The Effects of Combination of Watermelon Juice (Citrullus lanatus) and Coconut Water (Cocos Nucifera L) on Running Speed and Power of Adolescent Taekwondo Athletes

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The Effects of Combination of Watermelon Juice (Citrullus lanatus) and Coconut Water (Cocos Nucifera L) on Running Speed and Power of Adolescent Taekwondo Athletes

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Abstract

Study purpose. This study aims to evaluate the effect of watermelon (Citrullus lanatus) and coconut water (Cocos nucifera L) combination juice on 10m sprint speed and long jump power in adolescent male Taekwondo athletes at Al-Islam Beber Islamic Boarding School.

Materials and methods. The method used was an experiment where 20 athletes aged 14 ± 0.81 years were divided into 2 groups, 10 athletes were given a combination of watermelon juice and coconut water and 10 other athletes were given plain water as a control. Both groups performed taekwondo training in the form of technical and physical training for 1 hour. Before the training and after both groups performed a 10 m sprint and standing long jump.

Results. The results showed that the administration of the juice did not produce significant improvements in the 10m sprint with a value of P = 0.365 (P>0.05) and long jump with a value of P = 0.234 (P>0.05), so there was no statistically significant difference between the treatment and control groups.

Conclusions. Giving a combination of coconut water and watermelon juice positively improved standing long jump performance but was not statistically significant.

Keywords: Coconut-Watermelon Juice, Sprint, Long Jump, Adolescent Taekwondo Athletes.

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Introduction

Taekwondo is a martial art sport that requires high leg power due to its dominant kicking characteristics (Bridge, C.A., et al, 2014). Fatigue in taekwondo athletes, like in other athletes, is a complex and multifactorial phenomenon. This fatigue can be influenced by several factors such as training load, training intensity, and training duration. Monitoring training load is crucial to ensure proper adaptation to the training programme and to minimise the risk of non-

functional overreaching (fatigue that lasts for weeks to months), injury and illness (Halson, 2014).

Nutrition and hydration play an important role in sport to improve performance, health and body balance. Proper nutrition can improve an athlete's performance, while an inappropriate diet can reduce performance. Nutrition also plays a role in modifying muscle protein synthesis and degradation, which impacts muscle structure and function. In addition, proper nutrition can increase the capacity of muscles to oxidise fat, which can reduce limited carbohydrate reserves. Adequate and timely protein consumption can increase muscle protein synthesis, which is important for muscle adaptation. Proper nutrition can also help prevent injury, disease and chronic fatigue, while improper nutrition can increase the risk of injury and disease (Maughan & Shirreffs, 2012).

Proper hydration can improve sports performance, while insufficient hydration can lead to fatigue, decreased performance and risk of injury. Proper hydration can also ensure proper fluid balance, which is important for maintaining body temperature and organ function. Proper hydration can help prevent dehydration, which can lead to fatigue, decreased performance and risk of injury (Maughan & Shirreffs, 2012).

According to Judge et al., (2021) hydration is essential to improve athlete performance and recovery. This study found that the majority of participants (97.3%) realised that dehydration can reduce athletic performance. However, half of them (50.5%) still mistakenly believed that thirst was the best indicator of dehydration, and only 41.4% knew that sports drinks were better than water at restoring muscle glycogen. Most participants (93.9%) believed that dehydration decreases performance, and 75% agreed that you cannot rely solely on thirst as an indicator of dehydration. They also agreed that fluids should be taken during training and easily available during training and competition. Many athletes did not meet proper hydration recommendations before and during training, with only 67.8% consuming the recommended amount of fluid (207-295 ml) 10-20 minutes before competition.

The interaction between nutrition and hydration in sports is very important. Proper nutrition can help maintain proper hydration. Proper fluid consumption before, during and after exercise can help maintain fluid balance. In turn, proper hydration can help maintain nutritional balance. Consuming the right foods and drinks before, during, and after training can help maintain nutritional balance. Thus, nutrition and hydration play an important role in sports to improve performance, health, and body balance (Maughan & Shirreffs, 2012).

Electrolytes such as sodium, potassium and chloride are important for maintaining proper fluid balance, which helps maintain body temperature and organ function. Proper electrolytes can also help prevent dehydration, which can lead to fatigue, decreased performance and risk of injury. However, improper electrolytes can increase the risk of injury, especially to muscles and joints, and increase the risk of diseases such as diabetes and heart disease (Maughan & Shirreffs, 2012).

