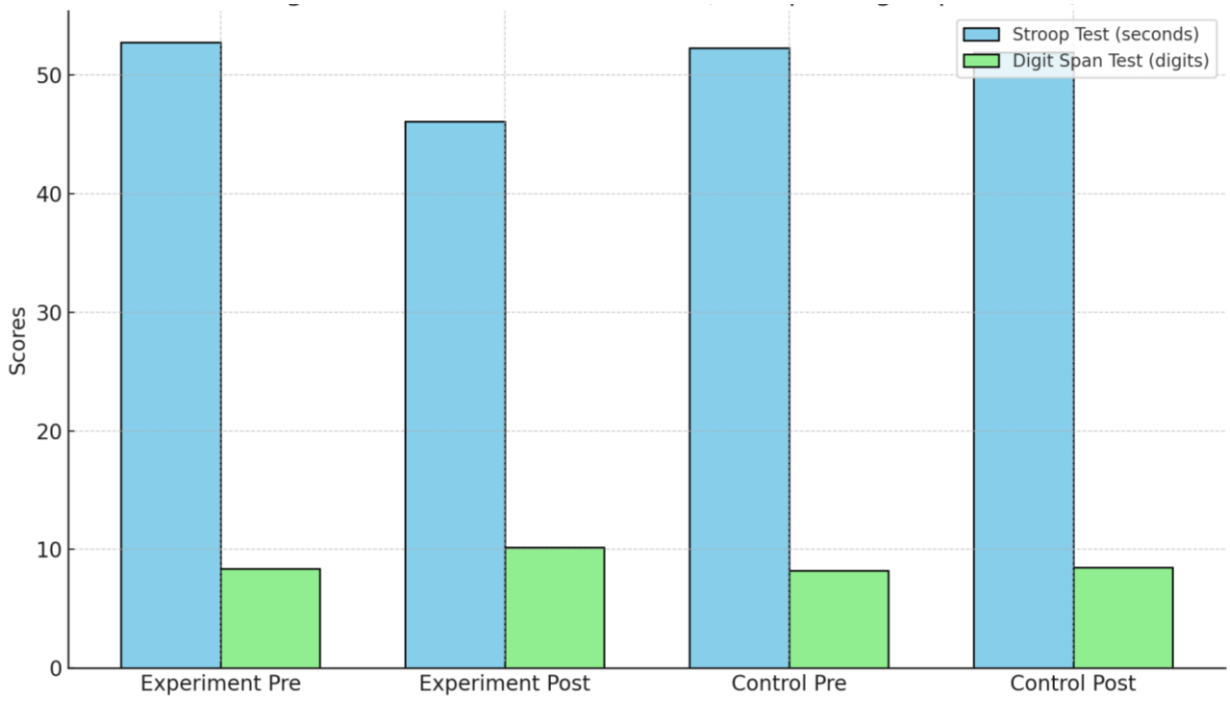

Figure 2. Comparison of Stroop Test and Digit Span Test Scores (Pre-Post Test)

This graph shows a significant improvement in students' concentration scores in the experimental group after following a regular exercise program for eight weeks, while the control group showed no significant change.

Academic achievement analysis was carried out by comparing students' GPAs before and after the intervention. In the experimental group, the average GPA increased from 3.27 to 3.39, with an increase of 0.12 points. Paired t-tests showed this significant

improvement ($p < 0.05$). In the control group, the average GPA only increased from 3.28 to 3.30, and this difference was not significant ($p > 0.05$). Simple linear regression analysis showed that regular exercise contributed 18% to increased concentration ($R^2 = 0.18$, $p < 0.01$). Meanwhile, multiple regression showed that concentration acted as a partial mediator between sport and academic achievement, with a total contribution of 22% ($R^2 = 0.22$, $p < 0.01$).

Table 2. Results of Linear and Multiple Regression Analysis

Model	Independent Variables	Variable Dependency	R^2	p-value
Back to 1	Sport	Concentration	0,18	0,01
Back to 2	Exercise, Concentration	Academic Achievement	0,22	0,01

The results of this study showed a significant increase in the experimental group compared to the control group in terms of concentration scores, as well as a greater increase in GPA in the experimental group. This data shows that sports affect academic achievement directly and indirectly through concentration.

