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Letter to the Editor

Master athletes and "1001 miles", the longest and most extreme European randonnée

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Keywords

Cycling • Sport • Physical activity • Italy

Dear Editor,
It is known that the most traditional endurance and ultra-endurance (ultra-endurance competition is defined as events that exceed the 6 hours in duration) sports are swimming, cycling, running, and triathlon as a combination of them. In recent years, several studies reported an increased participation in ultra-endurance performances of six hours or longer [1] such as ultra-running [2, 3], ultra-cycling [4] and ultra-triathlon. In several cases in these ultra-endurance events has been observed an increased participation from master athletes older than 35 years [5].
Several authors investigated the influence of age in triathlon performance [6] and in running performance [7], but only a few studies investigated other endurance disciplines such as swimming or cycling. In particular, cycling as a non-weight-bearing activity represents an interesting model because it can be performed even in older ages [8]. Most of the studies on ultra-endurance race cyclists have been performed in experimental conditions, so the aim of this study was to evaluate "on field" the effects of this activity.
The so-called "1001 miles" is the longest and extreme randonnée of Europe and stretches over a distance of 1600 km to go across in 7 days in a region characterized by high temperatures and high humidity (the race occurs in August, in Italy). Remarkable is also the commitment in terms of slope and altitude changes to deal with [9]. The so-called randonneuring is a sport born in France. During each competition (called randonnée), the participants tackle paths of 200 km and beyond, passing through predetermined control points. The aim is to complete the course within certain time limits, and the order of arrival is irrelevant.
In August 2016 Twenty-one cyclists were voluntary enrolled in the study. This small sample size was due to the limited available economic resources. The study was approved by the Ethical Committee of the race organizer and an informed consent form (in multiple languages) was distributed and signed by the athletes before being enrolled.
A medical evaluation, and the collection of blood and urine samples occurred before the race and at the end of the race. Data were managed in a totally anonymous way. Tests were not technically considered invasive. Samples were collected by a nurse and examined by an external laboratory (in Sesto San Giovanni, Milan). The performed analyses were: blood count, creatinine, urea (Blood Urea Nitrogen - BUN), calcium, sodium, potassium, chlorine, magnesium, bicarbonates, glycemia, creatine phosphokinase (CPK), urine analysis.
Collected data were inserted in a database and exported for statistical analysis. Percentages, means and standard deviations were calculated, followed by the creation of tables for a descriptive purpose. Continuous variables were evaluated using the Kolmogorov-Smirnov test in order to verify the normality hypothesis, and the Bartlett's test for homogeneity of variances between the two groups. For all variables, the assumptions of normality and homogeneity were satisfied. The differences between groups were evaluated with paired t test except for "Urine clarity" that was evaluated using the chi-square test. Statistical analyses were performed using R version 3.3.3. The significance level was set at $p < 0.05$. Athletes who agreed to participate in the study were 3 females (14.3%) and 18 males (85.7%). The mean age was 53.42 years old (Std. Dev. 8.27; range 40-69). 14 (66.6%) were from Italy, 2 (10%) from Germany, 1 (4.7%) from Canada, 1 (4.7%) from Switzerland, 1 (4.7%) from Japan, 1 (4.7%) from Peru, 1 (4.7%) from Spain.
Laboratory results are resumed in Table I. Temperatures recorded during the randonnée are resumed in the Supplementary Table I.
Our investigation showed a statistically significant increase in blood urea concentration (BUN) in cyclists involved in "1001 miles" race. The phenomenon is certainly due to the increase in energy demand by the large striated muscle masses involved in the exercise, whereas the perfusion of body organs such as the kidneys may decrease up to 25% of resting levels [10]. It resulted in a temporary reduction in the glomerular filtration rate (eGFR) with a consequent increase in the values of metabolic wastes such as urea [11, 12]. Not statistically significant differences were observed between men and women.

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Tab. I. Laboratory analysis.

Blood	Beginning (mean, Std. dev.)	End (mean, Std. dev.)
Urea* (mg/dL)	39.24 ± 6.50	52.62 ± 11.68
Creatinine* (mg/dL)	0.86 ± 0.12	0.81 ± 0.09
Calcium (mmol/L)	2.37 ± 0.10	2.15 ± 0.08
Sodium (mEq/L)	144.67 ± 1.59	138.76 ± 2.79
Potassium (mEq/L)	4.29 ± 0.31	4.10 ± 0.46
Chlorine (mEq/L)	105.19 ± 1.72	105.05 ± 2.87
Magnesium (mmol/L)	0.64 ± 0.07	0.85 ± 0.05
Bicarbonates (mmol/L)	25.60 ± 2.30	21.21 ± 2.34
Glucose (mg/dL)	97.10 ± 24.17	94.81 ± 21.77
Urine	**Beginning**	**End**
Urine clarity*		
Clear (%)	21 (100%)	6 (28.57%)
Turbid (%)	0 (0%)	15 (71.43%)
PH (mean, Std. dev.)	5.71 ± 0.89	5.43 ± 0.18
Specific gravity (mean, Std. dev.)	1.02 ± 0.004	1.03 ± 0.002
Blood* (mean, Std. dev.)	13.24 ± 40.61	16.95 ± 38.34
Leucocytes (mean, Std. dev.)	5 ± 5.5	10.14 ± 18.92

* statistically significant difference (p value < 0.05)

Concluding, in master athletes, it is important to have an adequate water-saline reintegration during ultra endurance races: this could lead to a good perfusion pressure of the internal organs and, especially some functional sport drinks (particularly those containing Glucose-Fructose and sodium) can improve athletic performance by sustaining metabolism and optimizing water absorption [13]. It is also important an adequate diet during the whole preparation phase and the race, aimed at enriching the hepatic and muscular glycogen reserves as much as possible, in order to contain protein catabolism and the synthesis of nitrogen compounds [14].

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Conflict of interest statement

The authors declare no conflict of interest.

Authors' contributions

FC had the idea of the study. LC helped conceptualize ideas, provided support and suggestions. AC helped conceptualize ideas, provided support and suggestions. SD provided helped conceptualize ideas, support and suggestions. MC helped conceptualize ideas, provided support and suggestions. RS helped conceptualize ideas, provided support and suggestions. MGD helped conceptualize ideas, provided support and suggestions. AC performed statistical analysis. GL helped conceptualize ideas, provided support and suggestions. GT provided support and wrote the article.

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Tab. S1. Temperature recorded in each 1001 miles stop (in Celsius degrees).

Day/place	Temp. med.	Min. temp.	Max. temp.	Humid. med.	Wind
I Colorno	27°	19°	32°	47%	19 km/h
II Lugo	25°	20°	30°	64%	15 km/h
III Todi	25°	17°	30°	61%	7 km/h
IV Staffoli	24°	20°	29°	85%	9 km/h
V Castellania	23°	21°	24°	85 % (rainy)	6 km/h
VI Nerviano	24°	21°	29°	67%	7 km/h

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