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The Effect of Dehydration Levels on the Training Volume of Special Class Pencak Silat Athletes in Semarang City

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Abstract
Optimal body hydration is essential in supporting physical performance and training effectiveness, especially in sports such as pencak silat, which demand strength, agility, and endurance. Fluid imbalance, or dehydration, can impair muscle function, accelerate fatigue, and hinder the body's ability to adapt to training loads. This issue is often overlooked, particularly among young athletes who may lack awareness of proper hydration practices. This study aims to examine the effect of dehydration level on the training volume of pencak silat athletes enrolled in the Special Sports Class (KKO) in Semarang City. Dehydration was assessed by observing urine color using a standard hydration scale, while training volume was measured through heart rate calculations based on the Karvonen formula. Data were analyzed using simple linear regression and Pearson correlation. The results revealed a significant negative relationship between dehydration level and training volume. Higher dehydration levels were associated with lower training volume among athletes. These findings emphasize the importance of hydration monitoring in youth athlete training systems to ensure effective performance development and reduce the risk of fatigue or injury.

Keywords: dehydration; training volume; pencak silat; hydration management

1. Introduction

Sports are an integral part of human resource development, not only for maintaining physical fitness, but also for shaping character, discipline, and competitiveness. Competitive sports, as one branch of the national sports system, require a planned, focused, and sustainable training process (Muhlisin et al., 2021). In this process, physical training is a key component which determines an athlete's performance. However, the effectiveness of training is highly dependent on the physiological readiness of the athlete's body, one of which is hydration status (Sidik, 2010).

Dehydration is a condition of fluid deficiency in the body that can affect the function of vital organs, including muscles and the cardiovascular system. In sports activities that involve high physical intensity such as pencak silat, fluid loss through sweat will increase, thereby increasing the risk of dehydration (Ulvie et al., 2017). If not properly managed, dehydration can reduce aerobic capacity, accelerate fatigue, hinder recovery processes, and even increase the risk of injury. This condition will certainly impact the low volume of training that athletes can perform (Baskara, Tamim, et al., 2020).

Training volume is a measure of the overall training load undergone by athletes in a given period of time. This volume includes the duration, frequency, and intensity of training. In the context of coaching young athletes, training volume must be adjusted to the body's adaptive capacity in order to improve performance without overloading the physiological system (Mahayuni, 2018). Poorly

controlled dehydration will reduce the body's tolerance to training load, causing a decrease in intensity and duration, and disrupting the process of learning techniques and strategies in sports (Leksana, 2015).

Pencak silat, as an indigenous Indonesian sport, has developed into one of the most reliable disciplines in national and international competitions (Nasri, 2019). In the city of Semarang, efforts to develop young athletes are carried out through the Special Sports Class (KKO) program, which collaborates with formal schools and the Youth and Sports Agency. This program aims to create accomplished athletes from an early age through an integrated training approach. However, in its implementation, several physiological problems have been identified, such as fatigue, inability to complete full training sessions, and complaints of muscle weakness. Initial observations by researchers while accompanying the training of KKO pencak silat athletes in Semarang at the Tri Lomba Juang Sports Hall showed that these symptoms could potentially be caused by a lack of attention to athlete hydration management.

Lack of awareness about the importance of adequate fluid intake, both by athletes and coaches, is one of the main causes of high dehydration rates among young athletes (Ulvie et al., 2017). In addition, the lack of a systematic and continuous hydration status monitoring system also makes it difficult for coaches to adjust training volume according to the athletes' physical condition. This has led to the need for scientific studies that can prove the relationship between hydration status (dehydration level) and training volume in pencak silat athletes (Baskara, Husni Tamim, et al., 2020). This study aims to analyze the effect of dehydration levels on the training volume of KKO Semarang City pencak silat athletes. It is hoped that the results of this study can provide a scientific basis for coaches, program managers, and policy makers in designing a more effective training system that takes into account basic physiological factors, particularly the hydration of athletes. This study is also expected to contribute to the development of sports science, especially in the aspects of training management and the performance of young athletes.

2. Method

This study uses a quantitative approach with a correlational design that aims to analyze the effect of dehydration levels on the training volume of pencak silat athletes. A correlational design was chosen because it is suitable for explaining the relationship between two variables in a predictive framework, namely the independent variable in the form of dehydration levels and the dependent variable in the form of training volume.

