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Determinants of Hydration Status in Martial Athletes at The Student Sports Training Center Jakarta

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ABSTRACT

Adolescent athletes are a group that's vulnerable to decreased water content and has a higher risk of dehydration. Results show that 22% of adolescent athletes were highly dehydrated. This study aims to observe the determinants of hydration status for martial arts athletes in Pusat Pelatihan Olahraga Pelajar (Student Sports Training Center) DKI Jakarta. The research uses a quantitative method with a cross-sectional design and a sample of 50 martial arts athletes (13-18 years). Data was obtained through food recall 1x24 hours for fluid consumption, nutritional status with BMI/U, percent body fat with Ultrasonic Body Fat Analyzer SR-HW 05 Serenity instrument, physical activity with PAL sheets, and hydration status with Specific Gravity values. Data analysis using Pearson correlation test. The results showed a significant correlation between female nutritional status ($p<0.05$), and male and female fluid consumption ($p<0.05$) with the hydration status of martial arts athletes. However, there was no significant correlation between male nutritional status, male and female percent body fat, and male and female physical activity with hydration status of martial arts athletes ($p>0.05$). Fluid consumption is a factor that affects the hydration status of male and female martial arts athletes. Athletes need to maintain their hydration status to carry out training and competitions optimally.

Keywords: hydration, martial arts athletes, nutrition.

INTRODUCTION

There are various types of sports, including martial arts. This branch itself consists of many specific sport sub-types, including wrestling, judo, and karate. Teenagers and youth are two of the groups of people who actively study martial arts as a competitive sport. Most athletes receiving championships are included in this population, which is also considered the productive age. The achievements of martial artists are determined by many factors, one of them is performance which is closely related to the nutritional approach. Water becomes one of the most important nutritional elements (Kuswari, 2016). Inadequate water intake leads to immediate tiredness and athletes are likely to have less optimal performance (Rachmawati, 2013). A study in Brazil showed that 22% of adolescent athletes consumed water below the limit, resulting in dehydration (De Sousa et al., 2008). Several factors cause dehydration, which are nutritional status, body temperature, fluid intake, ecological area, economy, body composition, water expenditure, age, gender, knowledge, and

physical activity (Hardinsyah, 2009). Martial artists or martial athletes are potentially dehydrated because their brains cannot properly detect signals of thirst and dehydration during exercise. In line with the meta-analysis conducted by Bayram (2020), the results showed that the Urine Specific Gravity (BJU) value of 15-year-old judo athletes was dehydrated as much as 81.2% in the morning, 63.64% before training, and 77.27% after training. Based on Mujib's research (2019) shows that 12 pencak silat athletes in the East Java PUSLATDA are 100% dehydrated with mild dehydration categories I, II, and III. There are 8% of the athletes included in the moderate dehydration I group, 17% in the moderate dehydration II group, and moderate dehydration level III as much as 42%. This shows that there is a relationship between fluid consumption and hydration status in martial arts athletes. According to Murray (2007), a lack of fluid consumption that causes dehydration is harmful to health and makes the body's workload heavier.

Based on the results of research by Merita et al., (2018) related to physical activity factors, the results show that there is a relationship between physical activity and hydration status. Physical activity is also widely known to directly correlate to dehydration status in a dependent manner. The higher the volume of physical activity further increases the likelihood of dehydration. School-age children and adolescents generally have activities that have the potential to drain energy. As a result, experiencing an imbalance in energy absorption and energy output can result in the child's body being underweight and easily dehydrated (Almatsier, 2005). Nutritional status factors show, that regulating energy and nutrient balance is very important. Both insufficient and excessive nutrition intake affect nutritional status, hydration status, and body health. According to (Rismayanthi, 2015), competition in the world of sports has increased the risk of developing anorexia nervosa, especially in martial arts (wrestlers, judo, and karate), where body weight is closely tied to performance. In addition, based on research conducted by Sepriadi (2019) related to athletes' weight loss problems, such as pencak silat. Some martial arts athletes deliberately vomit when going to do body weighing. This of course can have an impact on the nutritional status and hydration status of athletes to be disrupted because when athletes regurgitate food that has been eaten, food will come out mixed with fluids that come from the body which can make the body weak and lack fluids.

