13. PEDIATRIC FOOTBALL

O-073 Physiological responses of elite junior Australian Rules footballers under match situations

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OBJECTIVE Australian Rules Football (ARF) is Australia's major football code. Despite research in other football codes (Estell et al.1996; Deutsch et al. 1998), to date, no data has been published on the physiological responses of ARF players at either the senior or junior levels. This study will present Heart Rate (HR), Blood Lactate (BLa), Core Temperature (Tcore), and Hydration status of elite junior ARF players during two fully sanctioned pre-season junior (U18) matches.

METHODS Fifteen athletes (17.28±0.76yrs) participated in two Football Victoria pre-season U18 matches. Match HR was measured by HR monitors. BLa was measured via finger prick lancet. Tcore was measured by use of ingestible temperature sensor and measured wirelessly. Hydration was measured by urine specific gravity and body weight. Environmental conditions were measured continuously during each match.

RESULTS HR responses showed a high exertion of players in the 85-95% maximum HR range. Elevated mean BLa levels were observed in all players over the duration of the matches. Mean Tcore rose 0.68C between start and end of matches. Mean urine specific gravity increased between 0.010grams/ml with mean body weight decreasing 1.88

DISCUSSION The results observed in these two matches show similar results in similar age-group populations of other football codes (Estell et al, 1996; Deutsh et al, 1998). Data from this study will allow coaches to develop specific training programs. However, further research must continue under varying environments, and at all levels, to ascertain full physiological responses during ARF matches.

KEY WORDS Australian Rules Football, Junior athletes, physiological analysis, match play

O-074 Exercise intensity in training sessions and official games in soccer

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OBJECTIVE Heart rate (HR) is a physiological factor commonly used for estimating and controlling the exercise intensity (EI) of athletes (Eniseler, 2005). In fact, the training intensity is considered to be a major factor for the effectiveness of physical fitness training. Studying the EI during different soccer specific activities will provide sports scientists with new valuable information for the periodization of soccer training. The objective of this study was to compare the IE of soccer players during two types of soccer specific training sessions and official games by HR measurements .

METHODS The subjects were eight U-17 male players in a major Brazilian Soccer Club. The HR of these players was measured with a set of HR monitors (Polar Team System) during: 1) Practice game (PG): same duration and rules of an official game; 2) Modified game (MG): 8-a-side game on a reduced field (¼ of the soccer field) (2x25min); and 3) Official games (OG): 6 games. HRmax was measured during a 1000m maximal run or during the official games to express the intensity as percentage of HRmax (%HRmax). The Student's t Test was used for the comparisons and the significance level was set at $p<0.05$.

RESULTS The EI reached by the players during the official games was greater than the EI during the practice game. No differences were found between the EI of the official games and modified game. The results are presented in Table 1 (mean ± S.E.M.).

DISCUSSION This study indicated that eEI during MG was similar to that observed in OG that resembles the 8-a-side game on 1/2 field (160bpm) studied by Sassi et al.(2004). In contrast, Eniseler (2005) found lower EI(135bpm) in a MG compared to the EI(157bpm) in an OG.

Table 1. Intensity of the effort expressed as heart rate (HR) and percentage of maximum heart rate (%HRmax) for the analyzed activities.

	Practice Game	Modified Game	Official Game
HR (bpm)	150 (3)	157 (5)	166 (3)*
%HR_{max}	75.1 (1.8)	79.0 (2.6)	84.0 (1.3)*

*difference in relation to the practice game (P<0.05).

CONCLUSION From this perspective, this study suggested that when the individual playing area is smaller the EI remains unchanged.

REFERENCES
Enieler, N. (2005) *J Strength Cond Res* **19,** 799-804.
Sassi et al. (2004) *J Sports Sci* **22**, 5.

KEY WORDS Work-load, soccer, heart rate, training sessions

S-075 Effects of 6 week aerobic power training in indoor soccer players under-20

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OBJECTIVE The indoor soccer is characterized with intermittent activity that requires many different energetic sources due to the necessary changes in the intensity of the game. High intensity actions (righ intensity run, fast direction changes, dribbles) are alternate to rest periods (walk or ligth intensity run), covering 6000 meters (Moreno, 2001). Some studies presented that aerobic fitness is important to high intensity exercises as indoor soccer. The aim was to describe the maximum consumption of oxygen after 6 weeks of training for some indoor soccer athletics under-20.

METHODS Twenty one male Brazilian indoor soccer players (17.99±1.07years, 67.58±9.19kg, 177.63±5.60cm) particitipated this study, excluding the goalkeepers. The measures were made in the beginning and in the end of 6 weeks of trainings. To get the VO2max participants had to join Yoyo Endurance Test with the procedure described by Bangsbo (1996). Components were analyzed through the described statistic, delta percent and of "t" test for dependent samples. The significance level used was $p < 0.05$.

