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BAREFOOT VS. SHOD: A COMPARISON OF LOWER LIMB MOTION DURING RUNNING USING SYMMETRY ANALYSIS

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Introduction Previous research (Sinclair et al., 2013; De Wit et al., 2000) has assessed kinematic differences between barefoot and shod running and reported differences in sagittal plane hip, knee, and ankle motion at discrete points within the gait cycle. Further information may be gained about kinematic differences by analysis of the entire kinematic waveform. The aim of this work was to examine differences in barefoot and shod lower limb kinematics during running using symmetry analysis. Method Fifteen males (27 ± 5years, 1.77 ± 0.04m, 80 ± 10kg) ran at a self selected pace (2.8 ± 0.5m.s-1) on a treadmill in barefoot and shod conditions (standardized ASICS running shoes). Kinematic data were collected using an eight camera VICON MX motion analysis system (sampling at 200Hz). Hip, knee and ankle angles were calculated using the Plug in Gait model (Davis et al., 1991) and averaged over 5 gait cycles. Trend symmetry (TS) analysis (Crenshaw & Richards, 2006) was used to compare kinematic curves for the two conditions. A TS score of 1 equates perfect symmetry and > 0.95 highly symmetrical waveforms. TS values were calculated for each subject and averaged across subjects. Additionally, joint angles at initial contact (IC) and stance phase range of motion (ROM) were compared between conditions using paired t-tests and Wilcoxon matched pairs analysis. Results TS analysis revealed highly symmetrical (TS > 0.95) kinematic patterns for barefoot and shod conditions at the hip, knee and ankle in the sagittal plane, hip and ankle in the frontal plane and the knee and ankle in the transverse plane. Knee joint motion in the frontal plane was the least symmetrical (TS = 0.87). Significant (p < 0.05) differences between conditions at IC were recorded at the ankle in all three planes. Sagittal plane knee, and transverse plane knee and ankle motion were significantly (p < 0.05) greater in the shod condition. Sagittal plane ankle joint motion was significantly (p < 0.05) greater in the barefoot condition. Discussion The kinematic patterns recorded within this study are consistent with those reported by Sinclair et al. (2013) for barefoot running. Overall TS analysis revealed that barefoot and shod running patterns are highly similar. However, there are significant changes in lower limb orientation at IC and the ROM at the knee and ankle. References Crenshaw SJ, Richards JG (2006) Gait Posture, 24, 515-521 Davis RB, De Clercq D, Aerts, P (2000) J Biomech, 33, 269-278 Sinclair J, Greenhalgh A, Brooks D, Edmundson CJ, Hobbs SJ (2013) Footwear Science, 5, 45-53 Contact langley@uel.ac.uk

FOOD-INTAKE BY ULTRA-MARATHON RUNNERS DURING TRAINING AND COMPETITION: CROSS-SECTIONAL SURVEY AND CASE-REPORT

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Introduction Athletes competing in ultra endurance activities can have difficulties to meet nutrition recommendations due to a variety of reasons. We questioned whether general guidelines as stated in the IOC consensus (2010) are feasible for this discipline. The present field study focused on carbohydrate (CHO) and fluid intake of ultra-marathon runners competing in the 60 km or 120 km of Texel in April 2013. The purpose was to determine dietary intake during a training period, and during the day of the race. Methods 68 male and female ultra-marathon runners completed 2-3 24h-recalls with an additional questionnaire regarding sports nutrition and supplement intake during a training period several weeks before the race. Dietary intake of a small group of 120 km runners (n=4) was continuously observed and registered during the race (mean finish time 11:01:05h). Finally, dietary intake before and during the race of 60 km was assessed a day after the race (n=42), using a questionnaire (mean finish time 6:04:32). The Dutch food composition table (NEVO 2011) was used for conversion of dietary intake into energy and nutrients. If an Estimated Average Requirement value (EAR) was available group dietary intake was evaluated by SD-corrected % probability of inadequacy (POI). If not, dietary intake was evaluated qualitatively based on the median vs Adequate Intake (AI). Data are presented as means±SD or median(25th-75th). Results During training males (n=54) consumed on average 11.3±2.6MJ per day. Mean CHO intake was 4.4±1.3g/kg/day. POI was 2.7% based on an EAR of 2.9g/kg, 77% had an intake lower than 5g/kg and 100% had an intake below 7g/kg. Females (n=14) consumed 8.8±2.1MJ. Mean CHO intake was 4.5±1.3g/kg. POI was 0.3% based on EAR of 2.9g/kg, and 83.4% had an intake lower than 5g/kg. All had an intake lower than 7g/kg. The prevalence of inadequate fluid intake with an AI of 2.5L/day for both groups was considered low, based on the estimated median fluid intake of 2.9L±3.3 L/day and 2.7L±3.3 L/day for males and females, respectively. Before the race, 87.8% of the runners reported consumption of >1g/kg CHO, and 70.6% reported a consumption of >8ml/kg of fluid. During the race 24.4% of the group met the recommendations of >60g/h CHO and 14.6% consumed >500ml/h of fluid. The mean intake of 120 km runners for carbohydrate was 67.2g/h (range 31-108), with only one subject below 60g/h. Observed mean hourly fluid intake was 529.5ml (range 392.3-608.8 ml/h). Mean weight loss during the race was 1.5% but with large individual differences (-4% up to +1%). In conclusion, daily habitual CHO intake of ultra-marathon runners is above EAR, but more than 75% has an intake <5g/kg/day, which is considered the minimum for endurance athletes. Based on self-reported intake, recommended CHO and fluid intake pre-race was met by >70% of the runners. During the race fewer than one quarter of the athletes reported an adequate CHO and fluid intake. However, CHO and fluid intake in four 120 km runners observed during the race seemed adequate.

