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EDITORIAL

Uniting science and the art of football

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Uniting Edson Arantes do Nascimento's (Pele's) "the beautiful game" with David Beckham's "bending the ball" (talented players apply the laws of physics to the ball) is the major motivation of the 6th.World Congress on Science and Football. From Chinese *tsu chu* to today's modern football games, science was and will be an important part of this excellent sport (http://www7.nationalgeographic.com/ngm/0606/feature1/index.html).

The congress encourages all scientific aspects of football including soccer (1848) including Australian rules (1866), Rugby (1845), American football (1876), Gaelic football (1884) and Canadian football (1882). Issues such as Biomechanics, Nutrition, Psychology, Academies, Talent identification, Medical aspects, Injuries, Special Population, Coaching, Physiology, Testing, Referee, Fair play, Hooliganism, Management, Economics and Skill learning will be discussed during this congress.

Research is as significant as the coach, team and player in competition. Any player can aspire to become a superstar. Encouraging all participants and steak holders will take them to new places where no one has ever dreamt of. Are we close to these dreams? The answer to this question depends on what and how much we sacrifice for science and education. From science and education information should flow into the field. The decisive elements of the game are the referees, trainers, players and supporters. Their approach creates the "climate". They can end or start a war. Football is the sport that leads. It's no miracle but it promotes passion and love. If you are committed, you may even change the world. Football encompasses millions of players, coaches, scientists, administrators, physical education teachers, politicians and inevitably parents of young players. This "simple" game that requires a ball and a goal is not only the game of heroes but also of those who bear a childish enthusiasm that makes dreams come true. Skills include heading, tapping, passing and shooting but each of the football codes has its own unique skills. From Ronaldhinho's "elastico" (stretching an opponent one way and pass him on the other at top speed) to Zidane's "roulette" (360-degree turn at high-speed to dribble past an opponent) watching the game is more exciting than any other entertainment on the planet. The average number of viewers that watched the 2002 World Cup final exceeded 1.3 billion; the Superbowl final later this month and the Rugby Union World Cup in September 2007 will be watched live worldwide. Isn't there a passion involved; a passion that expands from the suburbs of Rio de Janeiro to the ivory league of the rich? Scientists cannot control all the variables involved but may measure the social, psychological and physical strength of the players. Still a trainer armed with information may go through the challenge with small and/or no losses.

The profound beauty of football in any of its codes lies in the fact that football requires power, accuracy and coordination. Unlimited options are assessed, decisions are taken and action is conducted in less than seconds during the course of every game whether it is played in a street or in a stadium that holds hundred thousands. This is not only done by "the black antelopes" of Angola but also by children of age five to veteran adult players of 75 years. The scale of association football, for example, is evident in more than 200 nations; *Federation Internationale de Football Association* (FIFA) has 207 members as of 2006 whereas United Nations has 191 members: Involvement of a natural instinct!

Preventing injuries by training is equally important as the Brazilian samba, the German and Japanese efficiency, the Italian defence and the English fast players. Social and psychological aspects are apparent at world cups, whether soccer, rugby league or rugby union. Besides those who stock their food and beverage at home throughout the month of games, many others can easily find a seat in their favourite restaurant if they wish to take the risk of the waiter pouring wine over them at the moment of a score. More likely is that food will accompany the wine when you are in a Mediterranean country or even in Australia.

This supplement of abstracts of the 6th World Congress on Science and Football will hopefully serve as a creative and dynamic source of education and science for football. We would like to thank the Journal of Sports Science and Medicine (www.jssm.org) for making this dream come true. We also thank the Scientific and Technological Research Council of Turkey, Turkish Football Federation and Turkish Red Crescent Society Middle East Technical University Branch for their support to this congress. Being the symbol of unity, we agree with Mr. Gündüz Tekin Onay, who believes that we should all keep "the ball" close to our hearts. We hope to touch the future of football through science and education.

ACKNOWLEDGMENT The author thanks Dr. Thomas Reilly for his contribution and comments.

ORAL PRESENTATIONS

1. ANALYSIS OF WORLD CUP 2006

O-001 Diachronic analysis of interaction contexts in '06 World Championship

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OBJECTIVES Observing how interaction in a concurrent and competitive situation happens can help to design better trainings. From this viewpoint, the information about the physiological aspects of the game results incomplete in terms of coaching whereas knowledge about the interaction processes generated by the relations with partners and against opponents happens to show an outstanding relevancy. This study detected behaviour patterns in the matches which were played during the 06' World Cup.

METHODS A continuous registration of events was done, without time gaps, in order to be able to use a lag technique for the sequence analysis. The sequential order as a time characteristic was used to describe the evolution of events during the match. Six matches of the second phase of the '06 World Cup were continuously registered. SDIS –GSEQ Software was used to analyze the data using lag sequential analysis, keeping maximum requirements of data quality (Kappa-Cohen association index over 0.85).

RESULTS Results showed more than 70 playing patterns. Z sum values allowed estimating triggering categories in relation to a focal category. The succession of interaction contexts did not occur by chance but according to an internal logic, which could be explained by certain offensive contexts that appeared to be closer to scoring opportunities, and by other more propitious ball recovering situations.

DISCUSSION In agreement with other sport studies which use the Observational Methodology, we propose new guides to describe, and, if possible, to predict the networks of endogenous interactions into this field of play-motricity situations.

KEY WORDS Observation, interaction behaviour, diachronic, World Championship, soccer.

O-002 Performance profiles of soccer players in 2006 UEFA Champions League and 2006 FIFA World Cup Tournaments

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OBJECTIVE There have been many speculations over recent years arguing that the UEFA Champions League tournament is a more quality competition than the FIFA World Cup; "I think the European Champions Cup is now bigger than the World Cup. All the best players are in Europe now" (Sir Alex Ferguson). The purpose of the current investigation was to explore such beliefs objectively by undertaking a performance analysis of a set of 8 players who competed in both tournaments in 2006.

METHODS A manual notational analysis system was developed to record positive and negative applications of a set of defensive and offensive skills. A reliability investigation revealed a total percentage error of 3.2% (Hughes et al., 2004). Performance of these 8 players was analysed during 3 UEFA Champions League performances and 3 FIFA World Cup performances each.

RESULTS Wilcoxon signed ranks tests revealed no significant difference between FIFA World Cup competition and the UEFA Champions League for the percentage of defence (77.7+/-16.5% v 82.4+/-7.9%, z = 0.3, P = 0.799), offensive (88.3+/-3.6% v 88.2+/-2.1%, z = 0.1, P = 0.889) or all events (86.6+/-3.5% v 88.0+/-2.7%, z = 0.8, P = 0.401) that were performed positively.

DISCUSSION There was much greater variability between player performances at the FIFA World Cup than during the UEFA Champions League. The current study does not provide sufficient evidence to support the view that there is difference in quality of the players' performances between the two tournaments.

REFERENCE
Hughes et al. (2004) Analysis of notation data: reliability, In: *Notational analysis of sport.* 2nd Edition. Eds: Hughes, M. and Franks, I.M. London: Routledge., 189-204.

KEY WORDS Soccer, invariant behaviour, match analysis.

O-003 Analysis of goals in 2006 FIFA World Cup

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OBJECTIVE The world cup is the greatest prize in football. In football, scoring a goal is the ultimate determinant of a successful team and has subsequently received considerable attention in notation research (Rep & Benjamin, 1968). Most people believe that the beauty of football will be completed by goals and each goal has its own beauty and specific characteristics. The aim of this study was to analyse goals which was scored by players in the 2006 FIFA World Cup 2006 in Germany.

METHODS Detailed analysis of goals was conducted on 44 games in the 2006 world cup. All of the 44 games were analyses using a TV and video. All information was recorded on data entry forms which were provided for this study. Further information was obtained via FIFA site.

RESULTS In 64 games played 143 goals were scored, in average 2.23 goals per match which 52.4% of those scored by forward players. Sixty one percent of goals were gained by direct shots which 47% of those were via short pass. Regarding the number of shots towards opponent's goals significant differences were found between the winners and losers ($P<0.05$) as the winners had highest number of shots (Table 1).

Table 1. Analyses of matches in 2006 FIFA World Cup.

Actions	Percent (%)
Average number of shot per game	11.1
Average number of shot towards goal per game	5.5
Average number of fouls committed per game	5.9
Average number of free kicks per game	2.9
Average number of offside per game	18.1
Average number of yellow cards per game	2.6
Average number of red card per game	0.2

CONCLUSION In conclusion, since highest number of goal was scored from the penalty zone (62%) and by the direct shots coaches should pay more attention to this area of the pitch and also on shots as well.

REFERENCES
Reep et al. (1968) *Journal of Royal Statistics Society* **131,** 580-585.

KEY WORDS Football, goal, World cup, Germany.

O-004 Analysis of goals scored in 2006 World Cup

Mustafa Ferit Acar ✉, Bülent Yapıcıoğlu, Nadir Arıkan, Sedat Yalçın, Namet Ateş[1] and Melih Ergun
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OBJECTIVE The most identified components of the performance in soccer games are the scored goals. An analysis of how goals are scored can reveal critical factors that will help determine the most appropriate attacking strategy, briefly to obtain winning formula. The purpose of this study was to conduct the technical and quantitative analysis of the scored goals, during the World Cup 2006, Germany.

METHODS The software MUNA was used for the analysis of 64 matches and 147 scored goals in the World Cup 2006, Germany.

RESULTS According to the analysis of the 147 scored goals, they had resulted from; 63% (92 goals) mature attacks, 16% (24 goals) free-kicks, 9% (13 goals) penalty-kicks, 8% (12 goals) corner kicks, and %4 (6 goals) throw-in.

CONCLUSION Results f this study demonstrated similarities with previous Wold cup data.

KEY WORDS Analysis, goals, soccer.

O-005 Recurrence plot analysis of successive passing sequences in 2006 World Championship

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OBJECTIVE The analysis of football in the framework of dynamical systems enhances the comprehension of the time dependent, non-linear and complex interactions which structure the game (Eckmann et al., 1987). In this context detection of transitions in system dynamics by Recurrence Plot Analysis (RPA) may convey crucial information about the changing states of play (Grehaigne et al., 1997). As the struggle for ball possession is a key element of play strategy/tactics in elite football matches, analysis of the non-linear evolution and transitions of passing sequences of teams may yield information about their play organization. Therefore this study tried to identify sequential passing patterns and transitions between these patterns by RPA in the World Championship 2006.

METHODS A one dimensional time series of passing sequences (total 650) was constructed by counting the number of successive passes of one team (France) until ball loss. The time series was embedded in M-dimensional phase space by construction of state vectors using lagged values of the scalar counts. Recurrence plots were constructed by calculating the Euclidean distances between all pairs of vectors (Grehaigne et al., 1997).

RESULTS Means ($p > 0.05$, one-way ANOVA), standard deviations and maximum pass counts for successive passing sequences of France in five games are shown (Table 1). The recurrence plot constructed by appending all passing sequences of the five games shows stationary periods (white squares) and sharp transitions (dark black lines) in the system dynamics, which correspond to variable periods in the games.

Table 1. Comparison of successive passing counts of France in five games.

France against	Mean (SD)	Max
Italy	2.5 (2.0)	9
Portugal	2.2 (2.5)	11
Brazil	2.4 (3.0)	16
Spain	1.9 (2.5)	19
Switzerland	2.8 (3.3)	21
Total	2.4 (2.7)	21

DISCUSSION By application of RPA to time series of passing sequences in football we were able to identify variable periods of ball possession with stationary system dynamics. Sharp transitions in successive passing dynamics were also detected. Thus, this study implied that RPA was able to identify 'historical epochs and events' of team dynamics in football, which could be scrutinized by detailed expert analysis.

REFERENCES
Eckman et al. (1987) *Europhysics Letters* **4,** 973-979.
Grehaigne et al. (1997) *Journal of Sports Science* **15,** 137-149.

KEY WORDS Recurrence plot, dynamic systems, nonlinear, tactics, time series.

O-006 Technical analysis of 2006 World Cup soccer champion Italy

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OBJECTIVE World Cup Soccer matches refer to the level of designations of improvement. Especially, the World Champion team's technical analysis would prove to designate the necessity of the level of soccer that is being played in the world. On these purposes, the 2006 World Champion Italian soccer teams' games against Ghana, The USA, Czech

Republic, Australia, Ukraine, Germany and France were analysed by scores, and also, some certain criteria had been terminated from broadcasting data.

METHODS The MUNA entitled software had been useful for the Turkish National Soccer Team and even for some Turkish 1st. Level Professional League's participants. During those analysis : the short-pass, long-pass, challenge gains, defensive heading, successful crosses, the shoots, fouls and the time of possessing balls as whole team, had been handled as criteria.

RESULTS Italy's successful short passes, in average (SD) were 283.0 (55.4) attempts, however, the opposing team's were, in average, 310.0±62.6, that is showing a meaningful superiority over loosing teams. No significant differences were found against to other teams regarding short and long passes, ball gaining and loosing, the total shoots and ball possession times. Other values were in the favour of Italy's.

DISCUSSION It can be stated that this study proved that the Italian National Soccer Team, had consistent scores in general as other teams. However they also possessed superiority in the defensive actions, which had brought considerable achievements in wining the world cup.

KEY WORDS Analysis, Wold Cup.

2. MOVEMENT ANALYSIS

O-007 Deceleration movements performed during FA Premier League soccer matches

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OBJECTIVE Deceleration (DCL) of high intensity movements in soccer has been related to cause of muscle damage (Reilly, 1990), which may be related to injury. Time-motion analysis can identify a breakdown of match time between different locomotive movements (LM). However, previous studies have not included deceleration as a movement classification and as a result such information has not been reported. The purpose of the current investigation was to characterise the nature of DCLs performed during elite soccer competition.

METHODS The on-field activity of 55 FA Premier League soccer players was recorded from Sky Television's PlayerCam facility for approximately 15 minutes each. The purposeful movement within these observations (about 5 minutes per player) was analysed using the Bloomfield Movement Classification (Bloomfield et al., 2004) allowing LM, direction and intensity of movement to be recorded.

RESULTS A total of 26,613 movements were recorded and 514 of these were DCL events. The analysis indicates that a player will perform a mean of 9.3 DCLs per 15mins. Table 1 shows the LM performed immediately before and after each DCL. There were 76.9% of the DCLs performed after sprinting and 41.6% of activity performed after all DCLs were classed as high intensity.

Table 1. Frequency of locomotive movements performed immediately before and after decelerations during 13 hours and 45 minutes of soccer match play.

Before Dec.	After Deceleration											
	Skip Low	Skip Med	Shuf. Low	Shuf. Med	Shuf. High	Shuf. VHI	Run Med	Run HI	Sprint HI	Sprint VHI	Other	Total
Run HI	12	19	1	23	29	0	14	8	3	1	9	119
Sprint HI	41	43	11	37	97	3	31	12	12	5	14	306
Sprint VHI	9	8	2	6	30	7	13	4	2	1	7	89
Total	62	70	14	66	156	10	58	24	17	7	30	514

Shuf = shuffle.

DISCUSSION The mean duration of all DCLs was 0.82s, however, there were 72.2% of all DCLs less than 1s and 95.5% less than 2s. The current results provide useful knowledge for strength and conditioning and injury prevention and rehabilitation exercises specifically for elite soccer players.

REFERENCES
Bloomfield et al. (2004) *Int J PerformAnalysis Sport* **4,** 20-31.
Reilly (1990) Football. In: *Physiology of Sports.* Eds: Reilly, T. et al.). London: Chapman & Hall. 371-424.

KEY WORDS Deceleration, injury prevention, strength, conditioning

O-008 A technical analysis of elite male soccer players by position and success

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OBJECTIVE If an analysis of the technical attributes of each player position was defined, results would influence selections and coaching. Notational analysis literature has few examples of technical analysis, in particular skill analysis involving soccer. This study developed analysis systems concerned with the technical requirements of each position in soccer, by using qualitative data within a quantitative system. The aim of this study was to analyse the technical ability

of every individual that competed in the 2004 European Football Championships. The measurements were based on a subjectively drawn continuum that analyses a player's technical execution of actions in the game. It was investigated whether technical differences occurred between player positions and successful and unsuccessful teams.

METHODS Data were gathered from matches within the 2004 European Championships (n = 31). A specifically designed notation system was tested for reliability by % error and the Chi-Squared test of independence. P value of 0.99 indicated strong inter-observer reliability between action observations, and 5.32% error was accepted as being acceptable given the subjective and qualitative nature of the data.

RESULTS The technically best team did not win the tournament; Greece was joint 10th in the overall technique-ranking table. Portugal and the Czech Republic had the highest average technique scores. The successful teams during the early rounds had higher technique scores in all positions but in the semi finals and finals the losing teams had the higher technique scores (Table 1).

Table 1. Technical Score summations for selected team's skill rating.

	Portugal	Greece	Spain	Russia	France	England	Croatia	Switzerland
Pass	1035	418	881	551	594	562	449	336
Receive	792	356	667	491	119	143	81	66
Shot	33	14	8	10	-1	21	14	12
RB	86	52	39	53	148	119	120	94
Dribble	251	71	139	95	162	60	136	53
Header	152	140	72	99	122	181	145	96
Cross	83	35	80	33	47	58	41	37
Tackle	14	94	31	57	113	115	160	138
Total Rating Frequency	2446	1180	1917	1389	1304	1259	1146	832
Mean	305.7	147.5	239.6	173.6	163	157.3	143.2	104

DISCUSSION A regression was made between the team's final position and their technique ratings at different skills. It gave insight into the relative strengths and weaknesses of these Performance Indicators. 'Heading' and 'running-with-ball' were ranked at the top, whilst fine skills, 'passing' and 'dribbling', were rated at the lowest. Perhaps this reflected the surprise result of the tournament.

KEY WORDS Technical analysis, elite male soccer, player position, success.

O-009 Method comparison of linear distance and velocity measurements with global positioning satellite (GPS) and the timing gate techniques.

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[1] University of Teesside, UK , [2] Middlesbrough Football Club, UK

OBJECTIVE Objective quantification of training volume and intensity in football has proved a complex task. Timing gates permit the quantification of speed over pre-planned distances but are not suitable for general training drills, which are random and multidirectional. Recent developments in GPS technology offer potential to overcome logistical issues and restrictions of the timing gate method. Currently, there is a limited understanding of the measurement properties of commercially available GPS units in football training environments. Therefore, the aim of this investigation was to perform a method comparison of linear distance and velocity measurements with commercially available GPS units and the timing gate technique.

METHODS Three Doppler shift 1 Hz GPS units were used to estimate distance (m) and velocity (km/h) in a linear running protocol at varying velocities and were compared against timing gates over 10 trials. For GPS-estimated distance, mean % error was calculated. For velocity a log-transformed linear regression was conducted. The standard error of the estimate for each unit was expressed as % CV.

RESULTS The error for GPS distance measurements varied by the velocity of the trial. The mean % error was highest during running at 22.5km/h (5.64%; 2.82m). The lowest % error (0.71%; 0.36m) was at the slowest velocity of 6.45 km/h. At the highest velocity (27 km/h) the mean % error was -1.51% (-0.76m). The % CV for the GPS-estimated velocity was 1% for each of the three units (95% CI 0.8% to 1.2%).

DISCUSSION GPS and timing gates produced comparable speed and distance data. One Hz seems appropriate for predicting distance at low velocity, but may be insufficient for higher velocity. Some error reported may be due to timing gate measurement issues and not the GPS technology. Doppler shift appears to improve the variability of the GPS speed data.

CONCLUSION To quantify football related movements' future work should consider comparison of GPS and image-based video analysis technology on non-linear courses.

KEY WORDS Technology, displacement, speed.

O-010 Analysis of technical-tactical parameters in young soccer players

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OBJECTIVE A soccer player's achievement depends on variables such as psychology, physical condition, coordination and cognition. Although researchers have focused on all variables, investigation in how the tactic influences achievement is yet unknown (McMorris, 1997; Rulence-Pâques et al, 2005). No experimental evidence exists about relation between technical and tactical actions. The principal aim of the study was to analyze the technical and tactical actions of passing, looking and opening space, and shooting the ball towards a goal in a football match.

METHODS Four groups of twelve football players participated in this study. They belonged to two age categories (8-12 years). Three technical-tactical tests were used to measure the variables (passes, looking opening space and shoots to the goal). In order to carry out the subsequent analysis, two video cameras (Panasonic AG-DVX 100AE) were used for filming.

RESULTS The descriptions of all the measured variables are shown in Table 1. No significant differences were obtained in any of the variables analyzed in relation to category, position and/or dominance of subjects. A positive correlation was found between the number of correct, looking opening space, and the number of goals scored ($r = 0.765$, $p < 0.001$. $n = 48$).

Table 1. Descriptions of the variables measured

TESTS	VARIABLE	CATEGORY	MEAN(SD)	MAX	MIN
Shoots to goal	**Goals**	**8-9 years**	1.54 (1.64)	6	0
		10-12 years	1.75 (1.29)	4	0
	Saves	**8-9 years**	0.58 (0.72)	2	0
		10-12 years	0.92 (1.25)	5	0
	Kick-Out	**8-9 years**	1.04 (0.95)	3	0
		10-12 years	0.75 (0.85)	2	0
Passes	**Correct**	**8-9 years**	2.29 (1.27)	5	0
		10-12 years	1.88 (1.23)	4	0
	Incorrect	**8-9 years**	1.38 (1.13)	4	0
		10-12 years	1.25 (1.64)	3	0
Looking opening spaces	**Correct**	**8-9 years**	2.13 (2.38)	7	0
		10-12 years	2.00 (1.67)	7	0
	Correct with goal	**8-9 years**	0.92 (1.18)	4	0
		10-12 years	0.79 (0.88)	3	0

Units are expressed as points, representing the highest scores of the highest number of action made.

DISCUSSION The present study showed no significant difference among the means of independent variables analyzed. Nonetheless, significant relations were found among the technical and tactical variables studied. It would be interesting to prolong observation times in future investigations to increase the likelihood of finding significant differences among the independent variables analyzed.

REFERENCES
McMorris (1997) *Percept Mot Skills* **85,** 467-476.
Rulence-Pâques et al. (2005) *Revue Eur Psych Apliquée* **55,** 131-136.

KEY WORDS Soccer, technique, tactic.

O-011 Automatic analysis of football games using GPS on real time

José Pino [1]✉, Raul Martinez-Santos [3], Maria Isabel Moreno [2] and Carlos Padilla [2]
[1] University of Extremadura, [2] Manager of C&M, [3] University of the Basque Country

OBJECTIVE Global Positioning System (GPS) is a localization system designed by the United States Department of Defence in 1978 that allows knowing latitude, longitude and altitude. To a certain extent, soccer action implies using space in an intelligent way that can be tracked by describing players' positions on the pitch. This technology has been used in human movement studies as well for the study of human locomotion and cross-country skiing for instance. The main objective of this investigation was to test and ad hoc designed and developed application for real time recording of cinematic and physiological variables of team sports.

METHODS The participants were 6 professional football players of 2nd B division El Ejido FC who played a 60'game (30'+30') practice game. Each of the participants wore a FRWD F 500 GPS set consisting of a recording unit, a tape and a heart rate (HR) transmitter band. All data produced during play action (velocity, distance, HR and position) were taken every second and stored constantly on the recording unit.

RESULTS According to collected data we found significant differences in distance travelled in four of the six players whereas HR was different for all players monitored. As far as velocity was concerned, differences were only found for three participants (Table 1).

Table 1. Inter-subject analysis of the variables (Heart Rate, Speed and Distance p < 0.005).

	Right defender			Mid-R defender			Left defender		
	HR	S	D	HR	S	D	HR	S	D
Right defender	,000	**,074**	,000						
Left defender	,000	,000	,000	,000	,000	**,248**			
Left midfielder	,000	,001	,000	,000	**,024**	**,147**	,000	**,717**	,004

CONCLUSION GPS technology can be taken one step forward for coaching control if it is implemented with appropriate software like the one designed by us. By these means, we found significant differences between playing positions as referred in bibliography.

KEY WORDS Soccer, software, heart rate.

O-012 Turning movements performed during FA Premier League soccer matches

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OBJECTIVES Time-motion analysis studies have provided a breakdown of match time between different locomotive movements. However, such information does not indicate the agility demands of the given sport as turning during movement or the transition between movements have not been reported. Therefore, the purpose of the current investigation was to characterise the nature of turning performed during elite soccer competitions and investigate the transition of locomotive movements (LM).

METHODS The on-field activity of 55 FA Premier League soccer players was recorded from Sky Television's PlayerCam facility for approximately 15 minutes each. The purposeful movement within these observations (about 5 minutes per player) was analysed using the Bloomfield Movement Classification (Bloomfield et al., 2004) allowing LM, direction and intensity of movement to be recorded.

RESULTS A total of 26,613 movements were recorded and 5,115 of these were turning events. Table 1 shows the LM performed immediately before (BF) and after (AF) each turn. There were 21% of turns performed within the same LM and 79% during a transition. Chi square tests of independence were applied to the angle (≤90° or >90°), direction (left or right) and movement BF and AF each turn.

DISCUSSION The frequency profile of movements performed BF ($X^2_{2,24}=185.0$, $P < 0.001$) and AF ($X^2_{2,24}=69.6$, $P < 0.001$) turns were significantly influenced by angle with more turns of ≤90° BF or AF jogging and shuffling and more

turns of >90° during skipping, stopping and slowing. The current results provide knowledge for development of speed and agility training exercises specifically for elite soccer players.

Table 1. Frequency of locomotive movements performed immediately before and after turning movements during 13 hours and 45 minutes of soccer match play.

Before turn	After turn									
	jog	**Run**	**shuffle**	**skip**	**Slow down**	**Sprint**	**stand**	**stop**	**walk**	**Total**
jog	391	107	140	307	0	45	49	10	170	1219
run	81	75	61	57	18	36	3	8	8	347
shuffle	176	128	178	173	1	113	62	30	102	963
skip	322	91	82	263	0	44	39	5	231	1077
slow down	35	11	33	31	0	7	7	2	28	154
sprint	3	8	15	1	33	21	0	2	0	83
stand still	79	32	45	42	0	17	0	1	147	363
stop	20	15	28	22	1	21	7	1	13	128
walk	241	59	76	178	0	23	51	3	150	781
Total	1348	526	658	1074	53	327	218	62	849	5115

REFERENCES
Bloomfield et al. (2004) *J Perform Analysis Sport* **4,** 20-31.

