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Prevalence of dehydration and fluid intake practices in elite rally Dakar drivers

Stratégies hydriques et prévalence de la déshydratation chez les pilotes élites du rallye Paris–Dakar

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KEYWORDS
Motor racing;
Water balance;
Dehydration;
Rehydration beverage

Summary Dehydration has long been shown to reduce physical performance, cognitive function, and alertness in a range of athletic and non-athletic populations. The motor sport needs several perceptive and neuromuscular skills to adequately perform the race.

Objectives.— Describe the hydration practices and dehydration prevalence in elite motor sport athletes. Equipment and methods used: the sample consisted of four distinct groups of drivers; motorcycle riders (n = 7), quad riders (n = 4), car drivers (n = 8), and truck drivers (n = 4). The urine samples and a brief questionnaire to assess hydration habits and practices were collected after the race. Urine specific gravity was determined for hydration status.

Results.— During the race, subjects consumed water (82%) and isotonic drinks (18%). After the race, athletes consumed energy drinks (17%), beer (13%), soft drinks (26%), water (30%), and isotonic drinks (13%), and showed a mean urine specific gravity of 1.031 ± 0.02 g·mL⁻¹, with drivers showing a significant and serious dehydration, 29% and 71% respectively. Our results show that rally racers present an important dehydration status after finishing the stage, in addition to inadequate rehydration strategies.

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MOTS CLÉS
Course automobile ;
L’équilibre de l’eau ;

Résumé Il a été classiquement montré que la déshydratation réduisait la performance physique et cognitive ou la vigilance dans des populations entraînées ou non entraînées. Les sports mécaniques requièrent des capacités neuromusculaires aussi bien que perpectives pour réaliser de façon optimale la course.

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1. Introduction

The Dakar rally is the most traditional rally in the world, with race stages taking place in very hostile environments, with elevated heat, and dangerous territories that require optimal motor control during long distance races. In motor sport competition, several perceptive and neuromuscular skills are needed to perform adequately during competition. For instance, the elevated heat environment encountered during competitions may increase fluid loss and produce dehydration, which has long been shown to reduce physical performance in sports, cognitive function, and alertness [1]. An adequate fluid intake before, during and between competitions may help provide better performance during rally races. Because in rally competitions there is only 8 to 12 hours of rest between race stages (including sleeping), adequate rehydration strategies become a very important factor in this group of athletes. The hydration necessities and practices have been described for many sports. Authors agree that a rehydration drink should include electrolytes (sodium and potassium), carbohydrates and have adequate osmolality to speed intestinal absorption and cellular hydration [2]. However, the steady hydration of rally drivers is lacking scientific literature. Therefore, the aim of this study is to describe the hydration habits and dehydration prevalence in elite rally athletes.

2. Material and methods

This research was conducted in the 2013 version of the Dakar rally; the starting point was in Argentina, continued through Peru, and finished in Chile. The study measurements were made after the 12th stage of Dakar rally. This race stage consisted of a route of 346 km of distance.

2.1. Participants

Twenty-three top-level rally male athletes were examined in this study (data means and standard deviations); 27.8 ± 4.8 age (year), 1.79 ± 0.6 height (m), 24.6 ± 1.1 body mass index (kg.m−2). The sample was included four groups of drivers; motorcycle riders (n = 7), quad riders (n = 4), car drivers (n = 8), and truck drivers (n = 4). An institutional review board approval for our study was obtained and a signed informed consent document was obtained according to the law before any of the tests were performed. We complied with the human experimentation policy statement guidelines of the American College of Sport Medicine, and in accordance with the Declaration of Helsinki.

2.2. Urine samples recollection

The urine samples were collected immediately after the Atacama stage of the Dakar rally. Athletes had 20 min to provide urine samples into specially designed containers. Subjects that did not fulfill this requirement were eliminated from the study, 35 subjects were recruited but 12 were excluded, leaving 23 subjects as the study population.

Samples were analyzed for urine specific gravity (USG; g.mL−1) using a portable refractometer (Robinar model Spx, USA). USG was classified by previously described values [3]. USG is used as an indicator of hydration status, which has proven to be an excellent indicator of hydration, which brings security features, speed of sampling and level type A.

