

ORIGINAL SCIENTIFIC PAPER

Special Features of Consumption of Water and Drinks by Kazakhstan Athletes

Yeldana Yerzhanova¹, Zhanna Sabyrbek¹, Zhanna Kalmatayeva¹ and Kazys Milasius²

¹Al-Farabi Kazakh National University, Department of Physical Training and Sport, Almaty, Kazakhstan, ²Lithuanian University of Educational Sciences, Department of Sport Teaching Methods, Vilnius, Lithuania

Abstract

In Kazakhstan, the regime and habits of consuming liquids by athletes in various sports have not been sufficiently explored yet. The purpose of the study is to determine the amount, schedule and characteristics of consumption of drinks by sportsmen after the example of different sports. In 2017 15 volleyball players of the Burevestnik team in Almaty, 15 judo wrestlers of the national team of Kazakhstan, 15 wrestlers of the club team and 15 triathletes of the national team of Kazakhstan took part in the estimation of the regime of water and other liquids consumption. A valid questionnaire was used to study the data on the volume and water consumption schedule and other liquids. The amount of water and other drinks consumed was studied by reproducing drinking during 24 hours. The questionnaire put questions about the amount of water and beverages consumed prior to training, during and after it, and furthermore certain types of beverages were determined. Our research showed that 63.34% of the Kazakhstan athletes under examination drink the recommended norm (2-3 liters per day), another 6.69% of the investigated consume from 3 to 6 liters of liquid. The researched athletes do not consume enough liquid 2 hours before training. Only 20% of volleyball players, judoists and triathletes of national teams consume the recommended norm of liquid (400-600 ml). Most of the investigated athletes consume necessary amount of water and other beverages during training. 70.0% of respondents drink water and juices during training, and only 16.7% of them drink sport drinks.

Key words: athletes, training, water consumption, water consumption schedule

Introduction

A very important component in preparation of athletes and in their nutrition is the consumption of water and various drinks. Water - is a vital component of nutrition, as it performs important vital functions in the body. It is a universal solvent that plays an extremely important role in ensuring the normal functioning of all organs and systems of the human body. Depending on the nature of sports activities and temperature conditions, the daily need for liquid for the athletes of various specializations ranges from 2-3 to 5-6 liters per day (Sawka, Montain, & Latzka, 2001; Chevront, Carter, & Sawka, 2003; Institute of Medicine, 2005; De Sousa, Da Costa, Nogueira, & Vivaldi, 2008).

For a long time there was an opinion that the amount of liquid consumed by athletes should be limited. Current scien-

tific evidence has convincingly demonstrated the inconsistency of this approach to the athlete's water consumption schedule (Casa et al., 2000; Godek et al., 2010; Paken, 2010; Vasic, Dimitric, & Cokorilo, 2010; Novokshanova & Ozhiganova, 2013; Vasiljevic, Bojanic, Petkovic, & Muratovic, 2014). Lot of the information about water consumption and drinking liquids occurs in literature sources, but the information on them is pretty contradictory. In estimating water consumption the kinds of sport of biathlon are often referred to where there are weight categories, the possibility of regulating body weight by dehydration is analyzed.

The information on the suitability of drinking water and various sports drinks can also be found in literature sources. The advantage of carbohydrate-mineral drinks is often argued for (Boyadjiev & Tarulov, 1998). They are applied to replen-



Correspondence:

Y. Yerzhanova

Al-Farabi Kazakh National University, Department of Physical Training and Sport, Al-Farabi, avenue 71., Almaty city, Kazakhstan

E-mail: Eldana_777@mail.ru

ish liquid in the body, to maintain normal blood glucose level and provide energy to the working muscles. Despite some differences, the composition of many sports carbohydrate and mineral drinks is almost the same: it is characterized by the mandatory availability of water, sugar and salt. Nikityuk et al. (2012) believes that it is possible to replenish the supply of liquid by clean water. Although in this case, sense of thirst is quenched, but it is followed by decrease in the plasma concentration of dissolved substances in it, which stimulates urination in its turn. Thus, in consuming clean water, only a short-term rehydration of the body is achieved.

