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Human Kinetics
CONFERENCE ABSTRACTS

Abstracts From the 5th Annual Congress on Medicine & Science in Ultra-Endurance Sports, May 9–10, 2018, Castelló de la Plana, Spain

Introduction

The 5th Annual Congress on Medicine & Science in Ultra-Endurance Sports will be held on May 9–10, 2018, in Castelló de la Plana, Spain. Details of this Congress, as well as past and future meetings, can be found at the Ultra Sports Science Foundation Web site: http://ultrasportsscience.us.

Continued growth in participation in various ultraendurance sports and many unanswered questions related to such participation have stimulated increasing research related to these sports. That is evident by the growing number of abstract submissions for this meeting and the number of research proposals received by the Ultra Sports Science Foundation in its first year to offer grant funding. Research related to ultraendurance sports remains fertile ground for the scientist!

Martin D. Hoffman, Sacramento VA Medical Center, Founding Member Ultra Sports Science Foundation

Abstracts

Oral Presentations May 9, 2018, 1600–1700

Fatiguing Resistance Exercise Does Not Enhance Hamstring Muscle Cramping From Maximum Contraction in Shortened Position

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Objective.—The etiologies, risk factors and prevention strategies for exercise-associated muscle cramping (EAMC) are not well understood. To allow further studies on EAMC, this work was directed at developing a new technique for inducing skeletal muscle cramping. **Methods.—**Healthy adults underwent a familiarization session including 12 right hamstring cramp induction maneuvers, and then on two separate days performed two cramp induction maneuvers separated by 2 minutes before and then again beginning 1 minute after fatiguing resistance exercise of the knee flexors at ~60% of the one-repetition maximum. A 3-second maximum isometric knee flexion contraction with the knee at 90° of flexion and hip in neutral position was used to induce cramping. Outcome variables included the presence or absence of cramping (reported as none, near, unsustained or sustained) during the 5 seconds following the maximum contraction while the knee was maintained at 90° of flexion, and the maximum 1-second force generation during each maximum contraction. **Results.—**Of 15 subjects (12 reporting prior EAMC), 10 had at least one unsustained or sustained cramp during the first two laboratory visits and subsequently finished the study. For these 10 subjects, mean (±SD) maximum force of 101 ± 34 and 99 ± 32 N during the two pre-fatigue cramp inductions was reduced ($P < .01$) to 81 ± 29 and 89 ± 25 N (80–82% and 89–91% of pre-fatigue) for the first and second cramp inductions following the fatiguing resistance exercise. The presence of unsustained or sustained cramping of 45%, 10%, 20% and 15% differed ($P = .04$) across trials. **Conclusions.—**While the technique can induce cramping in some individuals, acute fatiguing resistance exercise causing ~10–20% reduction in maximal strength at the time of attempted cramp induction did not increase cramping, so the model does not appear specific for study of EAMC.

Biomarkers of Muscle Damage and Systemic Inflammation in Mountain Ultramarathon Versus Road Marathon Runners

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Objective.—Our objective is to compare musculoskeletal damage and systemic inflammation through serological biomarkers: Creatin Kinase (CK) and C-reactive protein (CRP) between ultratrail and marathon runners. Descriptive observational study with pre and post determinations among 100 runners of the CSP115 ultratrail of Castellón (118 km distance and 5,439 meters of positive drop) and 100 runners of the Valencia Marathon Trinidad Alfonso Foundation. **Results.—**67 runners finished the CSP115 with an average time of 22 h:17 min:55 sec (±4 h:11 min:34 sec), compared to 85 runners who finished the marathon with an average time of 3 h:34 min:31 sec (±20 min: 57 sec). The average weight loss was 4.05% (±2.01) in the CSP115, compared to 2.92% (±1.02) in the marathon. The average percentage increase in CK at goal in CSP115 was 2,858.23% (±2,272.87), while in the marathon it was 273.12% (±157.58). In relation to systemic inflammation in CRP, an increase of 3,166.98% (±2,907.25) and 93.30% (±64.82) in the marathon was measured. Through the Student's t for independent samples, we found significant differences between both races in both the CK ($P < .001$) and PCR ($P < .001$) with a calculation of the effect size of large magnitude in both cases (d = 1.000). Regression equations were performed following the stepwise procedure, explaining 49.5% of the variance of the increase in CK ($R^2 = 0.495$) through the type of race and weight loss as predictor variables

and 44.5% of the increment variance of the CRP ($R^2 = 0.445$) with the type of race as the only predictor variable. **Conclusions.—**The physiological response is very different depending on the type of race, with muscle injury and inflammation being significantly greater in ultratrails than in marathons. These aspects are important for the specific preparation of the athletes, being necessary to adjust the training and recovery loads in the preparation and competition phases.

Spontaneous Temporal Coordination Among Gender Groups in Sky Mountaineering During a Vertical Race

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Objective.—The aim of this study was to investigate the interpersonal coordination of elite ski mountaineering athletes during a trial competition. **Methods.—**Ten athletes of the Spanish National Team were divided in two groups (5 males and 5 females) to take part in the study. Participants run a total distance of 1980 m and 415 m of positive gain during the competition. Acceleration and speed were monitored using GPS system and HR was continuously recorded. Interpersonal coordination was measured through cross correlation function (CCF) analysis, conducted on the entire and partial (three parts corresponding to three different mean slopes) temporal series of acceleration. **Results.—**The female group started at speed of 1.23 m/s obtaining a mean CCF of 0.06 within 2–6 s of delay, losing speed (1.22 m/s) and CCF in the middle part (mean CCF of 0.02 at 8 s), and ending closer to the other athletes (mean CCF of 0.04 at 0 s) at speed of 1.12 m/s. On the other hand, the male group started at speed of 1.39 m/s (mean CCF of 0.03 in 2–5 s), reaching a speed of 1.51 m/s in the middle part where the slope was lower (mean CCF of 0.03 within 2–10 s), before finishing closer (mean CCF of 0.04 in 0–2 s) at speed of 1.48 m/s. **Conclusions.—**The interpersonal coordination between athletes shows different patterns during the race in both groups. The differences in the acceleration display temporal coordination between athletes as a function of its position in the race. These results suggest an interaction among participants during a ski mountaineering vertical race. Hence, trainings and race strategies should consider it.

