

8. NUTRITION AND PHYSIOLOGICAL RESPONSES

O-045 The effects of oral L-Arginine supplementation on muscular strength in young soccer players

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OBJECTIVE According to the literature L- Arginine supplementation improves physical performance by decreasing fatigue due to nitric oxide (NO) vasodilatation effect. This investigation sought to assess the effect of L-Arginine supplementation on strength and body composition of young soccer players during an 8 week weight training protocol.

METHODS 20 soccer players, age between 17 and 19 years old (mean 17.65 ± 0.8 yrs) were supplemented either with 3 g of L-arginine plus 1 g of vitamin C (group ARG) or just with 1 g of vitamin C (group CON). They underwent eight weeks of weight training (3 times/ week). Statistical analyses used were ANOVA and "t" test.

RESULTS Group ARG showed a significant increase in body-weight (66.4 ± 6.1 ; 67.84 ± 6.8 kg), lean body mass (60.38 ± 6.05 ; 62.07 ± 5.9 kg) and muscular strength of both legs, right(R) and left(L) (Extension R 184.8 ± 17.4 to 195.8 ± 16.3 ; L 191.1 ± 18.4 to 199.1 ± 19.1), as an decrease in body fat ($6.02 \pm 0.6 - 5.77 \pm 0.59$ Kg) and %body fat (9.45 ± 0.8 to 8.66 ± 0.77) ($p < 0.05$). There was no significant change in CON group.

CONCLUSION This study indicated that daily oral supplementation of L- Arginine for 8 weeks positively altered measurements of strength and fat-free mass, suggesting that the strategy of targeted nutrition had the ability to improve the muscular responses to weight training programs.

KEY WORDS Exercise, nitric oxide, vasodilatation, muscle.

O-046 Effects of sports drinks supplements on performance and thermoregulatory responses of soccer players

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OBJECTIVE As performance decrement may occur with as little as 1 - 2% dehydration, and fluid intake during the course of a soccer match is limited, various hyperhydration protocols have been applied to supercompensate total body water stores prior to a match. However, the efficacy of such hyperhydration protocols remains equivocal. The objective of the current study was to compare thermoregulatory maintenance and soccer-specific performance between a carbohydrate-electrolyte drink (CHO-electrolyte) and a CHO-electrolyte drink containing 4% glycerol.

METHODS Ten players participated in two outdoor training sessions and randomly assigned to each of two drinks. Players consumed 500mL of either drink at 30 min pre- and again at ½ time of the session. Pre- and post body weight was recorded, as well as thermoregulatory (core temp and heart rate), cardiovascular (plasma osmolality & volume) and renal (urine osmolality & specific gravity) responses.

RESULTS The degree of dehydration (% change in body weight) was greater after completion of the non-glycerol session ($p = 0.041$). Similarly, % decrease in plasma volume was also significantly greater ($p = 0.049$). Serum osmolality increased in both trials, however the glycerol trial was higher ($p = 0.033$). No main affect was observed between core temp and HR conditions (CT: $p = 0.350$; mean HR: $p = 0.256$).

CONCLUSION The addition of glycerol into the CHO-electrolyte drink provided players with better PV maintenance and attenuated dehydration even in relatively mild ambient temperatures ($\sim 17.0^\circ\text{C}$). However, the effects on performance were minimal, as no differences were observed between training intensities or fatigue tests throughout the two sessions.

Table 1. Plasma, urine and thermoregulatory responses after training sessions.