The population in this study consisted of all pencak silat athletes who were members of the Semarang City Special Sports Class (KKO) under the guidance of the Semarang City Youth and Sports Agency. The sampling technique used was saturated sampling because the population size was relatively small, namely 16 athletes, so the entire population was used as the research sample. Data collection was conducted using two types of instruments, namely tests and direct observation in the field. The level of dehydration was measured based on the color of the athletes' urine before training using a standard laboratory urine color chart. Urine color was categorized into four levels of hydration: not dehydrated (score 1-2), mildly dehydrated (3-4), moderately dehydrated (5-6), and severely dehydrated (7-8). Urine samples were collected before the training session began, and the data was classified according to this scale.

Meanwhile, exercise volume is measured by calculating heart rate using the Karvonen formula:

$$\text{HR Threshold} = \text{Resting HR} + 60\% \times (\text{Max HR} - \text{Resting HR})$$

where Max HR = 220 minus the athlete's age. Resting heart rate is measured before exercise, while heart rate after exercise is measured again to calculate the intensity of the heart's work during exercise. Based on the resulting HR threshold value, exercise volume is categorized from low to high. High exercise volume is indicated by a low-intensity heart rate (because it shows the body's ability to maintain activity for longer), while a high-intensity heart rate indicates low exercise volume.

The collected data were analyzed using simple linear regression statistical techniques to test the effect of dehydration levels on exercise volume. Prerequisite tests were conducted beforehand, including a normality test using the One-Sample Kolmogorov-Smirnov Test and a linearity test using ANOVA analysis. Hypothesis testing was performed using Pearson's correlation to determine the strength and direction of the relationship between variables. The coefficient of determination (Adjusted R^2) test was used to determine the extent to which dehydration levels contributed to explaining variations in training volume. The entire data analysis process was performed using SPSS software version 22.0.

The criteria for decision making in statistical testing are determined based on the significance value (p-value), with the provision that a p-value < 0.05 indicates a significant effect between the independent variable and the dependent variable, while a p-value ≥ 0.05 indicates no significant effect.

3. Result

Normality test

The normality test is used to determine whether the disturbance variable or residual in the regression model has a normal distribution. The t and F tests have previously shown that the residual values follow a normal distribution.

Table 1. Normality Test Results

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		**16**
Normal Parameters[a,b]	Mean	**.0000000**
	Std. Deviation	**.40034707**
Most Extreme Differences	Absolute	**.431**
	Positive	**.236**
	Negative	**-.431**
Test Statistic		**.431**
Asymp. Sig. (2-tailed)		**.000[c]**

The results of the analysis show a significance value of 0.41, where the residuals contribute normally because they are >0.05. This data makes the normality test results valid. Seeing that the sig value exceeds 0.05, the residual values contribute normally.

Linearity test

Using the ANOVA test (F test), the linearity test is used to determine whether there is a linear relationship between the independent variables and the dependent variables in this study.

Table 2. Table of linearity test results

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups (Combined)	0,414	5	0,083	0,409	0,832
Linearity	0,033	1	0,033	0,165	0,693
Deviation from Linearity	0,380	4	0,095	0,470	0,757
Within Groups	2,024	10	0,202		
Total	2,438	15			

The results of the analysis conducted on the ANOVA table show significant results in the Deviation from Linearity section, indicating a value of 0.757, where the significance value of deviation from linearity is >0.05. Therefore, there is a linear relationship between the independent variable and the dependent variable.

Hypothesis testing

Data analysis in this study used correlational analysis developed to test the relationship between self-confidence and flexibility. The researcher used this analysis technique because product moment correlation analysis is suitable for testing hypotheses regarding the relationship between variables.

Table 3. Hypothesis test results

Variable	N	Pearson Correlation (r)	Sig. (2-tailed)
Dehydration Level - Exercise Volume	16	-0,460	0,034

The results of the analysis show significance at 0.001, where the significance value of deviation from linearity is < 0.05. Therefore, H_0 is rejected and Ha is accepted. This means that there is a relationship between the independent variable and the dependent variable.