In accordance with the recommendations of the American College of Medicine (Convertino et al., 1996), the athletes' water consumption schedule depends on many factors, firstly, on temperature, humidity, and solar radiation and can vary in different ranges. You should drink 5-7 ml/kg of body weight 4 hours before training or competition, another 3-5 ml/kg body weight or 400-600 ml of water should be added 2 hours before the exercise (Casa et al., 2000), and you should drink another 200-300 ml of water or special drinks 10-20 minutes before the beginning of physical exertion. During training and competition, the amount of liquids drunk should not cause the digestive tract discomfort. Noakes (2003) recommends the athletes to consume the maximum acceptable volume of liquid, reaching 400-800 ml per hour during the exercise. After training and competition, athletes are advised to consume the amount of liquid that was consumed during the load, while in the course of recovery, this volume is 1.5 times higher than that was spent during physical activity (Coyle, 2004).

Kazakhstan is mainly situated in hot climatic conditions, where the ambient temperature often reaches 30-40 degrees. In such conditions, there is a danger of dehydration. Therefore, the study of the volume and water consumption schedule of and other liquids during physical activity is relevant. In Kazakhstan, the regime and habits of consuming liquids by athletes in various sports have not been sufficiently explored yet.

The purpose of the study is to determine the amount, schedule and characteristics of consumption of drinks by sportsmen after the example of different sports.

Methods

Sixty athletes, including 15 volleyball players of the "Burevestnik" team in Almaty, which plays in the country championship, 15 judo wrestlers of the national team of Kazakhstan, 15 judo wrestlers of the club team and 15 triathletes of the national team of Kazakhstan took part in the estimation of the regime of water and other liquids con-

sumption. The age of volleyball players was 19-22 years, their growth averaged 188.0±8.38 cm, body weight - on the average 78.11±7.68 kg, (BMI) -the body mass index averaged 22.1. The age of judoists was 20-28 years old, their average height was 174.3±8.3 cm, body weight - on the average 78.0±18.9 kg, BMI was on average 25.74. The age of judoists of the club team was from 17 to 21, their average height was 171.9±6.0 cm, body weight - 71.0±16.1 kg, BMI - on average 24.07. The age of the triathletes was 21-30 years old, their average height was 180.0±7.2 cm, body weight - on the average 65.5±7.1 kg, body mass index BMI averaged 20.2. A valid questionnaire (Baranauskas, 2012) was used to study data on the volume and mode of consumption of water and other liquids by directly interviewing each researcher. We studied the amount of water and other drinks consumed by method of reproduction of drinking during 24 hours. The questionnaire presented questions about the amount of water and beverages consumed prior to training, during and after it, and furthermore certain types of beverages were determined. The length of the questionnaire was not limited and lasted in average of 30-45 minutes. The survey was carried out during training camps at the place of their holding in April and May. We have received the permission by the Ethics Committee of the KazNU named by Al-Farabi for the purposes of conducting the research and carrying out biomedical research with the voluntary consent to participate in the research. Confidentiality of the research data was observed.

Statistical analysis of the study data was carried out using the "Statistical Package for Social Sciences" program (SPSS, version 16). Analyzing the data, the percentage distribution of answers on the questionnaire was calculated. The criterion χ^2 (chi-square) was applied for the analysis of categorical data. Statistical reliability was with p less than or equal to 0.05.

Results

Upon ascertaining water consumption by the Kazakhstan sportsmen during the research it has been determined that 26.65% of Kazakhstan athletes consume 1-2 liters of water per day, 41.67% consume 2-3 liters of water per day, 21.67% consume 3-4 liters of water per day. Estimating the consumption of water and other beverages among sportsmen of different sports, it should be noted that consumption of drinks from 2 to 3 liters per day is 73.3% among the triathletes ($\chi^2=18.867$, $p<0.001$), 40% among the judoists of the club team, 26.7% among volleyball players. From 3 to 4 liters consume 33.3% of volleyball players and 40.0% of judoists of the national team. From 4 to 6 liters of water and other beverages consume 6.7% of the investigated (Table 1).

Table 1. Water and other Beverages Consumption by Kazakhstan Athletes

No	The amount of water and other beverages consumption	Volleyball players n=15	Judoists of the national team n=15	Judoists of the club team n=15	Triathletes n=15	\bar{X}
1	Less than a liter	13.3	0	0	0	3.32
2	1-2 liters	20.0	33.3	40.0	13.3	26.65
3	2-3 liters	26.7	26.7	40.0	73.3	41.67
					$\chi^2=18.867$, $p<0.001$	
4	3-4 liters	33.3	40.0	6.7	6.7	21.67
5	4-5 liters	6.7	0	6.7	6.7	5.02
6	5-6 liters	0	0	6.7	0	1.67

Athletes are advised to consume a sufficient amount of liquid before, during, and after training with the aim of maintaining an optimal balance of liquid in body during physical activity, dehydration thus being avoided. The results of the study show that 58.3% of the Kazakhstan athletes researched

by us consume 200-400 ml 2 hours before training, and 25% of them 400-600 ml, among the triathletes, 73.3% ($\chi^2=11.200$, $p<0.02$) of the investigated consume 200-400 ml 2 hours before training and 60.0% ($\chi^2=10.333$, $p=0.07$) among the judoists of the national team of Kazakhstan (Figure 1).

