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The Effect of Drinking Water and Isotonic Sports Drinks in Elite Wrestlers

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ABSTRACT The purpose of this study was to investigate the effects of sports drinks (isotonic) and water consumptions of the elite wrestlers during the exercise. Eighteen-trained elite wrestlers participated in this study. The subjects were divided into two groups according to their body-weight and were also given either water or isotonic sports drink. Water and sports drinks get rid of the dehydration during the trainings ($P>0.05$). Blood samples were taken before and after the exercises,and were analyzed for Sodium (Na), Potassium (K) and Chlorine (Cl). Body temperatures of subjects were measured as ^{o}C. Post exercise sodium values of the two experimental groups were lower than the pre-exercise values ($P<0.05$) and there were nosignificant differences between sodium values of these two groups. Water could be replaced with sports drinks for shorter activities as compared to the sports drinks. Thus, water is very helpful for athletes when water is consumed before and during the exercise.

INTRODUCTION

It is a well known fact that nutrition is very important for athletes during competitions. For this reason, athletes use ergogenic aids. One of those ergogenic aids athletes use is sports drink, and it is usually preferred instead of water among the athletes. Elite wrestlers have to overcome 5 tough matches in order to win the gold medal. In every round in which they get tired, they consume liquids to recover themselves as soon as possible.

To improve their performance, athletes should apply the proper training programs and a good diet program. Recent studies have shown that the number of the meals and consuming liquids are very important for sports performance (Saglam1993). For being healthy and reaching their optimal performance, athletes have to consume these liquids periodically. Their bodies are dehydrated and they lose 2-3 percent of their body weights during the competitions (A 70 weighted person loses approximately 1.5,2 kg) and this situation affects their performance in a negative way. Also, when 4 percent of their body weight is lost, the blood volume of the athletes' decreases and cardiovascular thermoregulatory functions suffer (Ersoy 1993).

Ergogenic aids increase sporting performance besides the training affects; also, they can be defined as aids that can delay tiredness with increasing energy production. Some vitamins, minerals, amino acids, plants, metabolites and different combinations can be qualified as ergogenic aids (Ersoy 1993; Gunay and Cicioglu 2001; Then et al. 1995).

Sports drinks can also be classified as ergogenic aid. Athletes consume them during the competitions to boost their performances and compensate the dehydration and electrolyte loss. Many athletes increased their rate of drinking sports drinks (Fahlström et al. 2006). Many sports drinks consist of carbohydrates, minerals, electrolytes (for example sodium, potassium, calcium magnesium) and some vitamins (Committee 2011). The carbohydrate contributes to performance enhancement by offsetting the depletion of the body's stores of carbohydrate, which is the main fuel for intense endurance exercise. The sodium in the drinks contributes either by increasing the uptake of carbohydrate from the gut or by offsetting the decrease in circulating fluid volume that happens through sweating or a shift of fluid into active muscle. The stimulation of carbohydrate receptors in the mouth may also have an ergogenic effect (Carter et al. 2004; Cham-

bers et al. 2009). Optimizing the concentrations of carbohydrate and salt for performance is a concern for sport nutritionists and drink manufacturers (Coombes and Hamilton 2000).

During exercise, there is a decrease in total body water and plasma volume, causing an increase in sweating rate and skin blood flow, which can lead to increased core temperature (Ransone and Hughes 2004). It was confirmed that sweat contains electrolytes (including sodium, potassium, and chloride); thus, loosing sweat through dehydration may also lead to a significant loss of electrolytes, which may interfere with better performance and thus strength and power output (Ransone and Hughes 2004).

Restriction of energy and fluid intake as well as increased exercise decreases peak power and increases fatigue in wrestlers. Reduction in body weight may harm physical performance in various sports activities (Cheuvront and Kenefick 2014)

Moreover, weight loss via dehydration negatively affects cardiovascular stability (Cengiz 2015). Also, It was suggested that it could not be necessary to replace losses of sodium, potassium and other electrolytes during exercise since athletes are unlikely to deplete their body stores of these minerals during normal training (Institute of Medicine 2005).The inclusion of sodium and carbohydrates in sports drinks for events lasting longer than one hour to aid athletes in staying hydrated is also recommended to help maintain an optimal endurance performance (Nichols et al. 2005). However, the consideration of sports drinks versus water raises a question and In comparison with plain water, drinks containing carbohydrate and salt can enhance performance when consumed before or during high-intensity exercise lasting at least an hour (Coyle 2004). It is clear that the hypotonic sports drink has much less carbohydrate than the usual isotonic drinks and it can be an effective ergogenic aid for endurance performance of an hour or so (Darrell and Will 2010).