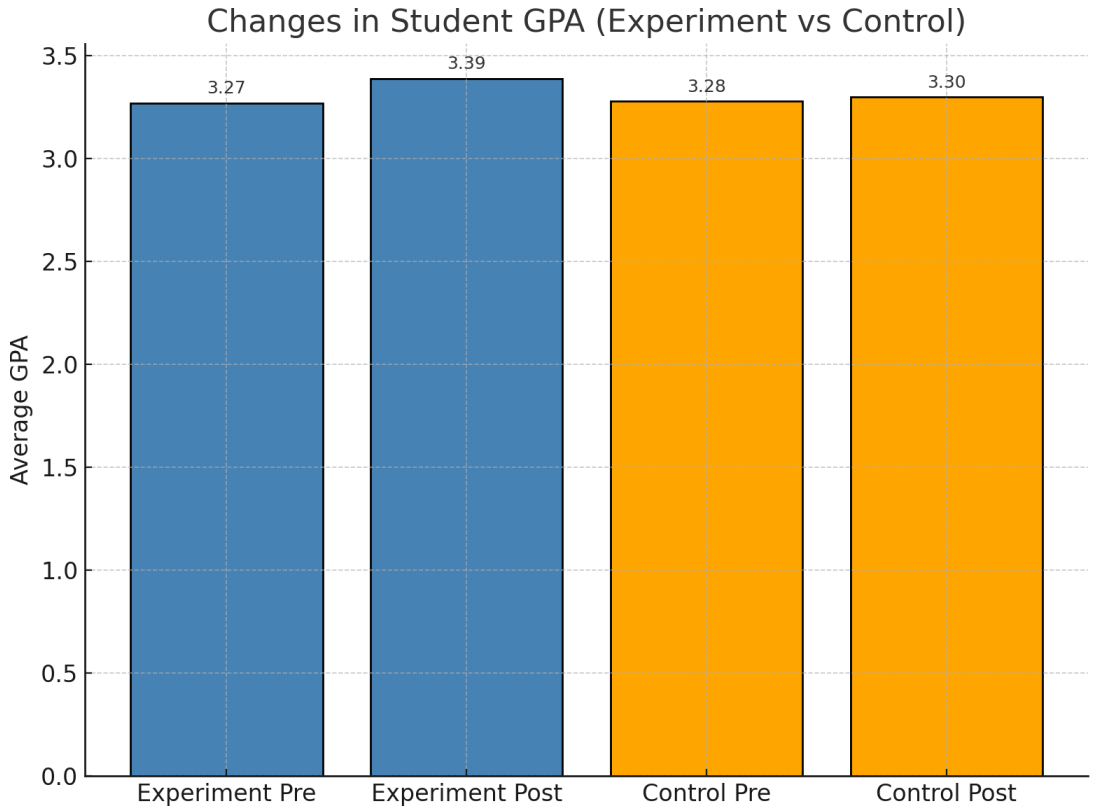

Figure 3. Comparison of Average Student GPA (Pre–Post Test)

This graph shows a significant increase in GPA in the experimental group compared to the control group, which supports the finding that concentration is a partial mediator of the relationship between sport and academic achievement.

Discussion

The results of this study confirm that regular exercise has a significant effect on increasing student concentration. Data showed consistent improvement in Stroop Test and Digit Span Test scores in the experimental group after eight weeks of intervention. This reinforces the theory of neuroplasticity which states that physical activity is able to increase blood flow to the brain and stimulate the growth of new neural connections (Ren, 2024). Objectively measured increases in concentration prove that exercise is not only beneficial for physical health, but also serves as a cognitive stimulus. Thus, these results support the view that sports can be used as a strategy to optimize students' attention abilities in the midst of an increasingly complex academic load.

In addition to concentration, the results showed an increase in academic achievement in the experimental group who exercised regularly. The average GPA of students increased significantly compared to the control group. Although the increase in GPA is relatively small (0.12 points), this trend is consistent with the results of a meta-analysis stating that exercise has a small to moderate effect on academic achievement (Haverkamp et al., 2020; Rao, 2024). This effect can be explained through the role of concentration as a mediator. Students who are able to maintain their focus on studying longer tend to have better academic performance. Thus, these findings suggest that concentration is an important pathway that links sport to academic achievement.