KEY WORDS Agility, turning, transition

O-013 Analysis of high intensity activity in soccer highest level competition

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OBJECTIVES The analysis of the physical activity during competition is a basic referent when establishing the means and loads of training. Bibliography determines volume and intensity of the player's activity during the match as essential parameters in the rating of effort, and the activity that the player performs at a high intensity as a key to distinguish the player's strain level. The objective of this research was to describe and compare the high intensity physical performance of the players during European professional leagues' competition, taking into account their playing position.

METHODS The AMISCO® system has been used to register player's performance. From the record of 194 matches in the highest competitive level in the 2003-04 season, we have considered a sample of 6112 entries: Wide Fullback (N=1326), Centre fullback (N=1388), Pivot (N=1187), Centre midfield (N=215), Wide Midfield (N=1032), Centre forward (N=275), Striker (N=689). An ANOVA test on one Factor has been done.

RESULTS The descriptive analysis of the results showed the obtained values (average and standard deviation) for each of the defined position in each half. The average of the total distance run over by the players has been 5,598Km, with a standard deviation of 0.481Km. The confidence interval of 95% for the average has been between 5,586 and 5,610Km. The results for each position are shown in table 1. Significant differences were found between plating positions ($p < 0.05$).

Table 1. Reference values of different playing positions.

	Total distance	**Distance 14-21 km/h**	**Distance 21> km/h**	**Distance 14> km/h**
Wide Full-back	5.557 (0.375)	0.958 (0.198)	0.341 (0.126)	1.299 (0.271)
Centre Fullback	5.205 (0.325)	0.736 (0.166)	0.196 (0.082)	0.932 (0.207)
Pivot	5.929 (0.366)	1.193 (0.255)	0.238 (0.099)	1.431 (0.299)
Centre Midfield	5.925 (0.465)	1.175 (0.304)	0.287 (0.104)	1.463 (0.344)
Wide Midfield	5.835 (0.417)	1.112 (0.245)	0.402 (0.135)	1.514 (0.302)
Centre Forward	5.750 (0.426)	1.080 (0.239)	0.339 (0.128)	1.420 (0.313)
Striker	5.383 (0.516)	0.859 (0.222)	0.353 (0.135)	1.213 (0.302)
TOTAL	5.598 (0.481)	0.981 (0.279)	0.298 (0.137)	1.279 (0.348)

CONCLUSION In conclusion, we have shown that the playing position of player determines his activity on the field. The originality, accuracy and reliability of our method, and the size and characteristics of this updated sample, makes this piece of research hard to be compared to the similar ones found in bibliography.

KEY WORDS Match analysis, team position, high intensity activity, computer analysis, video analysis.

3. MATCH ANALYSIS IN FOOTBALL GAMES

O-014 Profile of position movement demands in elite junior Australian Rules Football

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OBJECTIVE Australian Rules Football (ARF) is Australia's most popular football code. However, there is no published research in literature regarding movement activities and demands in match play at the junior level. To analyse movement data in elite junior ARF positions, comparing the activities, intensities and durations between players filling the various positions. The aim of the study was to analyse position characteristics rather than individual player performance.

METHODS Thirty athletes (17.07±0.89 years) participated in the study. Using the methodology from elite senior ARF research (Dawson et al. 2004) all on-field positions were videotaped on 3 separate occasions over 7 home games during the 2006 Victorian U18 season. Post match analyses involved reviewing each tape, calculating number of efforts, duration of efforts, and distance covered for each position.

RESULTS Comparisons showed the mean number of efforts over the 7 matches ranged between 752±107 to 942±62 (midfield). For all positions, the majority of effort durations were reported to last between 0-3sec. Comparison of mean distances completed between ranged between 10419m (range 9811-10774m) to 16691m (range 16167-17012m).

DISCUSSION These results suggest that movement activity differences occur between positions in ARF. However, further research must continue in this area to assist junior elite ARF coaches to plan position specific training programs whilst overall developing their players as well-rounded athletes.

REFERENCES
Dawson et al. (2004) *J Sci Med Sport* **7**, 278-291.
Fogelholm (1994) *J Sports Sci* **12,** 23-27.

KEY WORDS Junior athletes, Movement analysis, Positional differences.

O-015 Scoring profiles in rugby union: difference of league and tournament systems

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OBJECTIVE Senior league of Japanese Rugby Union introduced 'a Top 12 league system' (66 games in each season) form 2003, aiming for expanding opportunities of more competitive games in the country. The structures of the games played in three seasons (2003-2005) were analyzed based on the IRB game analysis system. The purpose of this study was to discuss the differences and analyze the changing structure of the scoring profiles and performances of the defences in Rugby Union games between 'the knockout tournament system MicroCup:MC' and 'the league system Top League:TL'.

METHODS Hand notation system was used to gather data from digital video recording by cooperating with Japanese Sky TV program. 10 experienced operators analyzed the games through the three seasons. To ensure acceptable reliability, an intra-operator reliability test was calculated with percentage errors for each variable.

RESULTS The scoring of points decreased in the values through the three seasons. Occurrence ratio of the source of try (Scrum, Lineout, PK/FK, Counter Attack from pant catch, Counter attack from handling error, Counter attack from tackle turnover have changed through three seasons (TL; Chi-squared=48.5, df=5, $p < 0.01$, MC; Chi-squared=31.3, df=5, $p < 0.05$).

DISCUSSION When data of the two data gathering systems were compared, the values of 'PK/FK' and 'CA-TO' both increased, which suggested that under competitive and continuity situations like PK and , turnover occurrences appeared to be important facets of the tries. This suggests that the defence performances should be connected to the successive quick attack by various strategies

KEY WORDS Notation analysis, scoring profiles, defence performance, turnover.

O-016 Patterns of play in men's elite 7-a-side rugby union

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OBJECTIVE Very little research in notational analysis has been carried out in 7-a-side rugby. The aim of this study was to extend the work of Hughes and Jones (2005) and define performance indicators (PI's) in 7-a-side rugby, and to make comparisons between the relative values of these PI's of 11 competing nations and correlate this with their final ranking position and ultimately with winning and losing.

METHODS Matches from the 2005/2006 World Sevens Series tournaments in Dubai, South Africa, New Zealand, USA, Singapore, England and France (n=308) were analyzed. Among 30 teams competed in the 2004/05 World Sevens Series, 11 of them were analysed who participated in each tournament analyzed. Table 1 shows the final standings.

RESULTS The average number of points scored by a team was 18 but there were major variations around this figure between the teams. It can be seen that New Zealand for example, scored 15 more than the average points scored and gave away 10 points less than the average points conceded. Canada, Scotland and Kenya all were below the average points scored and above the average points conceded.

Table 1. Final team position and average values/match of some of the performance indicators.

TEAM	RANK	POSS (min.)	PTS For	PTS against	Tries/ Game	% Racks With 1 player	% restart Success	Passes / game	Racks / game	Yellow cards/ season
NZ	1	3.65	33	9	5.2	87	18.5	37	6	17
ENG	2	4	25	10	3.9	50	34.5	43	9	12
FIJ	3	3.3	26	13	4.1	78	22.7	34	3	18
SA	4	3.6	26	13	4	68	33.3	36	5	16
ARG	5	3.75	22	12	3.7	72	41.7	36	9	9
SAM	6	3.95	21	13	3.3	74	28.6	48	7	23
AUS	7	3.6	20	16	3.3	64	27.2	38	6	15
FRA	8	3.8	19	16	3	43	31.25	38	7	28
CAN	9	3.7	16	19	2.6	70	21.7	39	11	17
SCO	10	3.4	16	19	2.6	72	29.4	37	6	13
KEN	11	3.15	13	21	2	76	10.5	32	6	19

DISCUSSION A regression of the variables, Table 1, with the respective ranking accounted for 99.3% of the variance. A correlation showed a number of variables were inter-dependent, so the PI's could be reduced to tries/match, racks/match and passes/match (R=0.963). The results of the study suggest that performance indicators of 7-a-side rugby can be determined by these variables, and the validity of PIs could be tested in this way in other sports.

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KEY WORDS Patterns of play, elite men's 7-a-side rugby, performance indicators.

O-017 Perturbation in game rhythms of elite male rugby union

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OBJECTIVE Match play sports exhibit rhythms when competitors perform at equal levels. A perturbation exists where the usual stable rhythm of play is disturbed by extreme elements of high or low skill. Research confirming the existence of perturbations by McGarry and Franks (1995) in squash identified particularly weak or strong shots that place one player at a recognised disadvantage to another. With the successful transition of perturbation methodologies from dyadic to team sports established within previous literature (McGarry and Perl, 2004), the aim of this study was to try and reliably identify and categorise perturbations within another team sport, namely Rugby Union.

METHODS A hand notation system was developed which classified perturbations using 18 variables from 4 separate categories. Following extensive training using the system, six expert rugby coaches were asked to identify if and when perturbations occurred within the build-up to tries (N=60) in Rugby Union matches.

RESULTS The results of this study show that transitions in phase stability could be reliably identified by experts within the sport (Mean Kappa Coefficient = 0.715). Furthermore a strong agreement on the timing of perturbations (82% paired level of agreement), further validated the consistency and accuracy with which perturbations were identified.

DISCUSSION Following an acceptable level of reliability being obtained from reliability studies, it was possible to develop performance profiles for the teams analysed. These results helped to form a comprehensive description of when, where, how and who is most likely to produce perturbations – a process which highlighted the capacity for such research to aid the coaching process.

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McGarry and Perl (2004) In: *Notational analysis of sport.* 2nd edition. EdS: M. Hughes and I.M. Franks. London: Routledge. 205-226.

KEY WORDS Perturbations, rugby union, performance profiling.

O-018 Time motion analysis of elite footballers in European cup competitions

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OBJECTIVE Performance of soccer players has attracted a lot of attention from sports scientists in the last two decades. Match-analyses of soccer games have been performed with the aim of understanding the physiological demands of elite soccer. We have recently conducted a study on elite soccer players to identify distinct patterns of activities between players' positions and compare the results to previous findings in the literature. In this study time motion characteristics of elite soccer players in European Cup competitions were analysed. The aims of the study were to determine time-motion characteristics according to playing position and identify differences in motion characteristics in 1st and 2nd halves of the games.

METHODS We analysed 68 European games, including 58 teams and 791 players (Champions League, UEFA Cup) with Prozone ® a new computerised video system. The system uses the following parameters: Walking (0.2-7.2km/h), Jogging (7.3-14.4km/h), Run (14.5-19.8km/h), High Speed run (19.9-25.2km/h) and Sprint (>25.3km/h). High Intensity was defined as the sum of high speed run and sprint distance (>19.9km/h).

RESULTS Professional soccer players cover a total distance of 11.01±1.12km during a game. Central defenders ran less ($p < 0.001$) both in total distance 10.02±0.653km and at high intensity 0.571±0.209km. The central midfielders ran a higher total distance 11.57±0.986km ($p < 0.001$). During the 2nd half the players walked 4.8% more ($p < 0.001$) but had less jog, run and high speed distance ($p < 0.001$).

DISCUSSION The results of this study suggested that further consideration should be given to elite soccer performance with particular consideration to the playing positions. It seems clear that much has changed in soccer in the last decade and it is also quite clear that elite performance differs between players in different positions. Therefore, since it is clear that performance demands are different between positions, we believe that is very important to introduce specific training sessions which take into account such differences.

KEY WORDS Football, soccer, positional role, match analysis, activity profile, specific training.

O-019 Research informing practice: Implications of rule changes to modified rugby league

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OBJECTIVE Modified Games is a vital area of the Australian Rugby League (ARL) operations. It is the grassroots of the game and involves children in the 6-12 years age group. In recent years some regions (i.e. Queensland Rugby League) have piloted several law alterations for different age groups. There is much debate as to which laws should now be adopted universally. The aim of this study was to evaluate modified rugby league and provide the ARL with scientific evidence in relation to the impact of the various law alterations on children's participation and performance levels during scheduled games.

METHODS This project involved the match analysis of 120 modified rugby league games under different laws (point score system; when the defensive line can move forward at the play-the-ball; mandatory number of passes performed by the attacking team in their 10/20m zone) in NSW and Old. To reduce the impact of individual team play teams were video taped on no more than three occasions.

RESULTS The following significant differences occurred in relation to the different rules: tackles executed; number of change of possessions on the 1st and 5th tackle; line-breaks; mistakes by 1st receiver; dummy-half runs; dropped balls, total passes and passes at play-the-ball 1,2 and 3. There was no difference in completed sets; when, where and how tries were scored, 1st receiver runs and tackles.

DISCUSSION The scoring system has no impact on the number of tries scored, passes thrown prior to a try, when the try is scored or where on the field the try was initiated. However results suggested attacking players were put under additional pressure when defenders were allowed to move once the ball had cleared the ruck and were may be more fatigued by the end of the game. The following recommendations were made:

- 4 point try to be adopted as it does not impact on participation and performance levels and will be 'easier' for the referee and administrators
- The defensive line is allowed to move once the first receiver makes contact with the ball. Defenders moving prior to this placed attacking players under additional pressure and players appeared more fatigued by the end of the game.
- Minimum of one pass within own 20m.

KEY WORDS Match analysis, junior sport participation, football.

4. COMPUTER SCIENCE AND MATCH ANALYSIS IN ASSOCIATION FOOTBALL

O-020 Comparison of activity profile during matches in Danish and Swedish premier league and matches in Nordic royal league tournament

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OBJECTIVE The first Nordic Royal League tournament was played in 2004/2005. The top-4 teams from Denmark, Sweden and Norway participated in the tournament. The proclaimed goal of this tournament was to give the best Nordic teams more off-season matches at a high standard. The aims of the present study were to compare the physical match performance in the Danish Premier League (DPL) and Swedish Premier League (SPL) and to compare the match activities in the national leagues (NL) with the Royal League Tournament (RL).

METHODS 23 players from DPL and 23 players from SPL were filmed individually by camcorders for later obtainment of computerized time-motion analyses (Mohr et al., 2003). Players in the two groups were matched according to positional role in the team as well as representation of top-, middle- and bottom-teams. 14 of those players were also filmed in RL matches. Differences between DPL and SPL were evaluated by Student's unpaired t-test and differences between NL and RL by Student's paired t-test.

RESULTS Total distance covered was higher ($p < 0.05$) in DPL than SPL (10.80±0.17 vs. 10.15±0.21 km), but high intensity running (HIR; 2.13±0.10 vs. 2.03±0.12 km) and sprinting (SPR; 0.47±0.03 vs. 0.44±0.03 km) over 90-min was not different. HIR (0.21±0.01 vs. 0.21±0.01 km) and SPR (72±4 vs. 67±5 m) in the most intense 5-min period were also similar. No difference was observed between RL and NL games ($p > 0.5$).

DISCUSSION The physical performance in the Royal League tournament was similar to the national leagues and was considered to be a good off-season supplement. Danish Premier League players covered a greater total distance than players in the Swedish Premier League, which seems to be related to more offensive running by the defensive Danish League players. However, no differences were observed in high intensity running and sprinting between the Danish and Swedish league.

REFERENCES
Mohr et al. (2003) *J Sports Sci* **21**, 519-528.

KEY WORDS Total distance covered, high intensity running, sprinting, tackles, headers.

O-021 The effect of a succession of matches on the activity profiles of professional soccer players

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OBJECTIVE In modern day soccer, the capacity to recover from intense training or matches is often considered to be an important determinant of subsequent performance. Incomplete recovery may be a regular occurrence where UK elite soccer players repeatedly perform over a short time frame, often 3 times a week. This may have implications with regards to fatigue, overreaching, injury, preparation and activity profiles. Research to date has concentrated on the influence of fatigue within matches (Di Salvo et al 2006) and fatigue over different phases of the season (Mohr et al 2003). The aim of this study was to investigate activity profiles of professional UK-based Premiership/Championship soccer players competing over an intense period of matches.

METHODS This study incorporated time motion analysis data captured via the computerised ProZone system (3) ProZone Group Ltd. This system has been independently validated to verify the capture process and subsequent accuracy of data (Di Salvo et al., 2006). Twenty-two teams, who played 3 matches across 5 days were assessed and activity pro-

files were collated to evaluate each player's match contribution. Data Analysed Via One Way ANOVA & Post Hoc Paired T test.

RESULTS High intensity (HI) activity profiles declined with respect to the distance covered in possession of the ball (376.8± 259.2 Vs 273.6±211 m, $p < 0.05$) and when the ball was out of play (82.2±40.9 Vs 53.1±38.1 m $p < 0.05$) for matches 1 & 3 respectively. Overall distance covered did not change (Table 1) between the 3 matches whereas average recovery between HI activity bouts did (52.1±13.6 Vs 62.3±22.6 sec. $p < 0.05$).

Table 1. Mean values (SD) for each variable for matches 1-3 over 5 days

Variable	Match 1	Match 2	Match 3
Distance (m)			
Total Distance	10695.9 (882.5)	10789.9 (809.2)	10492. (1001.9)
HI Distance	889.2 (263)	858.5 (300.8)	768.8 (260.8)
Sprint Distance	233.3 (89.6)	214.6 (115.2)	190.6 (76)
High Speed Run	655.9 (186.1)	643.9 (197.2)	578.3 (206.8)
Run Distance	1639.7 (311.1)	1652.1 (335.4)	1613.6 (367.2)
Jog Distance	4237.3 (531.6)	4415.8 (497.8)	4301.7 (587.9)
Walk Distance	3902.8 (195.2)**	3839.1 (194.7)	3785.1 (297.6)**
HI with possession	376.8 (259.2)*	299.1 (234.9)	273.6 (211)*
HI Without Possession	430.3 (134.6)	500.4 (171.7)	442.1 (145.8)
HI Distance Ball Out Of Play	82.2 (40.9)*	59 (33.6)	53.1 (38.1)*
Frequency (number)			
Total No. HI Activities	113.6 (26.6)	114.1 (36.4)	99.1 (35.9)
Sprints	34 (12.3)	34.1 (15.9)	27.1 (12.1)
HSR	126.5 (28.9)	126 (40.8)	111.1 (38)
Runs	364.9 (59.2)	378.8 (83.2)	352.8 (85.2)
Jogs	962.5 (111.5)	1002.6 (133.7)	956.2 (146.6)
Duration (seconds)			
Sprinting	30.2 (11.7)	27.9 (14.8)	24.6 (9.8)
HSR	107.3 (30.3)	105.3 (32.1)	94.5 (33.7)
Running	355.9 (67.0)	358.8 (72.1)	351 (79.7)
Jogging	1500.9 (182.9)	1563.6 (167.4)	1521.4 (200.5)
Walking	3491.4 (241.9)**	3426.7 (217.9)	3362.1 (311.8)**
Other			
Recovery (s)	52.1 (13.6)	57.1 (33.6)	62.3 (22.6)
Relative Intensity	1.2 (0.3)	1.2 (0.4)	1.1 (0.4)
Distance per minute	110.8 (9.8)	112.8 (8.4)	111.9 (9)
Top Speed (m/s)	9.1 (0.3)	9.0 (0.5)	9.0 (0.3)

* $p < 0.05$, ** $p < 0.01$.

DISCUSSION When 3 matches were played in 5 days activity profiles revealed that players were able to recover when the total distance is considered, although some residual fatigue may be apparent which affects certain HI aspects of play. This finding is supported by altered HI activity profiles, which may influence the way teams approach training and preparation during future intense playing schedules.

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KEY WORDS Activity profiles, recovery, fatigue, soccer players, prozone, high intensity activity.

O-022 A dynamical analysis of momentum in football

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OBJECTIVE The current paper discusses and reviews the application of momentum within performance analysis of soccer, incorporating some components of dynamical theory as a means of interpreting these data and identifying the critical periods of a match. This paper extends the ideas presented by previous research (Hughes et al., 2006; Reed et al., 2006) to explore the significance of momentum within team sport when considered from a dynamical perspective.

METHODS Over 85,000 pieces of raw match data (N=38), courtesy of ProZoneTM, from one English Premiership Football team were interpreted using algorithms and simple numerical values.

RESULTS Within this study, the system itself is composed of positive and negative instances, each corresponding to a discrete event within the match itself. Perturbations therefore exist where the momentum profile is disturbed, commonly leading to an observed shift in state.

DISCUSSION The identification of these perturbations within the momentum profile could provide benefits from a physiological and psychological perspective, in addition to influencing immediate or post-event tactical change. With the integration of computerised analysis and video technology, players and coaches can then review those periods of play identified as critical to performance.

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KEY WORDS Momentum, dynamic systems, profiling, perturbations.

O-023 Intelligent system of tactics' analysis in a soccer team

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OBJECTIVE Soccer players act in time and space inside an unpredictable environment that often complicates team work. When organizing a team play, the main task is to provide coordinated actions of players, all trying to realize their individual actions. Thus, the behaviours of soccer players as a team is a more complex phenomenon than coordinated individual actions of separate athletes. We are building a digitized soccer match analysis tool and implementing situation patterns in a real match. The goal of this study was to create an intelligent system of tactics analysis (ISTA) in a group of interacting players in game situations and during tactical training exercises. To create the ISTA, we used multi-agent technologies elaborated by specialists in artificial intelligence.

METHODS Qualitative spatial reasoning was used to determine the game pattern, which exists on field at certain moments. 3 layers were distinguished in cognitive agent: physical actions, individual and coordinated behaviour. Experimental connection of size and distance was defined in Table1. Spatial situation on field was described by determination of spatial relations between players, ball and goal. We use qualitative spatial reasoning to determine the game pattern, which exists on field at certain moment.

RESULTS In this study 4 games of European teams, 10 games of Russian national and 2nd Division teams were analyzed. The higher qualification a team had, the less number of interactions it demonstrated in separate episodes, but the number of tactical schemes grew both in attack and defence (Table 1). We determined strong and weak tactical interactions of different level used by a team against tactical actions of an adversary.

Table 1. Connection of object size and distance.

	Small&small	**Middle-sized&middle-sized**	**Big&big**
small	near	near	near
middle-sized	not far	near	near
big	Far	not far	near

DISCUSSION The Intelligent System of Tactics Analysis for automatic situation recognition in a group of players was realized as a hybrid system with the use of the expert system, fuzzy controllers, and artificial neural network. It is a successful attempt to describe collective behaviour of people solving a common goal with the use of a knowledge-based hybrid system.

KEY WORDS Tactics analysis, multi-agent technologies, artificial intelligence, automatic situation recognition, collective behaviour.

O-024 Successful performance in soccer: team kinematics of goal-scoring opportunities in small-sided soccer games

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OBJECTIVE In recent years, growing interest in performance analysis and technological innovations has led to new forms of match analysis techniques. A systematic approach seems to provide a promising framework for the analysis of goal-scoring opportunities (Gréhaigne et al., 1997; McGarry et al., 2002). In this study, we propose two variables; centre of teams (team pressure) and surface area (team position). The objective was to test the hypothesis that changes in the centre position of teams and changes in surface area precede goal-scoring opportunities. Besides, we expected to find a phase relation for the centre position of teams.

METHODS Ten elite youth soccer players, aged 16-18, participated in this study (2 goalkeepers, 8 outfield players). Two 4-a-side games of 4 minutes were played on a 35x40m pitch. No instructions were given with respect to game playing. Player positions were recorded by means of an innovative Local Positioning Measurement system (LPM) at 50 Hz. Both matches were videotaped.

RESULTS Results show that in 7 out of 9 goal-scoring opportunities, changes in the centre position of teams and in surface area precede a goal-scoring opportunity (Figure 1). Furthermore, a phase relation characterizes the displacement of the centre position of teams.

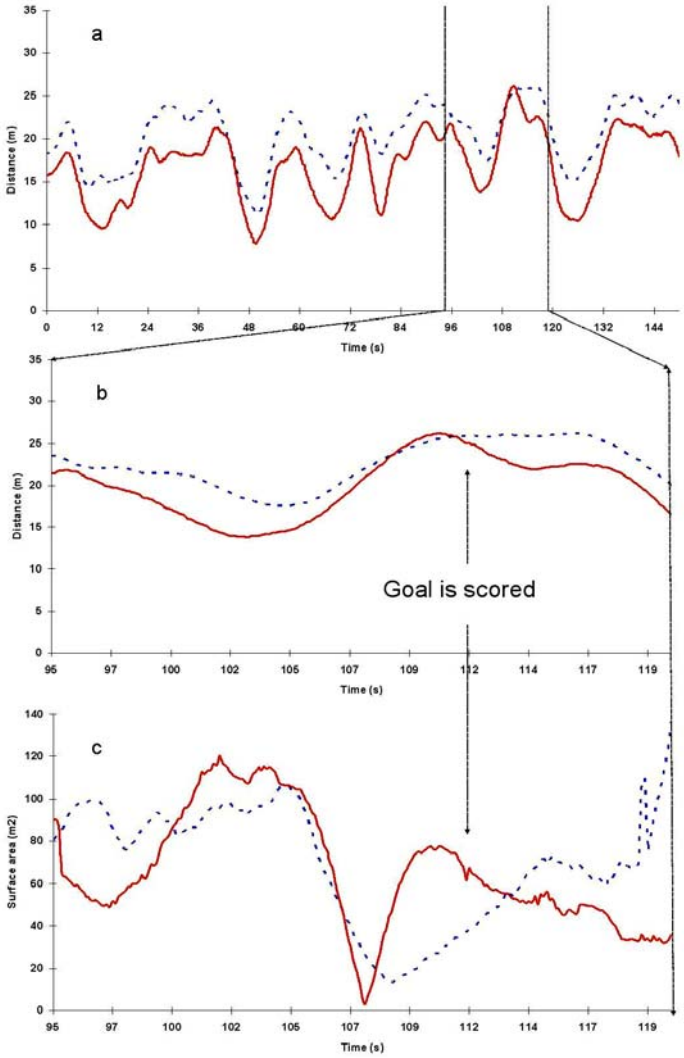

Fig. 1: a) Phase relation center of teams, b) Center of teams as a goal is scored, c) Surface area as a goal is scored.

DISCUSSION Changes in the center position of teams, accompanied by changes in surface area, indicate goal-scoring opportunities. It is shown that these variables are promising with respect to the systematic analysis of soccer games. Ongoing studies focus on the effects of task constraint manipulations on these variables during small-sided soccer games.

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KEY WORDS Soccer, match analysis, systematic approach.

O-025 Match analysis of 2005-06 Champions League Final with Amisco system

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OBJECTIVE The analysis of football matches is nowadays one of the bases among the process of soccer training. There are many systems to register and edit the matches that are already being used by football clubs. The Amisco system is being applied since 2001-2002 season, by some of the most important football clubs in the Spanish, French, German and English leagues. The objective of this communication is to show the main characteristics of one of the most advanced systems to analyse matches, the AMISCO® system, and its application for the analysis of a referential match: 2005-06 Champions League Final Match.