Coconut water provides various nutrients that are beneficial to the body. Young and old coconut water contain a variety of nutrients including water, protein, carbohydrates, fat, fibre, mineral nutrients, fatty acids, amino acids, and vitamins (Jeallyza MA, et al., 2022). Coconut water has great potential in the world of sports thanks to its rich content of electrolytes such as sodium, potassium, and chloride, which are essential for maintaining fluid balance and organ function. In addition, coconut water also contains important minerals such as magnesium, calcium and iron, all of which play a vital role in various bodily functions. Coconut water's ability to maintain fluid balance makes it highly effective in maintaining an optimal body temperature and ensuring the body's organs function properly during intense physical activity (Gonzalez & Trexler, 2020).

Coconut water provides a hydration effect equivalent to that of plain water and sports drinks. There was a small improvement in physical performance when consuming coconut

water compared to plain water, although it was not statistically significant. Coconut water can be an effective natural alternative to artificial sports drinks in the context of rehydration after physical exercise (Chaubey et al, 2017)

Watermelon is potentially a good fruit to use for hydration. Watermelon has a source of carbohydrates that can be oxidised by muscles to produce ATP, the energy used for movement. Not only that, but watermelon is also rich in vitamin C, vitamin B6, and potassium, all of which play an important role in overall body function. The carbohydrates in watermelon also contribute to muscle adaptation, as the carbohydrates available after exercise can help modify muscle protein synthesis and degradation, which has a positive impact on muscle structure and function (Gonzalez & Trexler, 2020).

Sports drinks are recommended to promote recovery by rehydrating the body and replacing essential nutrients lost during exercise. Sports drinks containing carbohydrates and electrolytes are particularly effective at maintaining blood glucose levels during exercise and aiding the recovery of muscle glycogen after exercise. These drinks usually contain sodium, which stimulates thirst and helps retain fluids, ensuring better rehydration and recovery compared to water alone. In addition, consuming a sports drink within two hours of exercise provides an adequate supply of carbohydrates and electrolytes, which are essential for recovery and preparation for the next physical activity (Orrù et al., 2018).

Combining the potential of coconut water and watermelon to make a sports drink can be a very effective solution. A sports drink consisting of a mixture of coconut water and watermelon will provide electrolytes and minerals from coconut water, as well as carbohydrates and vitamins from watermelon. To get the optimum benefits, it is necessary to consider the ratio between coconut water and watermelon, such as 70% coconut water and 30% watermelon. In addition, adding other nutrients such as protein, vitamins, and minerals needed by athletes will improve the quality of the sport drink. Trialling and evaluating these sports drinks on athletes can help confirm their effectiveness in improving performance and delaying fatigue (Gonzalez, Adam & Trexler, 202

Sports drinks play an important role in supporting athletes' performance, especially in sports that require strength and speed. The combination of watermelon and coconut water was chosen because of its nutritional content that can increase hydration and energy. This study aims to evaluate the effect of giving a combination of watermelon and coconut water on the running speed and strength of adolescent taekwondo athletes. It is hoped that the results of this study can provide new insights in the development of more effective sports drinks.

Materials and methods

This study used an experimental design with two groups: a treatment group that was given a watermelon and coconut water combination drink, and a control group that was not given the drink. Both groups underwent pre-test and post-test to measure standing long jump performance, 10m sprint speed.

The type of research conducted based on the above data is experimental research. This study involved two groups of subjects, namely the treatment group and the control group, to test the effect of giving a combination drink of watermelon and coconut water on physical performance (standing long jump and 10m sprint) of adolescent taekwondo athletes. The research design can be seen in figure 1 below.