RESULTS Between the before and after training it was possible to verify some increases at the aerobic power performance (7.23±3.82%; p=0.044), showing VO_2max increases of 50.58±3.16 ml/kg/min for 54.20±3.38 ml/kg/min after training.

Table 1. The aerobic power training program.

Weeks	Running time	Quantity		Intensity% $VO_{2máx}$	Series break	Exercises break
		Series	Times			
1	120sec	3	6	90	90sec	90sec
2	120sec	3	6	90	120sec	90sec
3	90sec	4	5	95	120sec	60sec
4	90sec	4	5	95	150sec	60sec
5	60sec	5	4	100	150sec	45sec
6	60sec	5	4	100	180sec	45sec

CONCLUSION These results suggested that there were increases in the maximum consumption of the oxygen in under-20 indoor soccer players after 6 weeks of training, and besides that, it was noted that the training effects with interval stimulus of high intensity of VO2max developed important increases in the aerobic power of the indoor soccer players.

REFERENCES
Bangsbo, J. (1996) *Yo-yo Test.* Copenhagen: Ho+Storm.
Moreno, J.H. (2001) *Apunts*, **65**, 32-44.

KEY WORDS Indoor soccer; VO_2max; under-20 athletics, training.

O-076 Anthropometric and fitness variables of 15 -16 years old Gaelic footballers

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OBJECTIVE Fitness profiles have been used to identify the characteristics that distinguish county level and club level of Gaelic footballers at different times of the season. Physiological profiles have also been presented in relation to playing position of elite college Gaelic footballers (McIntyre and Hall, 2005). Yet, no study has examined the relationship between anthropometric and fitness profiles and playing positions in underage players. The purpose of the current investigation was to analyse anthropometric measurements and fitness test performances for 79 under 17 Gaelic footballers selected for elite training camps because they were identified among the 6 players with the highest potential in their counties. The players were analysed during training camps in 2004 and 2006 and came from the 9 Ulster counties.

METHODS Anthropometric measures including height (HT) and body mass (BM) were obtained with body mass index (BMI) being computed. The players performed a series of standard physical fitness assessments including a; 5m sprint test (SP) through Swift Performance light gates (Sydney, Australia), a variation of the seated 2-handed medicine ball (4 kg) throw, a counter-movement jump using the Takei jump meter (Toyko, Japan), and the multistage fitness test, allowing VO_2 max to be estimated (VO). All variables except SP and VO were normally distributed ($P>0.05$). One way ANOVA tests with Bonferroni adjusted post hoc tests were used. Kruskal Wallis H tests with Bonferroni adjustments were applied to SP and VO.

RESULTS Position had a significant effect on HT ($F_{9,69} = 5.4$, $P<0.001$), BM ($F_{9,69} = 3.5$, $P=0.001$) and SP ($H_9 = 23.6$, $P=0.005$).

DISCUSSION These results provide an insight into the anthropometric and fitness attributes relative to each position at underage level. The findings suggested that midfielders required differing characteristics to other outfield players. These outcomes should be considered by those involved in talent identification and development programmes for Gaelic football.

REFERENCES
McIntyre et al. (2005) *British Journal of Sports Medicine* **39**, 264-266.
KEY WORDS Gaelic football, fitness, profiles.

O-077 Differences in neuromuscular and energy systems of junior elite soccer players with different sprint abilities

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OBJECTIVE The activity profile of high-standard soccer play is of intermittent nature with repeated bouts of high intensive actions during a prolonged time (Mohr et al. 2003). Thus, an elite soccer player should have a highly developed neuromuscular system (e.g. sprint and strength qualities) besides energy system (ability to repeatedly perform intense exercise and the potential to recover). Sprint running is of special interest in the physical development of young soccer players since sprint running can be decisive in critical game situations (Reilly et al., 2000). The aim of the study was to compare the neuromuscular and energy systems of junior elite soccer players with different sprint abilities.

METHODS 37 junior elite soccer players performed a maximal-effort 40m-sprint, a jump test on a force platform, a 6-sec tapping test and a Yo-Yo-IR1 test. For data analysis, the players of the fastest quartile (n=11; age: 16.9±0.6y; height: 177.5±4.5cm; body weight: 72.4±5.2kg) were compared with the players of slowest quartile (n=10; 17.1±0.4y; 180.3±8.5cm; 72.04±8.8kg) using a paired t-test.

RESULTS The players of the fast group had a significantly higher maximal power output relativ to bodyweight in the countermovement and squat jumps. Tapping frequency was also higher, but not significantly. No differences could be found in the distance covered in the Yo-Yo-IR1 test.

CONCLUSION The players of the fast group showed a higher level of the neuromuscular functions. The higher rate of force production of the fast group emphasise its importance for the sprint performance. No difference between the

groups was found in the endurance test, which means that the development of the neuromuscular system in junior elite soccer players may not affect the energy system negatively.