METHODS A setting of eight cameras and several computers was installed in the Stade de France. The match was recorded and digitalized and, in the production centre, the player's position and movements were registered with a frequency of twenty-five records per second. Every player's actions with the ball are registered as well. High levels of reliability, validity and accuracy were obtained (Zubillaga, 2006).

RESULTS The FC Barcelona makes 22 shots, 45% on target. Arsenal FC makes 9 shots, 55% on target. The players of FC Barcelona run, at average 10339 meters. The players of Arsenal run at average 10549 meters. The distances run over 21 km/h, were 460 m for the FC Barcelona players and 410 for the Arsenal players. The highest distance in one half at more than 21 km/h was registered to Eto'O (394 meters).

Table 1. Tactical and physical data obtained in 2005-06 Champions League Final Game by using Amisco®.

Tactical Data		**SHOTS**	**ON TARGET (%)**	**CROSSES**	**PASSES**	**COMPLETED PASSES (%)**	**GOALS**
FC BARCELONA	**1st half**	9	44	9	342	85	0
	2nd half	13	46	17	374	89	2
ARSENAL FC	**1st half**	5	60	4	188	78	1
	2nd half	4	50	4	116	62	0
Physical Data (Covered Distances)		0-11 km/h	11-14 km/h	14-21 km/h	>21 km/h	TOTAL Distance	
FC BARCELONA	**1st half**	3448	645	834	194	5121	
	2nd half	3423	647	882	266	5218	
ARSENAL FC	**1st half**	3636	670	789	202	5297	
	2nd half	3523	659	861	208	5252	
Maximun Distances		Fabregas 3850 (1st Half)	Gilberto Silva 1048 (1st Half)	Deco 1578 (1st Half)	Eto'O 394 (2. half)	Fabregas 6090 (1st Half)	

DISCUSSION The analysis of the registered data with AMISCO system was done from a double perspective. Firstly, the viewing of the player's group actions, through the showing of the match in a two dimension view, complemented with the video. The second perspective, allows through a statistic way, the analysis of the data that refer to the player's physical, technical and tactical performance during the match. The results showed the performance level in this Final Game were congruent to the results founds in season games (Zubillaga, 2006).

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KEY WORDS Soccer, match analysis, computer analysis, video analysis.

O-026 Provision of FIFA on government interference in administration of national football federations: hindrances to full compliance in Africa

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OBJECTIVE FIFA was founded on 21st May, 1904 in Paris by seven members from France, Belgium, Switzerland, the Netherlands, Denmark, Sweden and Spain. In accordance to article 2 of its constitution, FIFA is empowered to regulate and develop international football and protect the interests of its members. Today FIFA has 204 affiliated members spread over the continents of the world. One of the most important issues that have generated lots of friction between FIFA and National football Associations (NFs), especially those in the continent of Africa is the non-compliance with the provisions of Section II, Article 17 of FIFA's statutes, which demands government's non-interference in the administration of NFs.

METHODS The Nigeria Football Association (NFA) shall be the case study for this position paper. The author feels that most of the hindrances confronting NFA and inhibiting it to adhere to Art. 17 are the same hindrances confronting other NFs in Africa. Some of these hindrances include politics, funding, facilities, sponsorship, and personal interest, among others.

RESULTS In examining the issue of hindrances to full compliance to Art 17 of FIFA's statutes, it was revealed that NFs found it difficult to comply due to the facts that leadership and membership of NFs were most often decided by political and tribal affiliations and not necessarily by competence, and that leadership positions were given to those who would succumb to the demands of those in government.

DISCUSSION There is no doubt that NFs in Africa do face a lot of hindrances towards their intention to comply with Art. (17 of FIFA Statutes). This was due to the fact that football administration in Nigeria, as in most African countries, was still subject to the control and authority of those that administer sports on behalf of the Federal Government of Nigeria.

KEY WORDS FIFA, Government interference, hindrances, sponsorship.

5. SPORTS MEDICINE (1)

O-027 Factors associated with soccer injuries: Effects of age, load of training and surface of training

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OBJECTIVE The injury risk in football is high, but little is known about causes and collateral factors of injuries. This study presented the monitoring of injuries produced through two seasons in several professional teams of soccer and their lower categories. The purpose of this study was to describe epidemiological factors and injury mechanism in soccer injuries (analyzing the differences depending on the age, load of training and surface of training), and provide preventive guidelines to be applied in the training process.

METHODS 87 professional and 96 players of lower categories (U19, U16 and U14) participated. For the registry, with a prospective design, of the dependent variable (injury) and variables (injury factors) a computerized instrument was designed. Data was analyzed with descriptives, comparison of averages through Kruskal-Wallis analysis and logistic regression.

RESULTS Results showed tipology of more frequent injury (muscular= 57.5%, joint and ligament= 19.2%, tendon= 14.2%, bone=12.7%), and other associated factors of interest like the possible differences based on the age (significant factor) (OR=1.78, p= 0.05), load of training (significant factor) (OR=2.13, p= 0.05), and surface of training (non-sig). The most common injury types in soccer were muscular pathology, of low gravity (70.1%), and that predominantly affected the adductor group, quadriceps, hamstrings and sural triceps.

DISCUSSION Age and previous injury were identified as the main risk factors for soccer injury. This study implied that in order to prevent injuries especially muscular ones, it is necessary to consider the training load, and integrate preventive programs that should include propioception skills, eccentric exercises, active flexibility training (PNF), postural corrections and muscular reforcement. Protections (shinguards) in all trainings and matches must be used.

KEY WORDS Soccer injuries, risk factors, data collection, prevention programs.

O-028 Effects of whole-body vibration and pnf stretching on the flexibility and range of movement in elite Australian Rules football players

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OBJECTIVE The ability to collect the ball from beneath the knees is a major skill in Australian Rules Football (ARF), and flexibility in the lower limbs is a contributing factor in its success. Whole-body vibration (WBV) has been found to aid in the acute increase of flexibility, however; few studies have investigated its potential long-term effects. Proprioceptive neuromuscular facilitation (PNF) stretching has been found to result in increased joint range of motion (ROM) and has been suggested to be more effective than other forms of stretching. The purpose of this study was to determine whether WBV training confers a positive effect on hamstring flexibility when incorporated with PNF stretching in ARF players. It is hypothesised that the flexibility of the hamstring muscles will be greater with WBV training and PNF stretching than PNF stretching alone.

METHODS Eighteen elite male ARF players (age 20±3 yrs) were randomly assigned to either a WBV or control group. Both groups stretched the hamstring musculature 3 times per week for 6 weeks. Prior to stretching, WBV group performed squats whilst being exposed to 45 secs of WBV at 40Hz & 4mm amplitude on the VibroGym vibration platform. Flexibility measurements were taken with a goniometer at pre, 4 , and 6 weeks.

RESULTS The WBV group had a significant increase ($p < 0.05$) in hamstring flexibility (19.8%) when compared to that of the control group (9.2%).

DISCUSSION The results showed that WBV and PNF used together produced a greater increase in flexibility than PNF alone. Further research should be directed at clarifying the mechanisms behind this finding.

KEY WORDS Whole-body vibration (WBV), PNF, flexibility, stretching.

O-029 A comparison of injuries in professional and non-professional youth football players

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OBJECTIVE Football players' potential to succeed may be determined by their susceptibility to injury. However, there is limited data on the epidemiology of adolescent soccer injuries in elite youth players, and no study has investigated the role of injury in players' ability to become a professional player. The aim of this study was to investigate, whether the incidence and severity of injuries differed in graduate players who did not progress to professional level compared to those who succeeded on graduation. The nature and location of these injuries sustained over the course of the season were also compared.

METHODS Depending on whether or not they had signed a professional contract with a club on graduation, 192 players in elite male French youth football players were divided into two cohorts for comparison (professional and non-professional). Over 10 seasons, injuries were prospectively diagnosed and documented by a sports physician for each player over the three-years he resided at the centre.

RESULTS No significant difference was found in the overall incidence of injury between groups. Incidence of individual injury type and location were similar between groups. The percentage of injuries lasting more than one week was significantly higher in non-professionals ($p < 0.05$) and these players lost 4.8% more development time compared to professionals during the first year at the Centre.

DISCUSSION In elite French youth players, there was no certitude whether injury played a part in players' progress into professional level. Overall injury incidence and patterns did not appear to be decisive factors in the players' potential to succeed. A higher percentage of serious injuries and development time lost may have affected the youth football players' progress into the professional ranks.

KEY WORDS Football, injury, incidence, youth, development time.

O-030 Effects of long term playing soccer on lumbar spine degeneration

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OBJECTIVE Acute injuries to the lumbar spine in soccer have been closely investigated since they immediately intensely draw attention. Although chronic injuries of the lumbar spine and their relation to spinal flexibility and trunk muscle strength were investigated, sparsely their long term affects were investigated. The purpose of this study was to determine whether playing soccer at high intensity training for a long period causes degeneration of the lumbar spine or not.

METHODS There have been totally fifty-seven participants in this study (15 active soccer players & 15 controls, 14 veteran soccer players & 13 controls). Isokinetic trunk strength data were recorded with the isokinetic dynamometer at the 60º/sec and 120º/sec. Plain lateral radiographs were taken. Degenerative change of each lumbar vertebra was determined by using the Kellgren and Lowrence Score.

RESULTS Significant difference was found among veteran soccer players, active soccer players and age matched control groups in terms of lumbar disc degeneration ($p < 0.05$). Among these groups, veteran soccer players displayed greater lumbar disc degeneration (Table 1). Active soccer group players' showed greater trunk extension strength (at 60º/s. than the other groups in the study ($p < 0.05$).

DISCUSSION Findings of the study supported that playing soccer at high intensity training at a long period of time may cause lumbar spine degeneration. Having abnormal trunk extension strength and less spinal flexibility may cause lumbar disc degeneration on the spine in later years. Therefore, well-balanced trunk muscle strength and spinal flexibility exercises should be emphasized in training program.

Table 1. Multivariate Analyses of Variance for soccer and control groups for trunk strength, spinal flexibility and Lumbar disc degeneration.

	Trunk Fle@60ºs		TrunkExt @60ºs		Trunk Fle@120ºs		Trunk Ext@120ºs		Trunk Rat@60ºs		Trunk Rat@120ºs		Spinal Flexibility		Lumbar Disc Degeneration	
GROUPS	Md.	Sig.	Md.	Sig.	Md.	Sig.	Md.	Sig	Md.	Sig.	Md.	Sig.	Md.	Sig	Md.	Sig.
Active P Cont. G	27.6	.39	81.8*	.005	34.4	.95	50.71	.32	-4.9	1.0	2.09	1.0	.40	1.0	1.33	1.0
Veteran P Cont. G	11.8	1.0	36.6	.85	-8.6	1.0	28.70	1.0	-1.8	1.0	-4.4	1.0	-.22	1.0	7.36	1.0
Active P Veteran P	45.4*	.02	69.4*	.03	49.3*	.006	43.92	.59	.64	1.0	5.10	1.0	.21	1.0	-.16*	.04

KEY WORDS Soccer, lumbar degeneration, trunk strength, spinal flexibility.

O-031 Incidence of injury between guest and host football teams

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OBJECTIVE Home advantage is a well-documented phenomenon in many sports and has been demonstrated in all team sports although to a defend degree (Koning, 2005). There is also some evidence for home advantage and injuries, but there is a much more limited literature. This paper addresses the issue of home advantage in football injuries. The aim of this study was to determine the rate of injury in professional football players when playing at home and away.

METHODS In order to assess injury in professional 2005-2006 football league, 38 matches of Zobe-Ahan and Sepahan clubs were selected and analyzed using video analysis system. The rate of injury, injury time, side and cause of injury in both at home and away games were compared and analyzed.

RESULTS Although the rate of injury at away games (n=69) was 14% more than home games (n=52) the difference was not significant (P>0.05). Injuries in the second half (n=68) were more than the first half (n=53) and occurred in mid field zone (n=87) of the pitch. The highest number of injury was moderate (n=64) and happened at the left side of body (n=47) due to tackle (n=48).

DISCUSSION This study showed that home advantage had no effect on the rate of injury, location of injury, time of injury, side of injury and causes of injury. Therefore it can be concluded, that existence of more injuries in away games must be considered by health professionals and team doctors.

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KEY WORDS Football, injury risk, home advantage.

O-032 Incidence, epidemiology and risk factors in professional soccer injuries

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OBJECTIVE Soccer injuries are a habitual problem in training and competition. Monitoring soccer injuries offers useful information for training and preventive programs. The purpose of this study was to determine injury incidence, describe epidemiological factors and injury mechanism in soccer injuries, and provide prevention programs in soccer.

METHODS 87 professional players participated. Dependent variable (injury) and indepents variables(injury factors and mechanisms) were registered, following the indications established by UEFA. All injuries were registered during 04/05 and 05/06 seasons, with a prospective design. Data was analysed with descriptives, comparison of averages and logistic regression.

RESULTS A great majority of the players were injured at least once throughout the season (78%). In this study a predominance of muscular injuries were shown (52,4%). Direct traumatism was a frequent mechanism (32,1%), along

with the abrupt appearance (26,8%), and the processes of overuse (18,1%). Most injuries were recovered in 8 days and took place during the competition (70,1%). Age (OR= 1.162, p= 0.05), past injuries (OR= 3.21, p= 0.01) and load of training (OR= 2.32, p= 0.05) predicted muscular injuries.

DISCUSSION Predominantly soccer injury as muscular injury, low gravity, in adductor group, quadriceps, hamstrings and triceps, although it also appeared to be a typical of the ligamental affectation of the ankle (LL) and the syndromes of overuse of pubis. With regard to the findings specific preventive guidelines to implement in training process can be established.

CONCLUSION In conclusion, with regard to the findings specific preventive guidelines to implement in training process can be established.

KEY WORDS Soccer injuries, risk factors, prevention programs.

6. BIOMECHANICS (1)

O-033 Ball-foot interaction in impact phase of instep soccer kick

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OBJECTIVE Ball impact technique is essential for successful in instep soccer kicking. However, to date, only a few studies focused on ball impact phase, in which plantar flexion motion of the foot was solely reported (Asai et al., 1995; Nunome et al., 2006). Furthermore, no study has examined the behavior of the ball during ball impact that would be related to motion of the foot during ball impact. The aims of this study were to illustrate the three-dimensional motion of the foot (plantar / dorsal flexion, abduction / adduction, inversion / eversion) and the motion of center of gravity of the ball during ball impact, and to examine the interaction between the motion of the foot and the ball behavior during ball impact.

METHODS Eleven experienced male soccer players participated in this study. To analyze the interaction between foot and ball in detail, two ultra high-speed video cameras (NAC Inc., Tokyo, Japan) were used to capture the motion of kicking limb and ball at 5000 Hz. Ball deformation and position of center of gravity of the ball were calculated from the lateral side image.

RESULTS The foot was plantarflexed, abducted and everted during contact with the ball. In particular, the foot was dorsalyflexed slightly at the beginning of the impact, and begins to plantarflexed after middle of the impact. The peak force acing on the foot almost coincides with the peak ball deformation, and magnitude of peak force reached approximately 2700N.

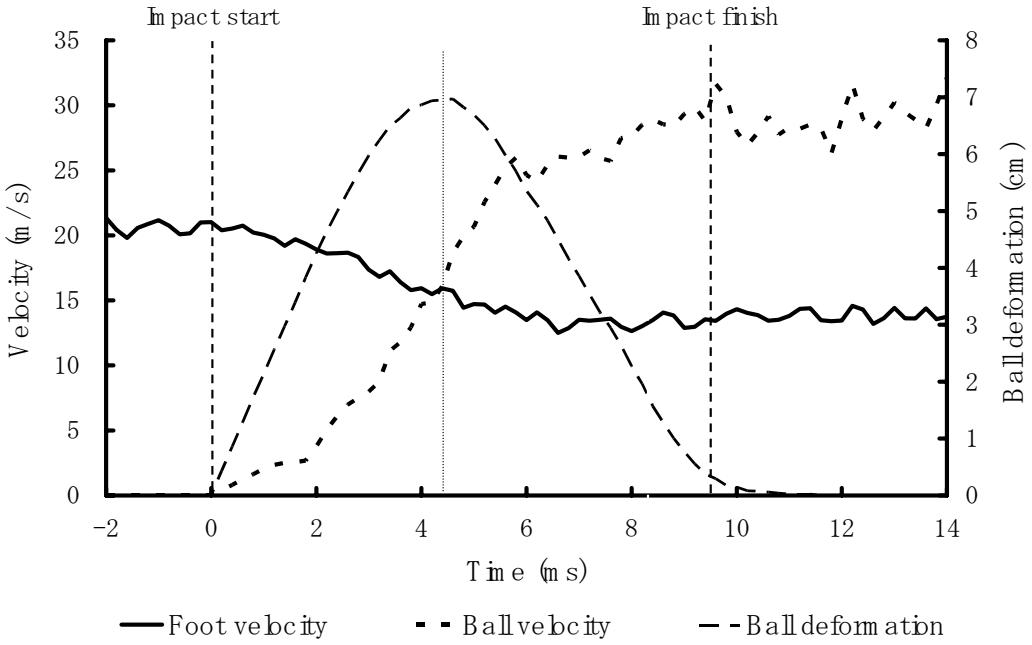

Figure 1. Foot velocity, ball velocity and ball deformation during ball impact.

DISCUSSION In this study it was seen that the foot was forced into plantar flexion by the force of the ball. The ball velocity exceeded foot velocity when the ball was maximally deformed (see Figure 1). It can be suggested that the foot can't directly increase the ball velocity after this moment, nevertheless the foot contact with the ball.

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KEY WORDS Three-dimensional foot kinematics, ball deformation, ball reaction force.

O-034 An alternative feature of impact phase kinematics of instep kicking in football

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OBJECTIVE Biomechanical data associated with impact situations involving large accelerations can be prone to error due to inadequate data processing (Knudson et al. 2001) and sampling rate. For football kicking, the movement data at or just before initial ball contact could suffer from such problems, which would affect true kinematics of lower limb motion during ball impact phase. The purpose of this study was to describe the more representative kinematics of kicking motion through ball impact phase by exploring the influence of both sampling rate and smoothing procedures.

METHODS Nine male footballers performed maximal instep kicking. The lower limb motion was three-dimensionally captured at 1000 Hz. The displacements were smoothed by a new time-frequency filtering (TFF). Also the co-ordinates were re-sampled (250 Hz) and smoothed by Butterworth digital filter using a 10 Hz cut-off (RSF) to resemble typical sampling and processing conditions used in the literature.

RESULTS The shank angular velocity was found to be increased during the final phase of kicking (TFF). Meanwhile, a totally different curve (apparent decrease in the shank angular velocity before ball impact) was created when the conventional filtering at 10 Hz cut-off was applied on the re-sampled co-ordinates (RSF). This nature has been consistently observed in the most of previous studies.

CONCLUSION Practically, coaches often recommended players to kick as if kicking through the ball. However, in literature no evidence was shown to support this type of instruction from a biomechanical point of view. The present study was the first to strongly support the above practical advice of kicking by clearly illustrating the true kinematics of the shank during kicking.

REFERENCES
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KEY WORDS True kinematics of shank, time-frequency filtering, soccer**.**

O-035 How to evaluate full instep kick in soccer?

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OBJECTIVE Soccer performance such as kicking performance is dependent on a myriad of factors such as technical/biomechanical, tactical and physiological aspects. One of the reasons for soccer being so popular and common worldwide is that players do not necessarily need to have extraordinary level of endurance, strength, power and flexibility but need to possess some level of the ability to be efficient during a soccer game. The purpose of this article was to present a way on how to evaluate the full instep kick in soccer. The instep kick test is comprised of three parallel tests; the ball speed test (km/h measured by stalker radar gun, Texas), the full instep kick accuracy test (goal divided into six fields) and the full instep kick technique test (seven aspects of the full instep kick).

METHODS The sample was comprised of elite male soccer players, members of first league clubs in the Croatian League (n=21), age 22.13±0.85. Reliability of kicking performance test was determined by reliability analysis (alpha) and test-retest. ($p < 0.05$). Ball Velocity was measured using the radar gun (Stalker-Pro, Texas).

RESULTS All tests had normally distributed data. Mean ball velocity measured by radar was 104,4 (4,38) km/h. Reliability coefficient alpha and test-retest analysis for all three tests was 0,96.

Table 1. Results of elite Croatian male and female soccer players in full instep kick test

ID	Unite of measurement	U-19 (f)	Seniors (f)	U-19 (m)	Seniors	Cadets (m)
MESBL	Km/h	78.07	80.08	101.3	112.2	100.4

CONCLUSION The soccer full instep kick test with parallel evaluation of technique, ball accuracy and speed was a very good diagnostic procedure. A similar test could be used for the evaluation of other soccer kick types

KEY WORDS Soccer, evaluation, full instep kick

O-036 Consistency of the lower limb acceleration patterns during inside and instep soccer kicks

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OBJECTIVE The inside kick is the most frequently used technique when a shorter and precise pass or shot is required, whereas the instep kick is used when a faster ball speed must be generated. The difference in accuracy of the inside and instep kick might be explained by repeatability of acceleration patterns. The repeatability of the kicks might be evaluated by acceleration waveforms. Therefore, the aim of this study was to examine the consistency of the lower limb acceleration patterns of these two soccer kicks.

METHODS 13 male soccer players (between 15-16 years old) performed 4 trials for each type of kick. Acceleration data were collected by tri-axial accelerometers fixed on subjects' knee and ankle. The RMS SD (precision error) of the 4 trials was calculated for 3 axes. Were there no difference among acceleration curves among trials, the RMS SD would yield a value of 0, corresponds highest repeatability.

RESULTS Comparisons were made between the two kicks using Student t-tests. Differences in the RMS SD values of acceleration waveforms measured at knee were statistically significant for all axes between inside and instep kicks, whereas it was only significant for x- and y-axis at ankle ($p<0.05$). Correlation coefficient between RMS SD values at knee and ankle in the relevant limb was higher for instep kick.

CONCLUSION The findings of this study revealed that the inside kick with smaller precision error have higher consistency considering the acceleration patterns of the lower limb. Since the waveform demonstrates different acceleration-deceleration patterns for segments, it might also be used to evaluate consistency in proximo-distal sequence between different types of kick.

KEY WORDS Acceleration, soccer, repeatability, instep kick, inside kick.

O-037 Kicking velocity: Barefoot kicking superior to shod kicking?

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OBJECTIVE Full instep kicking in soccer has received wide attention in biomechanical research (Barfield et al., 1998). There are just a few contributions on the influence of soccer shoes on kicking velocity (Amos et al.,2002)Soccer shoes evoke different ball velocities during full instep kicking. So far, the basic consideration that a shoe is an additional artificial interface between foot and ball during kicking has been neglected. Anecdotally, shod kicking is reported to be inferior compared to barefoot kicking already in 1971 (Plagenhoef, 1971). This study aimed to examine the general influence of a shoe in the kicking procedure, as it is necessary to know whether a soccer shoe acts as an enhancing, reducing or neutral piece of equipment in fast kicking. Features like mechanical support and protection of the foot had to be addressed.

METHODS Five shoe/kicking conditions were tested: Adidas (AAA), Nike (NNN), subject's own (OSC), sock (SOC), barefoot (BAR). Peak ball velocity was measured by a Stalker Pro radar gun. GRFs and HSV were taken. 19 subjects performed six full instep kicks in each condition. A pain rating (1 - low, 9 - high) and a velocity ranking of perceived ball velocity (1 - highest speed, 5 - lowest speed) was required.

RESULTS The ANOVA showed higher ball velocity for barefoot compared to shod kicking (Figure 1). Perception data showed that barefoot and sock conditions were perceived most painfully. Although perceiving highest pain in the bare

foot condition, subjects kicked faster compared to the shod conditions. The more painful a kicking condition was perceived the lower the condition was ranked for ball velocity.

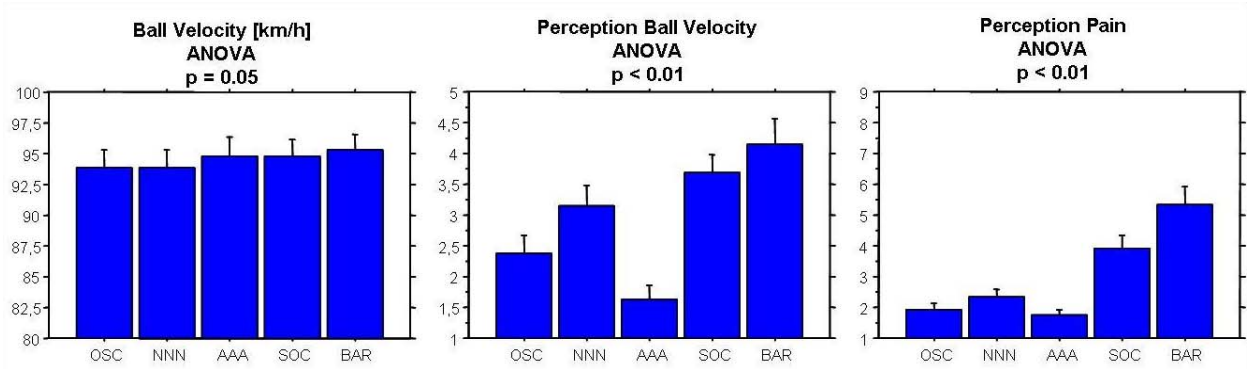

Figure 1. Means and standard errors for ball velocity and perception parameters

CONCLUSION Soccer shoes do not generally provide support for fast kicking. Pure anatomical structures perform better in a full instep kicking situation than the functional unit of foot and shoe does. At initial ball contact, a bigger plantar flexion angle at the talus joint results in higher foot rigidity and less give during the collision in barefoot kicking, as high speed video pictures suggest.

ACKNOWLEDGEMENT This study was supported by Nike Inc., USA.

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KEY WORDS Kicking velocity, full instep kick, soccer shoe, barefoot.

7. SPORTS MEDICINE (2)

O-038 Deep vein thrombosis and the athlete: A case study

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OBJECTIVE Although trauma is one of the most common causes of lower extremity DVT, athletes may present with DVT from other non-related causes. There is a lack of scientific literature concerning the return to sport protocol following a deep vein thrombosis (DVT). A systematic literature review of football players diagnosed with a DVT is conducted for relevant primary studies on the issue of ambulation and the initiation of vigorous exercise or rehabilitation in the setting of a recently diagnosed DVT.