Neurophysiological Response of the Autonomic Nervous System to an Ultramarathon

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Objective.—We evaluated changes of activity in the autonomic nervous system (ANS) in response to an ultramarathon. Heart rate variability (HRV) is well described in ultramarathon, but represents mostly mixed (sympathetic and parasympathetic) or parasympathetic activity alone. Electrodermal activity (EDA) is solely controlled sympathetically and may therefore supplement HRV to allow independent analysis of both ANS branches. This may facilitate a more physiological assessment of exercise load, fatigue and recovery. **Methods.—**15 male ultramarathon runners (age: 42.2 ± 7.9 years; VO_2max: 49.3 ± 4.5 $mL \cdot kg^{-1} \cdot min^{-1}$) completed 65 km (cumulative ascent +109 3 m) in an average time of 431 ± 43.5 min. Supine resting measurements of ANS activity were conducted before and after the ultramarathon in laboratory indoor conditions (room temperature: 21.5 ± 1°C) using a wearable multi-device on the wrist (Inter-beat-intervals and EDA). Mean heart rate (HR), root mean square of successive differences (RMSSD) and mean EDA as indicators of parasympathetic and sympathetic activity were calculated from movement free 3 minute segments. Subjective perceived exertion was assessed by questionnaire. **Results.—**Subjectively perceived exertion (difference between overall recovery and stress value [0 = *does not apply at all* to 6 = *completely agree*]) changed from positive to negative after ultramarathon (2.93 ± 1.87 to −2.2 ± 2.04). HR (Δ%HR: 33.72 [$CI_{90\%}$: 30.50–36.93]; $T_{(14)} = -15.274$; $P \leq .001$; $d = 2.919$) and mean EDA (Δ%EDA: 161.56 [$CI_{90\%}$: 142.70–180.45]; $Z = -3.408$; $P = .001$; $r = -0.88$) increased from pre to post ultramarathon. RMSSD (Δ%RMSSD: −55.03 [$CI_{90\%}$: −73.56 – −36.50]; $T_{(14)} = 4.419$; $P = .001$; $d = -1.594$) decreased from pre to post ultramarathon. **Conclusions.—**Parasympathetic activity decreased and sympathetic activity increased after the ultramarathon. The combination of HRV and EDA allows better characterizing the interplay of inhibition and excitation and therefore the regulative function of the ANS. EDA may be an important supplementary parameter in addition to HRV and help us to understand and guide training loads and recovery processes in ultramarathon.

Physical Activity Classification in Middle-Aged Recreational Marathoners Using Triaxial Accelerometer

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Objective.—The purpose of this study was to establish GENEA cut-points for discriminating between six relative-intensity activity levels in middle-aged recreational marathoners. **Methods.—**Nighty-eight (83 males and 15 females) recreational marathoners, aged 30–45 years, completed a cardiopulmonary exercise test running on a treadmill while wearing a GENEA accelerometer on their non-dominant wrist. The breath-by-breath $\dot{V}O_2$ data was also collected for criterion measure of physical activity categories. Each minute of the run exercise test was then classified into one of the six relative-intensity categories: sedentary (<10% of $\dot{V}O_2$max), light ($10 \leq X < 25\%$ of $\dot{V}O_2$max), moderate ($25 \leq X < 45\%$ of $\dot{V}O_2$max), vigorous ($45 \leq X < 65\%$ of $\dot{V}O_2$max), very vigorous ($65 \leq X < 85\%$ of $\dot{V}O_2$max), and extremely vigorous (≥85% of $\dot{V}O_2$max). GENEA cut-points for physical activity classification was performed via Receiver Operating Characteristic (ROC) analysis. Statistical analysis were done for all individuals, and separating samples by sex. **Results.—**The GENEA cut-points established were able to distinguish between all six-relative intensity levels with an excellent classification accuracy (area under the ROC curve (AUC) values between 0.886 and 0.973) for all samples. When samples were separated by sex, AUC values were 0.881–0.973 and 0.924–0.968 for males and females respectively. Cut-points in SVM_{gs} of all six relative-intensity categories of physical activity were determined. **Conclusions.—**The wrist-worn GENEA accelerometer presents a high capacity of classifying the intensity of physical activity in middle-aged recreational marathoners when examining all samples together, as well as when sample set was separated by sex. This study suggests that the triaxial GENEA accelerometers (worn on the non-dominant wrist) can be used to predict energy expenditure for running activities.

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Foot Dimensions and Sensitivity Evolution During Extreme Mountain Ultra-Marathon

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Objective.—This study investigated the change in foot dimensions and sensitivity during the world's most challenging mountain ultra-marathon (MUM, Tor des Geants® 336 km and 30000 m D+). **Methods.—** Twelve MUM finishers (11 male, 1 female, 41.4 ± 11.2 years old) were included in this study. Measurements were taken before (pre-), during (at 50 and 150 km), and immediately after (post-) the MUM. Measurements consisted in (i) a scan of both feet from which were extracted specific dimensions (foot length, ball width, ball girth and instep girth), (ii) a manual bilateral measurement of calf girth, and (iii) a tactile sensitivity threshold test of the right foot (including both dorsal and plantar aspects) using Semmes-Weinstein monofilaments. **Results.—**Foot length remained unchanged along the MUM. Conversely, ball width, ball girth and instep girth increased at 150 km (+1.3 ± 1.2 mm, +4.0 ± 2.9 mm, +4.0 ± 2.8 mm respectively, $P < .05$) and at post- (+2.2 ± 1.7 mm, +7.1 ± 3.8 mm, +5.7 ± 4.4 mm respectively, $P < .05$), while were unchanged at 50 km. Calf girth was lower (−8.7 ± 8.3 mm, $P < .05$) at 50 km than at pre- but was back to pre- values at 150 km and post-. Dorsal foot sensitivity threshold remained unchanged along the MUM except for the 5th metatarsal head area at post- (−10.5 ± 15.6%, $P < .05$). Plantar foot sensitivity threshold was lower (−6.6 ± 12.2%, $P < .05$) at post- than at pre-, while there was no difference at 150 km compared to pre-, except for the 1st metatarsal head area (−3.6 ± 7.9%). **Conclusions.—**This study provides quantification of foot swelling during an extreme MUM. While foot length was unchanged, other dimensions increased up to 7 mm corresponding roughly to one shoe size. Foot sensitivity also showed a lower threshold after the MUM especially for the plantar aspect.