Oral presentations

OP-PM23 Obesity & Exercise

IMPACT OF ADRB3 SNP ON ABDOMINAL FAT IN OVERWEIGHT AND OBESE WOMEN

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Introduction The β-3 adrenergic receptor takes part in lipid metabolism and the Trp64Arg polymorphism of the gene has been associated with metabolic factors and obesity. The aim of this study was to analyze the effect of the Trp64Arg polymorphism of the ADRB3
gene on the android adipose tissue (AAT) and the abdominal visceral fat (VAT) during a controlled exercise and diet program in overweight and obese healthy women. Methods 101 women (38.28 ± 8.11 years, 1.62 ± 0.06 m, 80.21 ± 10.23 kg) followed a 24-week weight loss intervention of a controlled training program (supervised exercise group, 3 times/week; 36-60 min/session; strength, endurance or combined training) or exercise recommendations (non-supervised group, NS) and a caloric restriction (30% of the total daily energy expenditure). AAT kg and VAT kg were determined by dual-energy X-ray absorptiometry before and after the intervention. Genotyping of the overweight subjects was done based on the PCR and RFLP techniques according to previously used protocols, and of the obese subjects using Real Time PCR. Results Genotype distribution was 84 Trp64Trp and 17 Trp64Arg subjects. In the NS group we found higher AAT in Trp64Trp women than in Trp64Arg only after the intervention (2.94±0.320 vs 2.26±0.13 kg, p=0.049). Pooling NS+S we observed a tendency toward the same (2.6±0.18 vs 2.29± 0.07 kg, p=0.070). Trp64Arg NS group tended to have higher AAT after 24 weeks than 5 group (2.94±0.32 vs 2.33±0.15 kg, p=0.083). Regarding VAT, within NS group Trp64Trp and Trp64Arg significantly differed before and after the program (1.35±0.22 vs 0.74±0.09 kg, p=0.01 and 1.2±0.19 vs 0.51±0.08 kg, p=0.001). Pooling NS+S we found a borderline significance between Trp64Trp and Trp64Arg at baseline (1.02±0.12 vs 0.78±0.05 kg, p=0.056) and significant difference at the end (0.87±0.11 vs 0.55±0.04 kg, p=0.001). Trp64Arg women of the NS group did not improve significantly these parameters during the weight loss program in contrast to other groups. Discussion Previous studies mentioned the importance of the Trp64Arg polymorphism of the ADRB3 gene [3,4]. Our data confirm that it has an influence on android and visceral adipose tissue and that controlled exercise combined with diet seems to be the best tool to reduce them. (Funding: DEP2008-06354-C04-01) References [1] Clement et al. 1995. N Engl J Med 333(6): 352-354. [2] Zacipo et al. BMC public health, 12(11), 1100. [3] Tchernof et al. 2000. Diabetes, 49(10), 1709-1713. [4] De Luis, D. A. et al. 2008. Annals of Nutrition and Metabolism, 52(4), 267-271. Contact: barbara.szendrei@upm.es

DOES SERUM IL-6 CONCENTRATION EXPLAIN THE RELATIONSHIPS BETWEEN ADIPOSEITY AND MUSCLE SIZE AND STRENGTH IN YOUNG AND OLDER ADULTS?