METHODS A case report is presented of an American flag football player who was diagnosed with a DVT. The athlete in this case report returned symptom-free to vigorous sporting activity within 3 weeks of being diagnosed of having a lower-limb DVT, this despite the DVT still being evident on the duplex doppler ultrasound evaluation. The results of the literature review did not provide adequate scientific evidence to guide practitioners regarding when to advise their athletes to restart physical activity.

RESULTS The athlete in this case report returned symptom-free to vigorous sporting activity within 3 weeks of being diagnosed of having a lower-limb DVT, this despite the DVT still being evident on the duplex doppler ultrasound evaluation.

CONCLUSION Until more evidence becomes available from randomized controlled trials and other case reports, the appropriate time for the athlete to return to sporting activity remains unknown. Incorrectly diagnosed DVT in athletes may have fatal consequences. The practitioner can greatly benefit from case reports in this subject.

KEY WORDS Deep vein thrombosis, clinical examination, athletic activity.

O-039 Preventing iron deficiency and anemia in professional and semi- professional football players

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OBJECTIVE Two distinct haematological phenomenons can occur in endurance-trained athletes: a) a rheological adaptation to endurance exercise leading to a rapid increase of plasma volume which decreases hematocrit (Ht), and haemoglobin (Hb) levels (athletes' pseudoanemia) and b) a true iron deficiency and anaemia. Most studies, in the past, had failed to differentiate these two conditions. The aim of this study was to assess two haematological conditions and suggest a potential time schedule for laboratory tests during training season in professional and semiprofessional football players to prevent true iron deficiency and anemia and avoid improper use of iron supplements.

METHODS Fifty five male football players were divided into 3 groups and had a full clinical and laboratory evaluation. Pre-tests performed prior to the beginning of the preparation period for group 1 (24.6±4.8y) and one week after the beginning of this period for groups 2 (19.6±5.7y) and 3 (19.7±1.6y). Post-tests performed at the end of the preparation period for groups 1 and 2 and after 4 weeks of training for the 3rd group. All training sessions performed by subjects were similar in number, volume, and intensity with a slight variance on strength training for adolescents.

RESULTS There was a significant decrease in Ht and Hb levels (Table 1) at the end of the preparation season only in participants of the 1st group (McNemar's p=0,002). This indicated that this observed reduction was probably the result of a plasma volume increase. No significant change was observed in Fe and ferritin levels in all 3 groups' pre and post tests. Compared to professional players, semi-professionals showed a higher prevalence of low ferritin levels.

Table 1. Mean pre and post Ht and Hb levels in groups 1, 2, 3.

Variabble	Mean Ht (pre)	Mean Ht (post)	Mean Hb (pre)	Mean Hb (post)
Group 1	47.0	44.2	15.7	14.6
Group 2	44.7	44.4	14.8	14.9
Group 3	43.8	42.8	14.6	14.3

CONCLUSION According to the results of this study athletes' pseudoanemia occurred early at the beginning of the preparation period and could mislead to unnecessary iron supplementation. Scheduling of blood tests 1 and 5 weeks after the beginning of the preparation period seemed to be more efficient to prevent or treat true iron deficiency anemia.

KEY WORDS Anemia, iron deficiency, pseudoanemia, football players.

O-040 Determination of bone mineral density and trunk muscle strength in active soccer players and veterans

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OBJECTIVE Soccer is a popular, complex strategically game of physical and mental challenges. Soccer players have to possess moderate to high aerobic and anaerobic power, have good agility and joint flexibility, and be capable of generating high torques during fast movements. Moreover, higher level of physical activity were directly associated with higher Bone Mineral Density. The main purpose of this study was to determine whether playing soccer at for a long period affected bone mineral density or not in further years.

METHODS In this cross-sectional study, there were fifty-seven participants in this study (15 active soccer players & 15 controls, 14 veteran soccer players & 13 controls). The Bone Mineral Density was measured from hip region with a dual energy X-ray absorptiometry device. Isokinetic trunk strength data were recorded with the Biodex System at the angular speed of 60°/s in semi standing position.

RESULTS Active soccer group had more BMD than other groups ($p<0.05$), but the veteran group's BMD scores was not statistically different compared to the control group ($p<0.05$). Active soccer group had greater trunk extension strength at 60º/s than the other groups. There were no significant differences for veteran soccer group and its age matched control group in terms of their trunk strength.

Table 1. Multivariate analyses of variance for soccer and control groups for trunk strength and bone mineral density.

	BMD (gr/cm^2)		***Trunk Ext@60º/s.***		***Trunk Flex@60º/s.***	
Groups	Md.	Sig.	Md.	Sig.	Md.	Sig.
Active Players Control Group	.17*	.003	81.76*	.005	27.6	.251
Veteran Players Control Group	.04	.872	36.60	.450	11.84	.871
Active Players Veteran Players	.22*	.000	105.97*	.000	57.22*	.002

* $p < 0.05$.

DISCUSSION Veteran group has not been active nearly for five years. The insignificant difference between their controls in terms of their BMD scores may be related to irregular exercise after their active carriers. Active soccer players' trunk extension strength results verify the positive effects of exercise on BMD bluntly. Therefore, after the active carrier, players should perform regular activity in order to keep BMD.

KEY WORDS Soccer, bone mineral density, trunk strength.

O-041 Isokinetic strength of quadriceps-hamstring muscle in soccer players playing in different leagues

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OBJECTIVE Soccer requires high muscular performance on legs. Muscle strength imbalances contribute to knee injuries. The quadriceps and hamstring muscle strength are important in running, kicking and stabilizing of knee. Isokinetic strength evaluation is common in the sports medicine. Muscle strength imbalances contribute to knee injuries. The aim of this study was to compare the concentric and eccentric isokinetic quadriceps and hamstring muscle strength among the professional soccer players according to their playing league.

METHODS 145 professional soccer players in concentric (1st league n=74, 2nd league n=51, 3rd league n=20) and 130 players in eccentric test (1st league n=59, 2nd league n=51, 3rd league n=20) participated in this study. Concentric and eccentric strength of quadriceps and hamstring in both legs was assessed using a Biodex at 60º/s (Peak torque, peak torque/body weight and hamstring quadriceps ratio).

RESULTS Concentric and eccentric muscle strength were different between the leagues. Concentric and eccentric strength values of quadriceps in both leg were higher in the 1st league than 2nd -3rd league ($p<0.05$). Same values of concentric hamstring in both legs in the 3rd league teams were less and eccentric hamstring and ratio values were higher in the 2nd league than the others($p<0.05$).

Table 1. The values of quadriceps and hamstring concentric and eccentric peak torque (N-m), on both legs at 60 degree/second in three league teams.

			Concentric (60 degree/second)			Eccentric (60 degree/second)		
			1st league	2nd leaque	3rd league	1st league	2nd leaque	3rd league
Quad	PT (N-m)	Pre	257.6 (32.9)[a]	238.3 (30.2)[b]	221.9 (25.5)[b]	210.9 (38.3)[j]	190.5 (35.8)[k]	175.9 (36.2)[k]
		Non-pre	262.3 (38.3)[c]	235.5 (29.3)[d]	221.2 (24.5)[d]	207 (36.1)[l]	185.4 (39.1)[m]	178 (29.3)[m]
Ham	PT (N-m)	Pre	141 (21.6)[e]	132.3 (41.4)[f]	113.2 (23.4)[f]	253.7 (92.8)[n]	301 (57.4)[o]	262.5 (70.7)[n]
		Non-pre	134.9 (20.1)[g]	128.2 (44)[h]	106.9 (20)[h]	250.8 (97.2)[s]	296.7 (64.4)[r]	255.5 (54.3)[s]

Quad: Quadriceps, Ham: Hamstring, PT: Peak Torque, Pre: prefered leg, Non-pre: Non-prefered leg. a>b, c>d, e>f, g>h, j>k, l>m, o>n, r>s: Significance of difference between the three league teams $p < 0.05$

CONCLUSION Muscle strength imbalances contribute to knee injuries. The results showed that the muscle strength of players can be related to their playing league because soccer teams have different strength training programs. Specific eccentric exercises for quadriceps and hamstring muscle should be supported into the soccer player's training program. Therefore; knee injuries can be prevented.

KEY WORDS Soccer, league, isokinetic, concentric and eccentric muscle strength

O-042 Effect of age on isokinetic concentric and eccentric strength of knee muscles in soccer players

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OBJECTIVE Soccer is widely considered to be the most popular sport in the world. Several injuries have shown that muscle strength is affected by several parameters such as height, body mass, dominant leg and age. The purpose of this study was to investigate the effect of age groups and the difference of dominant and non-dominant leg on concentric and eccentric isokinetic peak torque of quadriceps and hamstring muscles strength in men soccer players.

METHODS 102 (19.71± 3.8 years) soccer players participated. The players were divided in to four groups as 15-17 years (n=34), 18-20 years (n=35), 21-23 years (n=16), 24>-years (n=17). Concentric and eccentric isokinetic quadriceps and hamstring muscle strength was measured at angular velocities of 60 degree/seconds (5 repetitions).

RESULTS Our results showed the effect of age had no significant difference on concentric and eccentric peak torque values between four age groups. Dominant leg hamstring concentric peak torque values were greater than non-dominant leg peak torque values ($p<0.01$). No significant difference was found for eccentric peak torque values ($p>0.05$).

Table 1. Quadriceps and hamstring peak torque comparisons between dominant and non-dominant leg.

PT (Nm)	Concentric (60 degree/second)				Eccentric (60 degree/second)			
	Dominant X (SD)	Nondominant X (SD)	t	p	Dominant X (SD)	Nondominant X (SD)	t	p
PTE	222.7 (30.2)	224.4 (28.2)	-0.9	0.36	176.5 (34.5)	171.3 (35.7)	1.8	0.73
PTF	115.8 (19.7)	110.6 (18.8)	3.6	0.0*	273.3 (71.4)	267.9 (64.3)	1.08	0.28

PT: Peak Torque, PTE: Peak Torque Extension, PTF: Peak Torque Flexion, $p < 0.01$.

CONCLUSION The results presented that muscle strength may not be affected by age. The concentric muscle strength value of the dominant leg is expected to be higher than that of the non-dominant leg. Following studies should be carried out with increased number of age groups and number of players.

KEY WORDS Soccer, age, isokinetic, muscle strength, concentric, eccentric.

O-043 Dental health status and behaviors of young soccer players

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OBJECTIVE The high performance standards required athletes can only be attained by a totally healthy individual. Poor oral health among athletes has been related to poor performance in training and games, poor social relationships and less success in future life (Kerr, l983). The purpose of this study was to examine behaviours related with oral health as well as DMFt (Decayed, Missing, Filled Teeth) and DMFs (Decayed, Missing, Filled Surface) index of the licensed young soccer players

METHODS 208 licensed young soccer players age between 13 to 19 years old participated in this study. Athletes were examined by three expert dentists. As an indicator of oral health, DMFt and DMFs indexes were calculated. In addition, oral health questionnaire were administered to determine oral health behaviours' of the athletes.

RESULTS Findings related to dental health status indicated that 85.4 % of athletes have at least one decayed tooth (DMFt>1). Mean value of DMFt was 3.2± 2.5 and mean value of number of decays on tooth surface (DMFs) was 4.12±3.35. 95% of athletes believed importance of regular dental care for their oral health. 21% of athletes had dentist fear and only 15.9% of them had regularly been using dental health services.

DISCUSSION There is no nationwide study about oral health of athletes. It may be assumed that this study is the very first one in this field. All of the oral exams were made by three dentists and because of acceptable examination conditions it was assumed that the collected data were reliable. Although the importance of oral health is known by the majority of athletes, this study implied that their oral health status was unsatisfactory. Only some of the participants, who reported that they have enough information about oral health, had been receiving regular oral health services.

REFERENCES
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KEY WORDS Dental health, Soccer, DMFt and DMFs index.

O-044 Physiological profiles of soccer players with respect to playing positions

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OBJECTIVE Soccer players are expected to have different physiological characteristics according to their playing positions. However, the results of the previous studies are contradicting with each other. Understanding their physiological capacities may assist coaches while preparing different training programs for goal keepers, defenders, midfielders and strikers. The aim of this study was to examine the physiological differences of soccer players with respect to their playing positions.

METHODS Ninety seven soccer players participated in the study. Physical and physiological variables including body mass index (BMI), body fat, sit & reach, velocity, heart rate and lactate measurements were recorded and compared among goal keepers, defenders, midfielders and strikers. A portable finger-stick blood lactate meter (Lactate Pro) was used for lactate measurements.

RESULTS ANOVA was conducted and significant difference was found between playing positions in terms of BMI $F(3, 93)= 2.87$, $p< .05$. No significant difference was found between playing positions with respect to body fat, sit & reach, HR and velocity (3 and 4 mmol). Post-Hoc analysis was conducted and significant difference was found between goal keepers and midfielders.

Table 1. Means and standard deviations for independent variables for playing positions.

	Defender (*N*=27)	**Midfielder (*N*=39)**	**Striker (*N*=20)**	**Goal keeper (*N*=11)**
BMI	23.0 (1.96)	22.58 (1.5)*	22.69 (1.8)	24.25 (1.6)*
Body Fat	10.5 (5.6)	9.6 (4.5)	9.7 (2.9)	13.2 (7.2)
Sit & Reach	16.7 (6.2)	17.1 (5.6)	17.3 (6.8)	16.3 (5.7)
HR (3 mmol)	163.8 (7.8)	162.3 (12.9)	164.0 (14.0)	159.3 (11.4)
Velocity (3 mmol)	12.1 (1.8)	11.7 (2.0)	12.0 (2.2)	11.2 (1.0)
HR (4 mmol)	176.3 (8.3)	176.5 (9.8)	177.4 (10.9)	171.9 (11.4)
Velocity (4 mmol	13.8 (1.5)	13.6 (1.4)	13.5 (1.8)	12.9 (1.2)

* significant difference between midfielder and goal keeper $p < 0.05$.

CONCLUSION The results showed that goal keepers have higher BMI scores than midfielders. Non significant variables among the playing positions may be the result of competitive and collective structure of the soccer game for all players. It can be concluded that physiological and physical profiles may not be affected by playing positions.

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

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 vitamine C (group ARG) or just with 1 g of vitamine 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 ± 0.6 – 5.77 ± 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 (~ 17.0ºC). 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 (ºC)	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.

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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.

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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 adapations occured 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 (HRend of postexersise -HR3rdmin of postexercise)/3 and (LA2ndmin of postexercise-LA15thmin 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.

9. SPORTS INJURIES AND PREVENTION

O-051 Risk factors for overuse knee extensor mechanism disorders in adolescent soccer players

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OBJECTIVE Overuse disorders of the Knee Extensor Mechanism (KEM), such as Osgood-Schlatter's disease, are common in adolescent soccer players. Although those disorders are said to be related to increased tension in the KEM, which is elongated by rapid skeletal growth during the growth spurt period, a simple and quantitative measurement for the tension has to be established to prevent disorders. We hypothesized that tension in the KEM could be evaluated using a tissue hardness meter. In this prospective study, we investigated the incidence of overuse disorders of the KEM and examined whether different variables, including KEM tissue hardness, could be identified as risk factors for KEM overuse disorders in a multivariate model.

METHODS A total of 184 legs belonging to 92 adolescent male soccer players, aged 13.1 ± 2.5 (mean ± SD) years, were examined in the study. In the initial medical check-up, physical features, including KEM tissue hardness, were examined. After the initial medical check-up, we prospectively observed the incidence of KEM overuse disorders for a period of one year.

RESULTS During the observation period, KEM overuse disorders occurred in a total of six legs from four individuals, including Osgood-Schlatter's disease and jumper's knee. In the logistic regression analysis, increases in absolute body weight over the year and KEM tissue hardness were found to be significant predictor variables for the incidence of disorders (Table 1).

Table 1. Significant Predictor Variables for Overuse Knee Extensor Mechanism Disorders in Adolescent Soccer Players from the Logistic Regression Analysis

Variable	OR	95% CI	P
Increase of body weight [b]	1.95	1.24-3.06	<0.01
Tissue hardness [c]	1.41	1.02-1.96	<0.05

[a] OR : odds ratio, 95% CI : 95% confidence interval, P : P value. [b] Increase of body weight over a year. [c] Tissue hardness of knee extensor mechanism.

CONCLUSION Based on our results, it can be concluded that increases in body weight and KEM tissue hardness, which may cause knee overload, are valuable predictive indicators for the incidence of KEM overuse disorders. In a future study females can also be included and the sample size can be increased to shed further light on the relationship between risk factors and the incidence of KEM overuse disorders.

KEY WORDS overuse injury, adolescent soccer player, risk factors, knee extensor mechanism, tissue hardness.

O-052 Prevention, rehabilitation and re-injury-prophylaxis of knee and ankle injuries in young elite soccer players

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OBJECTIVE Epidemiological studies show an increased number and impact of serious knee and ankle injuries that occur not only in the field of high level senior soccer but also with dramatically rising figures in youth soccer. Therefore, the German Federal Institute of Sport Science (BISp) promotes a several years lasting interdisciplinary project in close cooperation with the German Soccer Federation (DFB). Injuries of the lower extremities or the proneness to certain knee and/or ankle injuries are thought to be caused by many factors. Therefore the aim of this study was to

optimize prevention, rehabilitation and reinjury-prophylaxis of knee and ankle injuries in soccer and get information about the coherences of physical, psychological and biomechanical data concerning injury frequency.

METHODS Diagnosis variables include the individual knee and ankle stability, coordinative and psychological abilities. Thus, a manifold of research disciplines (biomechanics, training science, psychology, medicine) worked together. Five elite male youth soccer teams (U 17, U 19) of five 1st division clubs (n=157 players) participated at eight diagnosis sessions throughout two seasons.

RESULTS Data of the coordinative abilities showed gradual increase during the observed period as well as increased values of knee stability, whereas maximum isometric strength did not improve. Psychological data suggested that the measured mood status correlated with training intensity and injury in single cases. A multivariate analysis was conducted for all variables and for all measurements is in progress.

CONCLUSION First results indicated a positive influence of the proprioceptive training concerning knee stability and coordinative ability, even though there seemed to be no structural changes. Psychological data would be very useful for coaches to modify the training process, as well as provide increased awareness of the body perceptions of the soccer players.

ACKNOWLEDGEMENT This project was funded by the federal government and the German Soccer Federation

KEY WORDS injury, prevention, elite youth soccer, interdisciplinary

O-053 Safety measures against tackle in rugby union

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OBJECTIVE Rugby union has a high rate of injuries, caused by tackling to head, neck and facial regions. In Japan, there was an increase in the frequency of tackle-related head injuries. The incidence of head injuries were higher in the younger generation of the under 19 players, compared to that of adults in Japanese rugby union players. This study investigated the effectiveness of the shrug motion (Shrug) tackle and the power-foot (Foot steps in the base of support powerfully) tackle in preventing tackle injuries .Furthermore, the effectiveness of the tackle skill to prevent tackle injuries were investigated

METHODS 30 Japanese university rugby union players participated. The electromyographic (EMG) activity around the neck was recorded using surface electrodes. The maximum force and impulse of Shrug and Non-Shrug (N-Shrug) with EMG were analysed with separate repeat-measures analysis of variance. The muscle tonicity of the Power-foot tackle and the Diving-tackle were analysed with EMG.

RESULTS Both of 45° and 60° mean normalized EMG of the shrug were higher for the bilateral upper trapezius than those of the non-shrug ($p<0.05$). There were significant differences in the angle of anterior incline between Shrug and N-shrug ($p<0.05$). The trapezius muscle tonicity of the power foot tackle was higher than that of the Diving tackle ($p<0.05$).

CONCLUSION The tackled skill based on these results was coached for head and neck injuries to U17 and U19 players at all areas in Japan. The numbers of the severe head injured players have decreased after that. These findings suggest that the tackle with Shrug and the power-foot may contribute to decreasing the severe tackle injuries of the rugby union players.

KEY WORDS Power-foot, shrug, tackle.

O-054 Watch out: Is it safe to play soccer on synthetic turf for ACL injury?

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OBJECTIVE Since the numbers of synthetic turf are getting higher as playing surfaces there has been great focus on high risk for Anterior Cruciate Ligament (ACL) injuries in soccer as it is the most favourite worldwide sport with a large number of participants played at amateur and professional levels. The objective of this study was to analyze retrospectively the injury mechanisms of ACL ruptures related to type of sport and by focusing on soccer the importance of synthetic playing surface as injury mechanism.

METHODS Examination of the records from the sports physiotherapy unit (outpatient clinic of Hacettepe University, School of Physiotherapy& Rehabilitation) showed that over the period 1991-2006, 327 cases with mean age; 27.6±7.8 (rage 13-62), mean weight and height; 73.79±11.23 and 175.4±9.2; either followed after a reconstruction or had conservative treatment for ACL. The cases were investigated by means of sports activity, type of sport that caused the injury, injury mechanism focusing on playing surface.

RESULTS 304 (93%) of the cases had been doing sport rather professionally (44.1%) or amateur (55.9%). 85.3% had a surgery. 62.4% of the cases had an isolated ACL rupture, 37.6% had another accompanying injury. The types of sports caused the injury were shown in Table 1. For 57% of the cases the reason was soccer. 93.6% of amateur, 82.6% of professional soccer players had injury on synthetic turf.

Table 1. The types of sports that caused the injury.

MECHANISM	Number	Percentage
Soccer	186	56.9
Westling	5	1.5
Ski	16	4.9
Basketball	31	9.5
Teakwando	7	2.1
Volleyball	11	3.4
Hentball	11	3.4
Track and field	4	1.2
Tennis	5	1.5
Nonsportive trauma	51	15.6
Total	327	100

CONCLUSION Playing fields as tough as synthetic turf that is not suitable for standard conditions may indicate a risk factor for ACL ruptures not only for amateur players but also professionals. Therefore we would like to warn especially amateur-weekend soccer players about the surface that if you play on synthetic turf you are probably at high risk of having a rupture of ACL.

KEY WORDS Soccer, ACL injury, risk factor, pitch surface

O-055 Computerization of soccer injuries: A key for supervision of injuries and elaboration of preventive guidelines

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OBJECTIVE Variations in definitions and methodologies have created differences in the results and conclusions obtained from studies of soccer injuries, making interstudy comparisons difficult. A working document on definitions, methodology, and implementation was discussed by UEFA Injury Consensus Group. To register and analyze the injury aetiology in the sport, in addition to numerous variables associated with interests like location, injured weave, injuries mechanisms, intrinsic (previous injuries, load of training, competitive load, physical training conditions, etc.) and extrinsic (thermal stress, type of pavement, etc.) risk factors.

METHODS "PryLesión: Control of sport injuries®" was presented in this study, which is a computer application that allows the supervision of injuries in soccer and associated factors (as much predisposition, as of course and resolution).

The program was designed by starting from the Multifactorial Model, following recommendations and protocols standardized at an international level (UEFA Medical Group).

RESULTS Data of the supervision of different football teams are offered like example, analyzing the effect of different associate variables (age, competitive load, etc.)

CONCLUSION Prylesion® constituted a tool of easy handling and discharge power to monitorizing sport injuries. It allowed to explore the associated aetiological factors to the injury problem. Facing an integral prevention and control of the training, the application also allowed information that should be integrated into training programs.

KEY WORDS Soccer injuries, informatizing data collection

10. BIOMECHANICS (2)

O-056 Use of weighted balls in improving kicking for distance

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OBJECTIVE Kicking for distance is an important part of Australian Rules Football (ARF). However there has been no research examining how distance can be improved. Weighted implements have been successful in improving performance in sports such as baseball (Escamilla et al., 2000). The use of weighted balls might be useful in training for maximal kick distance. The aim of this study was to examine the effect of maximal distance kicking training using regulation and weighted balls on maximum kick distance.

METHODS Twenty-eight elite Australian rules footballers were divided into three groups. Group 1 used regulation balls, Group 2 used regulation and weighted balls (soaked in water to increase from 450 to 500 g), and Group 3 was the control. All were tested for maximum kick distance before and after the 4 week (10 sessions) intervention. Groups and changes were compared by ANOVA.

RESULTS There was no difference in kick distance in pre-testing between groups. In post-testing, both Group 1 and Group 2 produced significantly longer kick distances than the control group. As well, both group 1 and group 2 significantly increased distances from the pre-test to the post-test.

Table 1. Kicking distances for Group 1 (regular balls), Group 2 (weighted balls) and Group 3 (control before and after a five week distance kicking intervention

		Group 1 (N = 10)	**Group 2** (N = 10)	**Group 3** (N = 7)	**F**	**p**	**Effect**
Pretest	**Mean**	58.7	56.2	55.5	1.50	0.24	0.111
	SD	5.0	4.2	2.5			
Posttest	**Mean**	63.4	61.8	56.4	5.86	0.01	0.328
	SD	5.8	3.6	3.6			
Change	**Mean**	4.8	5.6	0.9	7.66	0.00	0.390
	SD	2.5	2.7	2.6			

DISCUSSION Specific kicking for distance improved maximal kick distance in an elite group. The use of regulation balls only or regulation and weighted balls both increased distance. There was no statistical difference between methods, although the weighted ball group improved 0.8m more. A longer intervention might show a significant result. Specific kick distance training is recommended to increase distance.

REFERENCES
Escamilla et al. (2000) *Sports Medicine* **29,** 259-272.

KEY WORDS Australian Rules Football, kick distance, weighted balls.

O-057 Development of a mechanical kicking simulator

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OBJECTIVE Ball sports equipment has utilised impacting machines or 'robots' for experimental verification of prototypes and computer models. In the case of soccer kicking machines are used during ball development as they provide repeatable impact conditions unobtainable during human testing procedures. This paper describes the development of a kicking machine and details some preliminary results. The study aimed to develop a kicking machine to allow accurate and repeatable simulation of impact between foot and ball that exists within various kicks in a game of soccer and rugby.

METHODS Previous player studies stated maximum ball launch velocities of 38.1m/s. The design was based on a rigid A-frame, using a servo motor, capable of accelerating the kicking leg to a maximum velocity of 2300deg/sec. The leg's

rotation was adjustable within the machines software, and various launch conditions were replicated using an adjustable teeing mechanism and interchangeable end effectors.

RESULTS High speed video of soccer and rugby ball impacts at 10,000 fps, enable detailed analysis of launch conditions and ball deformation. A maximum ball speed of 50m/s was achieved, with the repeatability of the leg speed calculated to 0.06kph (1SD).

CONCLUSION The kicking machine developed was capable of producing the launch conditions experienced during game related impacts in an accurate and repeatable manner, using an adjustable teeing mechanism and interchangeable end effector. This development would allow manufactures to create and evaluate new products quickly and consistently.