Youth martial arts, such as wrestling, judo, karate, and pencak silat require greater attention because the high exercise intensity affects various body composition features. Body composition has the potential to affect the fluid balance that the body needs. People with less fat mass have higher total body water composition compared to people with a lot of fat mass since water in muscle cells is higher than in fat cells. Thus, obese people are more likely to lack fluids than non-obese people (Hardinsyah, 2011). According to the study (Prayitno &; Dieny, 2012), dehydration is more common in obese adolescents (83.9%) than non-obese adolescents (51.6%).

Based on observations, martial arts athletes at the Student Sports Training Center in DKI Jakarta train twice a day in the morning and the evening until night. This routine is chosen since they also need to attend school as students in the Ragunan Special School for Sportsmen after morning training. Exercise in the afternoon to evening needs more attention because the activities they have

done before have the potential to cause a lack of fluids or dehydration. Athletes have the potential to become dehydrated during training, especially athletes who are not adequately informed about the fulfillment of nutrients and fluids during their exercise. The purpose of the study was to discover the determinants of hydration status in martial arts athletes at the DKI Jakarta Student Sports Training Center.

METHODS

This type of research uses quantitative methods through a cross-sectional design approach. The implementation of this research is directed at martial arts athletes (wrestling, judo, karate, and pencak silat) at the DKI Jakarta Student Sports Training Center on January 17-27, 2020. The number of research subjects was 50 respondents, determined through saturated sampling with inclusions: 1) samples recorded as athletes at the DKI Jakarta Student Sports Training Center; 2) the age of the sample is classified as adolescence; 3) the sample is in good health; 4) Willing to be a sample from the beginning to the end of the study. This research earns ethical approval from the Commission of Research Ethics in Universitas Esa Unggul No. 0445-19.443/DPKE-KEP/FINAL-EA/UEU/VIII/2019.

The data collected consisted of data on respondents' characteristics, anthropometry, body composition, fluid consumption, physical activity, and hydration status. Data on respondents' characteristics, including name, date of birth, gender, age, education, and sports were collected through forms and analyzed using descriptive analysis. Data on the nutritional status of respondents were obtained by weighing and measuring height using a microtome. Then, it was calculated using a Z-score based on Body Mass Index according to Age (BMI / U). Percent body fat is obtained from the results of body composition measurements using Bioelectrical Impedance Analysis (BIA) with the Ultrasonic Body Fat Analyzer SR-HW 05 Serenity instrument. Fluid consumption is obtained from a 1x24-hour food recall form to seek knowledge about the intake of food and beverages consumed by respondents for 1 day (the result is in the form of URT which will be converted into grams and mL based on the Indonesian Food Composition Table in 2017). Physical activity is obtained from a 1x24-hour physical activity recall form with Physical Activity Level (PAL) measurements. Hydration status is obtained from the urine test form related to Urine Specific Gravity (BJU).

Data is analyzed through coding, cleaning, and processing stages. Univariate analysis was used to derive the frequency distribution of each dependent variable (hydration status) and independent variable (nutritional status, percent body fat, fluid consumption, and physical activity). Bivariate analysis is used to see the significant or insignificant relationship between independent and bound variables by utilizing the Pearson correlation test (normally distributed variables).

RESULT AND DISCUSSION

In total, there were 50 martial artists from different sports with characteristics:

Table 1. showed that the frequency distribution of respondents' characteristics, mostly male, was 32 respondents (64%). The age of respondents was mostly in the middle adolescent category (15-17 years) as many as 36 respondents (72%). Most of the respondents were high school/equivalent students, as many as 32 respondents (64%).