REFERENCES
Mohr. et al. (2003) *Journal of Sports Sciences* **21**, 519-528.
Reilly. et al. (2000) *Journal of Sports Sciences* **18**, 669-683.

KEY WORDS Sprint, soccer, physical testing, youth, elite, physical development.

O-078 Longitudinal changes in isokinetic strength in relation to peak height velocity in youth soccer players

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OBJECTIVE Physical performance is positively associated to biological maturation in male adolescents. The adolescent growth spurt can vary in timing and tempo among individual athletes. In the general male adolescent population, strength attains maximal growth after peak height velocity (PHV) and peak weight velocity (PWV). Corresponding information in young soccer players is scarce or not available. The purpose of this study was to investigate longitudinal changes in isokinetic strength (peak torque flexion and peak torque extension of the knee at 60°/sec) in relation to the age at peak height velocity.

METHODS Changes in height, weight, and isokinetic strength were studied in 33 Flemish male youth soccer players over a 5-year period. Mean age at the start of the study was 12.2 ± 0.7 yrs. PHV and PWV were determined as in Philippaerts et al. (2006). The estimations of PHV, PWV and age at PHV were resp. 9.7 ± 1.5 cm/yr, 8.4 ± 3.0 kg/yr, and 13.8 ± 0.8 yrs. BIODEX System 2 measured the isokinetic strength.

RESULTS Performances in both flexion and extension showed a peak development at PHV. Knee flexion (Hamstrings) showed the highest absolute and relative velocities (19.8 Nm/year and 22.5 Nm/kg/year respectively) at the age of PHV. The absolute and relative velocity values for isokinetic knee extension (Quadriceps) were 30.5 Nm/year and 35.2 Nm/kg/year at PHV respectively.

CONCLUSION Isokinetic strength showed a peak development at peak height velocity. Trainers and coaches should be aware of the individual characteristics of the adolescent morphological and physical growth spurt.

REFERENCES
Philippaerts et al. (2006) *Journal of Sports Science* **24,** 221-230.

KEY WORDS Strength, youth sports, peak height velocity, growth.

O-079 Physiological profiles of soccer players: U17, U19, U21 and over21

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OBJECTIVE Physical characteristics and fitness components have been identified as being crucial for soccer players. Blood lactate, heart rate (HR), flexibility, body mass index (BMI) and body fat percentages give valuable information while assessing the players and their capacities (McMillan et al., 2005). The purpose of this study was to compare the physiological and physical characteristics of soccer players in relation to their ages.

METHODS Ninety seven soccer players participated in this study. Physical fitness and physiological variables; blood lactate, HR, flexibility and body fat were recorded and compared among U17, U19, U21 and Over21 groups, by Lactate Pro Portable Lactate Analyzer, polar heart rate monitor watch, sit & reach, and skinfold calliper respectively. Post-Hoc analysis was conducted in order to see the differences among age groups. The significance level was set at .05.

RESULTS The ANOVA results revealed that there were significant differences between age groups in terms of BMI $F(3, 93)= 4.34$, $p< .05$, and running velocities $F(3, 93)= 3.19$, $p<.05$ (for 3 mmol lactate level) and $F(3,93)=2.81$, $p<.05$ (for 4 mmol lactate level).

Table 1. Means (SD) for independent variables for age groups.

	U17 (N=33)	U19 (N=20)	U21 (N=15)	Over 21 (N=29)
BMI	22.5 (1.9)*[1]	22.2 (1.5)*[2]	23.3 (1.4)	23.7 (1.7) *[1,2]
Body Fat	9.9 (6.2)	8.7 (3.1)	11.3 (4.7)	11.2 (4.5)
Sit & Reach	16.8 (5.7)	18.9 (6.8)	16.1 (7.1)	16.3 (5.7)
HR (3 mMol)	163.3 (12.1)	162.9 (15.0)	165.5 (7.6)	160.5 (10.5)
Velocity (3 mMol)	11.3 (1.8)*[3]	11.5 (2.6)	13.0 (1.6)*[3]	12.1 (1.2)
HR (4 mMol)	179.3 (10.6)*[1]	175.3 (9.2)	177.0 (7.2)	172.6 (9.6)*[1]
Velocity (4 mMol	13.2 (1.7)*[3]	13.3 (1.6)	14.5 (1.3)*[3]	13.5 (1.1)

*$p < 0.05$, [1] significant difference between U17 and Over 21, [2] significant difference between U19 and Over 21, [3] significant difference between U17 and U21.

CONCLUSION The results revealed that U17 soccer players reached 3 and 4 mmol lactate level earlier than U21 soccer players. Coaches should be aware of the age differences while preparing the training programs. In conclusion younger players tend to reach higher lactate levels earlier than older players.

REFERENCES

McMillan et al. (2005) *Br J Sports Med* **39,** 432–436.

KEY WORDS Soccer, blood lactate, BMI, body fat, flexibility.