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Introduction Sarcopenia, the age-related loss of muscle mass, has been associated with elevated markers of chronic inflammation, such as interleukin-6 (IL-6). However, it is not clear how increased adiposity influences skeletal muscle properties in both young and older individuals, and how inflammatory cytokines may explain potential relationships between body fat and muscle size and strength. The purpose of this study was to investigate the relationships between adiposity and skeletal muscle size, architecture and maximum strength in healthy young and older adults, and to examine whether serum IL-6 could explain these relationships. Methods One hundred and forty-two healthy, untreated men and women aged 18-80 yr (BMI: 17-49 kg/m2) performed isometric and isokinetic plantar flexor maximal voluntary contractions (MVCs) on a Cybex dynamometer. Voluntary muscle activation and antagonist muscle co-activation were assessed using the interpolated twitch technique and EMG, respectively. Achilles tendon moment arm, volume (Vml, fascicle length and pennation angle (AoP), and physiological cross-sectional area (PCS A) of m. gastrocnemius medialis (GM) were measured using ultrasonography. GM specific force was calculated as GM fascicle force/PCSA. Body fat mass (BFM) and lean mass (LM) were assessed using dual-energy X-ray absorptiometry. Serum IL-6 (n=67) was measured using ELISA. Results Isometric and isokinetic MVC torque correlated with LM, Vml, PCSA and AoP (r=0.426; p<0.001), isokinetic MVC torque also correlated with BFM (r=0.245; p=0.003), and IL-6 (r=-0.280; p=0.023). BFM correlated with Vm, PCSA, AoP and LM (r=0.312; p<0.001), and with IL-6 (r=0.380; p=0.002), muscle specific force (r=-0.296; p=0.011). In addition to isokinetic MVC and BFM, IL-6 correlated with BFM (r=0.358; p=0.003). Discussion Our data show that positive relationships exist between fat mass and precise measures of muscle size and architecture in young and older adults, which suggest a loading (hypertrophic) effect of chronically elevated adiposity on skeletal muscle. However, the inverse relationships between BF% and dynamic strength, and between fat mass and muscle specific force, suggest that any hypertrophic effect of increased adiposity is countered by a decrease in muscle quality (possibly by an increase in intramuscular fat content). Moreover, the positive relationships between IL-6 and fat mass and BF%, and the inverse relationship between IL-6 and muscle strength indicate a role for inflammatory cytokines in further reducing skeletal muscle quality, possibly by chronically elevating muscle protein breakdown. Contact R.M.Erskine@ljmu.ac.uk

EFFECTS OF TWO DIFFERENT TYPES OF EXERCISE ON CIRCULATING IRISIN LEVEL IN OBESE ADULTS

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Objective The novel myokine irisin has been reported as a therapeutic target for obesity and diabetes. Irisin is induced by exercise and activation increases gene expression of brown fat thereby elevates energy expenditure. However, only a few study investigated the effect of exercise on expression of circulating irisin level. In addition, there is no study how different exercise effects circulating irisin level in obese adults. Therefore, the objective of this study is to reveal the effects of aerobic exercise (AE) and resistance exercise (RE) training on expression of circulating irisin level in obese adults. Material/Methods Participants were randomly assigned into exercise groups. Twenty-eight obese adults (20-30 yrs) were included in this study. The final participants were AE(n=10), RE(n=10) and control (n=8). The samples were analyzed before and after 8 week of 60 min exercise program. Results. The subjects, in both aerobic and resistance training, showed significant improvement in anthropometric parameters, maximal oxygen uptake and muscle strength. Interestingly the circulating irisin was significantly increased in resistance training group but not in aerobic training and control groups. Furthermore, the exercise-induced change of the circulating irisin was positively correlated with muscle mass. On the other hand, the exercise-induced change of the circulating irisin was negatively correlated with fat mass and body fat percentage. Conclusion. These findings suggest that resistance training might play important role in improvement of circulating irisin level in obese adults.

ACUTE PHYSIOLOGICAL EFFECTS OF A SINGLE BOUT OF AEROBIC INTERVAL AND CONTINUOUS MODERATE INTENSITY CYCLING IN OBESE INDIVIDUALS.

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Introduction There are informal reports that obese participants prefer aerobic interval (AI) training to continuous moderate (CM) intensity exercise [Tjønna et al., 2008]. While both AI and CM exercise are effective in the treatment of many chronic diseases, it is possible that the