	CHO-electrolyte		CHO-electrolyte + glycerol	
	Pre Practice	Post Fatigue	Pre Practice	Post Fatigue
Hb (gm·dL⁻¹)	14.7 (1.0)	15.4 (0.9)	15.4 (1.0)	15.5(1.0)
Hct (%)	47.1 (2.7)	48.8 (2.9)	47.9 (2.7)	49.1(3.2)
Serum Osmolality (mOsm·kg⁻¹)	292.3 (4.1)	306.6 (3.6)*	292.3 (3.6)	310.9 (5.7)*^
Serum Glycerol (mmol·L⁻¹)	0.6 (1.7)	5.6 (8.1)	0.9 (2.4)	165.8 (51.2)*^
Lactate (mmol·L⁻¹)	N/A	8.57 (0.89)	N/A	8.58 (0.88)
Urine Specific Gravity	1.017 (0.01)	1.016 (0.01)	1.021 (0.01)^	1.023 (0.01)*^
Urine Osmolality (mOsm·kg⁻¹)	680.4 (316.5)	570.5 (382.0)	790.6 (266.8)	802.8 (227.7)
Urine Glycerol (mmol·L⁻¹)	5.3 (4.9)	7.9 (6.8)	3.7 (4.5)	230.0 (39.8)*^
Body Weight (kg)	74.7 (8.9)	73.6 (8.6)	74.9 (8.5)	74.2 (8.2)
Core Temp (°C)	37.2 (0.3)	38.5 (0.4)	37.3 (0.2)	38.4 (0.4)
% Changes				
% Δ BV		-3.50 (1.49)		-2.46 (2.21)
% Δ CV		1.15 (4.09)		-1.89 (2.01)
% Δ PV		-6.42 (3.27)		-2.86 (3.55)^
% Δ BW		1.49(0.90)		0.97 (0.58)^

Hematocrit (Hct); Hemoglobin (Hb); Blood Volume (BV); Red Cell Volume (CV); Plasma Volume (PV); Body Weight (BW); N/A: Sample contamination prior to both resting lactate analysis did not allow for an accurate depiction of resting blood La levels; ^significantly different from CHO-electrolyte; *significantly different pre – post

KEY WORDS Soccer-specific training strategies, hydration, glycerol

O-047 Thermoregulatory response to base layer garments during intermittent treadmill exercise

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OBJECTIVE The use of base-layer garments in team sports has become widespread in recent years. Different types of garments purport to afford distinct functional properties to the wearer. However, the thermoregulatory effects have yet to be systematically studied. The thermoregulatory response to wearing preparatory base-layer garments was assessed using an intermittent treadmill protocol based on Drust et al., (2000) and compared to data obtained wearing a cotton t-shirt and a bare-chested condition. Participants' skin and core temperatures were measured as was garment moisture retention. Four healthy adult males participated.

METHODS Following implementation of a preparatory regime, mean nude skin temperatures were recorded pre- (PrA) and post-acclimatisation (PoA), at mid- (ME) and end-exercise (EE) using an infrared imaging camera. Core temperature was logged every 30 s. Garment mass pre- and post-testing was recorded to determine garment moisture retention.

RESULTS With respect to the mean skin and core temperatures observed, garments rank (from lowest to highest) bare-chested, base-layer hot, base-layer cold, and cotton (Table 1). Increases in garment mass due to moisture retention post exercise were 0.029 kg ± 0.021 SD, 0.042 kg ± 0.026 SD, and 0.052 kg ± 0.037 SD for base-layer hot, base-layer cold, and cotton respectively.

Table 1. Mean skin and core temperatures recorded for each of the four test conditions.

	Bare-chested	Base-layer hot	Base-layer cold	Cotton
Mean skin temp. (PrA)	31.5 (0.65)	31.0 (0.16)	31.1(0.98)	30.9 (0.94)
Mean skin temp. (PoA)	31.5 (0.55)	31.4 (0.65)	31.5 (0.66)	31.5 (0.59)
Mean skin temp. (EM)	28.6 (0.76)	28.9 (1.01)	29.1 (1.05)	29.4 (1.23)
Mean skin temp. (EE)	28.7 (0.67)	29.3 (0.30)	29.7 (1.03)	29.7 (1.02)
Core temp. during exercise	37.8 (0.17)	37.8 (0.08)	37.9 (0.08)	38.0 (0.28)

CONCLUSION Skin and core temperatures are affected by garment choice during intermittent treadmill exercise. Mean skin temperatures vary more substantially than core temperatures across garment types. Base-layer hot garments

are most effective in terms of cooling and moisture management, whereas Base-layer cold garments exhibit a similar thermal effect to cotton but with lower levels of moisture retention.