KEY WORDS Kicking robot, ball impact simulation, launch conditions, soccer impact, rugby impact.

O-058 Movement patterns of body segments for curved running in soccer players

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OBJECTIVE Research into locomotion has tended to focus on linear motion, with only limited studies on non-linear motion that would be used in soccer play (Hamill et al., 1987; Smith et al., 1997). Body lean is a consistent feature of non-linear motion. For maintenance of body lean, the body centre of gravity must be moved toward the centre of the curve to counter the toppling moment. This study aimed to quantify the segmental contributions towards body lean and how this would affect the maintenance of non-linear motion in soccer on a natural turf surface. Body lean is achieved by reorientation of larger body segments.

METHODS In this study 8 male soccer players (21.7±2.3yrs, 72.3±6.4Kg) volunteered to participate. All wore standard six-studded soccer footwear. Trials were performed whilst running at 5.4ms-1 in both straight, and curved (radius 3.5m) conditions. Kinematic data was collected at 50Hz using Peak Performance pan and tilt software. Angles of lean with respect to vertical in the frontal plane were calculated.

RESULTS Differences were shown between straight and curved conditions at the torso, the neck, and the thigh of the inside and the outside limbs of the curve. Values were lower in the curved condition at Heel-Strike and Toe-Off in both limbs ($P<0.05$). Mean torso lean reduced from 181° (straight) to 158° (curved). Outside thigh from 180° to 155°, and inside thigh from 170° to 147°.

CONCLUSION Differences in function of inside and outside limbs were noted. The inside limb provided greater lean angles that the outside limb in the frontal plane. Lean of the lower extremities enabled repositioning of the larger torso segment. Subsequently body centre of gravity repositioning enabled maintenance of the curved running pattern of the type required to make offensive runs whilst remaining onside.

REFERENCES
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Smith et al. (1997) *Journal of Human Movement Studies* **33**, 139–153.

KEY WORDS Soccer, curve, lean, running.

O-059 Kinematic analysis of high performance rugby props during scrum training

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University of the Sunshine Coast

OBJECTIVE International rugby games have approximately 19 scrums and teams use scrums to establish dominance over the opposition, and to initiate offence. Despite its importance and the issues surrounding scrummaging and injury, there is limited research on the biomechanics of scrimmaging. No scientific research has reported the kinematics of scrummaging in elite rugby players. The purpose of this study was to examine the sagittal plane kinematics of several international rugby props during a combination of both training and game based scrummaging drills in order to develop a greater understanding of the techniques involved.

METHODS This study was based on 2-dimensional analyses of (n=5) from an international rugby team during machine (5 and 8-man), and live scrum training. High-speed (500 Hz) and 50 Hz digital video were recorded over 6 trials and analysed using APAS motion analysis software. Paired t-tests were used to test for differences in scrum technique between the scrum drills, and machine and live scrummaging.

RESULTS Differences in lower limb kinematics were evident amongst all scrum types. For example, peak hip and knee angular extension velocities were greater for 5-man scrums, while peak horizontal velocities of the CoM were greater for the 8-man scrums. Conversely, peak hip and knee extension velocities for live scrums were slower than during scrum machine training.

CONCLUSION It was concluded that clear differences exist in the sagittal plane kinematics of props during different types of scrummaging training. The implications of these findings are considerable, as these data suggest that the excessive use of scrummaging machines, plus some scrum training drills (e.g. 5-man) may have a negative training effect.

KEY WORDS Biomechanics, rugby, scrum, kinematics.

O-060 Foot to ball interaction in kicking in Australian Rules football

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OBJECTIVE Kicking is the most important skill in Australian Rules Football (ARF). A major coaching cue in kicking is the nature of contact with the ball (Ball, 2006). However, no ARF data exists for ball to foot contact times or for the distance the ball moves while in contact with the foot. As well, if work can be done on the ball during impact, this will have implications for conditioning and coaching. The first aim of this study was to provide basic information on contact times, the distance the ball moves and change in shank angle during ball contact. The second aim was to see if differences existed for these parameters for short and long kicks. The third aim was to determine if work was done on the ARF ball during kicking.

METHODS Eight elite level ARF players kicked an ARF ball over 30m and 50m. High speed video focused on the foot and lower leg and was used to calculate contact time between foot and ball. Digitised data was used to calculate the distance the ball moved, shank angle and ball velocity. T-tests compared 30m and 50m kicks.

RESULTS For 30m and 50m kicks mean contact times were 9.8 to 10ms, mean ball distances were 0.19 and 0.24m, and mean change in shank angles were 14 and 18 degrees respectively. 50m kicks were significantly larger change in shank angle, larger ball distances (small effect, p=0.06 only) and significantly larger change in ball velocity. No difference existed for contact times.

Table 1. Foot to ball interaction for a long and a short kick.

	Distance ball moved (m)	Change in shank angle (degrees)	Time in Contact (ms)	Change in Ball Velocity (m/s)
Long Kick (50 m)	0.24 (0.06)	18 (3)	10 (1.1)	25.0 (1.1)
Short Kick (30 m)	0.19 (0.02)	14 (2)	9.8 (1.2)	22.1 (1.8)
t-test (p-value)	0.068	0.048	0.79	0.027
Effect size (d)	0.046	0.049	0.005	0.063
	Small Effect	Small Effect	No Effect	Medium Effect

CONCLUSION Mean contact time and distance the ball moved lay between soccer values. Work can be done on the ball during the ARF kick (approx 270J) so using momentum equations is inappropriate. Change in shank angle and distance the ball moves during contact means muscular force can be applied and has implications for conditioning. In conclusion, recommendations for female soccer players are to encourage consumption of carbohydrate-electrolyte beverages to enhance carbohydrate intake and increase fluid intake, and ensure sufficient iron rich foods are included in the diet to meet the DRI.

KEY WORDS Kick, Australian rules, impact

11. FOOTBALL AND SURFACES

O-061 Development of a friction tester for soccer materials

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OBJECTIVE The existing techniques to measure the friction between sports balls and surfaces use methods which do not replicate the true contact conditions and velocities during a game situation. The friction between two materials is largely condition dependent and the data taken from a test machine is only relevant to that setup. The paper describes the development of a soccer materials tribometer. The study was to investigate the surface interactions that occur during a game of soccer with a view to quantifying the frictional properties.

METHODS Deformable material friction is sensitive to normal pressures and sliding velocities. The frictional force has two components: deformation and adhesion. Player studies have been researched to find typical ball velocities and spin rates. A finite element (FE) model then has been used to investigate further the contact conditions. Fig 1a shows the contact pressure variation with duration of impact.

RESULTS The machine design was based on a block-on-ring approach (fig 1b). A pivoted lever arm came into contact with a rotating drum by applying a force from the other end. With the surface in the tray in contact with the drum, the torque change was recorded by the inverter. The change in torque allowed the calculation of the coefficient of friction. Calibration of the load and torque was ongoing.

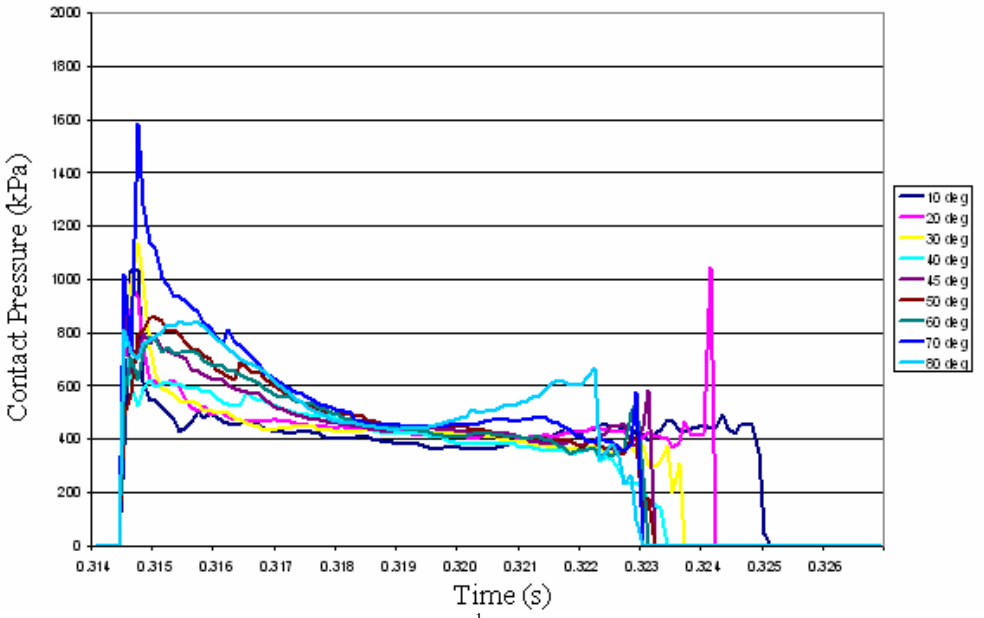

Figure 1a. FE contact pressure for a 25ms^{-1} oblique impact at varying impact angels.

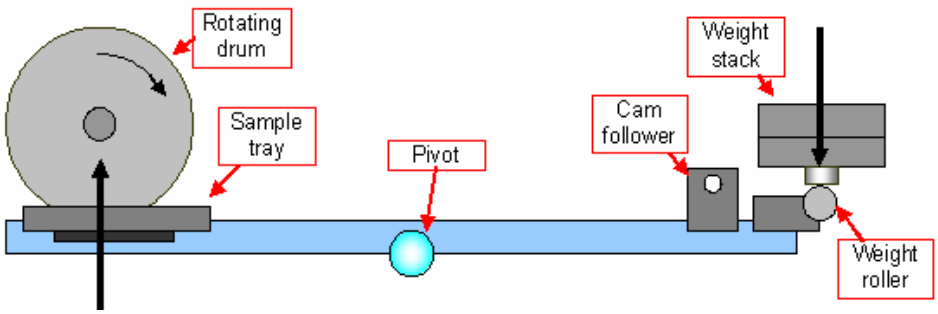

Figure 1b. Diagram showing the main features of the tribometer.

CONCLUSION The soccer materials friction tester has been developed to take in to account the contact conditions. The pressures and velocities can be replicated which in turn should give more representative friction data for soccer materials. However the contact time is difficult to replicate due to the short impact duration. This data is of fundamental importance to manufacturers in designing new equipment

KEY WORDS Tribology, tribometer, football, finite element, impact.

O-062 Identifying knuckle effect in football

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OBJECTIVE When the boundary layer of a sports ball undergoes the transition from laminar to turbulent flow, a drag crisis occurs whereby the drag coefficient (Cd) rapidly decreases. Especially, we can observe the strange swaying on non-spinning type soccer balls by lateral force fluctuations, which can cause the 'knuckle effect'. However, the aerodynamic properties and boundary-layer dynamics of a soccer ball are not well understood. The purpose of this study is to discuss the aerodynamic characteristics of football using computer fluid dynamics (CFD) and visualization of the vortex structure around the real flight football in high Reynolds number.

METHODS An incompressible unsteady analysis was performed using the finite volume method based on fully unstructured meshes. In order to visualize the flow around the soccer ball during flight, a ball was coated as uniformly as possible with titanium tetrachloride. The subject who is top level university soccer player performed an almost non-spinning straight kick towards the middle of a goal from a distance of 15 m.

RESULTS It was observed that a large scale of fluctuation was generated in the lift coefficient. The separation point of a non-spinning football in CFD retreated to ~120° from the front-stagnation point and with the vortex region shrank. The complex vortex structure was observed near the CFD ball model; however, it was difficult to represent the vortex structure from a short distance.

DISCUSSION The results of experiment in this study showed that the Strouhal number of wake near the real flight football was about 1.0 that was similar to the high-mode value of a smooth sphere. It was also observed that the vortex was paired in the wake. Moreover, it is observed that the large-scale of fluctuation in the vortex trail which Strouhal number is estimated for 0.1. It is considered that the large-scale of fluctuation in the vortex might have been due to the 'knuckle effect' of the non-spinning ball.

KEY WORDS Aerodynamics, knuckle effect, football, wind tunnel, visualisation.

O-063 Soccer ball dynamic force measurement and modelling

Daniel Price ✉, Roy Jones and Andy Harland
Loughborough University, UK

OBJECTIVE Equipment manufacturers continually strive to produce technically more advanced soccer balls as it is prerequisite of this game; however the effectiveness of this process requires a detailed understanding of the impact characteristics of soccer balls to ensure that new technologies and designs improve the quality of the game. Unlike previous studies which used force measurements at low impact velocities, this study investigated dynamic forces that occur for soccer balls at velocities of actual playing conditions. A soccer ball finite element (FE) model is developed and validated using the experimental data.

METHODS Normal impact tests were undertaken using a ball typical of that used in elite competition and force measurements were recorded using a Kistler force plate. Impact velocities of 9, 14, 23 and 30 m/s were used throughout experimentation. Simulated impact scenarios were compared with experimental results.

RESULTS Figure 1 shows peak forces increased with impact velocity (from 1494 +58 /-65 N – 6942 +471/-396 N), and depicts high speed video data of deformation, which also increased with impact velocity. The FE model slightly overestimated the peak force for impact velocities 9 and 14 m/s, but generally gave good agreement with both dynamic force and deformation data.

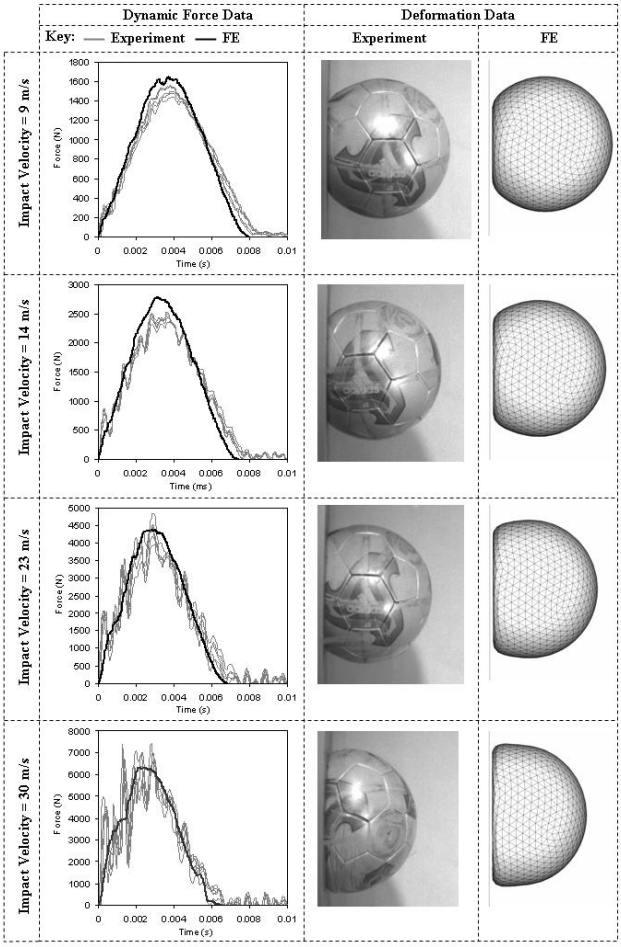

Figure 1. Experimentation and FE model comparisons of force vs time, and deformation data for impact velocities of 9m/s, 14m/s, 23m/s and 30 m/s respectively.

CONCLUSION This study showed that impact velocity had a profound effect on the measurements of dynamic force and deformation. It should be noted that the 30 m/s force data, gave significant variability due to natural frequency limitations of the force plate. The FE model showed good agreement with experimentation which gave confidence in its efficacy in understanding soccer ball impacts and it's use to assist in the development of future soccer ball designs.

KEY WORDS Soccer ball, impact mechanics, finite element modelling, force measurement, deformation.

O-064 Development of a sliding tester

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OBJECTIVE Today, artificial turf is becoming more and more used for soccer. The most inherent problem of this artificial turf are injuries due to sliding. The existing testing devices for sliding used by FIFA and UEFA, focus on the coefficient of friction of the turf and the caused abrasion of the skin. However, a crucial parameter in the process of skin burning, the temperature, cannot be measured. The aim of this study was to develop a new testing device that can assess how well different types of turf are fit to do a sliding on them. This device is a realistic approximation of a soccer sliding, considering realistic values for player speed and mass and measures the increased temperature during the sliding as well as the friction, in order to assess the risk of: burning wounds.

METHODS The new testing device consists of a ramp, from which a sledge is launched onto the field (Figure 1). At the bottom of the sledge, thermocouples in a newly developed artificial skin measure the temperature during the sliding. The speed of the sledge can be varied up to 22km/h, the weight can be varied between 15 and 31kg, leading to comparable contact pressures as in a real sliding.

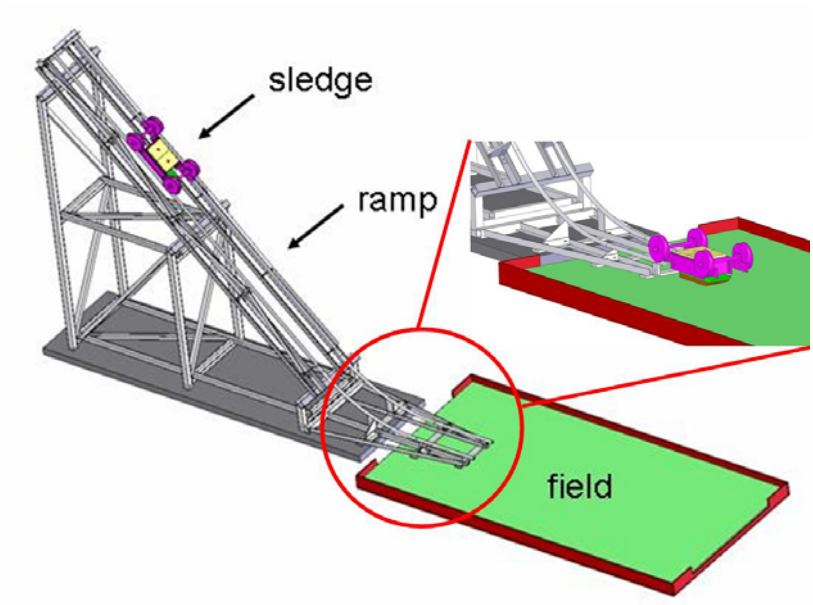

Figure 1. Testing device.

RESULTS The measurements showed that the temperature rises as soon as the sledge enters the field, and gradually decreases after it comes to a standstill. The rise in temperature is higher with increasing speed and mass of the sledge (Table 1). The varying amount of rise in temperature, as well as the sliding distance of the sledge, can be used to compare different fields.

CONCLUSION The developed testing device allows a classification of different fields: the lower the rise in temperature, the better the turf is suited to perform a sliding on it. The testing device can also be used for more fundamental research on the sliding phenomenon, as extensive sliding tests with soccer players are not possible due to the risk of burning injuries.

Table 1. Measured rise in temperature (average and standard deviation) as a function of mass and speed of the sledge.

Mass [Kg]	Speed [M/S]	Av Rise in Temperature [°C]	Stdev Rise in Temperature [°C]
14.8	2.4	4.1	0.4
14.8	3.1	5.6	0.4
14.8	3.7	8.0	0.2
14.8	4.2	8.4	0.6
18.8	3.7	9.5	0.6
22.8	3.7	11.2	0.8
26.8	3.7	12.6	1.3
30.8	3.7	14.0	1.0

KEY WORDS Artificial turf, soccer, sliding, burns, skin.

O-065 Comparison of test performance peculiar to soccer on synthetic and natural grass fields

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OBJECTIVE Soccer fields has great importance on playing soccer. Besides performances of soccer players on different fields is still searched. The goal of this research is the comparison of test performance peculiar to soccer on synthetic and natural grass fields.
METHODS Twenty soccer players participated in this research. 6 different tests were executed to determine performance with ball and without ball on synthetic and natural grass fields. The data which were obtained from the tests executed on synthetic and natural grass fields were compared by using T test.

RESULTS There were significant differences between the performances which were executed on synthetic and natural grass fields in 5 of the tests. On symmetric part of the tests synthetic grass fields provided better results but on asymmetric part of the tests natural grass fields gave better results. ($p>0.005$).

Table 1. Means and SD of test results.

	Mean (Sn)	(±SD)
30 M Grass	4,28	0,164
30 M Sen.	4,05	0,122
30 M Grs.Ball.	4,72	0,174
30 M Sen. Ball.	4,42	0,115
HÜFA 1 Grass	9,99	0,413
HÜFA 1 Sen.	10,02	0,331
HÜFA 2 Grass	12,12	0,427
HÜFA 2 Sen.	12,19	0,452
41 M Grass	11,47	0,554
41M Sen.	12,60	0,353
41 M Gra. Ball	14,43	0,625
41M Sen. Ball	15,06	0,430

CONCLUSION The results showed that synthetic grass fields were better in test divisions on symmetric structure. On the contrary, the results of natural grass field were better in test division on asymmetric. Moreover, there were meaningful statistical differences. It was concluded that natural grass fields were better for soccer dominated with asymmetric structures in halts, sudden movement and jumps.

KEY WORDS Soccer, tests, natural grass fields, synthetic grass fields.

O-066 Player perceptions of soccer ball performance

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OBJECTIVE The launch of a new soccer ball, especially for a major tournament, often instigates debate about the suitability and performance characteristics of modern balls. The soccer balls are typically criticised for being 'too light' or for 'moving too much in the air' yet these opinions are based on the subjective perceptions of the players, which often do not correlate with objective, scientific test. The aim of this study was to develop experimental methods to elicit, analyse and better understand players' perceptions of soccer balls. The objective was to use these methods to compare the playability and performance characteristics of a prototype ball with three tournament balls. In future, these techniques could be used to identify undesirable ball attributes earlier in the design process.

METHODS 38 players from four professional clubs in the UK conducted four skill tests (passing, ball control, heading & shooting) using four different ball types (A-D), After each test, the players rated characteristics of the ball related to that skill using 7-point scaled response questions developed in consultation with players and coaches. The mean ranking for each ball for each characteristic was computed from the players' ratings.

RESULTS Figure 1 show the mean ball ranks plotted on a scale for each characteristic studied during the shooting test. The bars in Figure 1 indicate the magnitude of Fisher's Least Significant Difference (LSD). If the bars for two balls do not overlap, then the balls were perceived to be significantly different. Ball D, therefore, was perceived to fly significantly faster and moved/swerved more than Ball C.

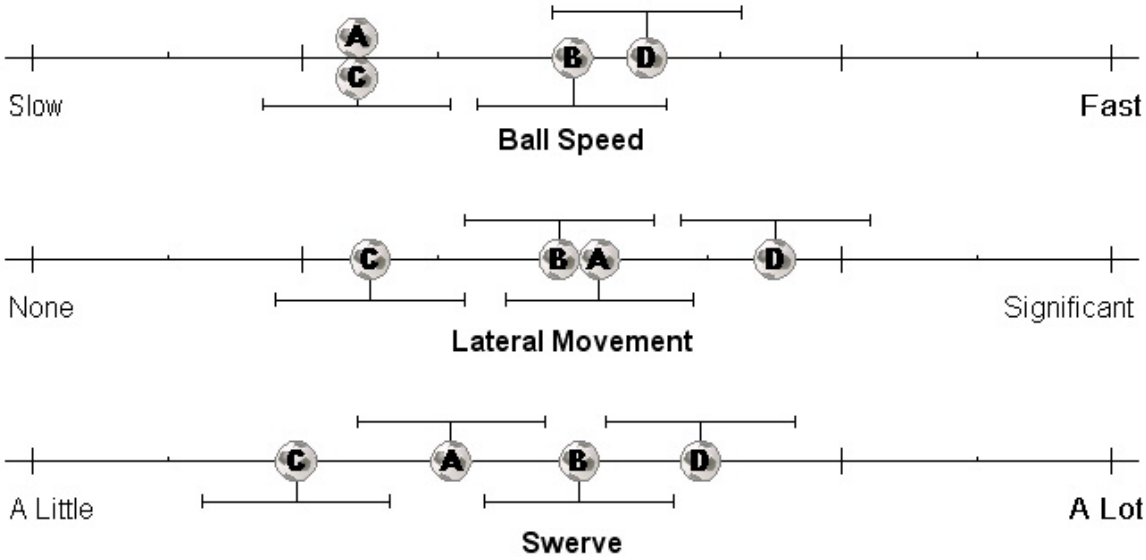

Figure 1. The mean ball ranks plotted on a scale for each characteristic studied during the shooting test.

CONCLUSION The experimental methods developed were successful in measuring players' perceptions of soccer balls. Significant differences in ball characteristics were identified and the suitability of a prototype soccer ball was evaluated against tournament standard balls. In future, the tests could be used to identify differences of opinion between goalkeepers and outfield players or between different football cultures.

KEY WORDS Sensation, perception, football.

12. KINANTHROPOMETRY (1)

O-067 Changes in body compositions of elite level amateur and professional soccer players during the competitive season

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OBJECTIVE Body composition is one of the success factors in soccer. Some studies have evaluated the seasonal alterations in body compositions of different elite athletes. However, there is no adequate information regarding changes in body composition during the competition period in elite level amateur and professional soccer players. The purpose of this study was to analyze and compare the seasonal alterations in body composition variables (% Fat, FMM, BM, BMI and leg skin folds) among Turkish elite professional and amateur soccer players in competitive season.

METHODS 22 amateur and 25 professional soccer players participated in this study. BF and FFM, bioelectrical impedance technique (Tanita BC 418; Japan) was used to monitor body composition, and Harpenden skin fold calliper (Holtain, UK) was used to measure skin fold thickness. T-test was used to analyze pre and post-tests and the seasonal comparisons between groups.

RESULTS Results of BM, %Fat, FFM and leg skin folds and changes in season are shown in Table 1. Mean body mass of professionals was significantly decreased in the competitive period. Body fat changing during the season was significantly different between professionals (-0.4%) and amateurs (0.6%). Thigh skin fold thickness decreased 1 mm at the end of the season.