Oral Presentations May 10, 2018, 0800–0900

Energy Cost of Running During a 65-km Ultramarathon

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Objective.—Running economy, expressed as the energy cost of running (Cr), is an important factor in ultramarathon performance. Controversy remains if Cr increases or decreases in ultramarathon running. We examined Cr before, during and after a 65-km ultramarathon. **Methods.—**15 male ultramarathon runners (mean age 45 ± 5.7 years) completed a standard exercise test on the treadmill (mean VO_2max 48.8 ± 3.4 $mL \cdot kg^{-1} \cdot min^{-1}$) for determination of their individual running and testing speed (60% VO_2max: mean speed 9.4 ± 0.7 km/h). A few days later they completed a 65km ultramarathon (cumulative ascent +1093 m) around our exercise physiology laboratory, consisting of 3 laps (each lap approximately 21.7 km). Immediately before the ultramarathon, after each lap and after the ultramarathon five minute spirometry measurements at the individual running speed on the treadmill were performed at an incline (+3%) for determination of ventilatory parameters for the calculation of the net Cr. Additionally measurements in the same fashion before and after the ultramarathon on level grade and decline (−3%) were performed in randomized order. Positive and negative inclinations were chosen in accordance to the specific ultramarathon course profile. **Results.—**The energy cost of running ($J \cdot kg^{-1} \cdot m^{-1}$) pre and post ultramarathon at level grade increased by 9% (3.88 ± 0.52 vs 4.22 ± 0.59; $P < .01$) and by 8% during downhill running (3.57 ± 0.52 vs 3.85 ± 0.55; $P < .01$). With uphill running during the different time points the Cr increased steadily and continuously (4.71 ± 0.59 vs 4.82 ± 0.54 vs 4.98 ± 0.63 vs 5.08 ± 0.60) and showed a pre vs post ultramarathon increase of 8% ($P < .01$). **Conclusions.—**The novelty of our investigation is that we were able to demonstrate a gradual continuous increase in the Cr during different time points and for different treadmill slopes during a 65 km ultramarathon. A similar percentage increase was observed in the pre and post values of the Cr with level, uphill and downhill running.

Speed Decay and Body Weight Loss During a 118-km Trail Race: Differences as a Function of Performance

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Objective.—This study examines whether relative changes in speed and Body Weight (BW) during an ultraendurance trail race differ as a function of runners' performance. Moreover, as a secondary aim, possible relationships between relative speed and BW were also assessed. **Methods.—** Forty six athletes enrolled in the 2014 Penyagolosa Trails CSP115 race (118 km and a total positive elevation of 5439 m) took part in the study. BW was measured just before the start of the race, at three midpoints (33 km, 72 km and 91 km) and at the finishing line. Flat-equivalent speed during the four race sections (ie. 0–33 km, 33–72 km, 72–91 km and 91–118 km) was calculated. Values were relativized for each runner as a function of his initial BW and speed at the first race section. Runners were divided into three performance levels (ie. finishing time <20 h, 20–24 h, >24 h). Repeated measures ANOVA were conducted to assess intra- and interindividual changes in BW and speed. Pearson correlation analyses were used to analyze possible relationships between both variables. **Results.—** Independently of performance level a constant decrease in flat-equivalent speed was noted during the race. However, highest-performance runners maintained a greater relative speed than lowest-performance runners during the second and third race section. Concomitantly, highest-performance runners showed a significant BW loss in the first and second midpoint and at the finishing line, whereas lowest-performance runners significantly lost weight in the first midpoint, increased their weight at the third midpoint and then lost weight at the finishing line. No relationships were found between changes in relative speed and BW loss. **Conclusions.—**Our results showed that faster runners are capable of sustaining a higher relative speed during the core segment of the race (ie. 33–91 km) despite showing a larger BW loss than slower runners. Bearing in mind this fact and the absence of relationships between changes in relative speed and body weight loss, it is suggested that a moderate weight loss (between 2–4%) during ultraendurance races may reduce speed decay.

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Influence of the Initial Running Speed on Overall Performance and Mechanics During 6-hour Ultramarathon Races

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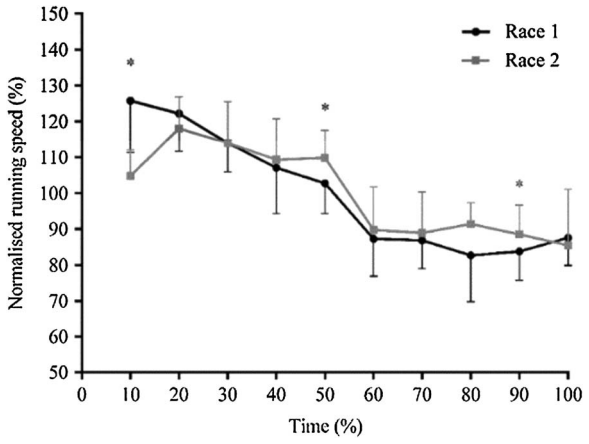
Objective.—To investigate whether a slow-start affect overall performance and running mechanics during 6-hour ultramarathon races.

Methods.—After a critical speed (CS) test, 10 ultra-runners (age: 40.5 ± 11.0 years, CS: 3.9 ± 0.5 m·s^{-1}, D': 119.9 ± 41.0 m) completed two 6-hour races on a 400-m track, 4 weeks apart. In the second race, they were required to run the initial 36 min (ie, the first 10% of the race) at speeds ~18% below their mean speed of the initial 36 min of the first race (self-paced). In both races, ratings of perceived exertion (RPE), ratings of fatigue (ROF) and running mechanics were measured repeatedly. To analyse pacing strategy, individual runners' mean speed of each 36-min intervals were percentage-normalised to their overall mean speed in each race. A paired t-test and two-way repeated-measures ANOVAs with Bonferroni pairwise comparisons were performed. Significance was set at $P \leq .05$. **Results.—**Despite lower normalised mean speeds during the first 10%-time interval ($P < .001$), and greater speeds at 50% ($P < .001$) and 90% ($P = .034$) of the second race, overall performance was not different between races (57.5 ± 10.2 vs. 56.3 ± 8.5 km; $P = 0.298$). However, runners decreased their RPE ($F = 56.31$, $P < .001$, $\eta_P^2 = 0.86$) and ROF ($F = 27.81$, $P < .001$, $\eta_P^2 = 0.75$) consistently throughout the second race. We found interactions between race and time for running mechanics (all $F > 2.01$, $P < .030$, $\eta_P^2 > 0.18$), with shorter stride length at 30 min and 1 h, and shorter stride frequency at 30 min (all $P < .004$) in the second than the first race. In addition, contact times were higher and aerial times shorter during the first lap and at 30 min (all $P < .047$).



Conclusion.—Decreasing initial speed by ~18% might not affect 6-hour ultramarathon performances, but it lowers RPE and ROF. Finally, running mechanics seem to be affected mainly by changes in running speed.

