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The Effect of Isotonic Drinks and Yellow Watermelon Juice on the Hydration Status of T-Rex Jawa's Football and Futsal Players

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ABSTRACT

Hydration status is a condition that describes fluid balance in the body and is essential to ensure the metabolic function of body cells. This study aimed to determine the effect of giving isotonic drinks and yellow watermelon juice on the hydration status of futsal and soccer players of T-Rex Jawa Semarang. This research is a *quasi-experimental* research using *a crossover design*. The sample comprised 26 people, all used as control and treatment groups. The control group was given 350 ml of isotonic drink, and the treatment group was assigned 350 ml of yellow watermelon juice. Measurements in this study included weight, height, physical activity, energy intake, nutrients and fluids, and hydration status values. The results showed differences in hydration status values before and after treatment in both the control and treatment groups. The *Mann-Whitney* test showed p = 0.006, i.e., there was a significant difference between the decrease in hydration status values of the control group and the treatment group, where the control group showed a more significant decrease. Nutritional status, physical activity, energy intake, macronutrients, minerals, and fluids did not correlate with hydration status. This study concludes that isotonic drinks affect the hydration status value of futsal and soccer players of T-Rex Jawa Semarang.

Keywords: hydration status, isotonic, yellow watermelon

INTRODUCTION

Football and futsal are the most famous and popular sports by almost all residents in various parts of the world. Football is a high-intensity and *intermittent* endurance sport that requires strength and endurance for approximately 2 x 45 minutes (Rizky, 2016). Futsal and football have some similarities. This can be seen from its characteristics, which are both using the field, several players work together to put the ball into the goal guarded by the *keeper*. However, futsal ball, field, and goal size are more petite than football (Badaru, 2017).

Futsal and soccer involve elements of physicality, technique, and tactics with high intensity. High exercise intensity is one of the factors causing the amount of sweat released by the body. The body will produce sweat to lower body temperature, which rises during exercise. This mechanism can lead to dehydration (Penggalih, 2016). Dehydration is a lack of fluids in the body or an imbalance of body fluids caused by an imbalance in the absorption and excretion of fluids. The Indonesian Regional Hydration Study on water intake results conducted in Indonesia show that the incidence of mild dehydration is higher in adolescents than adults, with adolescents at 49.5% and adults at 42.5%

(Sudarsono *et al.*, 2019). Research conducted in Central Java on soccer athletes showed moderate dehydration in 89.4% of athletes, and as many as 10.6% experienced minimal dehydration (Setiawan, 2016).

Athletes must maintain fluid balance in the body through regular fluid intake patterns before, during, and after exercise to function properly, especially thermoregulation or heat regulation functions (Salam, 2020). Dehydration and reduced carbohydrate stores are the two main factors that can reduce the body's performance during exercise. Therefore, athletes/sports activists should have the right drinking strategy to keep the body hydrated (Murray, 2007).

Fluid regulation is one way to prevent dehydration because, during exercise, the body needs fluids and carbohydrates that can be met by consuming 600 – 1500 ml of water and adding 24 – 100 grams of carbohydrates (4 – 7% carbohydrate solution) per hour which can be obtained from drinks containing carbohydrates and electrolytes including fruit juice, vegetable juice, milk and sports drinks (Dieny & Putriana, 2016). One drink that can be used as an option to overcome dehydration is an isotonic drink.

Isotonic drinks, as a substitute for body ions on the market, have a composition of water, sugar, citric acid, sodium citrate, sodium chloride, potassium chloride, potassium lactate, magnesium carbonate, and citrus flavorings. Isotonic drinks are intended for athletes. Body fluids lost during activity can be immediately replaced with this drink. However, in the long term, consumption of isotonic drinks contains some dangers. Galemore (2011) says that sports drinks containing carbohydrates should be avoided or limited because they can cause excess calories and increase the risk of overweight, obesity, and tooth decay.

Another alternative to supply carbohydrates and fluids to the body is a combination of fresh fruit and water, one of which is yellow watermelon (Dieny and Putriana, 2016). Yellow watermelon in 100 gr contains water 92.1%, carbohydrate content of 6.9 gr, and *citrulline* of 160 mg (Arifianto, 2008). In addition, yellow watermelon also contains many macro minerals, namely potassium, magnesium, sodium, and micro minerals, such as zinc, magnesium, and manganese. The nutritional content of yellow watermelon skin is not inferior to the fruit. Potassium is one of the minerals found in the skin of yellow watermelon, which is relatively high, 112 mg per 100 grams (Riasman, 2012). Potassium is believed to replace fluid in the intracellular space when dehydration occurs. Potassium is one of the components of isotonic drinks that binds sodium, chloride, and glucose. Potassium maintains fluid and electrolyte balance and acid-base in the body (Fadlilah *et al.*, 2021).