Table 1. Body composition values of amateur and professional soccer players and comparisons in competition period

	Weight(kg)			Percent Fat (%)			FFM(kg)			Calf(mm)			Thigh(mm)		
	pre	post	D †	pre	post	D †	pre	post	D	pre	post	D	pre	post	D
Amateurs	72.7 (6)	73.3 (5)	**0.6 ±2**	9.5 (3)	10.1 (3)	**0.6 ±2**	65.8 (5)	65.7 (5)	0.1±2	6.4 (3)	6.1 (3)	0.3±1	11(5)	10 (4)	-1 ±2
Pro	70.5 (8)	69.6 (7)	**0.9±2**	10.2 (3)	10(3)	**0.2±1**	63.2 (6)	62.6 (6)	0.4±2	8.1 (3)	8 (3)	0.1±2	12.4 (6)	11.6 (5)	-0.8±2
All Players	71.5 (7)	71.3 (7)	0.2±2	9.9 (3)	10 (39	0.1 ±2	64.3 (6)	64 (6)	0.3±2	7.3 (3)	7.1 (3)	0.2±1	12(5)	11(5)	-1 ±2

CONCLUSION Body composition is likely to change during the course of the competitive season as a result of soccer activities in amateurs and professionals. However, seasonal variation in body composition was not as much as expected, particularly in amateurs. Fat values in this study was similar to some of those in literature but was lower when compared to the other studies.

KEY WORDS Body composition, soccer, amateurs, professionals, competitive season.

O-068 Bone mineral density and body composition changes during a premier league association football season

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OBJECTIVE Body composition changes reflecting shifts in training throughout a season have been intensely studied in football players, yet little has been reported on the skeletal adaptations. It is possible that due to the bone remodelling cycle, the intense pre-season training period may have a negative impact on the players bone mineral density (BMD) during the early competitive season, before the positive gains are accrued later in the season and thereby increasing the risk of injury during this period.

METHODS The aim of this study was to assess skeletal training adaptations and seasonal changes in BMD and relate these changes in soft-tissue variables to seasonal variations in training and competition. Body composition was assessed using a dual-energy X-ray absorptiometry (DEXA) scanner (Hologic QDR series Discovery A, Bedford, Massachusetts).

RESULTS Negative BMD changes were observed only during the second more intense pre-season phase, BMD then increased during the competitive season. Percent body fat decreased during pre-season and during the competitive sea-

son, increasing only during the off-season. Fat-free soft tissue mass increased during the pre-season and was maintained during the competitive season and the off-season.

Table 1. Seasonal changes in BMD and body composition.

n	Time points	BMD changes ($g.cm^2$)	% Body fat changes	Fat-free soft tissue mass changes (kg)
4	T1 - T2	1.432 -1.423	11.50 - 11.53	70.44 - 72.09
10	T3 - T4	1.499 - 1.528b	10.74 - 9.99a	69.42 - 69.64
19	T4 - T5	1.496 - 1.487	10.33 - 11.62c	72.29 - 71.91
12	T5 - T6	1.489 - 1.471a	12.91 - 11.92c	72.73 - 73.44a
6	T1 - T3	1.486 - 1.486	12.7 - 11.25a	68.65 - 69.59
11	T1 -T4	1.448 - 1.483c	12.47 - 10.70c	71.20 - 72.87c
5	T2 - T4	1.420 - 1.464c	11.16 - 10.26	70.86 - 70.93
10	T1 - T5	1.448 - 1.477b	12.55 - 12.09	70.82 - 72.32b
2	T2 - T6	1.434 - 1.485	11.7 - 12.05	74.52 - 73.52

CONCLUSION The decrease of BMD due to intense training pre-season marked the start of bone remodelling with demineralisation. The following increase in BMD above initial values reflected the bone formation phase. It is concluded that the changes in both skeletal and soft-tissue variables reflected the seasonal variations in training and competition.

KEY WORDS Bone mineral density, football, seasonal changes, body composition.

O-069 Variations of total body water changes in football players during running

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OBJECTIVE Running is an aspect of many sport activities, which can be adversely affected by water loss of the body. Previous studies indicated that loss of water by sweating varies greatly across players who train even with the same intensity and environmental conditions. The purpose of this study was to reveal if body composition of sportsmen with similar experiences may relate to sweat loss during running in comfortable environment.

METHODS In this study total body water changes of 11 randomly selected football players were analyzed during a 20m shuttle run test (SRT). We assessed sportsmen's height, weight, body water content, body fat content, core body temperature and amount of calories burned during shuttle run test. By the end of each test body weight, body water content and temperature measurements were repeated.

RESULTS Analysis of body composition parameters showed higher values for body surface area (BSA, $1.76m^2$ vs $1.94m^2$), body mass index (BMI) and body water content (BWC) before tests in those,who lost <100ml of BWC(gr.B) in comparison with those who lost equal to or more than 100ml of BWC (gr.A, $p<0.05$). There was no significant difference for body fat percentage and core temperature parameters between groups.

CONCLUSION Higher BSA & BMI in gr.B in comparison with gr. A indicated on possibility of higher basal metabolic rate in former. Results allow to suggest, that higher basal metabolism in gr.B may require higher BWC to cool excessive sports-related heat. So, we can conclude that body composition is an important parameter in studies of body water changes in sportsmen.

KEY WORDS Body water, football player.

O-070 Physical and physiological status of champion American football players in Turkey

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OBJECTIVE Physical and physiological properties are not well documented particularly in some team sports, requesting aerobic as well as anaerobic pathways, such as American Football (AF). Besides, AF is one of the developing sports

in Turkey. The aim of this study was to determine physical and physiological parameters of champion American football players in Turkish league.

METHODS Totally 42 athletes' height, weight, body mass index (BMI: kg/m^2), body fat ratio, flexibility (by sit and reach test), vertical jumping (by jump meter), left and right hand grip strength (by hand-grip dynamometer), leg and back strength (by back grip dynamometer) and anaerobic (by 10 yard and 40 yard running test) and aerobic (by Astrand Rhyming Test) performances were evaluated.

RESULTS Training year: 2.71±2, age:22.4(year), BMI: 29.15 kg/m^2, waist/hip ratio: 0.86±0.06, body fat ratio: %18.81, flexibility: 8.06 cm, vertical jumping: 54.56cm, left and right hand grip strength: 47.72±10.27 and 44.92±9.48 N/kg, 10 yard and 40 yard running test: 1.71±0.13 and 5.02±0.77sec and aerobic power:38.01±8.22ml/kg/dk. No differences were observed between the offence and defence team in all parameters

CONCLUSION In conclusion, the specialized AF training allowed the participants to improve more of their fitness capacities compared with foreign players, and it is suggested that evaluations of fitness development should be continue systematically in order to gain success and to lower the injury risk.

KEY WORDS Aerobic, anaerobic, strength, body fat ratio, BMI, male, American footballer.

O-071 Cross-validation of non-invasive lactate threshold by bioelectrical impedance in football players

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OBJECTIVE The most accurate method of determining lactate threshold (LT) is the direct measurement of blood lactate concentration (BLC). A noninvasive method has been proposed to estimate LT, as critical power and heart rate deflection. A simple method for predicting the LT using bioelectrical impedance spectroscopy (BIS) during incremental test on a cycle ergometre was proposed by Alvarenga and Souza (2005). The aim of the present study was to estimate in cross-validation group (CVG) of football players the intensity of the LT from BIS variation (at rest and end of exercise) and to compare with LT using the BLC.

METHODS The CVG of football players(male, n=10) performed a cycle ergometre test started with initial power of 30 W and increased by 30 W every 3 minutes until 150 W (end of exercise). LT was determined as the intensity corresponding to 3.5 mm of the BLC. The BIS was measurement at rest and at end of the test from the method based on the response to the voltage step

RESULTS The mean of the LT using the invasive method was 94.27 ± 11.90 W and the LT using BIS was 95.46 ± 12.09 W. The comparison of the two methods showed r = 0.987 and SEE = 2.16 W. The LT intensity expressed in watts was not significantly different ($p>0.05$) across protocols.

DISCUSSION Recently (Stahn et al., 2006) used a non-exercise model based on bio impedance analyses for prediction of maximal oxygen. In this study, a progressive exercise model based in BIS was used for estimation LT and obtained high correlation. It was concluded that the proposed non-invasive technique could potentially be applied for prescribing an aerobic exercise.

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KEY WORDS Lactate threshold, blood lactate, bioelectrical impedance spectroscopy.

O-072 Body size and composition of Turkish National American Football League players

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OBJECTIVE American Football has been started to be played in Turkey since 1993, and has developed significantly. Despite its development, there has been limited data about American football players' attributes in Turkey. The purpose of this study was to present a profile of body size and composition of Turkish National American Football League (NAFL) players prior to the start of regular season. Forty-three members of a NAFL team were measured for height, body mass, body mass index(BMI), percent body fat(PBF), body type using bio impedance system during preseason training period of 2006-2007 football season.

METHODS For descriptive purposes, players were divided into the following groups: defensive line (DL), line backers (LB), corner back (CB), offensive line (OL), running backs (RB), wide receivers (WR), quarterbacks (QB). These data were analyzed by player position for comparison with previous studies of other countries NAFL football players. One-Way ANOVA was used for analysing the findings.

RESULTS Descriptive results of the study were presented in Table 1. Significant relationships observed were as follows (= represents not significant; > represents $P < 0.05$): Height: DL=LB=CB=OL=RB=WR=QB, weight: OL=DL>LB=RB=QB=WR=CB, mean body fat: OL=DL>LB=RB=WR=QB=CB, percent body fat: OL=DL=RB=LB=WR= CB=QB, Body Mass Index: OL>DL>LB=RB=WR=QB=CB.

Table 1. Descriptive statistics of the study. Data are means (SD).

	Defensive Line (DL)	Line Backer (LB)	Corner Back (CB)	Offensive Line (OL)	Running Backs (RB)	Receivers (WR)	Quarter Backs (QB)
N	7	13	9	7	5	9	3
HEIGHT (cm)	181.1 (5.2)	177.7 (5.4)	176.2 (6.9)	181.1 (4.7)	176.0 (8.8)	176.5 (4.1)	183.3 (2.9)
WEIGHT(kg)	105.8 (11.9)	88.3 (9.4)	72.5 (4.2)	110.5 (13.3)	82.8 (9.8)	76.4 (7.7)	80.0 (11.3)
MBF(kg)	29,3 (3,33)	21.3 (6.2)	13.1 (2.9)	32.6 (7.1)	20.3 (5.3)	15.2 (3.9)	13.7 (6.9)
PBF(%)	27,7 (2.4)	23.7 (5.1)	18.0 (3.6)	29.3 (3.4)	24.4 (4.5)	19.7 (3.1)	16.6 (5.8)
BMI.	32.2 (1.7)	28.0 (2.8)	23.4 (2.1)	33.7 (3.8)	26.7 (2.7)	24.5 (1.5)	23.9 (4.2)
AGE	25.1 (1.3)	23.7 (2.3)	22.7 (2.3)	22.3 (2.4)	22.2 (1.3)	21.1 (1.9)	24.7 (2.3)

MBF=Mean body fat, PBF.=Percent body fat, BMI=Body mass index.

DISCUSSION These data provided a basic template for body composition among various positions of Turkish football players and allow comparisons with other studies. When the results of Turkish players were compared with other players, it was seen that Turkish players were shorter and fatty than the others (Kremer et al., 2005). Size, strength, and endurance are obvious advantages for the successful player (Shields et al., 1984). Results of other studies indicate as the level of competition increases so do height, weight, and fat-free weight of the players (Williford et al., 1994). We concluded that Turkish players require strength and power training as to increase fat-free weight and strength. We concluded that Turkish players require strength training as to increase fat-free weight.

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KEY WORDS American football, body composition.

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.

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

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

Thiago Santi Maria[1] ✉, Miguel De Arruda[1], Alexandre Gomes De Almeida[2], José Mário Campeiz[3], Jefferson Eduardo Hespanhol[2], Rodrigo Alves Ramalho[2] and Cristiano Garcia Nunes[1]
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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.

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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.

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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.

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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.

14. TALENT IDENTIFICATION AND CHILD TRAINING

O-080 Role of morphological and physical factors in the evaluation of the abilities of young footbalers

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OBJECTIVE The young footballers' ability evaluation has had multitude of intents on the part of diverse authors to establish the ideal pattern for evaluation, while optimizing the resources, providing the minimum number of tests, avoiding loss of data, and giving the most accurate data to develop ideal training methods in order to enhance their performances. We try to go beyond and to realize a study in which the aspects are related morphological and physical factors with the specific skills of the football in youth categories. The aim of this work is to know what is the influence of morphological and physical characteristics in the skills' assessment. We study what abilities, tests of physical condition and morphological measurements would be the minimum ones necessary to determine the yield and we determine if the morphological factors and physical condition influence the abilities inside the soccer.

METHODS The population were 54 young football players. From Siete Picos Football Academy (age +/- 15.27 years old, height: 1.68 m.; weigh 57.67 kg) with at least three years of sport practice. We assess the different variables with those tests: Ability: Eight tests of abilities; Physical condition: yo-yo IET n2., 30 m., 10x5 m., 7 Sprints, SJ, CMJ, Abalakov; and morphology: height, weight,6 skindfolds,2 Perimeters, 5 diameters.

RESULTS Of the 8 test proposed by means of the study of the main components, they decreased to 3 explaining 78% of the variance in physical tests, the abilities at 4 explaining 70,9% of the variance. The analysis taking as dependent variables the three extracted abilities of the main components and as independent the equally extracted other components, so much physical as morphological.

CONCLUSION The results of this study induced that despite the relationships settled down by previous studies it was not possible to assess different abilities only by means of physical and morphological measurements. As a result, for the young footballers' ability evaluation we may consider the analyses of variety of aspects besides technical and physical contraints.

KEY WORDS Young, soccer, skills, evaluation.

O-081 Decision-making skill and visual search behaviour in soccer: Practical implications for training and coaching

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OBJECTIVE Coaches frequently adopt small-sided games in training sessions to improve technical, tactical and physiological capacities. Exercise-intensity in small-sided games can be manipulated by varying the number of players, field dimensions and encouragement. The aims of this paper were to: (1) examine the effect of different types (i.e., number of players) of small-sided games on information processing load and visual search behaviour, and (2) investigate the practical utility of a laboratory decision-making skill test for the testing and training of soccer players.

METHODS Participants were 65 youth soccer players (M age = 14.6 ± 0.6 yrs) with similar experience, but differing in competition level (elite, sub-elite and regional). Perceptual-cognitive skill was examined using film simulations of offensive patterns of play in soccer, movement-based response measures and an eye movement registration technique. The simulations varied in the number of players presented.

RESULTS An increase in the number of players on screen and a lower ratio offensive/defensive players led to an increase in information processing load (slower decision times and lower response accuracy scores) and more exhaustive visual search patterns (higher search rate). Significant differences in performance were observed across groups of players with similar experience but varying in playing level.

CONCLUSION Performance on a tactical test and visual scanning behaviour varied as a specific function of the unique task constraints conveyed by the number of players and the ratio of offensive/defensive players. These results demonstrate the practical value of decision-making skill tests for training of soccer players and highlight some tactical issues coaches should refer to when planning training sessions.

KEY WORDS Eye movement recording, decision-making skill test, perceptual-cognitive skill, task constraints

O-082 Assessing explosive strength in young soccer players

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OBJECTIVE Explosive strength (power) is apparently one of the factors that determine sporting achievement in actions such as kicking the ball, jumping, sprinting and dribbling (Cometti et al., 2001). Players of a high level who display superior speed, agility and strength show a greater probability of success in handling the ball when faced with rivals (Esposito et al., 2004). The aim of this study was to investigate interactions of physical condition and technical skill in young soccer players.

METHODS Fifty-six soccer players with 3 years of experience in soccer training (aged between 8-12 years) were asked to perform slalom with a ball (with the dominant and non-dominant leg), explosive force of the upper and lower body, speed and precision at which the ball was kicked (with either the dominant or non-dominant leg), and speed over 20 m were assesses by an electronic timekeeping system (0.001s), photocells, sound sensor and strength platform (Wisløff et al., 2004).

RESULTS Differences between the dominant and non-dominant leg were established in the slalom and ball-kicking tests (12.75±1.75% and 14.82±0.87% respectively; $p<.05$). The results of the group (10-12 years, n=28) were significantly better than those of the group (8-9 years, n=28) in all physical and technical variables ($p<.05$). Kicking the ball with either leg was significantly correlated with other physical variables [CMJ; $r=.70$; $p<.001$ / ABK; $r = .37$, $p<.001$ / upper limb force; $r = .60$, $p<.001$/ 20 m speed; $r = -.56$, $p<.001$].

CONCLUSION The assessments showed in physical and technical tests with regard to age groups. It appears that older players and those with more training experience influence the results. Kicking speed with either leg presents positive correlations with the jumping tests and negative correlations with speed. A positive correlation for precision is only found with the dominant leg.

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Esposito et al. (2004) *Eur J Appl Physiol* **93**, 167-174.
Wisløff et al. (2004) *Br J Sports Med* **38,** 285-288.

KEY WORDS Field tests, soccer kick, dominant leg, young players.

O-083 Relative age effect in a professional football club setting

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OBJECTIVE A relative age effect phenomenon, that is an uneven distribution of birth date favouring subjects born in the first months of a selection year, was identified in competitive association football, at both senior and youth development levels (Helsen et al. 1998; Vaeyens et al., 2005). This may be a problem for football clubs with limited access to young talented players. The aim of this investigation was to assess the extent of the relative age effect in a professional football club characterised by its heavy reliance on players developed at its own academy, and to identify bias in the development process.

METHODS The 2005-06 season was analyzed in four data sets as Athletic Club Bilbao first division squad (n = 24), Athletic Club Bilbao youth development (n = 189), Football Federation youth players (n = 4382), school level youth

players (n = 8834). Chi-square analysis was used to determine the differences between observed and expected birth dates distribution by quarter, based on data from the general population.

RESULTS Significant differences ($P < 0.001$) were observed in the birth date distribution by quarter in all four data sets compared with the expected distributions, with a clear over-representation of players born in the first and second quarters of the selection year (Table 1). The percentage of players born in the first quarter of the selection year progressively increased with competition level.

Table 1. Percentage birth date distribution by quarter (%), 1st quarter corresponding to the first three months of the selection year.

Group	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
First Division	50.0	29.2	12.5	8.3
Youth Academy	45.9	39.3	14.8	9.9
Youth Federation	29.0	26.6	23.5	20.9
Youth Scholar	27.1	27.4	22.7	23.0
General Population	24.8	26.4	24.9	23.9

CONCLUSION In conclusion, players born in the first quarter of the selection year were over-represented in the investigated professional football club setting. This bias started at the lowest level of participation, and the club's talent identification and selection process seemed to aggravate the bias.

REFERENCES

Helsen et al. (1998) *Am J Hum Biol* **10,** 791-798.
Vaeyens et al. (2005) *J Sports Sci,* **23,** 747-756.

KEY WORDS Talent identification, youth development, maturation, performance.

O-084 ACE genotype biochemical and physiological variables of different level soccer players in Egypt

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OBJECTIVE Many of us recognize that some individuals seem gifted in sporting ability. We may also have noted the association of such elite performance with past parental success, recognizing intuitively the role of inherited traits. This paper examines the role played by ACE gene and the related Physiological and Biochemical variables of different levels of soccer players.

METHODS 36 soccer players of 1st class club(n:12), 2nd class club (n:12), student of physical education (n:12) participated with the mean demographics of age (18.8 ± 0.9 yrs), height (176 ± 0.7 cm), weight (73.4 ± 5.1 kg) ACE genotype was determined using PCR for all the three groups using venous blood, with EDTA. Biochemical variables (LA., glucose, total protein) physiological variables(BMI, Fat %, FF Mass) were also assessed.

RESULTS 1st and 2nd class clubs, ACE genotype was ACEDD for both Defenders and Forwards, while Midfielders were ACEID.3rd group ACE genotype revealed ACEDD, ACEID, ACEII for Forwards, Defenders and Midfielders. LA, glucose and total protein were lower in case of Midfielders compared to Forwards and Defenders in 1st and 2nd class club. Biochemical variable decreased Physiological variable.

DISCUSSION The current findings are similar to those previously reported. Fogelholm (1994) reported daily energy intake of 2131 ± 400 kcal with a 111 ± 450 kcals energy deficit in normal weight female soccer players. Carbohydrate is the primary fuel substrate during soccer, and consequently high dietary intakes of 60-70% of total calorific intake have been recommended for footballers (Schokman et al., 1999). In the present study carbohydrate intake was significantly lower than these recommendations (53.8 ± 6.8%, $p < 0.05$), but fall within the range previously reported for female soccer players 47.8 ± 9.8 to 55.0 ± 7.5% (Clark et al., 2003; Scott et al., 2003).

CONCLUSION It is concluded that ACE genotype might be used for selection, and assigning soccer players to the positions, and that the midfielders might have a higher fitness level than the other soccer players, and depend more on aerobic capacity.

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KEY WORDS Genotype, biochemical variables, soccer.

O-085 Influence of age, maturity and body dimensions on selection of under-17 Algerian soccer players

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OBJECTIVE Selection procedures in soccer tend to favour players who are born early in the competition year (Helsen et al., 2005). Additionally, individual differences in the maturity status are associated with variations in the functional capacities of the youth and may influence their selection. Thus, in football, early maturing adolescents are likely to be selected because they present greater body size, strength and power. The purpose of the present study was to analyze the influence of age, maturity status and body dimensions on the selection criteria for the under-17 (U17) national Algerian soccer team, by comparing their parameters with those of the players of the various regional teams.

METHODS Anthropometric characteristics of 91 boys (U17) (28 elite and 63 sub-elite) were measured. Subjects were subsequently dispatched in 4 groups named quarter according to their month of birth. Their age to Peak Height Velocity (PHV) was calculated according to the equation of (Mirwald et al., 2002). Student's t test and Khi-square were used to compare characters of the two groups.

RESULTS No differences were found in age and birth-dates distribution between national and regional selections. Subjects of the national selection reached or exceeded the PHV. They were significantly more mature (1.11±0.49 year; 0.46±0.54 year; $P<0.01$), taller and heavier ($P<0.001$) and they presented significant higher lean body mass ($p<0.01$) and higher thigh circumference ($p<0.001$) than regional ones (Table 1).

Table 1. Age and anthropometric characteristics of regional and national under-17 Algerian players.

	Regional selection Mean (± SD)	National selection Mean (± SD)	p
Age (years)	16.60 (0.27)	16.59 (0.28)	-
Height (cm)	171.96 (5.42)	176.46 (6.87)	0.001
Weight (Kg)	61.45 (7.71)	69.23 (7.77)	0.001
Lean body mass (kg)	49.74 (7.22)	53.99 (7.32)	0.001
Thigh circumference (cm)	53.03 (3.59)	55.87 (3.56)	0.001

DISCUSSION Opposite to (Helsen et al., 2005), relative age had no effect on the selection process of the under-17 national Algerian team. In accordance with Malina et al. (2000) maturity status influenced the selection of young players in national team.

CONCLUSION To conclude, further longitudinal studies are needed to determine which of anthropometry, maturity status and relative age becomes determinant at each age.

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Malina et al. (2000) *J Sports Sci* **18**, 685-693.
Mirwald et al.(2002) *Med Sci Sports Exerc* **34**, 689-694.

KEY WORDS Football association, adolescence, body dimension, peak height velocity, selection.

15. KINANTHROPOMETRY (2)

O-086 A comparison of skinfold thickness measurements and dual-energy x-ray absorptiometry analysis of percent body fat in football players

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OBJECTIVE The method of Dual-Energy X-ray Absorptiometry (DEXA) is considered to be the 'gold standard' for the measurement of bone density and body composition. Skinfold thickness is a commonly used technique for assessing percent body fat, where accuracy depends on the prediction equation being specific to the population assessed. Results of skinfold measurements are occasionally interchanged with those of DEXA for convenience. The purpose of this study was to check the validity of skinfold thickness measurements by callipers as opposed to DEXA, in predicting percent body fat (%BF) in male elite English Premier League football players, and to establish a new prediction equation based upon skinfolds to estimate %BF.

METHODS Players from one Premiership football squad (N = 28; 81.94 ± 9.16 kg; 1.82 ± 0.06 m; 24.1 ± 5.4 years) %BF were assessed using DEXA, and skinfolds of triceps, subscapular, biceps, iliac crest, supraspinale, abdominal, front thigh and medial calf (Withers et al., 1998). Paired t-test and correlation coefficient were used to assess the relationship between the methods; linear regression was used to create new prediction equations.

RESULTS Values for %BF were: DEXA- 11.53 ± 1.61 % and skinfold- 11.20 ± 2.53 %. There was no difference in the players' % BF between the two methods ($P > 0.05$), which were highly correlated ($r = 0.700$; $P < 0.001$). A regression equation specific to elite male football was generated using 8 skinfolds (Equation 1), mean % BF being 11.52 ± 1.22 % ($r = 0.762$).

Equation 1: Fat % = (0.161 x triceps) – (0.033 x subscapular) – (0.005 x biceps) + 0.175 x iliac crest) – (0.123 x supraspinale) + (0.046 x abdominal) + (0.023 x front thigh) + (0.162 x medial calf) + 6.692

DISCUSSION The assessment of %BF can be estimated by skinfolds using the formula of Withers et al. (1998) The novel prediction equation increased the correlation and reduced the TEM, CV% and total absolute difference of %BF, improving accuracy in predicting %BF from skinfolds. In a future study the unexplained variants on repeated use of skinfolds shall be studied in this elite football population.

REFERENCES
Withers et al. (1998) *Journal of Applied Physiology* **85**, 238-245.

KEY WORDS Percent body fat, dual-energy X-ray absorptiometry, skinfold, football.

O-087 Relationship between isokinetic knee strength, anaerobic performance and sprint ability in players of American football

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OBJECTIVE American football has a complex composition and involves combination of factors like anaerobic performance, strength and sprinting abilities. During the game like many other field sports, players perform multiple sprints that require explosive muscular contraction which involve muscular strength and anaerobic power and capacity. The purpose of the study was to evaluate the relationship between isokinetic knee strength, anaerobic performance and sprint-ability in American football players.

METHODS A total of 28 American football players from a university team participated in this study. Isokinetic knee extension and flexion torques were determined at 60º.s-1, 150º.s-1 and 240º.s-1 (Cybex 770 Norm, USA). Wingate Anaerobic Power Test was used to determine the anaerobic performance, and sprint-ability of the players was assessed by single-sprint and repeated-sprint ability tests.

RESULTS Results indicated significant correlation between 60º.s-1 extension and peak (r=0.491) and mean (r=0.466) powers. Similarly 150º.s-1 knee extension was correlated with peak (r=0.559) and mean (r=0.522) powers.240º.s-1 knee flexion was found to be positively correlated with peak power (r=0.418) while 240º.s-1 knee extension was found to be positively correlated with peak r=0.581) and mean (r=0.502) powers.

Table 1. Peak isokinetic knee torques, anaerobic performance and sprint ability of American football players.

