

**THE EFFECT OF LEARNING HOURS ON STUDENTS' MOTIVATION TO LEARN
PHYSICAL SCIENCES AT STATE SENIOR HIGH SCHOOL 3 SEMARANG**

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Abstract

The purpose of this study is to determine how weather factors, represented by class time variations, affect the desire of SMA Negeri 3 Semarang students to study Physical Education, Sports, and Health (PJOK). A comparative quantitative approach was used in this study. Two classes formed the population and sample of the research: class XI-1, which was studied in the morning from 7:00 to 9:15, and class XI-5, which was studied in the afternoon (09:30–11:45). The number of respondents sampled in this study was 36 students from class XI-1 and 36 students from class XI-5. Data collection was carried out using a Likert scale questionnaire instrument containing 30 items, distributed via Google Forms and completed using the students' respective devices. The results of the percentage data analysis showed that class XI-1 had an average learning motivation score of 71.64%, while class XI-5 had an average score of 71.89%. This study established that if the p-value is above 0.05, the null hypothesis (Ho) is accepted; if the p-value is below 0.05, Ho is rejected. The significance value (Sig(2-tailed)) of 0.824, which is above the p-value of 0.05, demonstrates the acceptance of Ho and the rejection of Ha. This indicates that weather does not affect the increase in students' desire to engage in Physical Education at SMAN 3 Semarang. The conclusion of this study shows that the hot weather during the late morning hours in Semarang City does not significantly decrease student learning motivation. This indicates that extrinsic motivation from the weather can be offset by an appropriate pedagogical approach during the learning process.

Keywords: Weather, Motivation to Learn, PJOK, Physical Education.

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INTRODUCTION

Physical Education, Sports, and Health (PJOK) is an integral part of the national education system that aims to develop aspects of physical fitness, motor skills, and emotional intelligence of students (Rahayu & Priambodo, 2021). In its implementation, PJOK learning is dominated by outdoor physical activities (outdoor education). This makes the learning process very vulnerable to being influenced by environmental factors, one of which is weather and air temperature. Therefore, physical education learning must be able to adapt to natural conditions and the surrounding environment so that learning objectives can still be achieved optimally (Siregar dkk., 2024). Education is an important means in developing individual knowledge, abilities, and skills. Through the educational process, a person can experience changes in the way of thinking, attitudes, and behavior that lead to better self-development

(Sembodo, 2021). Education is a holistic process through teaching and guidance to develop individual potential (cognitive, emotional, and psychomotor) to achieve independence and active participation in society (Syamsul Arifin, 2017).

As a component of education to shape Indonesian people of Pancasila quality, physical education uses systematic movement activities to optimally develop fitness, health, skills, intelligence, and character of students. Specifically, sports are separated from physical education. (Latansa et al., 2025). Education improves the quality of individuals holistically through systematic and continuous guidance, teaching, and training. The goal is to shape individuals who are proactive, independent, disciplined, have a commendable character, have strong mobility, and are intelligent in all areas (Farolia Riska & Candra Dewi Ratna, 2022). Physical education aims to optimize motor, physical, social, emotional, and personality abilities through planned activities. This process does not only rely on competitive sports, but also utilizes traditional games that function to shape students' social-emotional characters such as collaboration, mutual respect, fair play, courage, and honesty (Purbangkara Tedi & Nasution Nana Suryana, 2019).

Semarang, located in a coastal area, is characterized by very high temperatures, especially around midday. Increased air temperatures can cause fatigue, mild dehydration, and possibly reduce students' concentration and desire to learn in the field. This is consistent with research (Ridwan dkk., 2020) showing that meteorological conditions can affect student motivation in physical education classes. A pleasant educational atmosphere is crucial for facilitating student academic achievement. A positive and energetic classroom environment can improve student concentration, thus making the learning process more effective (Aqil Juniardi & Rizqa, 2024).

