Bulletin of the *Transilvania* University of Braşov
Series IX: Sciences of Human Kinetics • Vol. 9 (58) No. 1 - 2016

IMPORTANCE OF HYDRATION DURING THE ENDURANCE EFFORT

M. CHIRAZI[1] C. UNGUREANU[2]

Abstract: *Due to the characteristics of the endurance effort (duration, increased number of active muscle groups, involvement of the important systems and functions of the organism), hydration has a decisive role both during the race (effort) – for obtaining a valuable result -, and during the recovery period! The study consists in the monitoring of some somatic and functional parameters (body weight, heart rate, etc.) of an amateur athlete. The assessment and the control of the training from the point of view of the covered distance, elapsed time, reached speed, heart rate, as well as the difficulty degree of the training field (climbing, descending, altitude) has been performed with the help of a GPS sports watch, Garmin 910xt. This device also has the option to download the information during the training under graphic form. The results of the study have shown the ability of the organism to adapt, as well as the correlation between the water intake and the body weight.*

Key words: *body weight, hydration, running.*

1. Introduction

Due to the characteristics of the endurance effort (extended stress duration), the increased number of active muscle groups, the total amount of systems and functions of the human organisms involved in the effort, the water intake plays an essential role in obtaining the sports performance or the training goals [2]. Dumitru Buiac [4] asserts that a 2% hydric loss, (1.2 l for a runner weighing 60 kg.) can decrease the performance capacity up to 10% and in the case of a 5-6% loss, the effort must be interrupted. A characteristic of the long term aerobian effort is also the fact that the water requisite is high because the decomposition reaction of the energy compounds on cell level are numerous, frequent and a high quantity of blood is circulated. At the same time, the absorption of the energy substances and the elimination of the residues are done in an amplified hydric environment, while the concentration of mineral salts must be maintained [5].

Another peculiarity of the endurance physical effort is the increase in the body temperature due to the fact that one of the results of the burning of the energy compounds of the organism is heat. Thermoregulation is done through perspiration and this is influenced by the duration and the intensity of the effort, the body weight and the surface, the outside

[1] PhD "Alexandru Ioan Cuza" University from Iaşi, Faculty of Physical Training and Sports.
[2] Master "Alexandru Ioan Cuza" University from Iaşi, Faculty of Physical Training and Sports.

temperature and the physical training level of the sportsman [1].

Among the minerals that are lost through perspiration, the main percentage is that of chlorine and sodium, followed by iron, magnesium and potassium [7]. Water participates directly to the energy reactions so that for each gram of glycogen the organism retains 2.7 grams of water. The water loss through perspiration overloads the activity of the cardiovascular system by increasing the viscosity of the blood and as a result the quantity of oxygen that reaches the muscles decreases and the heat transfer inside the body on the surface is low [6].

Therefore it is recommended to drink 150 ml – 250 ml of water every 20 minutes so as to dissolve a series of nourishing elements, glucides, salts and vitamins. This is why even in the regulation of the endurance races (half marathon, marathon, ultramarathon) hydration spots are provided and placed, calculated for an estimated time of 14-15 minutes of running.

2. The Experiment

2.1. Purpose

– monitoring some somatic and physiological indexes under different hydration conditions;

- adjusting the diet according to the duration of the effort and the requirements of the organism.

2.2. Hypothesis

Hydration during a race must be done depending on the ability of the subject to adapt to the effort and the meteorological conditions