Model of Performance in Downhill Trail Running: A Multifactorial Approach

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Objective.—Trail running (TR) is characterized by downhill and uphill sections as well as uneven surfaces. Empirical evidence demonstrated that faster runners over downhill sections are the better ranked at the end of the race. Therefore, our purpose was to determine factors which mainly influence performance in downhill TR. **Methods.—**Twenty-eight male trail runners were included in the study for two consecutive days. The first day consisted in a multifactorial evaluation of each subject, including visual perception, muscular and proprioceptive laboratory tests, and a psychological questionnaire, followed by an assessment of the maximal aerobic speed on a running track. The second day was dedicated to the downhill tests. Subjects were instructed to run as fast as possible on a downhill trail (1 km and 255 m of negative elevation) composed by technical and easy sections. Downhill performance was appraised by measuring running time, and foot strike pattern was also measured using two wireless accelerometers. The correlation between the independent variables (visual perception, muscular, proprioceptive and psychological parameters and foot strike pattern) and the dependent variable (downhill performance) was tested using a multiple regression analysis. **Results.—**This study showed that downhill performance was explained by (1) a low amount of heel strikes during downhill, (2) a high visual perception ability, (3) a high quadriceps rate of force development, and (4) a high psychological tendency to take risks. **Conclusion.—**This study highlights that downhill performance is multifactorial. These results could be used by athletes in order to increase downhill performance in different kinds of TR races.

Field Adaptation of a Specific Trail Running Incremental Test: IncremenTrail

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Objective.—Trail running (TR) is characterized by uphill and downhill sections as well as uneven surfaces. Evaluation of uphill performance for TR has recently been purpose with a specific progressive treadmill test: IncremenTrail (IncT). The aim of the present study was to adapt IncT to the field environment. **Methods.—**18 subjects underwent IncT in field conditions in a constant slope of 30%. Field IncT is based on incremental ascending speed (AS), starting at 500 meters per hour (m·h^{-1}) with a progressive increase of 100 m·h^{-1} every minute. From a practical point of view, markers were placed every 10 m of ascending elevation and the speed of subjects was given by a specific homemade sound recording. During all tests, gas exchanges were collected breath by breath together with heart rate by a Metamax 3B-R2 system (Biophysik GmbH, Leipzig, Germany) to obtain oxygen consumption (VO2), respiratory exchange ratio (RER) and heart rate (HR). First (VT1) and second (VT2) ventilatory thresholds were determined based on Beaver methods and verified by an experimented operator. At the end of all field IncT test, rate percept exertion was quoted on Borg's scale (RPE) and blood lactate concentration (La) was measured 1min after the end of the test. **Results.—**We observed that at least 2 of 4 criteria of maximality were obtained in all subjects at the end of field IncT (RERmax: 1.18 ± 0.03; HRmax: 183 ± 13 b·min^{-1}; RPE: 8.4 ± 1.2; Lamax: 8.5 ± 1.9 mmol·L^{-1}) suggesting that field IncT allowed reaching physiological exhaustion. Moreover, the stepwise approach of the field IncT allows the determination of under-maximal transition zones (VT1 and VT2) in all subjects. **Conclusions.—**This field version of IncT represents a well-adapted, progressive, test specifically based on AS in order to evaluate under-maximal and maximal aptitudes in TR racers.

Cardiac Biomarkers Following a 118-km Trail Race: Relationship With Performance

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Objective.—This study was aimed to describe cardiac biomarkers release following an ultraendurance trail. Moreover, as a secondary aim, possible relationships between cardiac biomarkers release and performance (ie. finishing time) were also assessed. **Methods.—**Forty six athletes enrolled in the 2014 Penyagolosa Trails CSP115 race (118 km and a total positive elevation of 5439 m) took part in the study. N-terminal pro-brain natriuretic peptide (NT-proBNP) and high-sensitive cardiac troponin T (hs-TNT) concentrations were measured before and after the race. The Upper Reference Limit (URL) for fixed at 14 ng/L and 125 ng/L respectively. proBNP values were compared before and after the race using a Student's *t*-test. Due to the nature of hs-TNT data, pre-post changes were assessed on a case-by-case basis. Pearson correlation analyses were used to assess possible relationships between performance, training-related data and post-race cardiac biomarkers concentrations. **Results.—**NT-proBNP and hs-TNT significantly increased postrace; 50% of the finishers surpassed the URL for hs-TNT while 87% exceeded the URL for NT-proBNP. Moreover, change in hs-TNT and NT-proBNP were largely and inversely associated with finishing time ($r = -.67$ and $P < .01$; $r = -.60$ and $P < .01$ respectively). On the contrary, change in cardiac biomarkers was neither correlated to age or training-related variables (ie. years since 1st ultramarathon and average training weekly sessions). **Conclusions.—**Current results endorse previous studies showing that ultraendurance races induce an acute release of cardiac biomarkers. Furthermore, the rise in cardiac biomarkers appears to be greater among faster runners and may reflect their capacity to stress their cardiovascular system to a greater extent during self-paced prolonged endurance exercises. However, it remains an open question whether ultraendurance exercise-derived cardiac biomarkers release reflect either a physiological or a pathological response.

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Oral Presentations May 10, 2018 1600–1700

Epidemiology of Marathon-Related Injuries Treated at United States Emergency Departments Between 2007 and 2016

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Objectives.—Marathon participation continues to increase worldwide. Many marathons provide organized on-site medical care, with one goal being to relieve the burden on local Emergency Departments (ED). While several studies have investigated injuries that present to on-site medical stations, there is little in the literature about how many marathon-related injuries and illnesses still make it to an ED. **Methods.—**Data from the National Electronic Injury Surveillance System (NEISS) from 2007–2016 was filtered by codes for "exercise" and "track and field", and refined by searching for "marathon" in the injury narrative. Injuries during shorter races and training were excluded. Ultramarathon-related visits were excluded given the small number found. Outcome measures included injury incidence and characteristics. **Results.—**From 2007–2016, 476 instances of marathon-related injuries presented to NEISS participating EDs. This represents an estimated 13,229 (8875 – 17582) total visits across the United States. Mean patient age was 36 ± 12 years (range 16–85), and about half (48%) were female. The most frequent injury types were other (62.8%), sprain/strain (18.9%), and fracture (6.5%). The most frequently injured body part was "all parts of the body" (35.9%), foot (14.5%), and ankle (7.8%). Males had more injuries to "all parts of the body" than females (39.3% vs 33.3%; $P < .069$). Females had more lower extremity injuries than males (45.4% vs 34.4%; $P < .01$). Most patients (91.2%) were treated and released. 12.8% of patients were treated and admitted for hospitalization. **Conclusions.—**This data provides a profile of injuries related to marathon events that present to an ED. The low injury rate is likely due to most runners presenting primarily to the event medical center. Given that the majority of injuries are labeled as "other" or to "all parts of the body," it is possible that these represent systemic illness rather than musculoskeletal injury.