Motivation significantly impacts learning outcomes because it makes students more diligent, enthusiastic, and focused. Therefore, increasing learning motivation should be a top priority for schools in all educational practices (Febrita & Ulfah, 2019). Learning motivation consists of two types: intrinsic (from within oneself) and extrinsic (from external influences). These levels of motivation significantly impact learning achievement, as optimal results require a strong will and determination to continue learning (Emda Amna, 2017). Learning motivation is a drive that arises from internal and external sources, encouraging students to actively engage in educational activities (Rahayu & Priambodo, 2021). The writing by (Prasetyo & Susanto, 2021) shows that the pedagogical attitude of educators has a beneficial and substantial impact on student motivation in Physical Education (PJOK) classes. Student learning success is greatly influenced by their motivation. An increase in the desire to learn is correlated with the possibility of optimal student success. Conversely, a lack of motivation can hinder the achievement of optimal learning outcomes (Daffa dkk., 2025). Motivation in learning is very important because it serves as a metric for evaluating student progress in academic and non-academic endeavors (Ernita & Umniati, 2022).

Physical Education (PJOK) learning is dominated by outdoor physical activities, making it

highly susceptible to environmental factors, including weather and air temperature. Therefore, learning must be able to adapt to the surrounding natural conditions to optimally achieve learning objectives. Semarang is characterized by very high air temperatures, especially around noon. This increase in temperature can theoretically trigger fatigue, mild dehydration, and reduce students' concentration and desire to learn in the field, in line with the finding that meteorological conditions can affect student motivation in physical education classes. However, most previous literature on environmental factors in PJOK still focuses on macro comparisons, such as differences in motivation when using indoor and outdoor field facilities, or the adaptation of innovative infrastructure in schools in areas with extreme natural challenges. There is a limited research gap specifically examining the impact of daily micro-temperature fluctuations based on the division of daily lesson schedule slots (cool mornings versus hot afternoons) within the same school ecosystem. In fact, this arrangement of teaching time slots is an absolute operational policy faced by every high school. This empirical gap is filled through this research. During the Field Practice Experience (PPL) at SMA Negeri 3 Semarang, a striking difference in schedule was found, where Class XI-1 attended lessons in the morning (07:00–09:15) when the weather was cool, while Class XI-5 had to do it in the afternoon (09:30–11:45) when the temperature increased. This paper aims to objectively assess and analyze the extent to which the conditions of the difference in learning hours arising from these differences affect students' motivation to participate in Physical Education (PJOK).

METHOD

This paper uses a quantitative strategy with a comparative descriptive method to answer the formulated problems. This strategy is used to provide an objective representation when comparing the phenomena studied. This paper was conducted at SMA Negeri 3 Semarang. The sampling approach was carried out through a purposive sampling technique. This conditional sample explicitly aims to identify two class groups that exhibit different characteristics or conditions related to different time allocations and learning plans for Physical Education, Sports, and Health (PJOK), specifically:

Table 1. Research sample

1. Class XI-1: Morning group (07.00 - 09.15 WIB)
2. Class XI-5: Afternoon group (09.30 - 11.45 WIB)

Researchers used a closed-format questionnaire as the primary tool for collecting field data. This instrument was methodically developed and has 30 explicitly formulated statements to assess writing variable indicators. This questionnaire uses a Likert Scale for measurement, with evaluation gradations with scores ranging from 1 to 4. This scale method offers four different answer choices, encouraging respondents to show their level of agreement: Strongly Agree (SS), Agree (S), Disagree (TS), and Strongly Disagree (STS). The quality level of a writing instrument can be seen from its validity and

reliability. Instruments are an important component in writing because they function as a tool to obtain accurate data. The use of instruments that meet validity and reliability standards will support the quality of the writing results, while poor instruments can affect the accuracy of the writing results obtained (Afifah Aulia Zayrin dkk., 2025).

Table 2. Likert Scale Assessment of Student Learning Motivation Questionnaire

No	Choice	Mark	
		+	-
1	Strongly Disagree (STS)	1	4
2	Disagree (TS)	2	3
3	Agree (S)	3	2
4	Strongly Agree (SS)	4	1