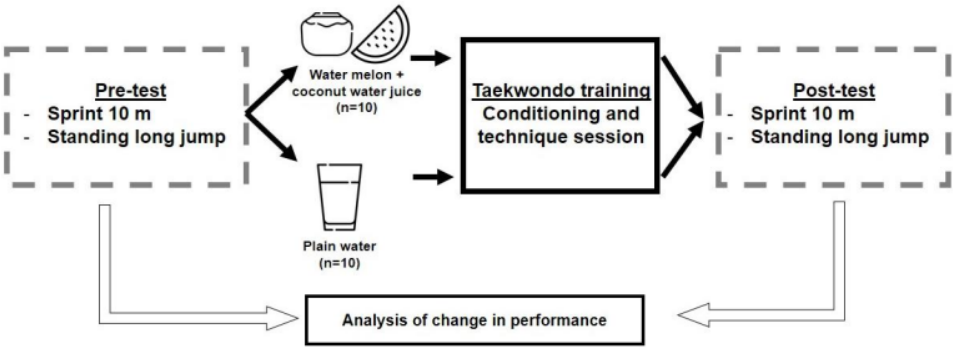

Figure 1. Experimental design

This experimental study allows researchers to conclude that there is a cause-and-effect relationship between the administration of a watermelon and coconut water combination drink and changes in physical performance and effort perception in adolescent taekwondo athletes.

Study Participant

Subject Description

This study involved teenage taekwondo athletes who trained at the Al-Islam Beber Islamic Boarding School. Subjects were selected based on several criteria to ensure homogeneity and validity of the research results.

Inclusion Criteria

The subjects of this study were adolescent taekwondo athletes aged between 13 to 15 years with a mean of 14.1 ± 0,81 year. Only male participants who met these criteria were accepted into the study. In addition, subjects must have a minimum skill level of green belt in taekwondo. To ensure valid study results, participants must be in good health and not have any injuries that may affect their performance during the study. Commitment to follow the entire course of the study, including pre-test, treatment (drink administration), and post-test, is also one of the key requirements.

Exclusion Criteria

Some exclusion criteria were applied to maintain the quality of the study data. Subjects with injuries or medical conditions that may affect their performance or safety during the study will not be accepted. In addition, participants who are unable to attend consistently throughout the research period will also be excluded from the study. Consumption of other supplements or sports drinks during the study period is also a reason for exclusion, as this may affect the results of the study.

Group Division

To ensure equality and reduce bias, subjects were randomly divided into two groups. The Treatment Group consisted of participants who would receive the watermelon and coconut water combination drink, while the Control Group would undergo their usual training without receiving the drink. This division was designed to evaluate the effects of the combination drink on physical performance and perceived effort.

Number of Subjects

The total number of subjects participating in this study was 20 adolescent taekwondo athletes, with 10 subjects given watermelon juice and coconut water and 10 subjects given plain water.

Informed Consent

Before the study began, all subjects and their guardians were given a full explanation of the purpose, procedures, benefits, and risks of the study. Informed consent was obtained from all subjects and their guardians.

With a clear description of the subje and strict procedures, this study sought to generate valid and reliable data regarding the effects of watermelon and coconut water combination drink on the physical performance of adolescent taekwondo athletes.

Instrumen

Standing Long Jump Test

The Standing Long Jump Test uses several important instruments to measure the explosive power and leg muscle strength of the subject because taekwondo is an explosive movement (Uh, Yoon, Jung, & Lee, 2024). Instruments used include a metre or tape measure to determine the jumping distance, a flat and non-slip surface to avoid injury, and a clear starting line to ensure consistency in the execution of the test. The test is performed by having participants jump as far as possible from a standing position, which gives a direct indication of their leg muscle strength and explosive ability.

10m Sprint Test

The 10m Sprint Test aims to measure short distance running speed to see the athlete's speed and acceleration (Healy et al, 2016) suitable for taekwondo sports that require high speed and explosive movements (Uh et al., 2024). The Sprint 10 test has a standard error of 2% or 0.04 seconds (Duthie et al, 2006). The main tool in this test is a stopwatch or automatic timing device, which is used to record the participant's travel time from the start line to the finish line. In addition, a straight track with clear markings at the start and finish lines is required to ensure proper measurement. Participants run as fast as they can within 10 metres, which helps assess the speed and efficiency of their movements..

Procedure

Pre-Test:

1. Preparation: Ensure all subjects are in the same condition with a light warm-up before the test begins.
2. Measurement: Perform baseline performance measurements for all subjects with the following tests:
   1) Standing Long Jump Test: Have the participant jump as far as possible from a standing position. Measure the distance of the jump using a tape measure.
   2) 10m Sprint Test: Use a stopwatch or automatic timing device to record the time it takes the participant to run 10 metres from the start line to the finish line.

