14th annual Congress of the

EUROPEAN COLLEGE OF SPORT SCIENCE

Oslo/Norway, June 24-27, 2009

BOOK OF ABSTRACTS

Edited by:
Loland, S., Bø, K., Fasting, K., Hallén, J., Ommundsen, Y., Roberts, G., Tsolakidis, E.

Hosted by:
The Norwegian School of Sport Sciences

ISBN 978-82-502-0420-1

European College of Sport Science:
Book of Abstracts of the 14th Annual Congress of the
European College of Sport Science, Oslo/Norway, June 24-27, 2009.
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ISBN 978-82-502-0420-1

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Conception & DTP: SporTools GmbH – Data management in sports
Cover: Elias Tsolakidis
Corrections: Patera, N., Tsianaka, G., Tsolakidis, K.
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EFFECT OF EXTREME ENVIRONMENTAL CONDITIONS ON PHYSICAL ACTIVITY PATTERNS OF SOCCER PLAYERS

OZGUNEN, K., KURDAK, S., CIGDEM, Z., KORKMAZ, S., YAZICI, Z., ERSOZ, G., BINNET, M.
ÇUKUROVA UNIVERSITY, TURKEY, ANKARA UNIVERSITY, TURKEY

Soccer teams may sometimes be obliged to play under difficult environmental conditions. Activity patterns of players of different standards have been analyzed by time-motion analysis, but there is dearth of knowledge how the players' match performance is affected by environmental conditions.

Purpose: This study aimed to evaluate changes in the activity patterns during a soccer match played in different conditions of environmental temperature and humidity.

Methods: Non-acclimatized soccer players (n=10, the goal keeper was excluded, 20 ±2 y, V'O2max=63 ±7 ml/min/kg) played 2 matches in different environmental conditions. Players ingested telemetric core temperature (Tc) sensors prior to each match and wore a heart rate (HR) and global positioning system (GPS) monitor during the match. A computer based analysis program was used to evaluate heart rate and speed changes during the match. The following locomotor categories were used: standing (0 – 0.4 km/h), walking (0.5 – 7.5 km/h), jogging (7.6 – 14.5 km/h), low – moderate running (14.6 – 19.5 km/h), high speed running (19.6 – 25.5 km/h) and sprinting (> 25.6 km/h). These were later divided into five categories: (1) standing; (2) walking; (3) running, encompassing jogging and low – moderate intensity running and (4) high intensity running, consisting of high speed running and sprinting.

Results: The average ambient temperature for the June 2007 match was 34 ± 1 ⁰C with a relative humidity of 38 ± 2 %. In the July 2007 match, ambient temperature was recorded as 36 ± 0 ⁰C with a relative humidity of 61 ± 1 %. Peak Tc values recorded for June and July matches were 39.1 ± 0.4 ⁰C, and 39.6 ± 0.3 ⁰C respectively. Total distance covered during June and July matches was 8.6 ± 0.6 and 8.1 ± 0.7 km respectively. The total distance covered in the first and second halves were: 4.4 ± 0.4 and 4.2 ± 0.3 km for June and 4.3 ± 0.5 and 3.8 ± 0.4 km for July matches. The difference between the halves of the July match was significant. The running distance covered in the second half of the July match was significantly shorter than first half of July and second half of June matches (2.1 ± 0.4 and 1.9 ± 0.3 km for the first and second halves of June and 1.9 ± 0.5 and 1.3 ± 0.4 km for the first and second halves of July matches;p<0.05)

Conclusion: In soccer matches played in high environmental temperature and humidity, the physical performance of the players may decrease due to high thermal stress. In the present study, the players' increased body core temperature at half time was followed by a decrease in total distance covered in the second half of the game. This may point to a centrally-driven performance reduction.

COOLING INTERVENTION AND SOCCER UNDER EXTREME HEAT CONDITIONS

KURDAK, S.S., ÖZGÜNEN, K.T., MAUGHAN, R., ZEREN, Ç., KORKMAZ, S., YAZICI, Z., ERSÖZ, G., SHIRREFFS, S., DVORAK, J., BINNET, M.S.
1. ÇUKUROVA UNIVERSITY, TURKEY, 2. LOUGHBOROUGH UNIVERSITY, UNITED KINGDOM, 3. ANKARA UNIVERSITY, TURKEY, 4. FIFA/FMARC, SWITZERLAND