To obtain findings consistent with the variables we want to research or measure, quantitative writing requires the use of instruments. Both tests (such as cognitive ability tests and process skills tests) and non-tests (such as interview guides, questionnaires, observation sheets, attitude scales, evaluation scales, and so on) can be used as instruments in educational writing. (Anam, 2017) Abraham Maslow's motivation theory in the learning process is the basis of the questionnaire used in this writing (Abraham Maslow et al., 2022). The research instrument is a questionnaire consisting of 30 statement items with a Likert scale of four answer choices, namely Strongly Agree (SS), Agree (S), Disagree (TS), and Strongly Disagree (STS). Before being used in data collection, the instrument was first tested to determine the level of validity and reliability. The validity test was carried out on 30 statement items involving 15 respondents. Based on the r table value of 0.514 at a significance level of 5%, 26 statement items were obtained whose r calculated value was greater than the r table so that they were declared valid. Meanwhile, 4 other statement items were declared invalid because they had an r calculated value smaller than the r table. Next, a reliability test was conducted on 26 valid statement items and produced a Cronbach's Alpha value of 0.922 which is included in the highly reliable category. These results indicate that the instrument has a very good level of consistency and is suitable for use in research. After being declared valid and reliable, the questionnaire was distributed via Google Form and filled out by students using their respective devices after the learning process was completed. The data obtained were then analyzed using SPSS 26 through descriptive statistics, normality tests, homogeneity tests and hypothesis testing using Paired Sample t -tests to determine differences in PJOK learning motivation based on learning time .

RESULTS AND DISCUSSION

Results Study

Based on a summary of data collected through a Google Form questionnaire, 30 questions were answered by respondents, namely students in grades XI-1 and XI-5. The researchers then conducted further processing and analysis on the raw data set to obtain descriptive statistical

calculations that measure the proportion of students' learning motivation levels. In the scoring guidelines instrument This, every student potential get accumulation score maximum worth 120, which is the result of multiplying the total of 30 questions with the highest score weight, namely 4, for each statement item.

Table 3. Comparison of Average Values of Motivation to Learn Physical Education and Health

Class	Learning Schedule	Weather Conditions	Average Motivation Score (%)	Category
XI-1	07.00 - 09.15	Morning / Cool	71.64%	Good
XI-5	09.30 - 11.45	Day / Hot	71.89%	Good

Purpose give description Which more comprehensive as well as make things easier process interpretation and reading of data by readers, comparative results regarding the level of student learning motivation from both class Which observed the visualized in a way more detailed through serving diagram the following stems :

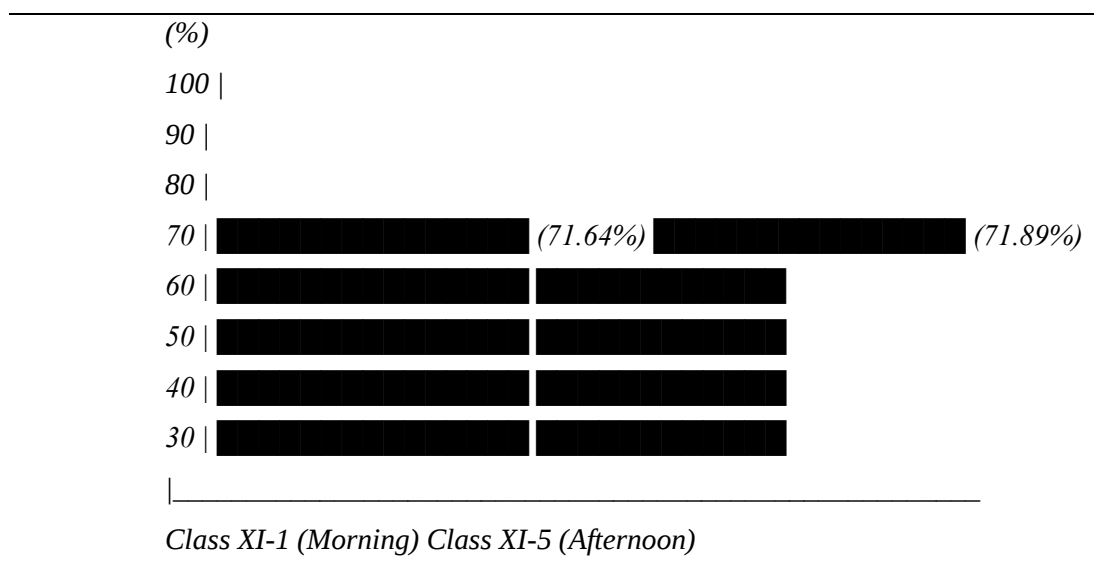


Diagram 1. Percentage of Student Learning Motivation Based on Time/Weather

Discussion

1. Descriptive Analysis

Table 4. Descriptive

	Descriptive Statistics							
	N	Range	Minimum	Maximum	Sum	Mean	Standard Deviation	Variance
	Statistics	Statistics	Statistics	Statistics	Statistics	Statistics	Std. Error	Statistics
XI1	36	20	78	98	3095	85.97	.948	5,690
X5	36	24	73	97	3106	86.28	.989	5,936
Valid N (listwise)	36							32,371