2.3. Hydration habits questionnaire

Immediately after the Atacama stage of the Dakar, rally athletes completed questionnaire regarding the type of fluids ingested during and after competition. Also, subjects were asked about weight, height, age, nationality, and sport category.

2.4. Statistical analysis

Descriptive statistical analyses were carried out using GraphPad Prism 5.0® (Graphpad Software, San Diego, CA, USA). Data in the text are presented as the mean ± standard deviation (SD). One-way ANOVA was used for mean differences. Alpha level was set at P < 0.05 and the percentages of beverage preferences are presented in circular graphs.

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Prevalence of dehydration in rally Dakar drivers

3. Results

After the race, all groups of athletes had a USG of 1031 ± 0.02 g·mL⁻¹ (data means and standard deviations: car; 1032 ± 0.002, motorcycle; 1030 ± 0.002, quad; 1032 ± 0.003 and truck; 1031 ± 0.003). No significant differences were observed for USG between groups. Table 1 contains the results of the hydration habits questionnaire in the detection of preferences of rally athletes for the intake of different beverages, during and after race. The percentage of consumption in these drinks, including energy drinks, beer, soft drinks, isotonic drinks and water, are shown (see Table 1).

<table>
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<th>Table 1</th>
<th>Intake of different beverages in athletes of rally Dakar (%); during race and after race.</th>
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<tr>
<td>Water</td>
<td>Typical isotonic drinks</td>
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<tr>
<td>During racing</td>
<td>82%</td>
</tr>
<tr>
<td>After racing</td>
<td>30%</td>
</tr>
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</table>

4. Discussion

To the best of the authors’ knowledge, this is the first time that hydration habits and hydration status are described among Dakar rally athletes. Our data show a serious dehydration status among athletes after competition, and most athletes’ error in the selection of rehydration beverages which could help in the recovery between races.

Our results show that among athletes, 29% significant dehydration and 71% a serious dehydration according to classification by Casa et al. [3].

The thermoregulatory system is one of the homeostatic systems that may be more critically affected during motor sport competitions due to dehydration, with possible life-threatening consequences. In the United States, it has been reported that each year approximately 14 drivers die, and many others are paralysed or seriously injured. Further investigation is required to clarify the role of dehydration on these accidents.

Our study shows that athletes evaluated in the Dakar chose to consume on average 18% isotonic drinks and 82% water during race. All athletes studied consumed liquid during the race, this being very positive for maintaining water balance; however, studies show that consumption of isotonic drinks could increase performance and reduce dehydration compared to water consumption during exercise [2]. Apparently, the amount of liquid consumed was insufficient since all subjects had high rates of dehydration after the race.

According to the American College of Sports Medicine, an ideal rehydration drink contains the following: 20 to 30 mmol/L sodium chloride, 2-5 mmol/L potassium and 5–10% carbohydrates [1]. Under these conditions, only the typical isotonic drinks would be useful for proper rehydration and efficient recovery (see nutritional characteristics of the drinks in Table 2).

Table 2 Nutritional characteristics of the drinks in study.

<table>
<thead>
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<th>Table 2</th>
<th>Nutritional characteristics of the drinks in study.</th>
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<tr>
<td>Energy (Kcal/L)</td>
<td>Water</td>
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<tr>
<td>CHO (g/L)</td>
<td>0</td>
</tr>
<tr>
<td>CHO %</td>
<td>0</td>
</tr>
<tr>
<td>Fat (g/L)</td>
<td>0</td>
</tr>
<tr>
<td>Protein (g/L)</td>
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<tr>
<td>Na (mmol/L)</td>
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<td>K (mmol/L)</td>
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<tr>
<td>Osmolality (mosmol/kg)</td>
<td>0</td>
</tr>
<tr>
<td>Others</td>
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5. Conclusion

Serious dehydration was highly prevalent in...
improve fluid intake practices, as this would prove an enormous benefit, not only to their competitive performance, but also for safety reasons.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

Acknowledgements

The authors would like to thank all of the participants who volunteered in the study.

References