The respondents' sports consisted of Wrestling, Judo, Karate, and Pencak Silat. Most of them came from Judo as many as 15 respondents (30%).

Table 2. shows the distribution of respondents based on nutritional status, percent body fat, fluid consumption, physical activity, and hydration status of martial artists at the DKI Jakarta Student Sports Training Center.

The results of nutritional status measurements showed that men had an average of 0.53 ± 0.79 SD with the lowest to highest value distribution, namely -1.44 – 2.14 SD, while women had an average of 0.32 ± 0.60 SD with the lowest to highest value distribution, namely -0.60 – 1.18 SD. The results show that the nutritional status of male and female athletes is included in the normal category (-2 – 1 SD) according to the Ministry of Health (2011).

The results of fat percent measurements showed that each man and woman has an average of 16,262 ± 4,738% and 24,256 ± 3,392%, so it is classified as acceptable (15-18%) in men and acceptable (20-25%) in women according to Williams (2002).

The results of measuring fluid consumption in this study were obtained from the results of food recall 1x24 hours using the conversion of the assessment of the Indonesian Food Composition Table in 2017, where the average results of fluid consumption were obtained of 2059.3 ± 498.5 mL with the lowest to highest value distribution, namely 1210 - 3174 mL in men and 2084.8 ± 620.9 mL with the lowest to highest value distribution, i.e. 1074 – 3533 mL in women.

The results of the distribution of respondents' physical activity obtained from PAL measurements obtained the most physical activity in men and women in the category of heavy activity. Men have an average of 2.47 ± 0.46 / minute and have the lowest to highest value distribution of 1.40 - 3.32 / minute, while women have an average of 2.60 ± 0.37 / minute and have the lowest to highest value distribution of 1.78 - 3.29 / minute.

The results of the hydration status measurement of respondents in this study were obtained from primary data using urine samples in the morning and Urine Reagent Strips (Dipstick) with Urine Specific Gravity (BJU) assessment in men and women with an average of 1,017 ± 0.006 g / mL and 1,018 ± 0.007 g / mL, which are included in the category of mild dehydration (1,010 – 1,020 g / mL) according to Fink (2013).

Table 3. represents the results of the Pearson correlation test of nutritional status, percent body fat, fluid consumption, physical activities, and hydration status of martial artists at the DKI Jakarta Student Sports Training Center. Based on the results of the analysis of the relationship between nutritional status and hydration status of male martial arts athletes having an r-value of 0.026, it shows that there is a sufficient and positive relationship. Based on its significance with a p-value of 0.889 ($p>0.05$) shows that H0 fails to be rejected, there is no significant relationship between

nutritional status and male hydration status. No significant association can be caused because athletes who have normal or abnormal nutritional status (fat and thin) can still be dehydrated.

This study is not in line with the research of Merita et al., (2018) which shows there is a significant relationship between nutritional status and hydration status, namely with p-Value = 0.026 ($p<0.05$), r = 0.235, and is not in line with the results of other studies that state there is a significant relationship between hydration and obesity. However, this study is in line with research, namely the relationship between nutritional status and hydration status showed meaningless results p = 0.606 ($p>0.05$).

Table 1. Frequency Distribution of Respondent Characteristics

Respondents Characteristics	Amount (n)	Percentage (%)
Sex:		
Male	32	64
Female	18	36
Age:		
Early adoloscent (age 11-14)	6	12
Middle adoloscent (age 15-17)	36	72
Late adoloscent (age 18-21)	8	16
Educational Background:		
Secondary School	18	36
High School	32	64
Sports		
Wrestling	13	26
Judo	15	30
Karate	12	24
Pencak Silat	10	20
Total	50	100

The r result from the relationship between nutritional status and hydration status of women, is -0.567*. These results show that the higher the nutritional status, the lower the hydration status. Meanwhile, the results of the test of the relationship between nutritional status and hydration status of women with the Pearson correlation, namely p-Value = 0.014 ($p<0.05$), mean that there is a significant relationship between nutritional status and hydration status of women. These results are in line with other studies that show that dehydration is often experienced by adolescents with obesity compared to non-obesity. The result was shown by p = 0.026 (Pertiwi, 2015). This is supported based on Buanasita (2015) who explained, that people who have obese status have a higher

dehydration average, which is 77.8%. While the remaining 22.2% in non-obese people suggests that nutritional status may affect hydration status.