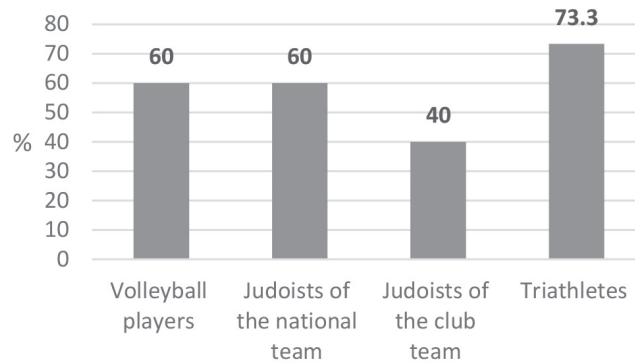


Figure 1. The percentage distribution of the athletes that consume 200-400 ml of drinks 2 hours before the workout

Athletes should consume an average of 400-600 ml of beverages 2 hours before the training starts as the recommended daily rate. We have established that only 20% of the volleyball players, judoists of the national team and triathletes consume recommended amount of beverages, and only 10.0% of the re-

spondents consume more than the recommended rate (from 600 to 1400 ml). It should be taken into account that 6.7% in each group of the investigators do not consume any beverages 2 hours before training at all (Figure 2).

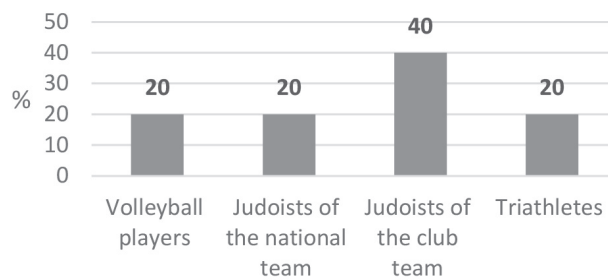


Figure 2. The percentage distribution of the athletes that consume 400-600 ml of drinks 2 hours before training

It is also important for athletes to consume enough water and drinks during the training. So while training athletes are recommended to consume 200-400 ml. of beverages every 15-20 minutes. Thus, during the 2 hour training, it is recommended to consume 700-1000 ml of beverages. Our research shows that water and other beverages consumption of investi-

gated athletes mostly does not comply with the recommended standards. Thus, 13.3% of investigated athletes said that they do not consume anything during the training, 20.0% of investigates consume 200-400 ml, 30.0% of them consume 400-600 ml and 28.4% of investigated athletes consume 600-1000 ml and even more than that (Table 2).

Table 2. Water and other Beverages Consumption by Kazakhstani Athletes during Training

No	The amount of water and other beverages consumption during training	Volleyball players n=15	Judoists of the national team n=15	Judoists of the club team n=15	Triathletes n=15	\bar{X}
1	Do not consume anything at all	20	0	13.3	20.0	13.3
2	200-400 ml	6.7	26.7	26.7	20.0	20.0
3	400-600 ml	26.7	20.0	26.7	46.7	30.0
4	600-800 ml	26.7	20.0	6.7	13.3	16.7
5	800-1000 ml	20.0	26.7	0.0	0.0	11.7
6	1000-1400 ml	0.0	6.7	20.0	0.0	6.7
7	1400-1600 ml	0.0	0.0	6.7	6.7	1.6

$\chi^2 = 3.933$, $p = 0.97$

Comparing the consumption of water and other beverages during the training among investigated athletes, we found out that the greatest number of triathletes (46.7%) consume 400-600 ml of beverages ($\chi^2=3.933, p=0.97$). It also should be noted that among the judoists of the national team of Kazakhstan 53.4% of athletes consume 600-1600 ml of liquid and 46.7% among volleyball players, whereas this amount of liquid among triathletes is taken only by 20.0% of the investigated

athletes (Table 2).