GPS Tracker Enabled Rescue of a Lost Runner During a Wilderness Ultramarathon: A Case Report

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Objective.—Global positioning system (GPS) tracking can be used to determine and track precise locations of athletes at regular defined intervals. This report examines a case in which a lost runner was quickly located and rescued because the event required participants to carry a GPS tracking unit. **Methods.—**Detailed information about the incident was collected from the subject, and those involved in the rescue. **Results.—**The subject was a very experienced middle-aged endurance runner participating in a 332-km point-to-point mountain ultramarathon that required competitors to carry a GPS tracking device. The timeline related to the response and rescue is as follows:

> ~1400 (77 hours into the race) — Subject's wife reported receiving a help message, and GPS tracking profile showed subject had been off course near the 301-km point since at least 0732.
>
> 1557 — Emergency assistance request message was received from subject.
>
> 1654 — Two-person rescue team left the 311-km aid station armed with subject's last known coordinates.
>
> ~1840 — Subject was located pacing back and forth ~190 m below and ~500 m off the course in very dense vegetation without obvious serious physical injuries, but indicating he had been seeing "gang signs on trees" and "burning piles of cell phones" as he pointed to pinecones on the ground.
>
> 2030 — Subject and rescue team arrived at the 311-km aid station.

The subject was subsequently driven to the finish line, and after undergoing medical assessment showing he was moderately disoriented and exhausted, he was released with his wife. **Conclusions.—**Given that the outcome of this case could have been tragic without the GPS data, we suggest that wilderness endurance event organizers consider requiring their participants carry a GPS tracking device, especially when the event extends over multiple days, and that there is a system in place to monitor for athletes who stray off course.

Use of Ondansetron for Nausea and Vomiting During an Ultra-Endurance Run

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Objective.—To evaluate the efficacy of ondansetron for runners with nausea and vomiting during the Tahoe Rim Trail Endurance Events. **Methods.—**Medical staff dispensed ondansetron (4 mg orally dissolving tablets) to runners who felt they needed care due to nausea and/or vomiting during a 55 k, 80 K and 160 K trail running race. Documentation of the treatment was recorded as part of the standard race medical records. Within 24 hours of the end of the race, runners who were given ondansetron were sent a web-based survey to evaluate the effects of the medication on their symptoms and race performance. **Results.—**Over a two year period, medical staff dispensed ondansetron to total of 24 runners during the race and 21 of them responded to the survey. Of the 21 runners, 14 (66%) felt the medication helped, 3 felt it didn't help and 4 were unsure. Amongst race finishers, 9 of the 10 felt the medication helped. Of the 11 non-finishers, 5 felt the medications helped, 3 weren't sure and 3 felt it didn't help. Eight of the 11 non-finishers dropped out of the race due to continued GI issues. **Conclusions.—**In this small pilot study, ondanestron helped reduce nausea and vomiting for 66% of the runners given the medication. Only one runner reported possible side effects. Larger studies looking at the effects of ondanestron for exercise induced nausea and vomiting in this population are warranted.

Beliefs of Ultramarathon Runners About Salt Tablets: Findings From the Ultrarunners Longitudinal TRAcking (ULTRA) Study

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Objective.—This study explores the beliefs of ultramarathon runners about salt tablets as functions of sex and age. **Methods.—**Questions about salt tablets were included in the Ultrarunners Longitudinal TRAcking (ULTRA) Study follow-up questionnaire distributed in 2018. **Results.—**Among the 882 respondents, 64.2% of the 579 men and 66.7% of the 303 women indicated that they believed salt tablets should be available at ultramarathons. For men and women divided into age groups of 10-year increments from 35 to 65 years of age, Pearson chi-squared tests showed there were no age- or sex-dependencies amongst those indicating they did or did not believe salt tablets should be made available. The percentages of the respondents indicating salt tablets should be made available within each of these three 10-year age groups ranged from 24 to 31% for men and 19 to 32% for women. A similar independence of the responses for age was also evident by the respondents indicating salt tablets should not be made available, with values ranging from 24 to 26% for men and 26 to 33% for women. Of the 575 respondents indicating a belief that salt tablets should be provided, 65.2% indicated this is since they prevent exercise-associated hyponatremia (EAH), while 57.7% indicated they prevent muscle cramping, and 42.7% indicated they help maintain hydration. Of the 307 respondents indicating a belief that salt tablets should not be made available, 82.1% indicated that runners should provide their own salt tablets while 29.0% reported that salt tablets are not necessary. **Conclusions.—**In this ULTRA Study questionnaire: i) the majority believe salt tablets should be provided at ultramarathons, ii) the view that salt tablets should be provided at does not vary across sex and age groups, and, iii) there are continued misconceptions about the effects of salt hydration, muscle cramping and EAH.

Systemic and Urinary Disorders in Mountain Ultramarathon Versus Road Marathon

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Objective.—Our objective was to determine the systemic inflammation and renal function in two different long distance events. Observational descriptive study with pre-post analytics in a sample of 50 runners of the CSP115 ultra-trail of Castellón 2015 (118 kms distance, 5,439 meters of positive drop) and 50 runners of the 2016 Valencia Marathon. **Results.—**In the CSP115, 68% completed the race, with an average duration of 19 hours and 8 minutes. Performing a T test for related samples, we found a significant increase in the biomarker of systemic inflammation, C-reactive protein (CRP) (0.08 (±0.11) vs 1.27 (±1.25), $P < .001$) and microalbuminuria (3.69 (±3.56) vs 5.88 (±6.61) $P < .001$). In the Marathon, 88% completed the race with an average duration of 3 hours and 34 minutes. There was no increase in CRP (0.12 (±0.32) vs 0.11 (±0.36), $P = .489$), although there was a marked increase in microalbuminuria (3.4 (±3.57) vs 73.07 (±110.94), $P < .01$). Through the Student's t for independent samples, we found significant differences between both races in the average increase in CRP ($P < .001$) with a calculation of the effect size of large magnitude ($d = 1{,}000$), and in microalbuminuria ($P < .001$), and an effect of magnitude ($d = 0.94$). **Conclusions.—**The extreme effort leads to microalbuminuria and systemic inflammation, varying between events according to variables of distance, unevenness and intensity of the race. After the marathon, we found an average increase in microalbuminuria, 2,127.62% higher than in ultra-trail, explained by running speed and the alteration of glomerular permeability evidenced in marathon runners. This is a good line for later studies. The inflammation at the finish line is superior in ultra-trail for the average duration of the race, observing in marathon the maximum peak in the following 24 hours (data not presented in this work).