REFERENCES

Drust et al. (2000) *Journal of Sports Sciences* **18**, 885-892.

KEY WORDS Mean skin temperature; infrared; core temperature; garment moisture retention.

O-048 Effects of high intensity intermittent exercise and carbohydrate supplementation on variations of specific biochemical markers of myocardial muscle (cTnI, CK-MB) in soccer players

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OBJECTIVE Cardiac damage has recently been concerned in the aetiology of exercise induced cardiac dysfunction (Shave et al., 2002). Prolonged steady state exercise can promote the release of cardiac troponin T (George et al., 2004). The purpose of this study was to examine the influence of three bouts of 90-minute high intensity intermittent exercise (specific for soccer) in a week along with carbohydrate supplementation on cardiac troponin I (cTnI) and creatine kinase-MB (CK-MB) in soccer players.

METHODS Twelve elite soccer players were selected from volunteers and divided into three groups of carbohydrate (CHO), placebo (P) and control (C, age: 22±2.6; 24.2±2.6; 25.2±0.5 y; body mass: 71.7 ±5.4; 76.5±11.3; 75.5±3.4 kg; height: 173.2±7.04; 177±12.2; 176± 0.8 cm) respectively. They were studied in 12 days time course. Blood samples were taken in six phases and were analyzed with Chemiluminescence's method.

RESULTS Results showed that 3 bouts of 90-min exercise along with carbohydrate does not have any significant effect on the level of cTnI indices. However, there was a significant difference in CK-MB values after second and third session than at first day (P<0.05). Comparison of three groups in different phases showed significant differences between carbohydrate and placebo after first and second session.

Table 1. Mean (± SD) level of cTnI and CK-MB (ng/ml)

	Day 1	Day 2	Day 5	Day 8	Day 9	Day 12
cTnI CHO	0.007 (0.024)	0.006 (0.002)	0.067 (0.035)	0.12 (0.14)	0.052 (0.005)	0.12 (0.13)
P	0.097 (0.095)	0.02 (0.002)	0.092 (0.063)	0.005 (0.00)	0.14 (0.01)	0.13 (0.077)
C	0.001 (0.063)	0.005 (0.00)	0.082 (0.037)	0.02 (0.034)	0.012 (0.013)	0.055 (0.001)
CK-MB CHO	3.47 (0.66)	3.36 (0.30)	4.77 (1.36)	4.14 (6.85)	3.88 (0.05)	3.28 (0.41)
P	3.26 (0.79)	5.15 (1.26)	7.88 (2.79)	3.84 (12.31)	5.53 (1.61)	4.45 (1.41)
C	2.36 (0.54)	3.03 (0.21)	3.18 (0.81)	-0.13 (9.1)	3.25 (0.97)	3.06 (0.95)

CONCLUSION The results of the study showed that there were inconsistent results even after ultra marathon events. It can be concluded exercises with less duration and intensity like soccer even with three sessions in a week does not appear be effective on the markers. When overall intensity of exercise was moderate it appeared that carbohydrate supplementation had less effect on the alteration of biochemical markers of myocardial muscle.

REFERENCES

George et al. (2004) *British Journal of Sports Medicine* **38**, 452-456.

Shave et al. (2002) *International Journal of Sports Medicine* **23**, 489-494.

KEY WORDS Carbohydrate supplementation, intermittent exercise, cTnI, CK-MB.