One of the various risk factors for dehydration is excessive weight because there is an electrolyte imbalance in the body which suppresses increased appetite. As a result, fluid intake in the body has the potential to decrease. Overweight people have excess fat, while water is an important point in fat metabolism. According to its basic law, fat is soluble in water. The evidence was in a study of the nutritional status of obese and non-obese adolescents which showed that dehydration was most prevalent in obese adolescents, which was 83,9%; while non-obese adolescents was 51,6% (Prayitno & Dieny, 2012).

Table 2. Frequency Distribution of Nutritional Status, Body Fat Percent, Fluid Consumption, Physical Activity, and Hydration Status of Martial Arts Athletes at the DKI Jakarta Student Sports Training Center

Variable (unit)	Sex	
	Male	Female
	Mean ± SD	Min – Max
Nutritional Status (SD)	0.53 ± 0.79	-1.44 – 2.14
Body Fat Percentage (%)	16.262 ± 4.738	8.6 – 29.7
Fluid Intake (mL)	2059.3 ± 498.5	1210 – 3174
Physical Activity (per min)	2.47 ± 0.46	1.40 – 3.32
Hydration Status (g/mL)	1.017 ± 0.006	1.005 – 1.030
Nutritional Status (SD)	0.32 ± 0.60	-0.60 – 1.18
Body Fat Percentage (%)	24.256 ± 3.392	19.0 – 31.7
Fluid Intake (mL)	2084.8 ± 620.9	1074 – 3533
Physical Activity (per min)	2.60 ± 0.37	1.78 – 3.29
Hydration Status (g/mL)	1.018 ± 0.007	1.005 – 1.030

The percentage of fat in the body is the ratio between total mass and body fat (Lukaski et al., 1985). Body composition, one of which is percent body fat will affect body fluid balance. The results of the analysis of the relationship between body fat percent and male hydration status using the Pearson correlation test had a p-value = 0.368, while the relationship between body fat percent and female hydration status had a p-value = 0.314, it showed that the results of fat percentage in the bodies of male and female athletes did not find a significant relationship between body fat percent and hydration status.

The absence of a significant relationship between body fat percent and hydration status can be caused because when viewed from body composition data, high and low percent body fat still have high urine specific gravity values which means dehydration. This study is in line with Eviani et

al., (2022), which uses the Pearson correlation test which states that there is no relationship between percent body fat and urine-specific gravity in weight training activists.

This research is supported by Hardinsyah's statement (2011). Someone who has more fat percentage will have lower total water in his body compared to people with less body fat percentage because the water content in fat cells is lower than in muscle cells.

Table 3. Relationship between Nutritional Status, Body Fat Percent, Fluid Consumption, Physical Activity, and Hydration Status of Martial Arts Athletes at the DKI Jakarta Student Sports Training Center

Independent Variable	Pearson Correlation			
	r		p-Value	
	Male	Female	Male	an
Nutritional Status	0.026	-0.567*	0.889	0.014
Body Fat Percentage	-0.165	-0.252	0.368	0.314
Fluid Intake	-0.967**	-0.966**	0.0001	0.0001
Physical Activity	0.004	0.184	0.983	0.464

(*) or (**)The results of statistical tests on the Pearson Correlation value indicate that between the variables analyzed, there is a correlation.