Several studies have been conducted on the effect of giving isotonic drinks and yellow watermelon juice on hydration status. The study from Lutvida (2018), which examined the effect of giving watermelon juice and isotonic drinks on hydration status in 10 male futsal athletes with an average age of 20.5years old in Cimahi City, showed results that giving watermelon juice and isotonic drinks can maintain hydration status and prevent dehydration in futsal athletes. Another

study examined the *pre-posttest design without control group design* on the effect of watermelon peel juice (*Citrullus lanatus*) on hydration status in 18 student soccer athletes at Universitas Ahmad Dahlan football UKM, showing the results that there was a decrease in the average specific gravity of urine after being given watermelon peel juice (Fadlilah *et al.*, 2021). Based on the background above, there is a need for further testing on the Effect of Isotonic Drink and Yellow Watermelon Juice on the Hydration Status of Semarang Java Futsal and T-Rex Football Players.

METHOD

This type of research is quasi-experimental with a *crossover design*. The research was conducted on the football field at Diponegoro University, Pleburan, and Manunggal Jati Sports Hall Semarang in July - August 2022. An unpaired numerical analytical formula determined the number of research samples, which obtained a minimum sample number of 26 subjects. The sampling technique used was purposive random sampling where the number met the inclusion criteria registered as members of the TRJ Semarang futsal and football clubs, male, aged 15-19 years, actively participated in the exercise at least one time every week, subjects were in good health, did not take drugs and supplements during the study.

Measurements in this study included weight, height, physical activity, energy intake, nutrients and fluids, and hydration status values. The stages of research consist of stages of preparation and implementation. The preparation stage includes providing informed consent to respondents and taking respondent data, including name, date of birth, age, residential address, disease history, and *mobile phone* numbers that can be contacted. The implementation stages include a pre-test, isotonic drink, yellow watermelon juice, and post-test. The isotonic drink used is pocari sweat, then the yellow watermelon juice used is given in fruit form and blended until liquid. Each of these products is given two times in 1 week at weeks 2 and 5, with each administration of 350ml. In weeks 1 and 4, all subjects were asked to pretest first without intervention before the test began. Then, in week three, all subjects rested for one week from various interventions and hydration status measurements before entering the next stage of the testing period, known as the washout period.

Data analysis includes univariate analysis to describe the characteristics of research subjects (age, height, weight, BMI / you, and physical activity), description of nutritional status and physical activity of research subjects, average energy and nutrient intake of research subjects, and descriptions of energy and nutrient intake of research subjects. Bivariate analysis was carried out to determine the difference in hydration status values before and after intervention in both the treatment group and the control group using the Wilcoxon test, as well as to determine whether there were differences in the values of the subject's hydration status between the control and treatment groups using the Mann-Whitney test. Multivariate analysis conducted to determine whether or not there is an influence of variables suspected of disturbing (confounding variables) on the dependent variables in this study uses multiple linear regression tests.

RESULTS AND DISCUSSION

Table 1. Characteristics of the Research Subject

Characteristic	Average ± SD (n=26)	Min	Max
Age	16.85 ± 1.43	15	19
Height (cm)	168.91 ± 7.42	151,00	184,30
Weight (kg)	58.00 ± 9.41	43,10	77,50
BMI/U (*z score*)	-0.19 ± 0.80	-1,45	0,88
Physical activity (kcal)	971.58 ± 275.34	626,04	1516,28

Table 1 showed all 26 subjects with an age range of 15 – 19 years. The height range of the subjects ranged from 151 – 184.3 cm, and the weight range ranged from 43.1 – 77.50 kg. The subject was 16 years old, with an average BMI / U z score of -0.19, which means that the subject has an excellent nutritional status (normal). The average physical activity of the subject was 971.58 kcal, which is a physical activity classified as moderate.

Table 2. Differences in Hydration Status Values Before and After Intervention in Control and Treatment Groups

Group	Hydration Status	Average ± SD	Min	Max	P value
Control	Before	1026.34 ± 3.33	1020,00	1030,00	0.001*
	After	1022.78 ± 4.81	1015,00	1030,00	
Treatment	Before	1028.26 ± 2.80	1020,00	1030,00	0.001*
	After	1025.76 ± 3.51	1017,50	1030,00	

#Non-parametric test (*Wilcoxon test*)
*Difference in significance value at 0.05 level

Table 3. Test Results of Different Differences in Hydration Status Values of Control and Treatment Groups

Group	Average ± SD		P value
	Control	Treatment	
Post-Intervention Hydration Status Assessment	1022.78 ± 4.81	1025.76 ± 3.51	0.012*
Δ Hydration Status Values before and after intervention	3.75 ± 2.85	2.50 ± 2.121	0.006*

#Non-parametric test (*Mann-Whitney test*)
*Difference in significance value at 0.05 level

Table 2 showed differences in hydration status values between before and after the intervention in both the control and treatment groups. However, from the results of statistical tests on Tabel 3, it is known that there is a significant difference between the decrease in hydration status values between the control group and the treatment group, where although both groups experienced a decrease in hydration status values, the more significant decrease (3.75 ± 2.85) was shown by the control group compared to the treatment group (2.50 ± 2.121). So, it can be concluded that the group of subjects who consumed 350 ml of isotonic drinks before the test provided better hydration

status values than those who consumed 350 ml of yellow watermelon juice. The results of this study are in line with research conducted by Flora (2005), proving that there is an effect of *giving pocari sweat* on changes in urine color in the rehydration process in athletes, as evidenced by significant changes before and after *exercise* in athletes.