Objectives of the Study

There are not many studies about the comparison of sports drinks and drinking water during less than an hour heavy exercise such as in sport of wrestling. Thus, the aim of this study was to analyze the sodium, potassium, chlorine, calcium and body temperature values of the wrestlers during exercise both with drinking water and sports drinks. This study hypothesize that there will be no difference on the physiological effects of consuming water vs. sports drinks during a 50 minutes of wrestling session.

MATERIAL AND METHODS

Experimental Design

Eighteen-trained elite wrestlers participated in the study. Their ages ranged from 18 to 20 years old. The subjects have been participating in both national and international competitions. They were divided into two groups according to weights and the total weight of these two groups was equal. For the first experimental group's (isotonic sports drink), their average age was 19, 11±0, 60 and their average body height was 175, 78±5, 19. The second experimental group's (water) average age was 18, 56±0, 52, and their average height was 176, 89±4, 37. The 4x200 ml isotonic sports drink was given to the first group 30 minutes before the exercise and 3 times during the exercise. The 4x200 ml drinking water was given to the second group 30 minutes before the exercise and 3 times during the exercise. The 10 cc venous blood was taken before and after the exercises from subjects' elbow venous. These 10 cc bloods' Sodium (Na), Potassium (k) and Chlorine (Cl) values were analyzed after hydroextraction for 10 minutes and they were also analyzed after being centrifuged for 4000 rpm. The body temperatures of subjects were measured with Medisana 48620 type Infrared distant thermometer and the results were recorded as ºC. The weights of subjects were measured with Casio gravimeter.

Exercise Protocol

The preparation stage of the training being implemented to the subjects is composed of free exercise carried out for 10 minutes. The main stage of the training program is composed of 2x6 minutes of technical training and 3x6 minutes of wrestling practices and ended after a total of a 50- minutes training followed by 5 minutes of jogging.

Statistical Assessments

The statistical assessments of the findings were analyzed by SPSS 16.0 computer package program and the arithmetic average and standard deviation of all the parameters are evaluated.To determine the homogeneity of the

data, "Single Sample Kolmogorov-Smimov" test was used to test whether the data were at normal distribution.To determine the differences between the groups, "Independent t" test was used before and during the training. (Differences at the level of P<0.05, defined as significant).

RESULTS

Table 1 shows the values of the group of athletes consuming the drink during exercise. Body weight (78.48 ± 12.93 vs. 77.58 ± 4.22) values were found significantly lower than the values that were measured before the exercise (P<0.05). Sodium (140.00±1.65 vs 141.22 ± 1.64) values were closer to the values that were measured before the exercise (P<0.05). Potassium (4.25±0.33 vs. 4.35±0.35), chlorine (99.56±1.42 vs. 99.22± 1.78) and body temperature (36.88±0.39 vs. 36.96±0.21) values were found to be similar before and after exercise (p>0.05).

Table 2 shows the values of the group consuming water during exercise. According to the results, after exercise (78.33 ± 13.33) body weight values were found to be significantly lower (P<0.05) compared to the values before exercise (79.28 ± 13.23), and a significant difference was detected in sodium levels (P <0.05) before exercise values (140.00 ± 1.65) and after exercise (141.56 ± 1.74) values. There was no difference in potassium chlorine and body temperature values when compared with pre and post-exercise values (p> 0.05).

