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No Effect of Pre Race Supplementation with Vitamins and Minerals on Performance in an Ultra-Endurance Race

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Abstract: Intake of supplements such as vitamins and minerals is widespread in athletes. The aim of the study was the investigation of the influence of intake of vitamins and minerals before an ultra-endurance triathlon and its effect on race performance in a descriptive field study. Participants of the "Triple Iron Triathlon Germany 2006" in Lensahn, Schleswig-Holstein, Germany, were contacted by a newsletter six weeks before the race by the organizer and received a questionnaire to fill in their intake of vitamins and minerals. Questionnaires were self-administered and not administered by trained personnel. During this race the athletes had to cover 11.4 km swimming, 540 km cycling and 126.6 km running within 58 hours. The athletes were divided into two categories: successful finishers with intake of vitamins and minerals and successful finishers without intake prior to the race. Race performance (total running time in h) of athletes with intake and athletes without intake of these substances was compared. In the four-week period prior to the race, nine athletes (53 %) ingested vitamins and eight athletes (47 %) minerals. Athletes with intake of vitamins (44.7 ± 7.0 h versus 50.4 ± 4.4h; $p>0.05$) and minerals (45.3 ± 7.2 versus 49.3 ± 5.4 h, $p>0.05$) finished the race not faster than athletes without intake of vitamins and minerals. In the "Triple Iron Triathlon Germany 2006" in Lensahn, Germany, no influence on race performance was observed concerning the regular intake of vitamins and minerals in the last four weeks before the race.

Key words: Nutrition, sports, vitamins, minerals, diet

Introduction

Ergogenic supplements are widespread in nutrition in athletes (Ahrendt, 2001; Crowley and Wall, 2004; Striegel *et al.,* 2006). Many athletes are concerned about vitamin and mineral intake and often use nutritional supplements both for security as well as for performance reasons (Greandjean, 1983). Intake of supplements is widespread in athletes (Huang *et al.,* 2006; Maughan *et al.,* 2004). About 75 % of female athletes and 55 % of male athletes use supplements (Nieper, 2005). The supplements often taken by athletes include vitamin C, the vitamin-B-complex, iron and magnesium, often as part of a multi-vitamin or multi-mineral product (Grandjean, 1983).

In several studies, no effect of intake of ergogenic supplements, vitamins and minerals has been shown (Fry *et al.,* 2006; Singh *et al.,* 1992; Weight *et al.,* 1988). Supplementation of vitamins and minerals for weeks does enhance neither anaerobic exercise (Fry *et al.*, 2006) nor prolonged endurance performance of two hours (Singh *et al.,* 1992; Weight *et al.,* 1988).

Only little is known about the intake of ergogenic supplements and their effect on performance in ultra-endurance athletes (Singh *et al.,* 1993). These athletes use in addition to rigorous physical training dietary manipulations as integral component to enhance performance (Applegate, 1991).

The aim of our study was to investigate the intake of vitamins and minerals before an ultra-endurance triathlon and their effect on race performance in ultra-triathletes in the longest triathlon in Europe, the Triple Iron Triathlon Germany in 2006.

Materials and Methods

Subjects: All participants of "The Triple Triathlon Germany 2006" in Lensahn, Schleswig-Holstein, Germany, were contacted by a separate newsletter from the organizer three months before the race and were asked to participate in our investigation. Twenty-nine Caucasian triathletes (one woman, 24 men) intended to start. Twenty- five athletes (one woman, 24 men) entered the race. The only woman and 21 men finished the race successfully within the time limit. Six weeks before the race all participants were contacted once again and received a questionnaire to fill in their nutritional habits with regard to the intake of vitamins and minerals.

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Questionnaires were self-administered and not administered by trained personnel. Athletes were invited to report their intake of all types of vitamins and minerals (type of product, dosage) in the four-week period before the race. Apart from an abundant choice of products to mark with a cross, enough space was left for personal remarks. After the race, the race director asked the successful finishers to hand in their completed form. Twenty-two male triathletes entered our study. They all gave their informed written consent. From these subjects, 17 male triathletes (age 39.2 ± 7.5 years, weight 80.7 ± 8.9 kg, height 178 ± 5 cm, BMI 25.4 ± 2.4 kg/m^2) finished the race successfully within the time limit. They trained 18.9 ± 7.4 (6 to 33) h per week in order to prepare for this race and had an average experience of 18 (2 to 55) finished ultra-endurance races of 24 h and more prior to this race.