Due to this condition, people with obesity are more easily dehydrated than non-obese. Differences in a person's body fat composition will lead to different consumption. Water intake is all water content from various foods and beverages, as well as metabolic water (Manz & Andreas Wentz, 2003). Consuming fluids is regulated through thirst and satiety. It can be known through various changes in the mouth, hypothalamus, and stomach. A person's drinking consumption is influenced by various factors including lack of fluids, one's drinking culture (taboo), the quality of one's drinking, and one's drinking availability. Drinking habits in the dormitory as well as at home were everything related to the drinking and drinking of respondents.

It is important for athletes to always maintain hydration status to maintain their hydration levels, especially before, during, and after training or competition because it can affect the performance and concentration of athletes. Adolescent athletes are particularly at risk of fluid loss during physical activity, especially during sports. Adolescents are a group that is vulnerable to a decrease in water content. Fluids are needed by the body for transportation media, body temperature control, and solvents. Therefore, the body's output water needs to be replaced immediately by consuming enough fluids to avoid dehydration (Santoso, 2012).

Based on the distribution of the frequency of fluid consumption, the average results of fluid consumption in martial artists were 2059.3 mL in men and 2084 mL in women. The highest values

were 3174 mL in men and 3533 mL in women. Based on the 2019 Daily Value Table, the average daily fluid consumption of martial arts athletes aged 13-18 years is recommended to consume fluids as much as 2,4 – 3,2 L / day, while female athletes (13-18 years) as much as 2,1 – 2,3 L / day (WHO & Grandjean, 2004), so it can be concluded that the distribution of fluid frequency in male and female martial arts athletes at the DKI Jakarta Student Sports Training Center is not as recommended. Many factors affect the hydration status of martial artists at the DKI Jakarta Student Sports Training Center.

Lack of fluid consumption can cause dehydration, especially for athletes, and make the workload on the body heavier (Irawan, 2007). If the water released by the body is not balanced by consuming enough fluids, body cells can lose fluid, the estuary will become dehydrated. The effects of dehydration will cause fatigue (Rahayu, 2002).

High fluid consumption can also affect hydration status because several types of fluids can trigger the body to become dehydrated. (Penggalih &; Huriyanti, 2007) states, that consuming tea, coffee, and alcohol with high doses can stimulate a decrease in fluid in the body. Because this type of faith has a reaction effect as a diuretic. Putriana (2014) said drinks containing carbon can reduce fluid consumption.

In general, fluid recommendations for athletes contain minerals, electrolytes, carbohydrates, and proteins (Penggalih et al., 2016). Carbohydrate content can supply energy in the form of liquids. The goal is to be more easily absorbed by the body, accelerating the replacement of glucose that is reduced during exercise and recovery. Then, protein is good for repairing muscle tissue when undergoing recovery. Then, consumption of vitamin C foods and drinks is also good for the athlete's immunity (Greenwood et al., 2008).

This research is not in line with research conducted by Rismayanthi & Ramdhan (2016) on male and female basketball athletes of Kejurda U-18 Indramayu Regency. The results of the relationship test with Pearson Correlation between fluid consumption and hydration status have a p-value (sig.) = 0.399, where $p > 0.05$. Thus, H0 is accepted and Ha is rejected. That is, there was no significant relationship between fluid consumption and hydration status. The difference in research results can be caused by differences in age characteristics and intensity of training undertaken by athletes.

However, this study is by Yurezka et al., (2017) on adolescent athletes in the city of Semarang, where the results of the Spearman Rank statistical test of the relationship between fluid consumption and hydration status, $r = -0.718$ and $p = 0.001$. This signifies, $p<0.05$, that there is a significant relationship between fluid consumption and the hydration status of adolescent athletes in the city of Semarang. Thus, the high volume of fluid consumption can further reduce the specific gravity of urine. This research is also in line with the results of Fitriyah's research (2018) on Hockey athletes at the Hockey UKM Universitas Pancasila which states there is a relationship between fluid consumption and hydration status, where the p-value value = 0.002. Based on observations, most

of the fluid consumption of martial arts athletes at the DKI Jakarta Student Sports Training Center comes from water, soupy foods, and fruits that contain high water, such as watermelon.