In Table 3 the values before and after exercise were examined between athletes who drank sports drink and those who consumed water. According to these values, no statistically significant differences were detected in the levels

Table 1: Pre-exercise and post exercise values of sport drinks group

Time	*Body weight Mean ± Sd*	*Body temperature Mean ± Sd*	*Sodium(Na) Mean ± Sd*	*Potassium(K) Mean ± Sd*	*Chlorine(Cl) Mean ± Sd*
Pre-exercise	78.48±12.93	36.88±0.39	139.89±1.61	4.25±0.33	99.56±1.42
Post-exercise	77.58±4.22	36.96±0.21	141.22±1.64	4.35±0.35	99.22±1.78
P	0.000*	0.458	0.050*	0.376	0.500

(p<0. 05)

Table 2: Pre-exercise and post exercise values of water group

Time	*Body weight Mean ± Sd*	*Body temperature Mean ± Sd*	*Sodium(Na) Mean ± Sd*	*Potassium(K) Mean ± Sd*	*Chlorine(Cl) Mean ± Sd*
Pre-exercise	79.28±13.23	36.97± 0.35	140.00± 1.65	4.21± 0.32	99.56± 1.59
Post-exercise	78.33±13.33	37.00± 0.15	141.56± 1.74	4.36± 0.34	99.11± 1.26
P	0.000*	0.864	0.019*	0.174	0.377

(p<0. 05)

Table 3: Comparisons of pre and post exercise values of water and sports drink groups

Variables	*Time*	*Sports Drink (n=9) Mean ± Sd*	*Water (n=9) Mean ± Sd*	*P*
Body Weight	Pre-exercise	78.48±12.93	79.28±13.23	0.902
	Post-exercise	77.58±12.68	78.33±13.33	0.909
Body Temperature	Pre-exercise	36.88±0.39	36.96± 0.21	0.662
	Post-exercise	36.96±0.21	37.00± 0.15	0.715
Sodium(Na)	Pre-exercise	139.89±1.61	140.00± 1.65	0.700
	Post-exercise	141.22±1.64	141.56± 1.74	0.873
Potassium(K)	Pre-exercise	4.25±0.33	4.21± 0.32	0.812
	Post-exercise	4.35±0.35	4.36± 0.34	0.948
Chlorine(Cl)	Pre-exercise	99.56±1.42	99.56± 1.59	1.000
	Post-exercise	99.22±1.78	99.11± 1.26	0.877

(p<0. 05)

of measured body weight, body temperature, sodium, potassium, and chlorine between the groups (P> 0.05).

DISCUSSION

Efficient training and faster recovery are important factors affecting sports performance. Liquid consumption before, during and after the competition can help to make athletes faster and get rid of tiredness (Eroglu1997).

In this study, there were no significant differences between body weights of the subjects before and after the exercise. This result showed that both water and sports drinks compensate the dehydration of wrestlers (P>0. 05). Thus, these are the positive features of these two liquids (Table 1).

Sodium (Na) values of both groups were measured before and after the exercise (Table 2). Post-exercise Sodium (Na) values were significantly lower than pre-exercise values (P<0.05). However, there were no significant differences between these two groups' sodium values (P>0.05) (Table 3). Ebert et al. (2007) provided two bicyclists and a 2.4percent weight loss was observed after their cycling at treadmill ergometer for 2 hours. Sodium (Na) values of the subjects decreased significantly. Similar to this study, Noakes and Sharwood (2005) analyzed 2135 athletes' blood hematocrit. Some of these subjects were dehydrated and the others were reinforced with water. As a result, there were no significant decreases in the sodium values of the subjects that were reinforced withwater. However, sodium values of other subjects decreased significantly. In other studies conducted by Mitchell et al. (2000), and Sejersted and Sjøgaard (2000), it was found that sodium (Na) values decreased significantly as a result of dehydration in the blood plasma during tough exercises. These findings support the values that were found in this study. Furthermore, this study found out that two of these liquids can be used during the exercises interchangeable. The reported studies indicated that for the subjects that undergo dehydration without liquid supplement, a decrease was observed in the sodium(Na) values while there was no decrease observed in the sodium levels of the subjects who had liquid supplementation. In our study, subjects in both groups lost body weight at a certain rate although they had liquid supplementation. In this study group, intra-group comparisons indicated that the subjects had sodium (Na) values which were parallel to the decrease in body weight. However, there were no significant differences between the groups of sodium levels (P>0.05) (Table 3).