Treatment (Exercise with Sport Drink):

1. Beverage Preparation: The formulation of watermelon and coconut water is 1:1 ratio. The watermelon and coconut water combination drink uses 100 grams of watermelon flesh and 100 ml of coconut water, then blended until smooth. This formula is the most ideal as it is close to the ingredients in commercial sports drinks (Effiong, B.N ; Udofia, 2017).

2. Drink Administration: After the pre-test, the treatment group was given a combination drink of watermelon and coconut water before starting the exercise. This drink was administered during the prescribed exercise period to ensure maximum effect.
3. Exercise: The treatment group underwent exercise as planned, which may include physical exercise sessions of a certain intensity. The control group continues with normal exercise without the administration of additional drinks.

Post-Test:

Re-measurement: After the training period is over, conduct the same performance measurement as in the pre-test for all subjects:

a. Standing Long Jump Test: Minta peserta melakukan lompatan lagi dan ukur jarak lompatan untuk melihat apakah ada peningkatan.
b. 10m Sprint Test: Ulangi tes sprint 10 meter dengan mencatat waktu tempuh untuk mengevaluasi perubahan kecepatan.

Data Analysis

The data that had been collected was then analysed for normality using the Shapiro-Wilk test and then correlation tests were carried out using paired and independent tests. This analysis used SPSS version 20 software.

Results

Data on the results of the 10 m sprint measurement were tested for normality with the results with a sig value. for the control group pre-test was 0.183, the control group post-test was 0.974, the treatment group pre-test was 0.415, and the treatment group post-test was 0.179, so that all data were normally distributed because all Sig values. > 0.05.

The data from the long jump test measurements were tested for normality with the results of the sig. value for the control group pre-test was 0.682, the control group post-test was 0.676, the treatment group pre-test was 0.318, and the treatment group post-test was 0.888, so that all standing long jump data were normally distributed because all Sig values. > 0.05.

Data that is considered normal is then tested paired sample t-test to compare the results of pretest and post test in each group. The treatment and control values were then compared with the independent sample t-test. The test results are presented in Table 1 for the 10 m sprint test and Table 2 for the standing long jump test.

Table 1. Paired Sample T-test & Independent Sampe T- Test Results 10 m Sprint

Group	N	Pre-Test (Mean ± SD)	Post-Test (Mean ± SD)	P-Value	Difference Pre-Test & Post Test	P-Value
Treatment	10	2,17 ± 0,21	2,06 ± 0,15	0,245	0,11	0,365
Control	10	2,27 ± 0,17	2,14 ± 0,14	0,096	0,08	

The average 10m sprint time in the treatment group increased from 2.17 ± 0.21 seconds to 2.06 ± 0.15, indicating that the results after treatment increased by 0.11 seconds. However, the P value of the paired sample t-test was 0.245, meaning that there was no statistically significant increase (P>0.05). The results of the treatment and control groups were subjected to

an independent sample t-test with the result being 0.365, meaning there was no statistically significant increase (P>0.05).

Table 4. Results of Paired Sample T-test & Independent Sampe T- Test Long Jump

Group	N	Pre-Test (Mean ± SD)	Post-Test (Mean ± SD)	P-Value	Selisih Pre-Test & Post Test	P-Value
Treatment	10	195,60 ± 20,35	200,80 ± 14,06	0,149	5,20	0,234
Control	10	179,80 ± 23,36	179,50 ± 16,16	0,953	0,30	

The average standing long jump achievement in the treatment group increased, from 195.60 ± 20.35 to 200.80 ± 14.06, indicating that the results after treatment increased by 5.2 cm. However, the P-value of the paired t-test was 0.149, which means there was no statistically significant increase (P>0.05). The results of the treatment and control groups were tested with an independent sample test with a P-value of 0.234, meaning there was no statistically significant increase (P>0.05).

Discussion

Giving a combination of coconut water and watermelon juice gives a positive increase in the standing long jump test. The treatment group experienced an average increase of 5.20 cm while the control group only increased by 0.30 cm. However, after statistical tests showed no significant difference between the pre-test and post test or comparison between the treatment group and the control group, the results of the independent test for standing long jump showed a value of 0.234 (P>0.05). The same thing also happened in the 10 m sprint test. The treatment group experienced an increase in sprint time of up to 0.11 seconds, while the control group was 0.8 seconds and based on the results of the independent sample t-test for the 10m sprint showed value of 0.365 (P>0.05). Thus the administration of watermelon juice and coconut water indicated no statistically significant difference between the treatment group and the control group with plain water.