Whole body pre-cooling with fluid ingestion had been discusses as one of the main interventions to improve athletic performance in extreme heat conditions. Extensive research had been performed to evaluate the effect of precooling on athletic performance and body core temperature, but the influence on a soccer match had not been investigated. Purpose: The aim of this study was to investigate the effect of cooling intervention on athletic performance and body core temperature during a competitive soccer game. Methods: 11 soccer players aged 21 ± 2 y (mean ± SD) with V'O2max of 59.8 ± 5.0 ml/kg/min volunteered to play two matches (without – C and with cooling intervention-CI) for this study. The ambient temperature and humidity was 34.3 ± 0.6 oC and 64 ± 2 % for the first and 34.0 ± 0.5⁰C and 62 ± 0 % for the second game (CI) respectively. Players had opportunity to consume ad libitum plain water during the C, plain water or sports drink by choice during CI study. A cooling tent and icy water filled buckets placed beside the soccer field were used for cooling intervention. Match activity was recorded by a global positioning system. Thermosensor pills were used for body core temperature (Tc) measurements. Blood samples were withdrawn from an antecubiteal vein 5 hours before and immediately after the game to determine hematocrit (Htc), hemoglobin content (Hb), calculate plasma volume loss, and changes of serum electrolytes. ANOVA and paired sample t-test was used to evaluate the level of significance, and p values < 0.05 were accepted as significant. . Results: The highest Tc value recorded during the last ten minutes of the first half and the difference between C and CI groups was not significant (39.54 ± 0.5 vs 39.3 ± 0.5oC respectively). Total liquid consumption was measured as 1473±422 ml for C, and 1230±494 ml for CI group (926±604 ml plain water, and 304±240 ml sports drink). Post-match dehydration % was similar for both C (2.49±0.67) and CI match (2.54±1.21). Pre- and post-match Htc (48.9±3.3 vs 49.2±3.3 %) and Hb (161±14 vs 163±13 g/L) were used to calculate % plasma volume change (0.1±5.5 %) for the C match. The plasma volume loss for the CI group was calculated as -5.1±5.6 with pre- and post-match Htc (46.2±2.3 vs 46.9±2.1) and Hb (153±10 vs 156±9) content. Plasma volume loss for C and CI groups were not significant. Pre- and post-match difference of serum Na (145±2.5 vs 144±3 mmol/L), and K (5.4±0.4 vs 5.4±0.4 mmol/L) for C and CI groups were not significant. CI did not change distance covered during the game significantly (8298 ± 589 meters vs 8315±549 meters for C and CI groups respectively) Conclusion: Cooling intervention was not sufficient to reduce Tc and improve match performance significantly. Slight reduction of Tc that observed with whole body cooling, may be important for prevention of heath related problems that occur in extreme heat conditions.

PLAYING FOOTBALL <SOCCER> UNDER EXTREME HEAT CONDITIONS – EFFECT OF ACCLIMATISATION

ERSÖZ, G., KURDAK, S.S.., ÖZGÜNEN, K.T., MAUGHAN, R.J.., ZEREN, C., KORKMAZ, S., YAZICI, Z., BINNET, M.S.
1. ANKARA UNIVERSITY, 2. ÇUKUROVA UNIVERSITY, 3. LOUGHBOROUGH UNIVERSITY

Exercise intensity is an important factor to induce thermal strain, and soccer is a challenge for the players who have to play under extreme heat conditions. Acclimation is an important intervention to improve thermal tolerance and endurance capacity.

Purpose: We aimed to evaluate effect of acclimation on sportive performance during a game played under extreme heat conditions Methods: 11 male acclimated soccer players (age 23  2 y, VO2 max 61.8  1.1 ml.min-1.kg-1) and 10 unaccli-

mated male soccer players (age 21  1 y, VO2 max 62.3  1.5 ml.min-1.kg-1) volunteered to participate in this study. Acclimated (A) and unacclimated (UA) teams played separately against a high level competitive local team at the second half of July 2007. Acclimated players played with an ambient temperature and humidity of 35.6  0.3 oC and 46  2 % respectively. Temperature and humidity was recorded as 36.00.2 oC and 61  1 % during the UA match. Match activity was recorded by a global positioning system. Thermosensor pills were used for body core temperature (Tc) measurements. Blood samples taken 4 hours before and immediately after the game to determine hematocrit (Htc), hemoglobin content (Hb), calculate plasma volume loss, and changes of serum electrolytes. Urine analyses performed before the game. ANOVA and paired sample t-test was used to evaluate the level of significance, and p values < 0.05 were accepted as significant. . Results: The highest Tc value recorded during the last ten minutes of the first half and the difference between A and UA groups was not significant (39.0  0.3 vs 39.51  0.3oC respectively). Urine specific gravity value of A players (10206) was significantly lower than UA players (10277) (p < 0.05). Pre- and post-match Htc (43.5  3.3 vs 46.1  2.5 %) and Hb values (153  11 vs 154  12 g/L) were used to calculate % plasma volume change (-4.38.13 %) for the A players. The plasma volume loss for the UA players was calculated as -4.82.8 % with pre- and post-mach Htc (45.8  2.6 vs 47.0  1.3) and Hb (161  7 vs 166  9; p<0.05) content. Difference of plasma volume loss for A and UA football players was not significant. Post-match serum Na (1412 vs 1424 mmol/L), K (4.30.3 vs 4.60.4 mmol/L) for A and UA players were not significantly different from each other. The difference of total distance covered by A (8514  630 m) and UA (8154  731) players were not significant. Average distance covered by A players during the second half of the game was significantly higher then the UA players (4156  354 vs 3761  358 m respectively; p<0.05). Conclusion: Playing football in extreme heat conditions is an important challenge for adjustment of thermal balance. Increased body temperature together with dehydration may reduce exercise capacity. Acclimatisation is an important intervention to reduce heat strain. The increased sportive performance may be interpreted as another beneficial effect of acclimatisation.