Analyzing the data of liquid consumption after training we found out that the recommended rate of liquid consumption (400-800 ml.) is consumed only by 58.4% of the investigated athletes, and the volume exceeding noted standards consumed by 15.0% of the investigated athletes while 26.6% of the investigated consume only 200-400 ml or do not consume any liquids after training at all (Table 3).

Table 3. Water and other Beverages Consumption by Kazakhstani Athletes after Training

No	The amount of water and other beverages consumption after the training	Volleyball players n=15	Judoists of the national team n=15	Judoists of the club team n=15	Triathletes n=15	\bar{X}
1	Do not consume anything at all	0.0	13.3	0.0	0.0	3.3
2	200-400 ml.	26.7	40.0	6.7	20.0	23.4
3	400-600 ml.	26.7	20.0	46.7	60.0	38.4
$\chi^2=10.667, p=0.08$						
4	600-800 ml.	13.3	13.3	33.3	20.0	20.0
5	800-1000 ml.	20.0	13.3	6.7	0.0	10.0
6	1000-1400 ml.	0.0	0.0	0.0	0.0	0.0
7	1400-1600 ml.	13.3	0.0	6.7	0.0	5.0

During the research, it was also revealed that 70.0% of respondents mostly consume water and juices during training,

16.7% consume special sports drinks and 13.3% do not consume anything during the training at all (Figure 3).

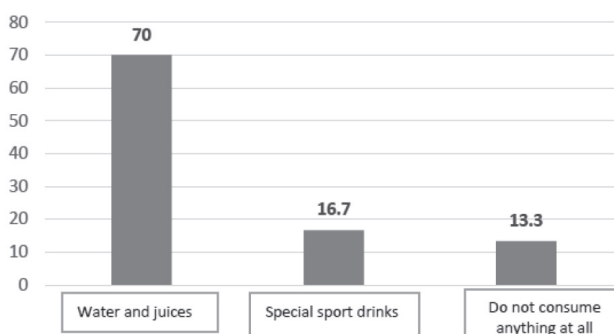


Figure 3. The percentage distribution of the athletes that consume different types of beverages

We also found out during the research the way Kazakhstan athletes control the body liquid balance, whether they weight themselves or not, and what weight loss is observed after training. The results showed that 86.7% of volleyball players and 10% of triathlonists do not weight themselves. On the contrary, 93.3% of judoists of the national team and the same number of judoists of the club team do it regularly. The largest amount of weight loss due to the loss of body liquids during the training which is up to 2.5 kg is observed of 28.6% of the judoists of high sportsmanship, and 57.1% of less trained judoists lose up to 1.5 kg of body weight.

Discussion

Optimal hydration of the body is of vital importance for humans. It has now been established that insufficient water consumption or moderate dehydration may cause the risk of developing chronic diseases (Gurevich, 2017). Water loss under moderate physical activity for 1 hour at temperature of 20-25° reaches 1-2 liters for the athletes with 70 kg body weight, 2-5% of body weight may be lost under physical activities due

to endurance with sweat. 1% water loss causes thirst, 2-3% - reduced endurance and strength, 5% - a health disorder.

According to Vorobyova et al. (2011) in order to avoid the risk of dehydration and physical performance reduction, athletes are advised to use special drinks containing carbohydrates and electrolytes, which are more favorable for sports than consuming water, during training or competition and after them.

Our researches have shown that 41.67% of investigated Kazakhstani athletes consume 2-3 liters of water and beverages per day and 21.67% consume 3-4 liters. Similar results are received by other authors as well. For example, French scientists believe that judoists of their country, being the strongest in the world, consume 2.5-2.7 liters of water and other liquid per day (Filaire, Maso, Degoutte, Jouanel, & Lac, 2001; Degoutte & Filaire, 2003; Finaud et al., 2006). A smaller amount of water and liquids which is equal to 1.4 liters is consumed by representatives of the sport as taekwondo in England (Fleming & Costarelli, 2007), and Brazilian athletes consume 1.6-2.0 liters (Rossi, Goya, Matayoshi, Pereira, & da

Silva, 2009). German runners consume 2.6-2.7 liters per day (Kemmler et al., 2006), and US runners –consume 2.7-2.8 liters per day (Barrak et al., 2010). Similar results were obtained by Martin, Lambeth and Scott (2006) during the research of English football players who consumed 2.4-2.5 liters, Ozdemir and Ersoy (2008) - Turkish weight lifters who consume 2.8-3.0 liters of water per day. According to Vasic and Jakonic (2008) the minimum amount of body liquid should be 1.5-2 liters. It is convincingly proved that there is no success in sports if the athlete has a proper hydration.