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Prevention of Exercise-Induced Hypoglycemia in 12 Marathon Runners With Type 1 Diabetes Using Continuous Glucose Monitoring: A Prospective, Mono-Centric Observational Study

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Objective.—To investigate the glycemic balance before, during and after the 2016 Paris marathon by using continuous glucose monitoring system (CGMS) in patients with type 1 diabetes mellitus (T1DM) in an observational mono-centric prospective study. **Methods.—** Inclusion criteria were adult T1DM patients, with HbA1C <9.0% followed at the Brest University Hospital between September 2015 and April 2016. Participants underwent two preparatory races (PR) 2 hours duration before the Marathon with CGMS 24 hours before, during and 72 hours after the races enabling them to anticipate and prevent hypoglycemia via adjustments in carbohydrate intakes and/or insulin doses. The strategies that prevented hypoglycemia were then applied to accomplish the Paris Marathon. CGM data were recorded during each PR and Marathon. Primary outcome was the area under curve (AUC < 70 and

>200 mg/dL) during the various races. Secondary outcomes were percentages of time spent in euglycemia (70 mg/dl–200 mg/dL), hypoglycemia (<70 mg/dL) and hyperglycemia (>200 mg/dL) during the PRs and marathon. **Results.—**Twelve patients (2 women, 10 men), median age 40YO; with a median HbA1C at 7.0% successfully completed the Paris marathon with a median race duration of 243.5 minutes [234–281]. The median AUC < 70 mg/dl/min during the PRs and the Marathon were equal to 0 respectively. Our study demonstrated a significant reduction in AUC < 70 mg/dl after the race between PR1 (0.9[0.8–3.0]) and PR2(0.4[0.2–1.0]) ($P = .008$) and between PR2 (0.4 [0.2–1.0]) and the marathon (0.1[0–0.3]) ($P = .008$). There was no severe hypoglycemia or hyperglycemia with ketosis at any time before, during and after the PRs and Marathon. **Conclusions.—**To avoid exercise-induced hypoglycemia, it is necessary to reduce usual doses of insulin and ingest additional carbohydrates. CGMS appears to be effective in defining individual needs and preventing hypoglycemia during and after exercise. Our study allowed us to define a validated medical approach for the accompaniment of patients with T1DM in extreme endurance physical activity.

Poster Presentations May 9–10, 2018

Does Vitamin D Status Influence the Exertional Stress Induced Neutrophil Response to 2 Hours Running at 70% $\dot{V}O_2$max?

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Objective.—It is well established that endurance exercise depresses neutrophil function, a key immune response in post-exercise recovery. Considering vitamin D (25(OH)D) role in immune maintenance, the study aimed to determine whether circulating 25(OH)D concentration influences bacterially-challenged neutrophil degranulation in responses to endurance running. **Methods.—**Male runners ($n = 8$) completed two hydration interventions (euhydrated and dehydrated) in a randomised order during 2 h running at 70% $\dot{V}O_2$max in thermoneutral conditions (0.4 and 3.1% body mass loss, 290 and 303 mOsmol·kg^{-1} plasma osmolality, and –0.9 and –5.8% plasma volume change, respectively). Immediately and 1 h post-exercise participants received water (equating to × 1.5 body mass loss). Venous blood samples were collected pre- and post-exercise, and during recovery. Whole blood was used to determine total circulatory neutrophil counts and their maturity status. Additionally, 1000 µl of whole blood was incubated with 1 µg·mL^{-1} of lipopolysaccharide for 1 h at 37ºC. Aliquots were assayed for plasma elastase by ELISA. Serum and plasma samples were also analysed for 25(OH)D and IL-8 concentrations, respectively. **Results.—**Sub-optimal 25(OH)D levels were observed in three runners (50.1 ± 14.7 nmol·L^{-1}), while five runners presented optimal 25(OH)D levels (99.1 ± 18.6 nmol·L^{-1}) ($P = .008$), with only one athlete having insufficient levels (<50 nmol·L^{-1}). A time effect (pre- to post-exercise increase) was observed for neutrophil degranulation ($P = .001$) and IL-8 response ($P = .003$), with no differences between the groups. A significant negative correlation was observed between serum 25(OH)D concentration and IL-8 responses in the euhydrated trial during recovery ($P = .031$). **Conclusions.—**The current study suggests that circulating 25(OH)D concentration has little impact on IL-8 or bacterially challenged neutrophil functional responses to endurance running. It is likely that the levels of 25(OH)D within the cohort were not low enough to induce substantial immune perturbations. However, the negative correlation between 25 (OH)D status and IL-8 responses in the euhydrated state warrants further investigation.

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Impact of Vitamin D Supplementation on Hepcidin Response During and After 100-km Ultramarathon

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Objective.—Iron is an essential component of hemoglobin and myoglobin, which ensure oxygen supply to the skeletal muscle. Exercise may induce an inflammatory response that may lead to changes in iron metabolism. In recent years, many studies have demonstrated that both single and regular exercise cause the rise of blood hepcidin and IL-6. However some studies have shown, no significant changes in blood hepcidin during and after physical activity, despite exercise induced growing IL-6 level. Vitamin D was recently show to reduce serum hepcidin concentration in healthy individuals. Therefore we examined whether treatment with vitamin D reduces serum hepcidin response in100 km ultramarathon runners. **Methods.—**A total 17 participants (amateur runners, mean age 40,75 ± 7,15 years) were randomized to receive either oral vitamin D_3 10.000 UI daily (VD group) or identically matched placebo (CON group) for 2 weeks. Blood samples were collected before the run, after every 25 km and 12 hours after the run. Blood was analysed for serum iron, ferritin, total iron-binding capacity (TIBC), soluble transferrin receptor (sTfR1), IL-6 and hepcidin concentration. **Results.—**There were no significant differences in the baseline characteristics between the CON and VD group. Serum vitamin D significantly decreased after two weeks in CON group (27,13 ± 3,67 vs 20,41 ± 4,67 ng/ml) whereas this marker did not change in the VD group (27,26 ± 7,09 vs 27,82 ± 5,8 ng/ml). Serum iron levels in VD group were higher (68,2 ug/dl) than in CON group (39,1 ug/dl) after exercise. There were no significant differences in the change in serum hepcidin, ferritin, TIBC, sTfR1 and IL-6 between the two groups before and during 100 km run. **Conclusion.—**Contrary to our hypothesis, two weeks vitamin D supplementation (10.000 UI /day), did not change the postexercise hepcidin response in long-distance runners.