Variables	Means (SD)
Knee extension	
60º.s^{-1} (N/m)	134.78 (15.86)
150º.s^{-1} (N/m)	129.75 (20.88)
240º.s^{-1} (N/m)	125.28 (20.61)
Knee flexion	
60º.s^{-1} (N/m)	97.42 (14.29)
150º.s^{-1} (N/m)	94.64 (15.59)
240º.s^{-1} (N/m)	92.64 (14.57)
Peak Power (W)	825.51 (133.97)
Mean Power (W)	611.42 (74.95)
FI (%)	47.62 (10.44)
Single-Sprint time (s)	3.15 (0.36)
Best sprint time (s)	
0-10m	1.64 (0.13)
10-20m	1.35 (0.19)
0-20m	2.99 (0.32)
RSA Total Time (s)	
0-10m	21.16 (1.82)
10-20m	17.96 (2.31)
0-20m	39.12 (4.13)
Performance Decrement (%)	
0-10m	7.83 (3.94)
10-20m	11.59 (10.26)
0-20m	19.42 (14.20)

DISCUSSION Similar to previous studies (Baker et al 1999a and 1999b), the isokinetic knee strength, anaerobic power and capacity were significantly correlated

CONCLUSION As a conclusion it could be said that the isokinetic strength plays an important role in anaerobic power and capacity of American football players. However, these findings also suggested that factors other than strength might contribute to the sprint ability.

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Baker et al. (1999b) *Journal of Strength and Conditioning Research* **13,** 224-229.

KEY WORDS Isokinetic knee torque, anaerobic capacity, sprint performance, American football.

O-088 Australian football league draft camp test scores and career success

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OBJECTIVE In many professional football codes, rookie Draft Camps for aspiring players are held annually (McGee and Burkett, 2003; Pyne et al. 2005). Whether this testing process accurately identifies those players most likely to have future career success is not known. This study determined the degree of association between the test scores recorded at the Australian Football League (AFL) Draft Camp and future player success. This was defined as initially being drafted, then making their debut and lastly, by playing 40 (or more) games at AFL level. The level of association between different draft camp test scores was also assessed.

METHODS The AFL Draft Camp measures a number of player attributes. Test results for the years 1999-2003 were used and separated into anthropometric, physical, psychomotor and psychological categories. The association of these

scores with being drafted, draft rank position, number of AFL games played and AFL success (40 or more games) was then analysed.

RESULTS Only 64% of the players, who were tested, were later drafted, with 83% making an AFL debut. Only 39% have since achieved 40 or more games (1999-2001 only considered). Overall, the results produced inconsistent and limited significant associations (of small magnitude) between the AFL Draft Camp test scores and the variables of being drafted, draft rank position, games played and AFL success.

CONCLUSION A number of test scores loaded strongly together (sprints and psychomotor tests) suggesting that some test items are measuring the same ability. Some tests recorded no significant association with any of the success variables for the period studied. In conclusion, the AFL Draft Camp test scores have only a small and practically insignificant relationship with being drafted and future success.

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KEY WORDS Rookie testing, career success, Australian football, draft camp.

O-089 Chronological versus skeletal bone age in schoolboy footballers

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OBJECTIVE The ability to accurately measure and confirm skeletal age in young soccer players continues to be a challenge for professionals involved in injury prevention. We are unaware of any longitudinal studies published on biological age. The aims of this study were to determine the accuracy of chronological age compared to skeletal bone age, to establish skeletal bone age trends over a five year period and to investigate the proportion of early and late developers.

METHODS Repeated measures, longitudinal study was carried out, with volunteer schoolboys from an English Premier League Football Academy. Left wrist x-rays were taken and bone age assessed with the TW3 and FELs method. ANOVA, with pairwise follow up was carried out on the results. The number of measures was 336 for FELs and 588 for TW3 across a five year period from 2001 to 2005. The age range was 8-16yrs, all boys. Ethical approval and full consent was obtained.

RESULTS ANOVA, with pairwise follow up, showed chronological age and FELs differed significantly compared to the TW3 across all years ($p<0.05$). ANOVA between the eight age groups found significant mean differences for TW3 ($F=380$, $p<0.001$) and FELs ($F=162$, $p<0.001$). The percentage of measurements above, within and below chronological age were 57%, 28% and 15% for FELs and 31%, 32% and 37% for TW3.

CONCLUSION Mean analysis of TW3 and FELs revealed that biological age varied significantly for all age groups across the study period. The use of mean comparison has its strengths statistically but has limited utility in determining early & late developers. TW3 and FELs showed that chronological age is inaccurate to the extent that two out of three cases differ significantly by 12 months from biological age.

KEY WORDS Injury prevention, skeletal maturity, soccer.

O-090 Muscular strength and functional performances in elite and junior elite soccer players: What does preseason testing really teach us?

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OBJECTIVE Muscle strength and anaerobic power of lower extremities are neuromuscular variables that influence performance in many sports activities, including soccer. Despite frequent contradiction in the literature, it may be as-

sumed that muscle strength and balance play a key role in targeted acute muscle injuries. The purpose of the present study was to provide and compare preseason muscular strength and power profiles in professional and junior elite soccer players throughout the developmental years 15-21.

METHODS 57 elite and junior elite male soccer players were assigned to 3 groups: PRO, n=19; U-21, n=20 and U-17, n=18. Players benefited from knee flexors and extensors isokinetic testing consisting in concentric and eccentric exercises. A context of lingering muscle disorder was defined using statistically selected cutoffs . Functional performances were evaluated throughout squat jump and 10m sprint.

RESULTS PRO ran faster and jumped higher than the U-17 ($p<0.05$). Fl and Q absolute PT are shown in Table 1. Individual isokinetic profile permitted the identification of 32/57 (56%) subjects presenting lower limbs muscular imbalance. 36/57 players were identified as having sustained a lower limbs previous major injury. Of these 36 players, 23 still showed significant muscular imbalance (64%).

Table 1. Quadriceps and hamstring peak torques (means ± SD, in Nm) for all modes of contraction and angular velocities in professional (PRO, n=19), U-21 (n=20) and U-17 (n=18) soccer players.

	Quadriceps		**Hamstrings**		**Hamstrings**	
	C 60°.s^{-1}	C 240°.s^{-1}	C 60°.s^{-1}	C 240°.s^{-1}	E 30°.s^{-1}	E 120°.s^{-1}
PRO	224.2^{a} (38.8)	136.9^{a} (18.7)	136.8 (34.1)	100.8 (12.3)	200.1 (52.4)	197.6 (44.2)
U-21	231.7^{a,b} (30.4)	133.3^{a,b} (17.6)	147.1 (23.4)	102.2 (10.8)	194.2 (44.5)	196.8 (39.8)
U-17	194.7 (23.6)	120.3^{a} (15.8)	128.1 (18.8)	92.4 (15.3)	174.6 (36.7)	171.2 (41.6)

C=concentric; E=eccentric. a,b Values represent significant differences ($P < .05$) between modalities of assessment for PRO, U-21,or U-17 groups.

DISCUSSION New trends in rational training could focus more on the imbalance risk and implement antagonist strengthening aimed at injury prevention. Such an intervention would not only benefit athletes recovering from injury, but also uninjured players. An interdisciplinary approach involving the trainers, physical coach, and medical staff is important to consider in implementing a prevention program.

KEY WORDS Muscular strength, vertical jump, sprint, imbalance, injury prevention.

O-091 Physical characteristics and performances of Turkish American football players

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OBJECTIVE American football has been one of the most popular sports in North America within the past century and has recently received support and increased participation in Europe, as has been the case in Türkiye. Despite its development, there has been limited data about American football players attributes in Türkiye. The purpose of this study was to analyse the performance and physiological characteristics of a Turkish American football team, and to determine if body weight (BW), mean body fat (MBF), percent body fat (PBF), body mass index (BMI), flexibility, and playing experience(PE) were correlated with changes in performance in the following events: strength, power, speed, agility, and quickness.

METHODS Fifty-tree men American football players participated in the study. Body composition was evaluated by BIA. Strength was evaluated by max. rep. bench pres (BP) with 65kg. Speed and power were evaluated by 10(10m), 30-meter sprints(30m), vertical jump(VJ), broad jump(BJ) and phosphate recovery test(PR).Agility and quickness were evaluated short shuttle run(9.12m) and 3 Cone Drill tests(3c).

RESULTS Pearson product correlations were presented in Table 1. Increases in age were positively correlated with performance in BP and 9.12m. Increases in BF, MBF, PBF and BMI were positively correlated with increases in BP and PR performance, but negatively correlated with BJ, 10m and 30m performance. Increases in playing experience were positively correlated with performance BP and 9.12m (Table 1).

DISCUSSION These data provide a basic template for the performance characteristics of Turkish American football players and allow comparisons with other studies. Physical and performance properties of Turkish players has been determined as low, although, we have observed harmonious results to literature. Our results can be interpreted as performance of Turkish players will improve as long as training duration and PE are increased (due to correlation between age, P.E. and performance tests).

Table 1. Pearson product correlations.

	Age	Height	Weight	MBF	PBF	BMI	FLEX	PE
Bench pres	.47**	.13	.38**	.30*	.24	.38**	-.06	.48**
Vertical jump	-.07	.14	-.16	-.22	-.27	-.24	-.04	.09
Broad jump	.14	.10	-.31*	-.38**	-.37**	-.39**	.00	.34*
10 m sprint	.19	-.06	.40**	.43**	.39**	.48**	.01	-.03
30 m sprint	-.09	-.04	.45**	.47**	.45**	.52**	-.04	-.26
4.57 m shuttle run (right)	-.31*	.02	.08	.14	.14	.09	.09	-.28*
4.57 m shuttle run (left)	-.33*	.00	.13	.20	.22	.16	.06	-.29*
3 cone drill	-.05	.00	.02	.09	.08	.01	-.05	.10
Phosphate recovery	-.09	.09	.61**	.68**	.66**	.65**	-.08	-.15

MBF= mean body fat, PBF= Percent body fat, BMI= Body mass index, FLEX=Flexibility, PE=Playing experience, ** Correlation is significant at the 0,01 level, * Correlation is significant at the 0,05 level.

KEY WORDS American football, body composition, playing experience, performance characteristics.

O-092 Physical match performance and yo-yo IR2 test results of successful and unsuccessful football teams in the Danish premier league

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OBJECTIVE Recent studies have shown that intermittent exercise performance in tests (Yo-Yo IR1 and IR2) and during games is related to the level of competition (Mohr et al., 2003; Krustrup et al., 2006), e.g. Yo-Yo IR2 performance was higher for Danish Premier League than Second Division players (2). However, it is still unknown whether Yo-Yo results and match activities differ between top, middle and bottom teams in the same league. The aim of the present study was to investigate possible differences in match performance and Yo-Yo IR2 test performance between successful and unsuccessful teams in the Danish Premier League.

METHODS Players from top teams (TT, n=13), middle teams (MT, n=13) and bottom teams (BT, n=13) were video filmed during matches in the Danish Premier League for computerized time-motion analyses. The players were chosen with respect to playing position. Furthermore, 20 players from TT, 22 players from MT and 20 players from BT performed a Yo-Yo IR2 test. Differences were evaluated by one-way ANOVA tests.

RESULTS Yo-Yo IR2 results were 12% and 28% better ($p<0.01$) for players in TT than MT and BT, respectively, and 14% better ($p<0.05$) in MT than BT. In the most intense 5-min period, TT and MT sprinted 42-46% more ($p<0.01$) and ran 31-38% longer ($p<0.05$) at high intensity (≥15 km/h) than BT. Over 90 min, TT and MT sprinted 25-33% longer ($p<0.01$) than BT. Total distance covered was not different between groups.

CONCLUSION Successful teams performed better in the Yo-Yo IR2 test than unsuccessful teams in the same league. Moreover, players in successful teams perform more high speed running and sprinting in the most intense periods and more sprinting over 90 min. In line with previous studies (1,2), these findings suggest that the ability to perform intense intermittent exercise is an important component in elite football.

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Mohr et al. (2003) *J Sports Sci* **21,** 519-528.
Krustrup et al. (2006) *Med Sci Sports Exerc* **38**, 357-368.

KEY WORDS Yo-Yo intermittent recovery test, intermittent exercise, sprinting, level of competition.

16. FOOTBALL ACADEMIES

O-093 Analysis of fitness and skill profiles by category and position: A case study of Spanish regional academy

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OBJECTIVE It is a well known fact that in the professional football, the position in the field determines certain physiological profiles of the football players (Reilly et al., 2000) as well as effecting young players present somatotypes of successful professional players (Peña Reyes et al., 1994). In order to avoid premature specialization of the football players, they have to be provided with experiences in several positions. This study aimed at determining if significant differences existed in physical levels and skills in players of different categories of football base in a football school that competes at the regional level.

METHODS The population were 54 young football players. From Siete Picos Football Academy (age +/- 15.27 years old, height: 1.68 m.; weigh 57.67 kg) with at least three years of sport practice. We assess the different variables with those tests: Ability: Tests of Skill: 8 Tests of specific skills of football; Physical condition: yo-yo IET n2., 30 m., 10x5 m., 7 Sprints, SJ, CMJ, Abalakov; and morphology: height, weight,6 skindfolds,2 Perimeters, 5 diameters.

RESULTS Having reduced all the tests proposed by means of principal components, there were related the most significant tests of physical condition and skill to the different categories (U18, U16 and U14) and positions on the field, we find only differences for categories in the diameter biepicondilar of the humerus (p=0,013) and for positions in the abalakov (p=0,024).

DISCUSSION The results of this study was in line with the previous findings of the literature as there was no significant difference among the three groups, except for the diameter biepicondilar from the humerus and for positions in the abalakov. This case study derived that, the conventional training system in football does not allow the football players to develop in various skills and physical capacities

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KEY WORDS Youth soccer, physical condition, skills, evaluation.

O-094 Youth development structure, working practices, and philosophies of top-level football clubs: A pan European perspective

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OBJECTIVE Professional clubs are investing in youth development. Developing young players may reap both sporting and financial rewards. Specifically, football clubs must reduce the risks of investment in youth training and development. This study was part of a research project that explored the youth development working practices of elite level professional football clubs from a Pan European perspective. Moreover, this study identified and explored the organisational structure, working practices, and philosophies regarding the development of young players.

METHODS Face-to-face semi-structured interviews were conducted with the Head of Youth Development within top-level clubs (n=19) across countries in Europe (n=4). Interviews were transcribed verbatim and analysed utilising the principles of content analysis. Interviews were supplemented with additional information sourced directly from club administrators and club web sites.

RESULTS Different macro organizational structures were evidenced. Many clubs have the same staff, but there appears to be a differentiation of the operationalisation of each role within different clubs. The main objective is to produce players for the 1st team however, in Sweden, the clubs presented also a more national orientation. The communication between the 1st team and the youth team staff proved difficult.

DISCUSSION Young players would benefit from a structured and coherent development approach with elements of socio-psychological support (Richardson et al., 2004), however the findings of this study showed difficulty in the communication between the 1st team and the youth team staff that may hinder a successful transition of the young players (Wylleman et al., 2004). Such communication difficulties were an element of staff dissatisfaction.

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Wylleman et al. (2004) *Psychology of Sport and Exercise* **5**, 7-20.

KEY WORDS Youth development, football, organizational structure.

O-095 Turning pro: The case for meaningful competitive football

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OBJECTIVE July 2004 witnessed the beginnings of UEFA's campaign to create (what they term) 'a level playing field' within their respective competitions (e.g., Champions League, UEFA Cup) by implementing a European wide policy on the utilisation of homegrown players. UEFA envisage that these directives to establish a better competitive balance should be adopted by its member associations at a domestic level. This paper offers a brief synopsis of UEFA's proposals and outlines the existing and subsequent challenges facing young players in their pursuit of first team football. The paper provides some contextualisation of the potential impact of UEFA's directives on the development of young English players, before proposing key issues for consideration for both football administrators and coaches.

METHODS Two 'young' professional football players from two top level English football clubs were engaged in a series of in-depth informal interviews (Dale, 1996) over a protracted period of 6 months following their transition from the youth academy to the professional environment. The experiences of player A and player B are presented in a series of creative non-fiction vignettes.

RESULTS The transition of an academy player to a young professional can be a complex and dysfunctional experience. Player A's experience was bereft of internal and/or external support and guidance. Player B's experienced an apparently more strategic and purposeful loan experience aided by more inclusive support from associated practitioners within the donor club. Specifically, Ryan experienced meaningful competitive football.

DISCUSSION The post-academy experience introduced new barriers to a young player's progression into the first team. Players experienced a heightened level of professionalism and performance expectation but lack of 'meaningful' competitive football. A more strategic and informed approach to this critical phase of transition may enhance the readiness of players for the next phase of their career.

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KEY WORDS Youth, professional, football, transition.

O-096 Barriers to progression in elite level English football academies: A player perspective

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OBJECTIVE The introduction of The Football Association Technical Department's 'Charter for Quality' in 1997 provided formal managerial structures for professional football clubs to adhere to with regards to developing talented players. The Charter aimed to maximise participation and to increase the quality of players at all levels, hence sustaining participation and improving performance. This paper offers an insight into youth players' perceptions on the role of football Academies in elite level English professional football. Moreover, it outlines the barriers to player progression that are perceived to exist in such environments. The paper also proposes some key messages for practitioners and administrators in enhancing the development and progression of young players.

METHODS A focus group methodology (Bloor, 2000) explored the perceptions of home-grown players (N=29) in four separate elite level English professional football academies. Data was analysed using content analysis (Côté et al., 1993). The authors engaged in triangulation to ensure notions of trustworthiness were adhered to (Patton, 1990).

RESULTS Analysis revealed that a football Academy was intended to develop and produce players for a club's 1st team, but a variety of contextual factors influenced the process (e.g., status of club, number of professional players). Some players viewed the acquisition of foreign players as a barrier to their progression. In this regard, opportunities to engage in higher-level football were restricted.

DISCUSSION The current findings are similar to those previously reported. Fogelholm (1994) reported daily energy intake of 2131 ± 400 kcal with a 111 ± 450 kcals energy deficit in normal weight female soccer players. Carbohydrate is the primary fuel substrate during soccer, and consequently high dietary intakes of 60-70% of total calorific intake have been recommended for footballers (Schokman et al., 1999). In the present study carbohydrate intake was significantly lower than these recommendations (53.8 ± 6.8%, $p < 0.05$), but fall within the range previously reported for female soccer players 47.8 ± 9.8 to 55.0 ± 7.5% (Clark et al., 2003; Scott et al., 2003).

CONCLUSION The global expansion of football in England has witnessed a significant increase in the acquisition of foreign-born nationals. The existence of such players appears to provide a further barrier for youth player progression in English football. Findings resonate with UEFA's concerns over the development of home-grown talent within domestic clubs in European football.

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KEY WORDS Football, academies, progression, youth.

O-097 Changes in body composition and aerobic fitness according to chronological age and maturity offset in elite junior rugby players

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OBJECTIVE Professional Rugby clubs are increasingly investing in young talent. Early maturing boys have a distinct physical advantage in a game not only reliant on skill and understanding but also size and power. There are no recent data reported on elite junior rugby players where playing position, chronological age and maturity have been taken into account. This study first aimed to provide descriptive, anthropometric and aerobic fitness data in elite young players by age, maturity and position, and second to compare differences in boys composition and aerobic fitness by controlling for decimal age and maturity offset.

METHODS 12 elite boys in season 2004-5 and 17 elite boys in 2005-6 had their body composition measured using DEXA, aerobic fitness using a discontinuous treadmill protocol. Maturity offset was also calculated (Mirwald et al., 2002). Differences in lean body mass (LBM), fat mass (FM) and VO_2peak were compared by time and playing position whilst separately controlling for decimal age and maturity offset.

RESULTS VO_2peak was stable across time for both forwards and backs although backs had significantly higher aerobic power than forwards even after controlling for decimal age of maturity offset. Forwards carried significantly more LBM than backs although increases were similar between time 1 and 2. Differences in LBM disappeared when controlling for maturity but nor for decimal age.

DISCUSSION Forwards had greater LBM and FM whereas backs had similar levels of LBM. Backs had significantly greater aerobic fitness than forwards. Forwards had greater amounts of LBM and FM than backs although the differences in LBM disappeared after controlling for maturity offset. It was suggested that most differences in LBM were a result of more advanced maturity in forwards.

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Table 1. Descriptive Data (±SE) for Forwards and Backs in the 2004-5 and 2005-6 Seasons

	Forwards		Backs	
Season	2004-5	2005-6	2004-5	2005-6
Decimal age (yrs)	13.18 (.11)	14.0 (.09)	13.2 (.11)	14.0 (.11)
Maturity offset (± years PHV)	.11 (.24)	.90 (.19)	-.23 (.24)	.67 (.22)
Stature (cm)	168.4 (3.3)	174.4 (2.6)	164.8 (3.3)	171.1 (3.1)
Mass (Kg)	66.3 (2.9)	72.4 (2.4)	52.1 (3.2)	59.0 (2.9)
Lean Body mass (Kg)	45.28 (2.13)	54.52 (1.78)	41.25 (2.30)	50.73 (2.13)
Fat Mass (Kg)	16.16 (2.25)	16.96 (1.86)	5.56 (2.48)	6.79 (2.04)
VO2peak (ml·O2·kg·min-1)	50.4 (2.0)	50.5 (1.7)	61.0 (2.2)	61.5 (2.0)

KEY WORDS Rugby union, elite juniors, maturity offset, decimal age, positions, lean body mass, fat mass, aerobic fitness, longitudinal.

O-098 A cross-cultural comparison of the participation histories of English and French elite youth soccer players

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OBJECTIVE The amount and type of soccer activity that young players participate in predicts their later performance levels (Ward et al., 2004). This participation may be dependent on the country or culture that they live in. The objective is to compare the participation histories of elite youth English soccer players to those living at the Clairefontaine Academy in Paris, France.

METHODS Elite U14 youth soccer players selected at randomly from the Clairefontaine Academy (n = 23) and an English Premier League Youth Academy (n = 16) completed a retrospective questionnaire recording the amount of time spent between the ages of 6 and 14 years in different types of soccer-specific activities. To explore for differences in these variables a 2 group (French, English) x 9 ages (6-14 years) x 5 activities (Match play, Coach-led practice, Individual practice, Play, Indirect involvement) mixed ANOVA with repeated measures on the last two factors was conducted.

RESULTS Clairefontaine players spent more hours per week compared to English players in peer-led play at U7 to U10 age groups (Figure 1), in coach-led practice at U13 and U14 age groups (Table 1), and in total playing time at U8. English players spent more time in peer-led play compared to Clairefontaine players at the U14 age group only.

Table 1. Mean (SD) hours per week spent in coach-led practice as a function of age group.

Age group	U6	U7	U8	U9	U10	U11	U12	U13*	U14*
English	0.33 (0.71)	0.73 (0.79)	1.50 (0.88)	1.88 (1.00)	1.90 (1.17)	2.66 (1.69)	3.50 (2.02)	4.72 (1.40)	4.74 (0.76)
Clairefontaine	1.09 (0.65)	1.35 (0.82)	1.98 (1.35)	2.38 (1.73)	2.86 (1.79)	3.70 (2.42)	6.05 (2.80)	8.25 (3.37)	9.62 (2.91)

* denotes significant difference.

DISCUSSION Clairefontaine players engaged in more peer-led play early in their participation histories, but more coach-led practice later at U13 and U14 compared to their English counterparts. Early exposure to a discovery learning environment, which peer-led play may provide, is advocated in the skill acquisition literature

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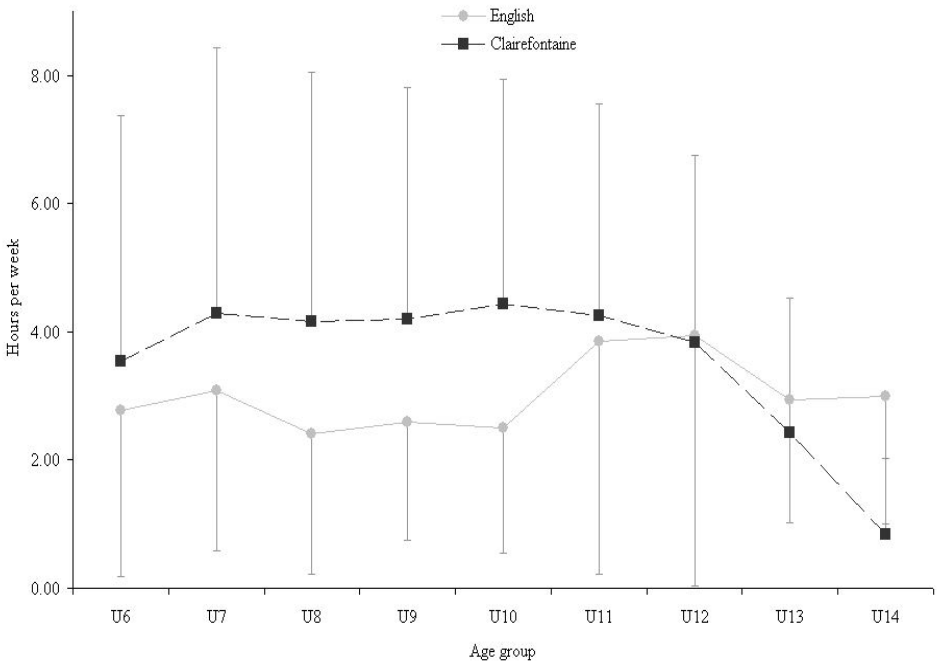

Figure 1. Hours spent per week in the age groups.

KEY WORDS Expertise, practice, play, soccer.

17. MONITORING TRAINING

O-099 Monitoring training loads in top-level professional rugby league

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OBJECTIVE There is limited research that describes periodisation models for football. Recent studies have shown the session-RPE method (Foster et al., 2001) to be a valid tool for quantifying training load (TL) (Foster et al., 2001; Impellizzerri et al , 2004). There have been no studies that have described the training loads undertaken by top level professional rugby league players. The objective of this study was to measure and describe the training periodisation of a top level rugby league club during a season.

METHODS Thirty eight professional players from the same club reported RPE (CR-10) within 30 minutes of finishing each training session. The TL, monotony and strain were determined using previously described methods (Foster et al., 2001). Data was collected for each session during the distinct training phases of the season. ANOVA was used to determine any changes in TL during each of the training phases.

RESULTS There were significant differences in the mean weekly TL and strain between the various phases of the season. The mean weekly TL's and strain were greater in the preparation than the competition phases (P<0.01). The match loads during the competition phase did not significantly change. Table 1 shows periodisation of TL's for the various training activities during the training phases.