The race: The Triple Iron Triathlon Lensahn, Schleswig-Holstein, is the longest triathlon in Europe. From July 28th to July 30th 2006, the 15th edition took place. The athletes had to cover 11.6 km swimming, 540 cycling and 126.6 km running. On Thursday 28th, at 07:00 a.m., the race started. Swimming was in a heated outdoor pool with 25^{o} Celsius. Wet suits were allowed. After passing the transition area, 67 laps of a hilly course of 8 km had to be cycled in the surroundings of the town. After cycling, athletes had to change to the run course of 96 laps with 1.31 flat km in the town of Lensahn. Cycling was nearly free of road traffic whereas the running course was completely free of traffic and illuminated during the night. All athletes had their own support crew for nutrition and change of equipment. The time limit was 58 h. The weather on the first day was cloudy, no rain and dry with a maximal temperature of 28^{o} Celsius. In the first night toward the sunrise, cold and rain appeared. The second day was initially cloudy, then in the afternoon the sun appeared and the temperature rose to 30^{o} Celsius.

Measurements and calculations: The athletes were divided into two categories: successful finishers with intake of vitamins and minerals and successful finishers without intake of such products prior to the race. Total running time in h of athletes with intake and those without intake of such substances was compared.

Statistical analysis: Statistical analysis was performed with the R software package (R Foundation for Statistical Computing, Vienna, Austria, 2005). Two-way-analysis of variances (ANOVA) was used to test the significance of influence of vitamins and minerals on race performance. The predetermined level of significance for the study was 0.05.

Results

Seventeen athletes of our study group finished the race within the time limit. According to the self-declaration by questionnaire as described before in the four-week period before the race, nine athletes (53%) consumed vitamins and eight athletes (47%) minerals (Table 1). Four different vitamins were preferred, especially a multi-vitamin product (47%) and five different minerals were consumed with special preference of magnesium (53%). Intake of vitamins and minerals had no effect on race performance (Fig. 1).

Table 1: Intake of vitamins and minerals in the four weeks before the race. *Multiple answers are possible when one athlete ingested several products.

Vitamins *		
Multi-vitamin	8	(47%)
Vitamin C	3	(18%)
Vitamin B (complex)	2	(12%)
Vitamin E	2	(12%)
No intake of vitamins	6	(53%)
Minerals		
Iron	4	(24%)
Multi-mineral	4	(24%)
Calcium	3	(18%)
Zinc	2	(12%)
No intake of minerals	7	(41%)

Discussion

The main finding of this investigation is that successfull nine finishers with intake of vitamins finished the race statistically not significantly 5.7 ± 2.6 h faster than the athletes without intake of vitamines. Likewise the eight athletes with intake of minerals (45.3 ± 7.2 h) finished the race statistically not significantly 4.0 ± 1.8 h faster than the athletes in the control group without such an intake (49.3 ± 5.4h). Nevertheless the difference did not reach a statistical significance.

Intake of supplements is widespread in athletes (Huang *et al*., 2006; Maughan *et al*., 2004). About 75 % of female athletes and 55 % of male athletes use supplements (Nieper, 2005). Depending upon different studies, the percentage varies from 6 % to 100 % (Nieman *et al.,* 1989; Nieper, 2005; Peters and Goetzsche, 1997; Sobal and Marquart, 1994; Sundgot-Borgen *et al.,* 2003; Worme *et al.,* 1990). In our study, nine male ultra-triathletes (53 %) consumed vitamins and eight athletes (47 %) minerals (Table 1). This is comparable to other studies with ultra-endurance athletes like ultra-runners. In the study of Singh *et al.* (1993), twelve of 17 ultra-marathoners (70 %) used vitamin and mineral supplements. Peters and Goetzsche (1997) found an intake of 48 % of supplementation in female and 59 % in male ultra-runners.

Supplements often taken by athletes include vitamin C, the B-complex and iron (Greanjean and Ruud, 1994). The main requirements of our athletes were especially a multi-vitamin product (30 %) and vitamin C (20 %). Among the minerals, magnesium (53 %), iron (24 %) and a multi-mineral product (24 %) were preferably consumed. Some of our athletes used three or four and