Impact of Vitamin D Supplementation on Hormone Levels and Cytokine Generation During Ultramarathon

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Introduction.—Vitamin D is responsible for multiple vital biological effects in humans. The major natural source of the vitamin D is its synthesis in the skin, that is dependent on sun exposure. In northern part of Europe the decrease of vitamin D level is observed during autumn and winter. In healthy subjects vitamin D suppresses the renin-angiotensin-aldosterone system (RAAS) activation and cytokine generation. The aim of this study was to investigate an impact of vitamin D supplementation on hormones and cytokine production during ultramarathon. **Methods.—**20 male participants (amateur runners, mean age 40,75 ± 7,15 years) took part in the 100 km run in November. Runners were randomized into two groups — VD and CON with the same age, run experienced and vitamin D level: 27,26 ± 7,08 ng/ml and 27,13 ± 3,67 ng/ml, respectively. Group VD had received vitamin D supplementation (10.000 UI /day) and CON group placebo for two weeks before run. Vitamin D, aldosterone, testosterone, cortisol, CRP and IL 6 were studied before and after the run. **Results.—**17 runners completed study (9 from VD and 8 from CON group). The vitamin D level in VD group were higher (27,82 ± 5,8 ng/ml) than in

CON group (20,41 ± 4,67 ng/ml) ($P < .05$). CK, CRP, IL6, aldosterone and cortisol increased and testosterone decreased after a run. The changes in CK, CRP, IL6, cortisol were similar in both groups. The aldosterone level was higher and testosterone level was lower in VD group, but without statistical significance. There was 5,39-fold decrease of testosterone to cortisol ratio in VD group and 3,53-fold in CON group. **Conclusion.—**In North Europe during autumn vitamin D level in healthy active subjects can be maintain stable only during supplementation. There is no impact of vitamin D on cytokine generation. The possible correlation between vitamin D supplementation and hormone levels needs to be studied in larger groups.

Assessment of Body Composition and Nutritional Analysis of Breakfast in Ultra Trail Runners

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Introduction.—Unlike other sports, in long-distance trail running, there are insufficient anthropometric studies to establish a profile of ideal body composition that serve as a guide when it comes to offering recommendations based on scientific evidence. This shortage of scientific studies leads to a need of new research in this sport. **Objective.—**Analyse the body composition to know the average percentage of body fat and kilograms of muscle mass and evaluate the usual breakfast in these athletes. **Methods.—**To collect data, an evaluation of the anthropometric characteristics and a dietary survey on common breakfasts were carried out. All volunteers signed their prior consent. The studies were carried out with the Helsinki declaration. Anthropometric data was collected from 33 ultra trail recreational athletes, aged between 30 and 55 years old, from February - August 2017. **Results.—**The mean percentage of fat in women was 14.25%; and in men 9.02%; the mean number of kilograms of muscle mass in women was 24.6 kg; and in men 33.1 kg; and the general BMI was 22.8. Regarding breakfast habits, the usual breakfast analysis met the micronutrient balance recommendations for endurance sports, consuming an average of 56% (0.83 g/kg) Carbohydrates, 17% (0.26 g/kg) of protein and 27% fats. **Conclusions.—**The average fat percentage in men was 9.02% and in women 14.25%; the average of muscular mass in men was 33.1 kg and in women 24.6 kg; The general BMI was 22.8. Participants showed a deficiency in kilocalories with an average intake of 402 kcal and a carbohydrate deficiency 0.83 g/kg compared to long-distance recommendations (600–1200 kcal, 1–4 g HC/kg).

Non-Protein Oxidation Rates of Ultramarathon Runners in Response to Incremental Intensity and Prolonged Strenuous Running

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Introduction.—It is well established that ketogenic dietary interventions increase fat oxidation during endurance running. Its translation to ultra-endurance performance is not substantiated. Conversely, carbohydrate provisions before and during endurance exercise is well established. The aim of this study was to explore carbohydrate and fat oxidation rates during incremental and prolonged strenuous running in ultra-endurance athletes consuming a balanced macronutrient diet. **Methods.—**Endurance athletes [n = 25 (male = 15, female = 10)] following a balanced macronutrient diet (energy distribution: 20% protein, 49% carbohydrate, 32% fat) to meet energy needs for daily training loads, performed an incremental exercise test to volitional exhaustion (IET). One-week later participants performed an endurance exercise test (EET), comprising 120 mins steady state running at 60% $\dot{V}O_{2max}$ consuming carbohydrates at 90 g/h (2:1 glucose-fructose ratio), followed by 60 min distance test. Total oxidation rates were calculated from breath-by-breath $\dot{V}O_2$ and $\dot{V}CO_2$ measurements. **Results.—**Maximum fat oxidation (Fatmax) during IET was (mean) 68 (95% CI: 61–74)% $\dot{V}O_2$max. The cessation of fat oxidation (Fatmin) occurred at 94 (91–97)% $\dot{V}O_2$max. No differences in Fatmax and Fatmin were observed between sexes and sports (endurance runners *vs.* ultra-distance triathletes *vs.* ultramarathon runners). At 180 mins EET, carbohydrate and fat oxidation rates were 1.1 (0.9–1.3) g/min and 0.9 (0.7–1.0) g/min, respectively; and were higher in males (carbohydrate 1.3 g/min, $P = .003$; and fat 1.0 g/min, $P < .001$) compared with females (0.7 g/min and 0.6 g/min, respectively). No differences in non-protein oxidation rates were observed between sports. **Conclusion.—**Despite the large inter-individual variation in oxidation variables, Fatmax at high exercise intensities (up to 94% $\dot{V}O_2$max) and high fat oxidation rates (up to 1.7 g/min) were observed during steady state running at the point of stressed glycogen stores in ultra-endurance runners consuming a balanced macronutrient diet. This data suggests that other factors (eg, training load, etc) beside dietary interventions may have a strong influence on endogenous fuel bioenergetics.