HORMONAL AND NEUROENDOCRINE RESPONSES AND TRAINING ADAPTATIONS FOLLOWING 8-WEEKS OF PRE-SEASONAL PREPARATION PERIOD IN YOUNG HIGH-LEVEL SOCCER PLAYERS

HADJICHARALAMBOUS, M.

UNIVERSITY OF NICOSIA

Introduction: Various hormonal responses to training-stress are measured for examining training adaptations particularly in adults' athletes. However, little information is available regarding hormonal and neuroendocrine responses to intense pre-seasonal preparation training in young athletes, in particular in youth soccer-players. The purpose therefore of the present study was to examine neuroendocrine and selected hormonal responses and their association with physiological adaptations to 8-weeks of pre-seasonal preparation training in young high-level male soccer-players.

Methods

All anthropometric measurements, physical fitness components and neuroendocrine and hormonal responses of eighteen (n = 18) well-trained players were evaluated in three occasions: at base-line, immediately prior to the initiation of preparation period (pre-conditioning) and 48-hours following the completion of the 8-weeks' training program (post-conditioning).

Results: Total IGF-1, growth hormone (GH), plasma testosterone (T) and cortisol (C) and T:C ratio were not different between assessments but plasma prolactin (Prl) (p = 0.001) was significantly lower at post-training period. Body weight (p = 0.349), BMI (p = 0.266), resting systolic (p = 0.230) and diastolic (p = 0.527) blood pressure and sit and reach flexibility (p = 0.61) were not different among measures but HRmax (p = 0.014) was significantly lower at post-conditioning evaluation. Body fat percentage (%) (p = 0.0005) was lower and aerobic capacity (p = 0.0005), leg explosiveness (p = 0.0005), and muscular endurance [1 min-sit-ups (p = 0.001) and 1 min-push-ups (p = 0.029)] were improved by the end of preparation period. There was a significant negative correlation between endurance capacity and resting plasma Prl levels. No correlation was observed between plasma IGF-1, GH, T, C and the other fitness components, which all were examined separately.

Discussion: The present study suggests that although the overload pre-seasonal training program improved soccer-specific fitness components of young high-level soccer players, several selected hormonal responses (e.g. total IGF-1, GH, plasma T and C and T:C ratio) were not influenced by the pre-seasonal training program with the exception of the reduction in resting plasma Prl concentration. Consequently, this response may reflect an increase in brain serotonergic system adaptations and/or tolerance to intense soccer pre-seasonal training. The present study provides preliminary evidence for using resting levels of plasma Prl as an indicator for training adaptations to pre-seasonal preparation period in young sub-elite soccer players.

AGE-RELATED DEVELOPMENT OF BIOLOGICAL - AND PERFORMANCE INDICES OF AUSTRIAN SOCCER PLAYERS

GUSCHELBAUER, R., OBERHAMMER, O., TSCHAN, H.

FACULTY OF SPORT SCIENCE, UNIVERSITY VIENNA

Introduction: Soccer is characterized by numerous sprint bursts interspersed by brief recovery periods over an extended period of time (60-90 minutes) activating both, the aerobic and the anaerobic energy systems. This study was intended to examine the age-related development of aerobic endurance and sprint velocity of seven age-related sub-groups of adolescent soccer players ranging from 7-18 yrs in comparison to elite players of the Senior League.

Methods: The sample included 105 soccer players (at least 11 players were tested in every sub-group). Biological development of height, body mass and body mass index were measured and two tests of functional capacity: Aerobic fitness 20-m multistage shuttle run (20 SRT) and sprint running abilities (sub-intervals and total time of a 30 m dash measured electronically) were administered. Estimated relative maximum of oxygen uptake (rel. VO2max) was predicted from age and maximum speed of the 20 SRT.

Results: Anthropometric data, sprint abilities and endurance performance improved continuously with increasing age. However, the performance improvement in speed and endurance capabilities was only significant in teams having an age difference of 3 and more years. The only exception in this respect was detected is between the players being 14 yrs old and those being 16 yrs old were a significant gap in performance indices existed probably due to the growth spurt. It is remarkable however, that there are no significant differences between the teams of the under 16 – and under18 year old soccer players, and players of the male elite team in aerobic performance measures and sprint abilities. Surprisingly there was a highly significant correlation between endurance performance and quickness of the tested players leading to the result that those players who had higher developed aerobic endurance performance also were the fastest players.