Based on table 4, it is known that class XI-1 has an average value of 85.97 while class XI-5 has an average value of 86.28. The initial assumption of this writing is that class XI-1 who exercises at 07.00-09.15 will have much higher motivation because it is supported by the cool morning air temperature and the students' physical condition is still fresh. On the other hand, class XI-5 who exercises at 09.30-11.45 is predicted to experience a decrease in motivation due to exposure to the hot temperatures typical of Semarang weather towards the afternoon which triggers dehydration and a feeling of stuffiness. However, the findings in the empirical data also reject this assumption in Table 1 and Diagram 1 showing that the difference in learning motivation between the morning and afternoon classes is very small, even class XI-5 (afternoon) shows a slightly higher average figure (71.89%) compared to class XI-1 (71.64%). Both classes fall into the category motivation Which "Good". Result show that mark average class XI-5 more tall from average grade of class XI-1.

2. Normality Test

Table 5. Normality Test

Tests of Normality				
	CLASS	Kolmogorov-Smirnov ^a		
		Statistic s	df	Sig.
	XI - 1	0.123	36	0.000
Results	X - 5	0.183	36	0.005

The significance value for class XI-1 is 0.000, while the significance value for class XI-5 is 0.005. The determination of decision making in the normality test is based on the significance value of the Kolmogorov-Smirnov test. Data is considered normally distributed if the significance value exceeds 0.05 ($p > 0.05$), but is considered not normally distributed if the significance value is below 0.05 ($p < 0.05$). The results of the analysis using SPSS version 26, as shown in the table, show that all significance values exceed 0.05. Therefore, the writing data meets the normality test and can be continued to the next analysis step.

3. Homogeneity Test

Table 6. Homogeneity Test

Test of Homogeneity of Variance			
Levene Statistics	df1	df2	Sig.
4,267	3	92	0.086

To see whether the data is homogeneous, it can be seen from the value of the homogeneity test results table processed using SPSS 26. The significance value obtained was 0.086. Researchers made decisions based on data analysis techniques, if the significance value is greater than 0.05, it is considered homogeneous.

4. Hypothesis Testing

Table 7. Hypothesis Testing

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Standard Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	XI-1	-.306	8,200	1,367	-3,080	2,469	-.224	35	.824
Pair 2	XI-5	.306	8,200	1,367	-2,469	3,080	.224	35	.824

This paper uses a paired sample t-test, a comparative hypothesis test in parametric statistics. The data used in the t-test are interval or ratio (quantitative data) using SPSS version 26. Decision making is based on the p-value (Sig(2-tailed)). If the p-value is above 0.05, the null hypothesis (H_0) is accepted; if the p-value is below 0.05, H_0 is rejected.

The significance value (Sig(2-tailed)) of 0.824, above the p-value of 0.05, indicates the acceptance of H_0 and the rejection of H_a . This shows that learning hours do not affect the increase in students' desire to be involved in Physical Education at SMAN 3 Semarang.

Motivation is a catalyst that directs and sustains human actions to achieve goals with greater effort and enthusiasm. Psychologically, motivation is defined as a change in conditions (impulses, emotions, and reactions) that facilitate the achievement of these targets. (Nurhidayati dkk., 2023). Motivation functions as an effort to trigger success and maintain individual focus on goals. For students, motivation helps set priorities and choose relevant activities to achieve learning goals. (Fitriana Harahap dkk., 2021). Learning motivation greatly influences academic achievement by stimulating students to be more active and take initiative. Therefore, choosing the right learning technique is the main key to increasing this motivation (Savitri dkk., 2022).

The scheduling of physical education (PJOK) learning hours should not only be viewed from an administrative perspective, but must also consider the chronological effects and the physical environment of students. According to (Pope, 2016), there is a significant time-of-day effect where student performance and learning productivity decrease drastically as the time changes towards daytime. In PJOK subjects that are mostly outdoor-based, this impact is exacerbated by weather factors and extreme temperatures. (Tucker & Gilliland, 2007) emphasized that hot weather acts as a major

environmental barrier that reduces individual motivation for physical activity. When outdoor thermal comfort is not met (outdoor thermal discomfort), the body will biologically reduce the intensity of movement (L. Chen & Ng, 2012), which in turn has negative implications for students' motivation to learn PJOK.