The use of a combination of watermelon juice and coconut water on physical performance is very limited in the literature. Because generally the administration is done separately, watermelon alone or coconut water alone. However, the researcher found several references that are in line with this study, namely on the specific administration of watermelon fruit. Watermelon fruit contains C-Citrulline which is indicated to have an ergogenic effect. Several studies have failed to demonstrate the ergogenic benefits of supplementation on several sports performance parameters. A study supplementing watermelon juice concentrate (with C-trulline content) at 2.2 g/kg body weight per day for 7 days showed no improvement in isometric force production, bench press performance, blood vessel diameter, or muscle oxygenation parameters compared to trained men (Gonzalez, A.M., et al 2022). Even supplementation of 8 g watermelon extract L-citrulline did not improve isometric force production, muscular endurance or muscle oxygenation in 18 weight training trained males (n = 11) and females (n = 7) (21.4 ± 1.8 years; 172.3 ± 7.5 cm; 76.9 ± 10.8 kg) (Gonzalez et al., 2023).

Conversely, other research has demonstrated that acute L-citrulline supplementation can enhance strength training performance by raising the number of repetitions required for multi-joint exercises before attaining muscle failure. Exercises for multiple joints. Research by Wax, B., et al (2015) demonstrated that 8 g of citrulline malate can enhance performance throughout a protocol consisting of three rounds of bodyweight chin-ups, reverse chin-ups, and push-ups, as well as five sets of leg presses, back squats, and leg extensions at 60% 1RM. It was also

noted that administering 8 grams of citrulline malate increased repetition failure on 8 sets of bench press 80% 1RM (Pérez-Guisado & Jakeman, 2010) and on 6 sets of bench press and leg press at 80% 1RM (Glen et al 2017). While in a meta-analysis study by Vårvik, Bjørnsen, & Gonzalez (2021) demonstrated that during high-intensity weight training, citrulline malate can play a significant role in raising the number of repetitions before failure. Though still hypothetical, insufficient warm-up or restricted body muscle activation may have contributed to L-citrulline's lack of an ergogenic impact in the current study (Vårvik et al., 2021). In addition, the L-citrulline content of the watermelon that the researcher provided was not clearly measured to be 8 grams or the electrolyte content was not controlled as in commercial sports drinks.

Coconut water also has mixed effects on physical performance. Studies on football players showed insignificant results between coconut water and plain water or commercial sports drinks on cardiovascular endurance (bleep test) parameters. This suggests that the type of drink does not affect the performance of football players (Mohd Elias, et al, 2023). In another study, there was no significant difference in performance or physiological parameters between commercial sports drinks and coconut water during prolonged endurance cycling in 19 trained cyclists on blood glucose, lactate, sweat loss, and heart rate (O'Brien et al, 2023). Sodium from both watermelon and watermelon is a potential to maintain physical performance, but studies show that sodium administration during exercise is generally not required for endurance performance in events less than 2 hours. Sodium administration is required for 'salty sweaters' (>40 mmol-L-1) in endurance events lasting several hours (McCubbin, 2023).

The exercise performed in this study was a technical exercise for approximately 1 hour which may not require sodium or sugar (carbohydrate) supplements in terms of intensity and duration. Recommendations for the provision of carbohydrates at moderate intensity in exercise activities of 30 minutes - 1 hour duration the body only requires small amounts of carbohydrates or only mouth rinse with carbohydrates may provide benefits, carbohydrate intake is more important and provides benefits if given in exercise over 2 hours (Jeukendrup, 2014).

The unclear effectiveness of watermelon and coconut water on physical performance is a study that needs to be followed up. Other studies are needed and need to consider the factors of proper formulation between watermelon and coconut water, long-term consumption methods, active components such as L-citrulline in watermelon and electrolytes in coconut water may require longer time or certain conditions to show maximum effects.

Conclusions

Juicing a combination of coconut water and watermelon positively improved standing long jump performance but was not statistically significant after taekwondo training session.

Conflict of interest

The author has no conflicts or interests.

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