The Potassium (K) values of both groups were measured before and after the exercise (Table 2). After the exercise, no significant differences between the potassium values of water and sport drink group was found (P<0.05). According to the study by Ohiro et al. (1981), it was stated that if body temperature decreases much more than the normal level, blood Potassium (K) value can be decreased. Furthermore, Costilla et al. (2006) and Sejersted and Sjøgaard (2000) found that the level of potassium in the muscles were increased during the dehydration and this situation was the result of an increase in blood potassium level. NoakesandSharwood (2005) analyzed 2135 athletes' blood hematocrit. Some of these subjects were dehydrated while others were reinforced with water. The results of this study indicated that there were no significant decreases in the potassium values of the subjects that were reinforced with water. However, the potassium values of other subjects decreased significantly. In a similar study, Twerenbold et al. (2003) included 13 women in their experiment. The subjects run for 4 hours and they drank different liquids that include different types of sodium content in every one-hour. And every hour urea and blood parameters of these women were analyzed. As to the obtained results, it was seen that blood potassium values decreased significantly. These findings support the values that were found in this study. Furthermore, there were no differences between the blood potassium values of the two experimental groups that were analyzed in this present study (P>0.05) (Table 3).

Chlorine (Cl) values of both groups were measured before and after the exercise. After the exercise, there were no significant differences between the Chlorine (Cl) values of the experimental groups (P<0.05) (Table 2). Noakes and Sharwood (2005) analyzed 2135 athletes' blood hematocrit values. The results of the study indicated that there were no significant decreases in the blood sodium values of the subjects that were reinforced with either of the liquids. However, the chlorine values of other subjects decreased significantly. Kenefick and Hazzard (2004) conducted a research on the athletes who exercised for 90 minutes. The exercises caused

the athletes to lose 2.4 percent of their weight. The subjects' blood hematocrit parameters were measured after the exercise, and it was observed that the chlorine (Cl) levels in the blood of the athletes decreased. These findings support the present studies' results about CI values.

In addition, there were no significant differences between the body temperature values of the experimental groups that were measured before and after the exercises (P>0.05), (Table2). Furthermore, these two experimental groups' values were statistically similar (P>0.05). (Table3)

It was also found that water is a good heat regulator. For living, all the body cells use water as a fuel in an orderly manner. During exercise, the body needs energy and also burns fuel evenly. Thus, a huge part of the generated energy is a non-advantageous thermal energy. If there is no sufficient water in the body, the thermal energy cannot be carried over to the skin and sweltering, which is the cooling system, won't occur. And if the heat isn't carried into the body, body system, especially the circulatory system and nervous system, will be damaged. In the same vein, necessary operations which help the human body to function properly will not occur without water (Pak 1994). Thermoregulation mechanisms of the two liquids that we used in our study contribute to our work in a positive way and there are no statistical differences between the measurements that were made before and after the exercises.

Studies conducted to compare the effects of sports drinks with carbohydrates and water with less than an hour short-term exercise indicated that there were no differences observed in physiological and physical performance of the athletes who consumed any of these supplements or water (Ersoy 2004; Maughan and Shirreffs 2004). Similarly, in this study, an average of 50 minutes of vigorous exercise did not have any effect on body temperature, sodium, potassium and chloride values – as a result of the consumption of water and sports drinks. Evidence from several studies indicates that carbohydrate feeding during an exercise of about 45 minutes or more can improve endurance capacity and performance (Jeukendrup 2004; Jeukendrup and Jentjens 2000). Mechanisms by which carbohydrate feeding prior to and during exercise improve endurance performance include sustaining blood glucose levels, conserving high levels of carbohydrate oxidation, and the sparing of liver and possibly skeletal muscle glycogen (Kreider et al. 2010; Rodriguez et al. 2009).These results suggest that water and sports drinks are considered to have the same effect on blood electrolytes levels.

CONCLUSION

As a result of this study, the researchers discovered that the consumption of sports drinks and drinking water before and during exercises in less than an hour can save wrestlers from dehydration. Also, the consumption of sports drinks or water have similar effect on the electrolytes levels in blood. It was also previously reported that sports drinks can be helpful to athletes who are exercising at a high intensity for 60 minutes or more.

RECOMMENDATIONS

Sports drinks replace the electrolytes that are lost during sweating. However, they are not helpful for performance unless athletes are sweating enough to lose enough electrolytes to the extent of losing strength. Water has excellent functions and also it can be easily provided than sports drinks. Thus, water is very helpful for athletes when water is consumed before and during the exercise taking less than an hour.

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