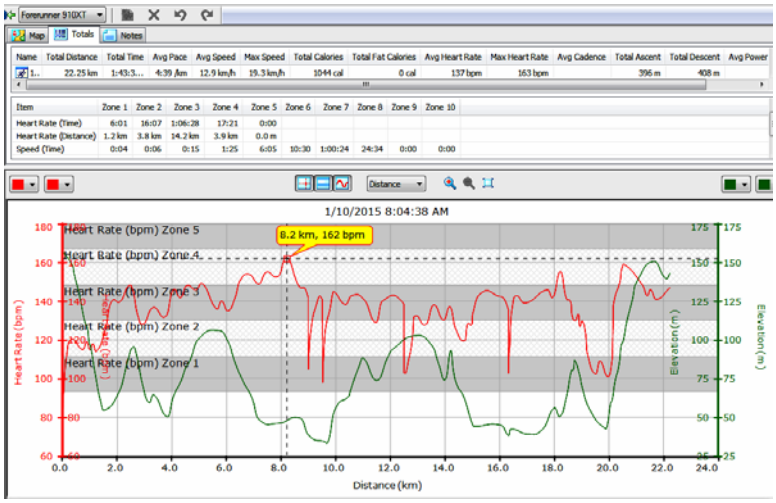
2.3. Content of Experiment

The paper represents a self-experimental case study performed under strict monitoring conditions of a subject with the help of a GPS sports watch, Garmin 910xt. This device measures the altitude, the shifting speed, the heart rate, the air temperature, the number of burnt calories, all the parameters presented on different areas and it also has the option to download on a computer the information recorded under different graphic forms. The subject presented in the study is an amateur sportsman that trains for half marathon and marathon contests organized under several conditions (mountain, road etc.) by different organizations and clubs. A fact that must be mentioned is that the subject found himself in this situation (amateur runner) following his decision to transform his food addition into effort addiction. Thus, 10 years ago, our subject suffered from morbid obesity, having a BMI of 40.91 and through a gradual and assumed effort, sustained by an alkaline diet, has managed to lose weight and at the same time to significantly increase the effort capacity specific to half marathon and marathon races.

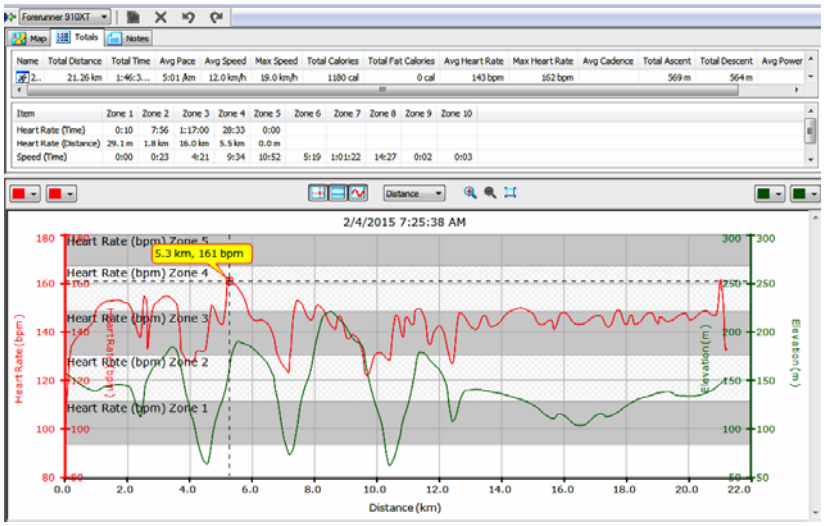
The subject was monitored during three races, two half marathons and one marathon. During one of the half marathon races, the subject drank a precise quantity of water (graph no. 1) and during the other half marathon race he did not drink water (graph no. 2). The graphs 1 and 2 show the evolution of the heart rate during the entire duration of the race (red curve). The variation of the heart rate depends on the shifting speed of the subject, but also the difference in level (green line). It can be easily noticed that the two variables, the level curve and the heart rate, are correlated.

There are visible differences in the number of burnt calories of 1044 cal. and 1180 cal. even if there is a slight difference, about 1 km, in the graph number 1 (22.25 km and 21.26 km).

For the third race, the same parameters of the subject were monitored during a marathon (graph no. 3) under the conditions of a partial hydration. In other words, he did not observe precisely the theoretical indications and recommendations out of the desire to adapt the organism to harder conditions during a race (increased temperature, increased fatigue–stress, incomplete recovery, unexpected variations of the landscape, etc.). The graph number 3 also shows the shifting speed (blue line) together with the heart rate and the level curve. It can be easily noticed that the shifting speed is influenced directly by the level curve. At the same time, the heart rate decreases during the descending stages even if the shifting speed increases which emphasizes the importance of choosing the shape of the running field, both for establishing the effort intervals and for the recovery or the stress of the joints.