The environmental psychology approach views outdoor classrooms as more than just a place for physical activity, but rather an environmental stimulus that actively interacts with students' psychological states. (Goodman dkk., 2018) In his study on the relationship between heat and learning, he found evidence that exposure to high temperatures during school hours acts as an environmental stressor that significantly erodes students' learning productivity and mental stamina.

This phenomenon explains why the timing of class sessions is so sensitive. (Keller dkk., 2005) states that the influence of weather on human psychological conditions is contingent; exposure to warm temperatures only triggers positive emotions in the morning, while during the day it actually depresses mood. Mechanically, this decrease in motivation occurs because heat stress during the day drains students' attentional resources for physical regulation of heat (Hancock & Vasmatazidis, 2003). As a result, the allocation of psychological energy of SMA Negeri 3 Semarang students to build motivation to learn PJOK is hampered because it is depleted by their own body's thermal adaptation.

Learning motivation in Physical Education, Sports, and Health (PJOK) has unique characteristics because it involves the integration of mental readiness and physical activity on the field. Based on *Self-Determination Theory* adapted in the sports context by (Standage dkk., 2003), students' autonomous motivation is very sensitive to the conditions of the learning environment. When external factors such as the choice of learning hours are not conducive, students are susceptible to experiencing a shift in motivation towards negative emotions. This decline in motivation, according to (Ntoumanis, 2001), can lead to a motivational phase, where students no longer see the value or benefits of physical activity due to obstacles to physical comfort. More specifically, (A. Chen dkk., 2001) it confirms that motivation in PJOK is strongly supported by *situational interest*. The time factor or learning hours during the day which are identical to increasing environmental temperatures act as negative stimulants that instantly reduce *the situational interest* of students at SMA Negeri 3 Semarang, thereby reducing their commitment to actively engage in the movement learning process.

The fact that the hot weather does not reduce student motivation at SMA Negeri 3 Semarang can be explained by several factors. Maintaining learning motivation during the day is closely related to the pedagogical strategies implemented by teachers. The implementation of student-centered learning models, such as Problem-Based Learning (PBL) or material design with the Understanding by Design (UbD) approach, plays a vital role. When students are given directed freedom, relevant materials, and enjoyable, differentiated learning in the field, their intrinsic enthusiasm is proven to overcome the extrinsic barrier of hot weather. Furthermore, managing break times (drinking) and using shaded areas around the school are also effective in maintaining student focus.

CONCLUSION

The writing and analysis of data regarding the influence of learning hours on motivation to learn Physical Education (PJOK) among students of SMA Negeri 3 Semarang shows that the variation in learning time (morning versus afternoon) does not have a significant effect on student motivation. The results of the hypothesis test, which was conducted using a paired sample t-test, produced a significance value (Sig. 2-tailed) of 0.824. Since the significance value exceeds 0.05, H_0 can be accepted. This lack of significant impact is in line with the descriptive data which shows that both subjects exhibit comparable levels of learning desire. Class XI-1, who studied throughout the morning in cooler conditions, had an average motivation of 71.64% (Mean = 85.97; SD = 5.690). In contrast, Class XI-5, who studied around noon in warmer temperatures, achieved a comparable motivation level of 71.89% (Mean = 86.28; SD = 5.936).

The finding that there was no significant effect of learning hours indicates that hotter environmental conditions towards the afternoon do not automatically reduce students' learning motivation in participating in Physical Education (PJOK) learning. This motivational stability proves that student enthusiasm is influenced by other factors that are more dominant than just morning or afternoon learning hours, such as learning strategies implemented by teachers, effective classroom management, and the use of interactive and enjoyable learning models. Thus, it can be implied that even though PJOK learning in the field is carried out under different conditions, students' intrinsic motivation can still be maintained optimally if supported by a student-centered pedagogical approach. The results of this paper recommend that PJOK teachers continue to innovate in designing active and creative movement activities, so that weather and environmental constraints do not become obstacles in achieving learning objectives.

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