Acute Caffeine Ingestion and Exercise Intensity Affects Executive and Arousal Vigilance Differently

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Objective.—The aim of the present work was to assess the effect of caffeine intake on attentional networks and vigilance during exercise. **Methods.—**Subjects performed a task suitable to measure vigilance and the functioning of the attentional networks (the ANTI-Vea task) in six double-blinded counterbalanced sessions combining caffeine, placebo or no-ingestion with light vs. moderate exercise. **Results.—**Moderate exercise led to faster global Response Time (RT) for ANT-I trials ($P = .037$), without impairing accuracy, and reduced executive vigilance decrement ($P = .020$). Caffeine reduced alerting index in the light exercise condition ($P = .012$), reduced global RT ($P = .002$), reduced arousal vigilance decrement by time on task ($P = .002$) and Standard Deviation (SD) of RT ($P = .022$) in arousal vigilance trials, independently of exercise intensity, but only reduced Lapses ($P = .031$) in moderate exercise. Sensitivity (A′) was linearly reduced ($P < .001$) while response bias (B″) was linearly increased ($P < .001$) during the ANTI-Vea task. ANTI-Vea blocks produced a linear ($P < .001$) and quadratic ($P = .009$) increase of RT and a quadratic increase of SD of RT ($P = .013$) and Lapses ($P = .005$) in arousal vigilance trials. **Conclusions.—**Caffeine and acute exercise have different effects on executive and arousal vigilance. While moderate exercise reduces executive vigilance decrement over time, only caffeine avoids arousal vigilance decrement.

Can We Predict Trail Running Performance With Laboratory Exercise Tests?

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Objective.—Trail running is a complex sport and performance prediction is challenging. Our aim is to evaluate three standard laboratory exercise tests in trail runners and correlate measurements to the race time of a trail competition evaluating its predictive power. **Methods.—**Nine trail runners (mean age 31 ± 5.8, BMI 21.1 ± 7.9 kg/m^2, body fat 7.9 ± 3.5%) completed three different laboratory exercise tests (step, ramp and trail test) for

determination of VO_2max, ventilatory thresholds, individual anaerobic lactate thresholds (IAT) and running economy (RE), followed by a 31.1 km trail race (cumulative ascent +515 m/ descent +710 m, XS category ITRA classification). Runners participated in the previous year in the same race and finished in the top 2%. Finishing times were recorded (dependent value) and were tested in multiple regression analysis with different independent value combinations. **Results.—**Values obtained in the step vs ramp vs trail test were as follows: VO_2max 60.4 ± 5.1 vs 59.6 ± 4.6 vs 63.0 ± 4.8 mL·kg^{1}·min^{-1}, vVO_2max 20.5 ± 1.7 vs 20.3 ± 1.3 vs 14.6 ± 0.5 (+10.1 ± 1.2% inclination) km/h, vVT2 17.2 ± 1.4 vs 17.6 ± 1.4 vs 13.3 ± 0.6 (+7.6% ± 1.2 inclination) km/h, speed at IAT (step test) 16.4 ± 1.7 km/h and RE at 12 km/h (level grade) 39.5 ± 2.9 mL·kg^{1}·min^{-1} oxygen consumption and caloric unit cost of 1.3 ± 0.1 kcal·kg^{-1}·km^{-1}. Average race time was 2:05:08 hrs (range 1:52:12–2:17:19 hrs). For the different laboratory exercise tests the step test showed the highest correlation with performance (R^2 = .867) followed by the trail test (R^2 = .685) and ramp test (R^2 = .499). Adding race time from the preceding year to the step test improved the predictive power of the model (R^2 = .972). **Conclusions.—**Values obtained from the step test most accurately predicted a 31.1 km trail running performance. When combined with the previous years race time the accuracy of the predictive power of the model rose to 97%.

Influence of Volume of Training on the Results of a 12-Hour Ultramarathon

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Objective.—The purpose of this study was to analyze the influence of the volume of training on the results in a 12 h ultramarathon. **Methods.—**In association with a 12 h ultramarathon in the city of Vila Velha/ES/Brazil, performed on a 1.4 km track, with 94 athletes, we applied a survey with questions about km/month, hours and weekly sessions of training. 27 ultramarathoners (20 men and 7 women) answered the survey. The athletes were separated in two groups according with the median of their monthly volume training: G1 (above 200 km/month); and G2 (equal or under 200 km/month). We calculated mean and standard deviation from variables of training and used Student t-tests for dependent samples (p > 0,05). **Results.—**G1 was composed of 14 runners (2 women and 12 men), with 8 ± 6.6 years of running training (2–20 years), 271,4 ± 62.1 km/month (220–440 km/month), 8 ± 2.8 hours of training/week (4.5–15 h/w) in 4.1 ± 1 sessions/week (3–6). G2 included 13 runners (5 women and 8 men) with 4.1 ± 2.8 years of running training (2–10 years), 149.5 ± 37.9 km/month (80–200 km/month), 4.8 ± 1.36 hours of training/week (2–6 h/w) in 3.4 ± 1 sessions/week (1–5). The performance was different between groups (P = .01), with G1 completing 82.2 ± 15 km (61.6–107.8 km) and G2 completing 60.9 ± 14.7 km (44.8–91). **Conclusion.—**The results indicated that athletes who have a larger monthly training volume achieve better results in a 12 h ultramarathon.

Injuries During Training Before an Ultra-Endurance Mountain Bike Race

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Objectives.—Long distance mountain biking is a popular sports worldwide. Athletes have a wide range of experience from novice recreational riders to professional cyclists. While several studies have investigated injuries during the race, there is a gap in our knowledge on injuries during training. **Methods.—**Leadville 100 is a 161 km trail mountain bike race in Leadville, Colorado. The course ranges in altitude from 2,800 m to 3,840 m. This was an observational study using surveys prior to the race in August of 2013. The main outcome measurements were self-reported injuries during the training within a year before the race. Cyclists' characteristics, race performance, and injuries were available through other studies associated with the race. **Results.—**Out of 1,839 cyclists who registered for the race, 1,653 (90%) completed the pre-race survey. A total of 1,549 cyclists started the race and the majority of them successfully completed the race under the 12-hour cut-off time (83%). The average age was 43 ± 9 years (range 18–80) with the majority being male (89%), and 65% had at least a bachelor's degree. Among respondents, 39% reported missing at least one day of training due to injuries during the previous year. Females were more likely to reports injuries (47% vs 38%; P < .05). The average time missed from training due to injury was 6 ± 16 days. The most common reported injuries were in lower extremity (23%), followed by back/neck (13%), and upper extremity (10%). Age of respondents was not correlated with reporting injury during the training. **Conclusions.—**This study provides a profile of injuries sustained during the training period before a mountain bike race. Rate of injury resulting in at least one day of missing training is relatively high. It seems that upper extremity injuries are more common than other injuries during training.