O-049 Performance on two soccer specific high-intensity intermittent running protocols after training

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OBJECTIVE During a soccer match players must be able to recover rapidly following high-intensity exercise and be able to repeat the work-rate pattern for the entire match. Therefore, it is important for coaches to be able to evaluate players' ability to perform repeated high-intensity intermittent exercises. The primary aim of this study was to evaluate the sensitivity of a high-intensity intermittent running protocol in young professional soccer players. A secondary aim was to compare performance on the "15-30" protocol to the Yo-Yo Intermittent Recovery Test.

METHODS Ten young male professional soccer players performed the "15-30" protocol and the Yo-Yo Intermittent Recovery Test Level 1 (YIRT) at the start (T1) and at the end of six weeks of pre-season training (T2). The "15-30" protocol consisted of a sub-maximal part (Part 1) and a maximal part (Part 2). Performance in Part 1 was measured by heart rate (HR) and in Part 2 by distance covered.

RESULTS In the "15-30" protocol, HR was significantly ($p<0.05$) lower during Part 1 at T2 compared to T1 but not during Part 2. Distance covered in Part 2 and in the YIRT was significantly ($p<0.05$) greater at T2 compared to T1. There was no significant relationship ($p>0.05$) between the YIRT and the "15-30" protocol in the performance changes as distance covered from T1 to T2.

Table 1. Performance in the "15-30" Protocol and the YIRT at the start (T1) and at the end of pre-season (T2)

Stage	HR (beats.min ⁻¹) during Part 1	HR _{peak} (beats.min ⁻¹) in Part 2	Distance covered (m) in Part 2	Distance covered (m) in the YIRT	HR _{peak} (beats.min ⁻¹) in the YIRT
T1	175 (10)	192 (8)	331 (333)	1930 (299)	196 (8)
T2	162 (13†)	193 (13)	1624 (759)†	2292 (315)†	194 (8)

† = significant ($p<0.05$) to T1

CONCLUSION The main finding of this study was that improved performance was reflected both in the "15-30" protocol and the YIRT following pre-season training in young professional soccer players. The significantly lower heart rate during Part 1 with training indicates that physiological training adaptations occurred following pre-season.

KEY WORDS Soccer, heart rate, intermittent, running protocol, field test, training

O-050 Relationship between angiotensin-converting enzyme activities and some exercise performance parameters of soccer players

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OBJECTIVE The angiotensin-converting enzyme (ACE) plays an important role in cardiovascular homeostasis through angiotensin II formation and bradykinin inactivation. The insertion/ deletion (ID) polymorphism of the ACE gene is a major determinant of plasma ACE activity. Several researches have shown significant relationships between ACE -ID polymorphism and some exercise performance parameters such as endurance. Our objective was to investigate the relationship between serum ACE activities and anaerobic threshold (ANT), lactate elimination rate (LE), heart rate recovery (HRR), maximal blood lactate, maximal heart rate after maximal exercise, and some haematologic parameters.

METHODS 18 healthy males (23.6±0.5yr) and 36 professional soccer players (22.3±0.6yr) participated. ANT was determined by an incremental exercise which goes on until fatigue. HRR and LE were calculated as (HR_{end} of postexercise - HR_{3rdmin} of postexercise)/3 and (LA_{2ndmin} of postexercise - LA_{15thmin} of postexercise)/13. Serum ACE activity (kinetically), iron, TIBC and haemogram were determined from fasting blood.

RESULTS Although ANT velocities ($p=0.000$), LE ($p<0.05$) and HRR($p=0.004$) values were significantly higher in soccer players. It was not found any significant relationship between serum ACE activities and exercise performance parameters in both the sedentaries and the soccer players.

CONCLUSION Contrary to findings in most literature there was not any significant relationship between serum ACE activities (ACE-ID polymorphism) and anaerobic threshold, lactate elimination rate and heart rate recovery, which are very important soccer exercise performance parameters in the soccer players and the sedentaries.

KEY WORDS ACE activity, lactate elimination rate, heart rate recovery, total iron-binding capacity, haemoglobine, soccer.