Casa et al. (2000) indicate that athletes should consume 400-600 ml of water 2 hours before the training, whereas according to our data only 20% of investigated Kazakhstan athletes consume such amount of water, and only 10% consume more than the recommended rate (from 600 to 1.400 ml).

Our research has shown that only 16.7% of investigated Kazakhstan athletes consume special sports drinks. Despite the fact that the advantages of sports drinks are obvious, the share of Kazakhstani athletes consuming them among the athlete dour research was taken from is comparatively small. Analysis of the types of liquid that Russian athletes use to quench their thirst conducted by Novakshanova and Ozhiganova (2013) showed that only 6% of Russian athletes regularly use sport drinks (rehydration) during sports. The overwhelming majority of the investigated people- 72% consume water for rehydration, 8% - fruit/vegetable juice, 14% prefer other drink (fermented milk, ice tea, water with ascorbic acid).

The Godek et al. (2010) data, which studied the volume of liquid consumption and sweating of football players of different sports skills, also witnesses in favor of sports drinks consumption. The authors found that the players of higher sportsmanship, consuming more sport drinks, the total liquid consumption and loss of sweat were smaller compared to less trained players which mainly consume water. Millard-Stafford et al. (2007) also believe that carbohydrate sport drinks saturated with caffeine support hydration, cardiovascular and thermoregulatory function.

It has been established that only 63.34% of the investigated Kazakhstan athletes consume the recommended norm (2-3 liters per day), another 6.69% of the investigated consume 3 to 6 liters of liquid. The investigated athletes do not consume enough liquid 2 hours before training. Only 20% of volleyball players, judoists and triathletes of national teams consume the recommended norm of liquid (400-600 ml). The majority of the investigated athletes (78.4%) consume the necessary amount of water and other drinks, reaching up to 1000 ml during training, 70.0% of investigated consume water and juices during training and only 16.7% consume sports drinks. The amount of liquid consumed by the investigated athletes is also insufficient after training. The recommended norm (400-800 ml) is consumed only by 58.4% investigators. 15% of the investigated sportsmen consume the volume reaching up to 800-1600 ml.

Acknowledgements

There are no acknowledgements.

Conflict of Interest

The authors declare that there are no conflicts of interest.

Received: 26 June 2018 | **Accepted:** 17 August 2018 | **Published:** 01 October 2018