Graph 1. *Profile of the training under hydration condition, preliminary period, 13th week, 10.01.2015*



Graph 2. *Profile of the training without hydration, period before the competition, 1st week, 04.02.2015*

Graph 3. *Profile of the training with partial hydration during a marathon race, period before the competition,*

5th week, 01.03.2015

3. Results and Discussions

The comparison of the results obtained in the three races (table 1) performed under different conditions from the point of view of the hydration, the distance and the meteorological conditions (temperature and humidity) allows us to formulated some conclusions.

One of the most obvious differences refers to the body weight of the subject recorded at the end of the race (69.8 kg.), that is a difference of only 200 gr as compared to the initial weight. If we add to the 200 gr. the 610 gr. of liquid ingested during the race, we can say that the subject has lost 810 gr. which represents 1.15% of the time for a period of 1h:43 min. During the second race, under the conditions of the absence of hydration, the subject has lost 1400gr. which represents 1.98% of the body weight for 1h:46. At the same time, we notice that during the second race (column 2), in the absence of hydration, the subject has covered a 1 km shorter distance, a running time 3 minutes moor and the heart rate is increased by approximately 6 bpm. This data can lead us to the conclusion that the lack of hydration during a race has determined a decrease of the recorded performances. Nevertheless, during the second race, the air temperature was negative which forced our subject to dress more heavily which led to the increase of the body temperature and a higher effort for the thermoregulation of the body.

The marathon race is another example of the lack of hydration. Thus, the average of the heart rate registered in the marathon race is lower by 11 bpm which emphasizes the increased training level of our subject. For the marathon race, we can notice an increase in the body weight of our subject by approximately 3 kg (73.5 as compared to 70 and 70.5) as compared to the initial moments of the two races. We must mention that the scheduling of a marathon run was done every two weeks, including a period of biological preparation for the race (energy food, additional mineral intake). The increased weight of the subject has also determined a significant decrease of the weight – 1900 gr., approximately 2.5%, respectively 3000 gr if we also add the 1100 gr of ingested liquid, approximately 4%.

Table 1

Monitoring of different parameters during the endurance effort depending on the hydration level

No.	Date/ Meteorological conditions	Duration	Distance (km)	AVERAGE of the heart rate (bpm)	Hydric intake (ml)	Weight (kg)		Difference in weight (gr)
						Before	After	
1	10.01.2015 +5˚C - 61% humidity	1h:43	22.25	137	610	70	69.8	200
2	04.02.2015 -4˚C 86% humidity	1h:46	21.26	143	0	70.5	69.1	1400
3	01.03.2015 +1 - +3˚C 93% humidity	3h:30	42.2	132	1100	73.5	71,6	1900

4. Conclusions

The water intake is recommended both during the training periods and during the official races. At the same time, through hydration energy substances and minerals can be ingested in order to help the organism increase its effort capacity.

Although our subject is not a performance sportsman, he has managed to become aware of the hydration need during the races, as well as the identification of an energy food diet for the recovery.

The weight loss is more accentuated during the endurance races when the effort is done without a proper hydration, taking into account even the virtual loss (the quantity of ingested water cumulated with the recorded difference in weight).

References

1. Alexe, C. I.: *Jogging pentru toți (Jogging for all)*. Bacău. Editura Pro-Didact, 2010.
2. Bompa, T.O.: *Teoria şi metodologia antrenamentului – periodizarea (Theory and methodology of training – periodization)*. Bucureşti. Ed. Ex Ponto, 2002.

3. Bouchard, C.: *Physical activity and obesity*. USA. Ed. Human Kinetics, 1997.
4. Buiac, D.: *Efortul de rezistență (The effort of resistance)*. Bucureşti. Editura Sport Turism, 1983.
5. Drăgan, I.: *Medicină sportivă (Sports medicine)*. Bucureşti. Editura Medicală, 2002.
6. Dumitrescu, S.: *Jogging. Alergi pentru viață (Jogging. Run for life)*. Bucureşti. Ed. Cartea de Buzunar, 2003.
7. Murakami, H.: *Autoportretul scriitorului ca alergător de cursă lungă (Self-portrait of the writer as a long distance runner)*. Iaşi. Ed. Polirom, 2009.