Physical activity in this study was obtained using physical activity recall 1x24 hours and the results of the recall were then calculated by the Physical Activity Level (PAL) formula. Based on the results of research on the relationship between physical activity and hydration status of men and women using the Pearson correlation test, it has an r value = 0.004 in men and an r value = 0.184 in women. That is, the r-value of the physical activity of men and women in the correlation test was seen based on its significance with p-value = 0.983 and p-Value = 0.464 (p>0.05), showing H0 failed to be rejected which means there was no significant relationship between physical activity and hydration status of men and women. The absence of a significant association between physical activity and hydration status of both men and women is because most athletes have strenuous physical activity and are dehydrated.

Heavy or light physical activity has the same chance of dehydration. Light activity can also reduce fluid consumption. As a result, it has the opportunity to become dehydrated (Briawan, 2011). Kant (2009) states, that heavy physical activity has a relationship with water from drinks and total water intake, it can affect hydration status.

This study is not in line with Anggraeni & Fayasari's (2020) research on Jakarta National University Students which states that physical activity during exercise has a significant relationship with dehydration, judging from the value of p = 0.004 (p < 0.05). This happens because according to aerobic exercise is an exercise that makes the heart and lungs work harder to meet the increasing need for oxygen, so it can be said that the heavier the intensity of exercise, the higher the value of hydration status.

Aerobic and anaerobic exercise of various intensities still cause dehydration. This dehydration can reduce exercise performance, but dehydration can affect performance only after reaching a certain duration (Keen et al., 2016). Good hydration can help overcome the problem of dehydration and can indirectly affect exercise performance. However, there is no one universal hydration strategy that athletes can apply to reduce performance decline due to dehydration because each sweats and loses sodium at different rates (Ayotte Jr. &; Corcoran, 2018).

However, this study is in line with the research of Yurezka et al., (2017) on adolescent swimming athletes in the city of Semarang, where the results of the Spearman Rank statistical test regarding the relationship between physical activity and hydration status with values r = 0.179 and p = 0.344. This shows that the value of p>0.05, means there is no significant relationship between physical activity and hydration status of adolescent swimming athletes in the city of Semarang. This is also in accordance with Purba (2018, wherein adolescent soccer athletes at Asiop Apacinti with the results of the Pearson correlation statistical test between physical activity and hydration status showed that the value of sig = 0.081 (p>0.05) and r = 0.244 which means there is no significant relationship between physical activity and hydration status related to Urine Specific Gravity (BJU) in youth soccer athletes at Asiop Apacinti.

Based on observations, athletes consume less fluids during moderate and heavy physical activity. Athletes only drink 500 mL – 1 L of water during heavy-intensity exercise. Even though it should be, athletes drink enough fluids during moderate and heavy-intensity training so that the body does not experience dehydration and fatigue which results in decreased athlete performance and concentration.

CONCLUSION

Fluid consumption is a factor that affects the hydration status of martial artists, both male and female. Limitations in this study, namely: 1) there is a limited time during the data collection process on respondents because researchers only have a short time to interview respondents because the interview was only held during lunch breaks. However, to reduce the bias data generated by researchers bring enough enumerators to help the course of research (supervision of data collection).; 2) Food and beverage intake recall data is only carried out during 1x24 hour, which will produce unrepresentative data to describe the daily eating habits of individuals. Therefore, 24-hour recall should be done at least 2x24 hours consecutively to provide a more optimal picture of nutrient intake and provide greater variation in individual daily intake. In future studies, it is expected that other researchers who want to conduct research on hydration status in martial arts athletes, to conduct further research on fluid knowledge and the importance of education on meeting fluid intake for the body.

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