References

- Baranuskas, M. (2012). *Assessment of actual nutrition and dietary habits of athletes during the 2008-2012 Olympic period*. Doctoral Dissertation, Biomedical Sciences, Public Health, Vilnius University.
- Barrack, M., Van Loan, M., Rauh, M., & Nichols, J. (2010). Physiologic and behavioral indicators of energy deficiency female adolescent runners with elevated bone turnover. *The American Journal of Clinical Nutrition*, 92, 652-659.
- Boydjiev, N., & Tarulov Z (1998). Prie-exerciseenergy drinks: which are the most appropriate carbohydrates – simple vs. complex sugars. *Hungarian Review of Sports Medicine*, 39(3), 151-167.
- Casa, D., Armstrong, I., Hillman, S., Montain, S., Reiff, R., Rich, B., Roberts, W., & Stone, J. (2000). National Athletic Trainer's Association position statement: fluid replacement for athletes. *Journal of Athletic Training*, 35(2), 212-224.
- Cheuvront, S.N., Carter, R., & Sawka, M.N. (2003). Fluid balance and endurance exercise performance. *Current Sports Medicine Reports*, 2, 202-208.
- Convertino, V.A., Armstrong, L.E., Coyle, E.F., Mack, G.W., Sawka, M.N., Senay, L.C., & Sherman, W.M. (1996). American college of sports medicine position stand: exercise and fluid replacement. *Medicine and Science in Sports and Exercise*, 28(1), i-vii.
- Coyle, E. (2004). Fluid and fuel intake during exercise. *Journal of Sports Sciences*, 22(1), 39-55.
- Degoutte, F. & Filaire, P. (2003). Energy demands during a judo match and recovery. *British Journal of Sports Medicine*, 37(3), 245-249.
- De Sousa, E., Da Costa, T., Nogueira, J., & Vivaldi, L. (2008). Assessment of nutrient and water intake among adolescents from sports federations in the Federal District, Brazil. *British Journal of Sports Nutrition*, 99, 1275-1283.
- Filaire, E., Maso, F., Degoutte, F., Jouanel, P., & Lac, G. (2001). Food restriction, performance, psychological state and lipid values in judo athletes. *International Journal of Sports Medicine*, 22(6), 454-459.
- Finaud, J., Degoutte, F., Scislawski, V., Rouveix, M., Durand, D., & Filaire, E. (2006). Competition and food restriction effects on oxidative stress in judo. *International Journal of Sports Medicine*, 27(10), 834-841.
- Fleming, S. & Costarelli, V. (2007). Nutrient intake and body composition in relation to making weight in young male taekwondo players. *Nutrition and Food Science*, 37(5), 358-366.
- Foster-Powell, K., & Brand Miller, J. (1995). International tables of glycemic index. *American Journal of Clinical Nutrition*, 62(suppl), 871-893.
- Godek, S.F., Bartolozzi, A.R., Peduzzi, C., Heinerichs, S., Garvin, E., Sugarman, E., & Burkholder, R. (2010). Fluid Consumption and sweating in national football league and collegiate football players with different access to fluids during practice. *Journal of Athletic Training*, 45(2), 128-135.
- Gurevich, K.G., Khanferyan, R.A., & Kambarov, A.O. (2017). Non-alcoholic beverages: russian priorities (in Russian). *Problems of Nutrition*, 86(3), 49-56.
- Institute of Medicine (2005). *Dietary reference intakes for water, potassium, sodium, chloride, and sulfate*. Washington, DC: The National Academies Press.
- Kemmler, W., Engelke, K., Baumann, H., Beeskow, C., Von Stengei, S., Weineck, J., & Kalender, W. (2006). Bone status in elite male runners. *European Journal of Applied Physiology*, 96(1), 78-85.
- Martin, L., Lambeth, A., & Scott, D. (2006). Nutritional practices of national female soccer players: analysis and recommendations. *Journal of Sports Science and Medicine*, 5, 130-137.
- Millard-Stafford, M.L., Cureton, K.J., Wingo, J.E., Trilk, J., Warren, G.L., & Buyckx, M. (2007). Hydration during exercise in warm, humid conditions: effect of a caffeinated sports drink. *International Journal of Sport Nutrition and Exercise Metabolism*, 17(2), 163-177.
- Nikityuk, D.B., Novokshanova, A.L., Abrosimova, S.V., Gapparova, K.M., & Pozdnyakov, A.L. (2012). The mineral composition of the carbohydrate-electrolyte drinks, vitamin-mineral complexes and dietary supplements for athletes (in Russian). *Problems of Nutrition*, 81(4), 71-76.
- Noakes, T. (2003). Fluid replacement during marathon running. *Clinical Journal of Sports Medicine*, 13(5), 309-318.
- Novokshanova, A.L., & Ozhiganova E.V. (2013). Medical and biological basis of the recipe of whey-contain in grehydrating beverage for the athletes (in Russian). *Problems of Nutrition*, 82(6), 67-70.
- Ozdemir, G., & Ersoy, G. (2008). The nutrition and health profile of the Turkish female national weightlifting team who attended to pre-camp of Beijing Olympics- Pilot study. *International Journal of Human Sciences*, 7(2), 529-542.
- Paken, P. (2010). *Functional drinks and special drinks (in Russian)*. 496 p.
- Rossi, L., Goya, R., Matayoshi, M., Pereira, C., & Bernardo da Silva, J. (2009). Nutritional evaluation of taekwondo athletes. *Brazilian Journal of Biochemistry*, 3(2), 159-166.
- Sawka, M.N., Montain, S.J., & Latzka, W.A. (2001). Hydration effects on ther-

- moregulation and performance in the heat. *Comparative Biochemistry and Physiology*, 128, 679 - 690.
- Vasic, G., & Jakonic, D. (2008). Importance of hydration in sports. *Sport Mont*, VI(15-16-17), 848-854.
- Vasic, G., Dimitric, G., & Cokorilo, N. (2010). Dietary nutrition of sportsmen. *Sport Mont*, VIII(23-24), 382-388.
- Vasiljevic, I., Bojanic, D., Petkovic, J., & Muratovic, A. (2014). Sport nutrition knowledge of coaches. *Sport Mont*, XII(40-41-42), 126-130.
- Vorobyova, V.M., Shatnyuk, L.N., Vorobyova, I.S., Mikheeva, G.A., Muravyova, N.N, Zorina, E.E., & Nikityuk, D.B. (2011). The role of nutritional factors in intensive physical activities of sportsmen (in Russian). *Problems of Nutrition*, 80(1), 70-77.