Isotonic drinks or *pocari sweat* contain many nutrients, such as glucose and ions needed by the body, such as sodium, potassium, magnesium, calcium, and hydrogen. Glucose and sodium ions are the most essential nutrients to replace body fluids. The binding of Na^+ increases affinity for glucose. Glucose that enters cells throughout the body is used for cellular respiration. Cellular respiration is a metabolic process that can produce ATP to maintain body functions. Nutrients in isotonic drinks result in faster gastric emptying time. They can be absorbed in the small intestine to replace electrolytes and energy quickly lost during physical activity compared to mineral water drinks (Pramono et al., 2014).

Yellow watermelon juice containing water, carbohydrates, and potassium can help prevent dehydration after physical activity. This is because potassium found in yellow watermelon functions in *intracellular* fluid rehydration, maintaining fluid and electrolyte balance and acid-base balance in the body, and plays a role in muscle contraction along with sodium and calcium (Irawan, 2017). Yellow watermelon is a fruit that contains very much water content. Arifianto (2008) revealed that 100 grams of watermelon has a water content of 92.1% and a carbohydrate content of 6.9 grams. The benefits of yellow watermelon have been proven by several previous studies that have been done. One study that proves that yellow watermelon has benefits for exercise is research that has been conducted, proving that giving watermelon juice affects muscle fatigue and *delayed muscle soreness* after weight training (Sirait et al., 2015).

Table 4. Results of Correlation Test Analysis Between Variables Suspected of Disturbing Hydration Status

Variables Suspected of Disrupting	R	Value of p[#]
BMI/U (*z score*)	-0,271	0,180
Physical activity (kcal)	0,123	0,548
Energy (kcal)	-0,915	0,341
Protein (g)	-0,094	0,646
Fat (g)	-0,130	0,527
Carbohydrates (g)	0,370	0,063
Sodium (mg)	0,003	0,990
Calcium (mg)	-0,020	0,926
Potassium (mg)	0,135	0,510
Magnesium (mg)	-0,092	0,655
Liquid (ml)	0,005	0,971

[#]*Spearman* Correlation Test (between variables suspected of interfering with hydration status values)
[*]Difference in significance value at 0.05 level

Table 4 showed that the nutritional status of subjects based on BMI/U was not related to hydration status (p = 0.180). This is because all subjects have normal nutritional status. Athletes with good nutritional status are expected to support optimal physical condition and club achievements. This is similar to the results of research conducted by Pustisari *et al.* (2020), which shows no significant influence between nutritional and hydration status.

The statistical analysis results in Table 4 showed that physical activity had no significant effect on the hydration status of the subjects (p = 0.548). This is similar to the results of research conducted by Setyarsih (2017), which showed no significant influence between physical activity and hydration status.

Energy, nutrients, and fluid intake are important factors in influencing an athlete's performance during training and matches. In general, consuming energy, nutrients, and fluids that are less or more than the total needs will adversely affect the body's physiological functions (Fink, 2018).

Table 4 showed that there is no significant effect between the intake of energy, protein, fat, carbohydrate, sodium fluid, calcium, potassium, and magnesium with hydration status values with p values of energy 0.341, protein 0.646, fat 0.527, carbohydrate 0.063 and fluid 0.971, sodium 0.990, calcium 0.926, potassium 0.510, magnesium 0.655 (p>0.05).

The results of this study are not in line with the theory that consuming energy, nutrients, and balanced fluids can improve nutritional status and increase physical endurance, productivity, and income. Energy, nutrients, and balanced fluids are the main requirements for determining work productivity (Ministry of Health RI, 2011). The results of 24-hour recall can cause research results that are not in line with theory during non-consecutive hydration status testing, and data on average energy, nutrient, and fluid intake of subjects obtained on average are insufficient for their needs. In addition, the value of a person's hydration status can be determined by factors other than food and fluid intake (Rismawati et al., 2018).

CONCLUSIONS

Based on the results of this study, it can be concluded that there was a difference in hydration status values before and after intervention in both the control and treatment groups. There was a significant difference between the average decrease in hydration status values of the control group and the treatment group, where the decrease in hydration status values in the control group consuming isotonic drinks as much as 350 ml showed more significant results than the control group consuming yellow watermelon juice as much as 350 ml. There was an effect of giving isotonic drinks on the hydration status of futsal and soccer players T-Rex Jawa Semarang. Nutritional status, physical activity, energy intake, macronutrients, minerals, and fluids were not correlated with hydration status scores.

Further research needs to be done on the effect of giving isotonic drinks and yellow watermelon juice on the hydration status of athletes in other sports. Interventions of isotonic drinks and yellow watermelon juice can be given more than twice a week for optimal results.

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