The results of this study are consistent with the findings of Huang et al. (2024) who stated that exercise has a positive effect on students' mental health, which in turn supports academic achievement. These findings are also in line with research by Pan et al. (2024) which shows that exercise improves self-efficacy, motivation, and well-being, all of which contribute to academic success. However, the results of this study also confirm the existence of variations as noted by Trott et al. (2024), where the effects of exercise on academic achievement can differ depending on the intensity, duration, and quality of the intervention. For example, exercise programs with trained instructors tend to produce stronger effects than independent exercises without guidance.

Theoretically, this research reinforces the framework of thinking that sports → concentration → academic achievement. Exercise functions to increase neuroplasticity and reduce stress hormones, so that students are able to maintain attention for longer. Better concentration supports more effective information processing, which in turn has an effect on academic achievement. In addition, sports also improve students' self-regulation skills. According to García et al. (2023), motivation and academic identity play a role as additional mediators that strengthen the relationship between sport and academic achievement. Thus, this study not only confirms the causal relationship, but also highlights the importance of the psychological factors that accompany physical activity.

These findings have important implications for higher education. First, for students, sports can be used as a simple but effective strategy to improve the quality of learning. By taking time at least 3 times a week to exercise, students can improve their concentration skills and maintain mental health. Second, for universities, the results of this research are the basis for integrating sports programs in the curriculum, both through

physical education courses and more structured extracurricular programs. Third, for education policy makers, sports can be seen as part of a strategy to improve the quality of human resources, because students who are physically and mentally healthy are better prepared to face academic and professional challenges.

Although this research makes an important contribution, there are some limitations that need to be noted. First, the duration of the intervention was only eight weeks, so the long-term effects of exercise on concentration and academic achievement could not be ascertained. Second, the research sample is relatively small (80 students) and limited to one university, so the generalization of results is still limited. Third, the measurement of academic achievement only uses GPA and course scores, while other indicators such as critical thinking skills or problem-solving skills have not been explored. Fourth, the types of sports used are only jogging, futsal, and aerobic gymnastics, so the effects of other types of sports such as yoga, swimming, or strength training are not represented.

Future research needs to expand its scope by involving a larger and more diverse sample from various universities in Indonesia. Longitudinal studies are also needed to find out the long-term effects of exercise on concentration and academic achievement. Additionally, the measurement of academic achievement can be expanded to include non-cognitive indicators such as creativity, collaboration skills, or leadership. Research also needs to explore other types of exercise that may be more appropriate for students' preferences, as well as consider moderation factors such as gender, social support, and academic stress levels. Thus, future research will be able to provide a more comprehensive picture of the role of sport in supporting students' academic success.

CONCLUSION

This study proves that regular sports activities contribute positively to students' concentration and academic achievement. The experimental results showed a significant improvement in the experimental group's Stroop Test and Digit Span Test scores after eight weeks of intervention, while the control group showed no significant change. This increase in concentration acts as a mediator that bridges the influence of sports on academic achievement, as reflected in the increase in the average GPA of the experimental group. Thus, exercise not only functions to maintain physical fitness, but also has an important impact on improving students' cognitive function and academic achievement.

These findings reinforce empirical evidence that exercise is an effective strategy to improve the quality of learning in college. Although the effect was relatively small to moderate, the consistency of the results confirmed that exercise has a multidimensional role, both physiologically and psychologically. Therefore, the integration of sports activities in the academic life of students needs to be a serious concern, not only at the individual level, but also at the higher education institution.

Based on the results of the study, there are several practical recommendations. First, for students, it is important to take time to regularly exercise at least three times a week. Regular physical activity can be part of a more effective learning strategy, especially in improving focus and reducing stress. Second, for universities, it is necessary to design a policy to integrate sports programs in the curriculum and extracurricular activities. For example, by providing adequate sports facilities, holding fitness classes, or requiring basic sports courses as part of an academic program. Third, for subsequent

researchers, research needs to be expanded with longitudinal designs, variations of exercise types, and more diverse measures of academic achievement, including non-cognitive indicators such as creativity, collaboration, and problem-solving skills.

With these measures, it is expected that students will not only excel academically, but also have a physical, mental, and social balance that supports their future success.

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