Simple linear regression test

A simple linear regression test is a statistical method for investigating the relationship between one independent variable (explanatory) and one dependent variable (dependent). The goal is to predict the value of the dependent variable based on the value of the independent variable.

Independent, and measure how strong the relationship is. To determine the magnitude of the influence of both variables, use the R Square or R2 value guideline found in the SPSS output in the following Model Summary section:

Table 4. Simple linear regression test results table

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

1	.735[a]	.541	.508	.283

The results of the analysis show an R2 value of 0.541, which means that variable X has a 54.1% effect on variable Y, while the remaining 45.9% is influenced by variables that were not examined.

Coefficient Test

A coefficient test is a series of statistical tests used to evaluate the relationship between variables in a model, especially in regression analysis. The goal is to determine how well the model explains the data and how significant the independent variables are in influencing the dependent variables. The results of the analysis show a figure of 4.462 in the unstandardized coefficients section, indicating that if there is no variable X, variable Y will still produce a value of 4.462

4. Discussion

The study was conducted during the first week of November, specifically on the 3rd. Hydration status data was collected by collecting athletes' urine, followed by exercise volume data collection by calculating heart rate in beats per minute. The results of the research data analysis showed that 3 athletes or 18.75% of the sample were not dehydrated, while 5 athletes or 31.25% of the sample were mildly dehydrated, and 8 athletes or 50% were moderately to severely dehydrated. Meanwhile, the analysis of training volume data showed that 13 athletes out of 16 athletes or 81.25% of the sample had high training volume, while 3 athletes or 18.75% of the total athletes had low training volume.

The results of the normality test show a significance value of 0.41, where the residuals contribute normally because they are >0.05. The results of the linearity test conducted on the ANOVA table show a significance value of 0.757 in the Deviation from Linearity section, where the significance value of deviation from linearity >0.05. Therefore, there is a linear relationship between the independent variable and the dependent variable.

Table 5. Dependent variable: exercise volume

Results of Coefficient Test Data Analysis						
Model		Unstandardized Coefficients		Standardized Coefficients	t	**Sig.**
		B	Std. Error	Beta		
1	(Constant)	4.462	.175		25.507	**.000**
	Hydration level	-.149	.037	-.735	-4.061	**.001**

The results of the hypothesis test analysis show a significance level of 0.001, where the significance value of deviation from linearity is < 0.05. Therefore, H_0 is rejected and Ha is accepted. This means that there is a relationship between the independent variable and the dependent variable. The results of the simple linear regression test show an R2 value of 0.541, which means that variable X has a 54.1% effect on variable Y, while the remaining 45.9% is influenced by variables that were not examined. The results of the coefficient test analysis show a figure of 4.462 in the unstandardized coefficients section, indicating that if there is no variable X, variable Y will still produce a value of 4.462.

Hypothesis testing shows a significance value of 0.001, which is less than the probability of 0.05, so it can be concluded that Ho is rejected and Ha is accepted, which means that there is an "effect

between hydration level and exercise volume." Putriana in Setiawati YN (2015) explains that athletes who start training with good hydration status are not necessarily well hydrated after training. Athletes can achieve good hydration status by consuming sufficient fluids before, during, and after training.

5. Conclusion and Recommendation

In youth athlete development systems such as those implemented in the Special Sports Class (KKO) program, attention to basic physiological factors is often not a top priority. However, the success of long-term training is greatly influenced by the athlete's internal condition, which supports progressive load adaptation. Poor hydration not only hinders the achievement of training goals, but also risks creating accumulated fatigue and the potential for early injury, which can disrupt the continuity of the training process.

Awareness of the importance of fluid intake needs to be instilled not only in athletes, but also in coaches and program managers. Hydration should not be viewed as a minor technical issue, but rather as an integral part of training planning. Regular evaluation of body fluid status, regulating drinking times before and after training, and education about the early signs of dehydration should be part of daily training habits. By paying attention to these things, the effectiveness of training programs can be improved, while also building a healthier and more sustainable training culture.

The findings in this study reinforce the importance of a scientific approach in developing training programs. Rather than focusing solely on increasing training volume or load, a good training strategy should take into account the overall physiological readiness of athletes. In this case, hydration is a simple variable but has a major impact on performance and the sustainability of the training process, especially for adolescent athletes who are in a critical phase of physical development and sports skills.

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