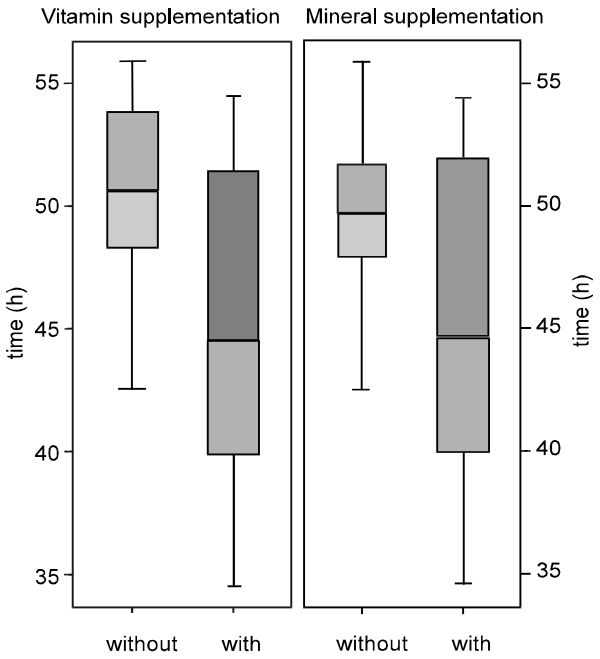

Fig. 1: Performance of athletes with or without intake of vitamins and minerals before the race.

more supplements (Table 1). This is in accordance with the literature where in some cases up to three different supplements are used (Huang *et al.,* 2006; Nieman *et al.,* 1989; Nieper, 2005). The most often used are combined products (Greandjean, 1983; Nieper, 2005) followed by minerals, vitamin C, iron, zinc, vitamin E, vitamin B-complex, niacin, folic acid, creatine, concentrates of amino acids, calcium and vitamin A (Huang *et al.,* 2006; Kim and Keen, 1999; Nieman *et al.,* 1989; Sobal and Marquart, 1994; Sundgot-Borgen *et al.,* 2003).

Vitamins and minerals and their effect on endurance performance: Numerous nutritional ergogenic supplements have been used in attempt to enhance performance, but apart from a few exceptions most have been shown to be ineffective (Williams, 1992). There is no evidence that special food will help elite athletes to perform better. The most important aspect of the diet of elite athletes is that they should follow the basic guidelines for healthy eating (Economos *et al.,* 1993). The use of vitamins and minerals is controversially discussed in endurance performance. The use of vitamin and mineral supplements does not improve measures of performance compared to people consuming adequate diets (Grandjean and Ruud, 1994; Lukaski, 2004).

Also the duration of intake of vitamins and minerals seems to have no effect on performance. Fry *et al.* (2006) could demonstrate that an eight week supplementation with a combined liquid multivitamin-mineral product did not improve anaerobic exercise performance. Singh *et al.* (1992) supplemented even for twelve weeks with a multivitamin-mineral supplement. Nevertheless performance during a 90 min endurance was not affected. And Weight *et al.* (1988) supplemented also for three months with a multi-vitamin and multi-mineral combination. The running time in a 15 km time trial was not improved.

Obviously also the kind of product and duration of performance does not have any influence. Fry *et al.* (2006); Singh *et al.* (1992) and Weight *et al.* (1988) supplemented with a multi-vitamin and a multi-mineral product without effect on performance. While Fry *et al.* (2006) studied the effect on anerobic performance, Weight *et al.* (1988) investigated runners over a time trial of 15 km and Singh *et al.* (1992) ultra-runners over a 90 min endurance run. As we could show in addition to the previous literature also the duration of endurance performance is not affected by the intake of vitamins and minerals.

Limitations of the present study: The major limitation of our study is related to the rather small number of participating athletes in the race due to the fact that ultra-endurance races are not a kind of mass sport but reserved for a small group of well trained athletes. The way of self reporting of supplement intake by questionnaire has to be discussed. One problem is surely how to verify the validity of self reporting. Nevertheless this seems to us being a small problem whereas no advantage or disadvantage is to expect for the athletes giving uncorrect selfreporting concerning the investigated substances. Nevertheless in further studies the keeping of full food diaries should be tried so an analysis of all dietary intakes could be made. Even the athletes with regular intake of vitamins and minerals finished the race faster due to the statistical limitations there was no significant difference to those athletes without supplementation. It can be postulated a statistically significant difference in a quiet longer ultra-endurance races with more participantes which should be the subject of further studies.

Conclusions: In the Triple Ultra Triathlon in Lensahn, Germany, over 11.4 km swimming, 540 km cycling and 126.6 km running within a time limit of 58 hours, athletes with regular intake of vitamins and minerals in the four-week period before the race finished the race not faster than athletes without intake of theses substances. Due to the fact that athletes with intake of vitamins and minerals were statistically not significantly faster in the race, we recommend studying the effect of supplementation of vitamins and minerals in controlled field studies in longer races. In groups of at least 100 athletes with a controlled ingestion of vitamins and

minerals and additional keeping of full food diaries over more than a four-week period, this will probably lead to results with respect to an effect of supplementation on race performance.

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