Table 1. Training loads for the various training activities during the different phases of the season.

	General	Specific	Match Practice	Competition
Conditioning	1452 (214$^{\#\dagger\ddagger}$)	1036 (354*†‡)	699 (188*)	380 (342$^{*\#)}$
Strength	519 (263)	815 (302†‡)	494 (127$^{\#}$)	379 (136$^{\#}$)
Skills	453 (101$^{\#\dagger}$)	790 (192*)	698 (120*)	613 (209)
Other	201 (161$^{\#}$)	489 (89*‡)	348 (172‡)	150 (89$^{\#\dagger}$)
Match			371 (70)	479 (110)

* Sig. diff. to General; $^{\#}$ Sig. diff. to Specific; †Sig. diff. to Match Practice; ‡ Sig. diff. to Competition

DISCUSSION In this study TL's were greater than those reported for semi-professional rugby league (Coutts et al., 2003) but less than high level endurance athletes (Foster et al., 1997). The present data showed that TL's were reduced during the competition phase to promote recovery between each match. These results show a periodised training structure in top level rugby league and support the use of session-RPE for monitoring TL's in football.

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KEY WORDS Periodisation, training load, rugby league, session-RPE

O-100 Physical loading, stress and recovery in a youth soccer tournament

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OBJECTIVE Different variations in the heart rate beat provide important information which can be used for monitoring physiological loading and stress-recovery process. Heart rate and rate variability (HRV) have been used to asses training effect indirectly by using EPOC prediction method (Rusko et al. 2003). HRV indices are field-capable variables to reflect stress-recovery processes (Hynynen et al. 2006). The purpose of the research was to study physical loading of young international level Finnish soccer players (n=10, age 16.9 + 0.2 yrs) in training and match conditions and stress-recovery state between training and match days during a competitive soccer tournament based on the heart rate variability measurements.

METHODS $MaxVO_2$, MaxHR, AerT and AnT were determined (Nummela, 2004). Players used Suunto t6 wristop computers in training sessions and 3 matches collecting RR-interval data during 6 days for EPOC and for nocturnal RRI-data collection. ACN system modulation was analyzed with HRV indices by using Firstbeat PRO software (Kettunen & Saalasti 2002). The players self-rated their perceived exertion and recovery.

RESULTS Mean $MaxVO_2$ was 53.5 ml/kg/min, MaxHR 198 bpm, AerT 38.0 ml/kg/min and AnT 46.3 ml/kg/min. EPOC values were in light and heavy training sessions18 and 72 ml/kg ($p<0.001$), respectively. EPOC values in matches were 213, 150 and 136 ml/kg ($p<0.01$). Average NHR after each match were 53, 50 and 51 bpm (ns). NHRV stress index was 0.061, 0.053 and 0.064 (ns), and recovery index 98, 103 and 98 (ns).

DISCUSSION The results indicated that maximal oxygen uptake had significant relationship to the perceived exertion in training sessions and matches and the loading of the whole tournament. According to the HRV stress and recovery indices the stress level was at highest after the first and last match. In conclusion, the HRV measurements analysed by the Firstbeat PRO software can be applied to soccer.

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KEY WORDS Soccer, physical loading, stress, recovery.

O-101 Physical features of American football players in post and pre-season period

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OBJECTIVE American football is a sport that demands high body contact at all levels of the game. Therefore an American football player needs a variety of physical components which are muscular strength, endurance and power. The purpose of this study was to compare the physical condition, in terms the muscular strength, endurance and power, of American football players in post and pre-season period.

METHODS There were eleven American football players in this study. Their mean age, height, mass, and BMD were 21.6 (2.3) years, 1.81 (0.01) m, 89.4 (16.6) kg, 1.303 (0.2) gr/cm2, respectively. Leg strength data were recorded with the isokinetic dynamometer. Lateral trunk flexions, core and back endurances, and vertical jumps were used to analyze the efficiency of the off season period activity of players.

RESULTS Current study findings (Table 1) demonstrated that there were only significant differences between post and pre-season period in lateral trunk flexion and vertical jump performances ($p<0.05$). In addition, the leg strength measures did not show any statistically significant differences between two periods ($p<0.05$),

Table 1. Comparison of physical conditioning parameters of American football players in post and pre-season (SE) period.

	Extension @60º/s. (%)		**Flexion @60º/s (%)**		**Trunk Ext. (cm)**	**Lateral trunk flex. (cm)**		**Endurance (sec)**		**VJ (cm)**	**FJ (cm)**
	Means (SD)					Means (SD)		Means (SD)		Means (SD)	
	D	N	D	N		R	L	Core	Back		
Pre-SE	258.4	259.6	132.9	123.6	19.4	25.9	26.3 *	222.9	157.9	.28 *	.42 *
	(46.3)	(47.2)	(26.1)	(20.9)	(4.5)	(3.6)	(6.0)	(54.1)	(62.3)	(.02)	(.05)
Post-SE	247.1	243.6	128.2	123.5	17.5	23.5	22.8	240	122.9	.20	.38
	(43.6)	(43.7)	(23.5)	(23.7)	(2.1)	(4.1)	(3.9)	(0.0)	(54.1)	(.07)	(.05)

* $p<0.05$

DISCUSSION Findings supported that there should be well-designed off season training program to compensate the physiological demands of the beginning of the season.

KEY WORDS American football, physical condition, muscular strength.

O-102 Changes in aerobic fitness in response to a season of professional Australian Rules Football

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OBJECTIVE Australian Rules football (ARF) players have been reported to cover 12.5 ± 1.7 km in a game 1. This suggests that it may be important to improve aerobic fitness to optimise performance. Indeed, enhanced aerobic endurance in soccer players has been reported to improve performance by increasing the distance covered and increasing the number of sprints and involvements with the ball during a match 2. While it is relatively easy to improve aerobic fitness during the pre-season, it is not known whether ARF players are able to maintain, or improve, their aerobic fitness during the competition season. The objective of this study was therefore to examine changes in aerobic fitness in elite ARF players during an entire season.

METHODS Eighteen senior members of a professional ARF club were tested at 3 different time points throughout the season (beginning of pre-season, end of pre-season, end of competitive season). Testing included an incremental treadmill test for the determination of VO_2max, the lactate threshold (increase in lactate > 1 mmol/L) and running economy at 10 km/h.

RESULTS During the pre-season period, there was a significant increase in the lactate threshold (11.2 ± 1.8 to 13.0 ± 1.1 km/h), running economy (36.8 ± 2.9 to 34.8 ± 2.6 mL/kg/min) and VO_2max (56.0 ± 4.5 to 58.4 ± 3.8 mL/kg/min). At the end of the competition season, there was no significant change in either the lactate threshold (12.4 ± 1.4 km/h; P=0.464) or running economy (34.6 ± 2.6 mL/kg/min).

DISCUSSION This is the first study to document changes in aerobic fitness of elite ARF players over a season. Consistent with previous reports for professional youth3 and adult4 soccer players, the aerobic fitness increased over the pre-season. However, despite less time allocated for fitness training as the season progressed, players were able to maintain their aerobic fitness during the competitive season.

KEY WORDS Longitudinal changes, lactate threshold, running economy, VO_2max

O-103 Effects of a hypertrophy and a maximal strength training program on speed, force and power of soccer players

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OBJECTIVE Recent studies, have shown a strong relationship between maximal half-squat strength and movement velocity (Wisloff et al, 2004) and suggested that training using heavy weights (>85% 1 RM) may be preferable for soccer players (Hoff and Helgerud, 2002). However, no study has compared this type of training with a program using lower loads commonly used for resistance training in soccer. The purpose of the present study, which had Ethical Committee approval, was to examine the outcomes of two different resistance training programs (half-squat) performed 3 times/week for 6 weeks during the pre-season period. One program was designed to promote muscle hypertrophy (H, 4 sets x 12 reps, with 70% 1RM) and the other aimed to increase maximal strength (S, 4 sets x 5 reps, with 90% 1RM).

METHODS Eighteen male soccer players were divided in two equal groups. The force-velocity characteristics [maximal force at zero pedal speed (Fo) and maximal pedal speed (Vo)] of each player were determined using short maximal sprints on a Monark cycle ergometer against different loads (Arsac et al. 1996). Maximal half squat strength and field-test performance was measured before and after training.

RESULTS Maximal squat strength increased significantly more in the S compared to the H group (9.9±1.2% and 17.3±1.9%). Lean leg volume was increased only in the H group (by 4.3±0.8%), but was unchanged in the S group. Fo was increased only in the S group. Improvement in squat strength was correlated with improvement in 10 m sprint time (r=0.67 P<0.01) and vertical jump (r=0.63 P<0.01).

Table 1. Changes in force-velocity parameters, half-squat strength and field test performance before (BT) and after training (AT).

	Half squat strength (kg)		Fo (Kg)		10m sprint time (s)		Vertical jump (cm)	
	H	S	H	S	H	S	H	S
BT	140 (10)	152 (11)	19.4 (.5)	18.8 (.8)	1.88 (.03)	1.87 (.02)	48 (1.8)	50 (1.7)
AT	154 (11) **	179 (13)**	19.9 (.5)	19.9 (1.0)*	1.86 (.03)**	1.84 (.02) **	50 (1.8)**	55 (1.8)**

* P<0.05, ** P<0.01 from before training

DISCUSSION The increase in maximal strength in the S group, without an increase in lean leg volume would imply that strength was increased due to neural adaptations. Expressing strength gain per unit lean leg volume resulted in a 3 to 5-fold greater increase in strength in the S compared to the H group. These results suggest that resistance training using high loads may be preferable for soccer training.

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KEY WORDS Force-velocity relationship, resistance training, field tests, cycle ergometer.

O-104 Effect of additional in-season aerobic high-intensity drills on physical fitness of elite football players

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OBJECTIVE Recent studies have shown that match-specific physical fitness decreases towards the end of the season for a large number of elite football players (Krustrup et al., 2003). This may be related to fewer intense training sessions during the competitive season, due to a need for recovery after matches and focus on tactical training. Although positive effects of additional high-intensity off-season drills and in-season dribbling have been observed for junior players (McMillan et al., 2005; Impellizzeri et al., 2006), it is still to be examined whether an extra 30-min per week with small-sided interval games would improve performance of soccer-related intermittent running and repeated sprint ability of elite players during the competitive period.

METHODS Sixteen elite soccer players carried out additional aerobic high intensity training once a week (0.9±0.1) for 12 weeks. Each session lasted 30 min and consisted of small-sided games, organized as interval training with 2-4 min work intervals separated by 1-2 min of rest. Several physiological tests (Yo-Yo IR2 test, incremental treadmill VO2max test, repeated 30-m sprint test) were performed before and after the intervention period.

RESULTS After the intervention period, performance of the Yo-Yo IR2 test was improved by 15% (980±42 vs. 851±35 m, n=15; P<0.001) and VO_2max was improved by 5% (62.2±1.3 vs. 59.1±0.9 ml O_2/kg/min, n=12; P<0.05). The best 30-m sprint time was unaltered after 12 wks (4.22±0.03 and 4.24±0.03 s; P=0.54), whereas fatigue time in a repeated sprint test was lowered (0.19±0.02 vs. 0.24±0.02 s, n=14; P<0.05).

DISCUSSION Additional high intensity 30-min drills performed once a week markedly improved aerobic power, anaerobic capacity and football-specific intermittent exercise performance of elite football players during the competitive season.

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KEY WORDS Intense intermittent-exercise training, VO_2max, Yo-Yo Intermittent recovery level 2 test.

18. HIGH INTENSITY TRAINING

O-105 Physiological determinants of an intermittent football-specific high-intensity test

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OBJECTIVE In Football the ability to repeat bouts of high intensity exercise over prolonged period of time is considered to be an important component of performance (Barbero Álvarez et al., 2004). Recently a match-analysis derived test (Football Intermittent Endurance Test, FIET) has been introduced to assess specific-endurance in Football (Barbero Álvarez et al., 2005). However no research has been undertaken to evaluate the physiological demands of FIET. Information in this context may result useful for testing and training in football. The aim of this study was to examine the relationship between the FIET performance (distance covered) and aerobic-fitness parameters in Football-players.

METHODS Eighteen well trained Futsal players in the Spanish Futsal League (n=18, 20.6±3.1 years, weight 71.6±8.5 kg, height 175±7.9 cm), performed the FIET and a progressive continuous test (1 km h^{-1} min^{-1}speed increment until exhaustion) on a level-treadmill (TM) in random order.

RESULTS Treadmill and FIET physiological responses are given on Table 1. Significant correlations were detected between FIET performance and TM speeds at VO_2max and Ventilatory Threshold (VT, r=0.61 and 0.60, p< 0.01, respectively).

Table 1. Physiological responses observed during the FIET test. RE=VO_2 at 8 Kmh^{-1}; **=P<0.01.

Variable	Treadmill	FIET
VO_{2max} (mL kg^{-1} min^{-1})	65.1 (6.2)	61.6 (4.6) **
RE (mL kg^{-1} min^{-1})	35.6 (3.4)	
VT (mL kg^{-1} min^{-1})	45.2 (4.6)	
Peak Blood Lactate (mmol L^{-1})	12 (2.9)	12.6 (2.3)
HR_{max} (beat min^{-1})	193 (8)	191 (7)
RER	1.15 (0.01)	1.14 (0.01)
Ventilation (L min^{-1})	162 (16)	177 (25**)

DISCUSSION The results of this study showed that FIET is an intermittent high intensity test that heavily taxes aerobic power and anaerobic capacity in futsal players. Being the physiological demands imposed to Futsal players in crucial moment of the game FIET may be considered as an endurance specific test in Futsal. Direct validity needs to be assessed with sound match analysis.

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KEY WORDS 5-a-side soccer, physiology, high-intensity exercise, intermittent exercise, field testing.

O-106 Strength training for young soccer players

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OBJECTIVE During a soccer match, the most interesting actions are represented by high intensity work, such as sprints, jumps and shots. A significant relationship has been observed between 1RM and acceleration, jump test and 30 m sprint results and a variety of training methods are used to increase strength and power, in sports demanding explosive force development (Bangsbo et al., 1988; De Proft et al., 1988; Wisløff et al., 2004; Diallo, et al., 2001). Knowledge concerning the strength training methods for young soccer players was scarcely documented to show if different methods induced diverse results. Many authors empathize the importance of strength for soccer players (Hoff, et al., 2004; Cometti, et al., 1988; Gauffin, et al., 1989), but we never find a similar training approach, any studies had showed if a different strength straining methods induced diverse results. The aim of these study was to evaluate witch are the

best strength straining methods for young soccer players and analyze the differences in 1RM, 20 m sprint, jump, after 8 weeks of training conduced in 3 different methods: GrA=incremental overloads, GrB=free weight, GrC=combined overloads and free weight.

METHODS 21 elite soccer players, selected form team Chievo Verona, mean age 17,6 ± 0,4 was randomly assigned to GrA=7 or GrB=7 otherwise in GrC=7. GrA training was based on incremental exercise by leg press, leg extension at 60-90% 1RM-12 to 4 rep. GrB training was based on 8-10 series of plyometric training, jumps and 20m sprint on steep street. GrC training was based on exercise by leg press, leg extension, jumps and 20m sprint on steep street. One way ANOVA & t-test was used to examine differences from groups and training effect.

RESULTS GrA = SJ+2% ($p>.05$), CMSJ+3% ($p>.05$), 1RM+30% ($p<.05$), 20mSprint+3% ($p<.05$).. GrB = SJ+4% ($p>.05$), CMSJ+6% ($p>.05$), 1RM+5% ($p>.05$), 20mSprint+3% ($p>.05$). GrC = SJ+18% ($p<.05$), CMSJ+13% ($p<.05$), 1RM+37% ($p<.05$), 20mSprint+3% ($p<.05$). The diverse training induced no statistical differences in 20m sprint result ($F=0.08$; $p=.949$). In SJ and CMSJ tests there was significant differences from GrC Vs GrA & GrB ($F=10.9$; $p=.001$) & ($F=4.3$; $p=.029$). In 1RM GrA and GrC saw a statistical differences to GrB ($F=5.79$; $p=.011$).

Table 1: Data is represented as mean and standard deviations after and before training

		SQUAT JUMP (cm)	COUNTER MOVE-MENT JUMP (cm)	1RM LEG PRESS (kg)	Sprint 20 m (sec)
GrA	PRE	36.3 (2.2)	37.8 (2.5)	281.5 (38.5)	3.05 (0.2)
	POST	36.9 (2.5)	38.9 (2.7)	366.4 (59.7) *	2.97 (0.2) *
GrB	PRE	37.1 (2.1)	38.6 (3.3)	296.5 (56.1)	2.64 (0.1)
	POST	38.6 (2.2)	41.1 (2.1)	312.3 (76.3)	2.56 (0.1) *
GrC	PRE	36.7 (2.2)	38.6 (2.1)	224.2 (52.6)	3.03 (0.1)
	POST	43.2 (3.4) *§	43.8 (3.8)*§	307.1 (60.5) *	2.94 (0.2) *

* = Simple Student t-test, $p<.05$ Pre Vs Post within group.
§ = One Way Anova, $p< 0.05$ and post hoc multiple comparisons Scheffe test.

DISCUSSION The results of this study suggested that a 8 weeks of combined training based on exercise by leg press, leg extension at 80% 1RM, 4-6 series of jumps and sprints on steep street, improved squat jump, counter movement squat jump, 1RM and 20m sprint tests. For young elite soccer players these training seem to be better than free weight training and incremental overload training in gym. These results are diverse from precedents studies (Hoff, et al., 2004; Hoffman, et al., 2005; Whitney, et al., 2005; Wisløff, et al., 1998) and underline that for young soccer players is better a multilateral training for improving strength. The differences among the training are probably induced by the bigger muscle recruitment on the combined training. A combination of general and specific resistance-training methods can be recommended to develop the neuromuscular factors contributing to sports skills requiring strength and power (Kotzamanidis, et al., 2005).

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KEY WORDS Combined training, strength, young soccer players.

O-107 Intensity of four types of elite soccer training sessions

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OBJECTIVE Several researchers have been studying the physiology of soccer. However, most studies have focused on official and friendly games and few have analyzed the intensity of training sessions. Specific soccer training has been used to train technical and tactical aspects of soccer. Nevertheless, these kinds of training also impose a significant workload on the cardiovascular and metabolic systems.

METHODS The participants were 10 professional players of a first division Brazilian Soccer club. Heart Rate (HR) was monitored during three of each type of training sessions: technical drills (TEC), tactical drills (TAC), modified games (MG) and practice games (PG). HRmax was determined during a field test (3x600m increasing intensity). The 4mM (Heck et al., 1985) anaerobic threshold (AT), was determined by linear interpolation. Comparisons were made using a one-way ANOVA and the differences were identified through Tukey's post-hoc. The significance level was set at $p<0.05$.

RESULTS The players had a mean HRmax of 192 ± 11 bpm and mean AT of 176 ± 10 bpm (91.7 ± 1.4 %HRmax). The TEC was significantly less intense than TAC, MG and PG (Table 1). No differences were found between TAC, RFG and FG.

Table 1. Intensity of the four types of training analyzed expressed as mean (SD).

	Technical		Tactical		Modified Game		Practice Game	
$\%HR_{max}$	71.1	(4.5)*	78.5	(4.4)	77.7	(5.5)	79.6	(3.2)
%AT	77.6	(5.1)*	85.7	(5.2)	84.8	(6.1)	86.9	(4.4)

* $P < 0.05$.

DISCUSSION This study showed that the TEC had a lower intensity when compared to the other types of training sessions. This result corroborates with the findings of Eniseler (2005). We speculated that the MG would have a higher intensity than the other types of training sessions analyzed. However, even though the field size was reduced, increasing the contact with the ball, the intensity may have been lower because the number of high intensity activities were reduced.

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KEY WORDS Soccer, anaerobic threshold, heart rate, intensity.

O-108 Improving repeated-sprint ability

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OBJECTIVE High-intensity sprints of short duration, interspersed with short recoveries, are common during most team sports 1. Therefore, the ability to recover and to reproduce a high power output in subsequent sprints is an important fitness requirement of team-sport athletes and has been termed repeated-sprint ability (RSA). However, little is known about what limits RSA and how best to improve RSA. The aim of this study was to analyze recent research that have developed methods to improve RSA..

METHODS While the recovery of 30-s sprint performance has been correlated with PCr resynthesis 3, we have not found the same relationship with the recovery of 4-s sprint performance (r=0.24). If PCr resynthesis is important for RSA, it is important to know how to improve PCr resynthesis. A cross-sectional research suggested that an elevated aerobic fitness was associated with faster PCr resynthesis.

RESULTS However, a 20% increase in aerobic fitness with training was not accompanied by an increase in PCr resynthesis rate. A decrease in muscle pH (pH) may also be an important limiting factor to the performance of repeated-sprint

exercise 5,6. The extent of the decrease in pH during muscular activity is dependent upon both the production of hydrogen ions (H+) and on muscle buffer capacity (ßm).

DISCUSSION It appears that high-intensity training is required to increase ßm. However, our research suggests that training too intensely could actually decrease ßm. While further research is required, it appears that the optimal intensity to improve ßm is approximately 100% VO2max. Furthermore, despite similar changes in aerobic fitness, training also increases ßm greater than changes in RSA.

KEY WORDS Repeated-sprint ability, phosphocreatine, muscle buffer capacity.

O-109 Ground reaction force of a drop jump on different kinds of artificial turf

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OBJECTIVE Recently third generation artificial turf has started to find acceptance in soccer. Several types of infill have been developed, aiming at minimising injury rates and enhancing performance. In the past, playing surfaces were mostly tested by means of mechanical tests. Currently biomechanical tests with actual players have become more popular because they provide better external validity (Meijer, 2006). The aim of this study was to compare the effect of different surfaces on the external forces when performing a 50cm drop from a platform immediately followed by a maximal vertical jump (Durá, 1999)(similar to jumping for a header). A testing rig that could be equipped with different surfaces was developed. Several relevant parameters were selected for statistical comparison of these surfaces.

METHODS 7 male recreational football players (shoe size EUR 44, weight 71.9±6.7kg, height 1.79±0.16m, age 26.0±1.8 years) performed 5 drop jumps on 2 artificial turf surfaces (Desso DD Challenge Pro), one with 3cm SBR rubber infill, and one with 3cm TPE infill. Force data were recorded with a Kistler force plate at 1000Hz. Statistical analysis was done with SPSS 12.0.

RESULTS From the force data, several parameters were obtained (Table 1). Most parameters showed good repeatability (ICC>.70). Nonparametric Wilcoxon tests revealed no significant differences between the surfaces for any of the parameters although there was a trend towards significantly higher maximal and average load rates in the force peak of the second impact on the TPE infill surface.

Table 1 Analysed parameters for the drop jump on artificial turf with TPE and SBR infill.

	TPE infill		**SBR infill**		**Correlation r (ICC)**		
	Mean	SD	Mean	SD	TPE infill	SBR infill	p-value
flight time [s]	0.497	(0.032)	0.499	(0.037)	0,955	0,954	**1,000**
load time 1 [s]	0.056	(0.007)	0.054	(.011)	0,858	0,798	**0,735**
load time 2 [s]	0.058	(0.010)	0.062	(.007)	**0,686**	0,733	**0,128**
contact time [s]	0.484	(0.187)	0.5	(.169)	0,992	0,990	**0,310**
max load 1 [N]	2873	(887)	2724	(628)	0,857	0,756	**0,866**
max load 2 [N]	4067	(1186)	3976	(1216)	0,771	0,903	**0,398**
max LR Fz peak 1 [N/s]	166133	(85249)	121850	(29661)	0,807	0,797	**0,237**
av LR Fz peak 1 [N/s]	59326	(25085)	54111	(15901)	0,911	0,731	**0,398**
max LR Fz peak 2 [N/s]	319203	(145676)	271608	(127299)	0,716	0,775	**0,091**
av LR Fz peak 2 [N/s]	80239	(33683)	70335	(24804)	0,734	0,859	**0,091**
active impulse Fz [Ns]	351	(20)	359	(32)	**0,636**	0,969	**0,612**

DISCUSSION The high repeatability shows that the presented experimental setup was a good alternative for material tests. Further tests with more subjects and probably also other soccer specific movements are required in order to examine whether TPE infill really leads to a higher risk for overload injuries or not.

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KEY WORDS Artificial turf, soccer, shock absorption, jump

O-110 Possibilities of evaluating complex training load influence in junior soccer players

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OBJECTIVE Soccer imposes demands on aerobic and anaerobic systems (Reilly, 1999). The assessment of player's aerobic performance could be of interest for coaches in order to evaluate and programme their training. Aerobic capacity can be developed by exercises with or without a ball. A widespread exercise with a ball is small game 3v3, 4v4 etc. (Balsom, 1998). It is important to vary training loads in youth training. According to this the aim of the study was to provide a comparative evaluation of the effect of complex training (game + running load + game) on player's aerobic capacity and establish connections between objective (HR, BLA) and subjective (PE, PRR) criteria in evaluating the effect of different loads.

METHODS The subjects were 20 male soccer players. The test consisted of an 8-min game 4vs4, an 8-min running load and game of 8-min. HR was measured with Polar sport tester (Finland). BLA samples were obtained after loads and analysed with Lactate analyser (Japan). For evaluating the PE after loads the Borg CR 10 scale was applied. PRR Scale (Karu et al., 2000) was used to obtain readiness ratings for next load.

RESULTS Mean HR values after 1st game and running were similar and on anaerobic threshold level. Whereas, mean BLA concentrations after 1st game and running, differed significantly (7.0±2.9 and 5.0±2.1mmol•l^{-1}; $p<0.05$) (Table 1). Higher BLA concentrations after 1st game and running imposed readiness for the next load ($r=-0.71$ and -0.85; $p<0.05$).

Table 1. Measures of some physical parameters for junior soccer players.

	1st small game	Running load	2nd small game
Mean HR (beats·min^{-1}) after exercise	176.6 (11.4)	177.3 (10.0)	180.0 (11.1)
Mean BLA concentration (mmol·l^{-1}) after exercise	7.0 (2.9)	5.0 (2.1)	5.4 (2.4)
Perceived exertion ratings	3.4 (1.1)	3.7 (1.6)	3.8 (1.3)
Perceived readiness ratings	4.1 (0.3)	4.2 (0.6)	3.9 (0.5)

DISCUSSION In almost the same HR the metabolic reaction to the loads differed significantly. So, to proceed only from HR metabolic shifts in organism may be underestimated. So, using complex objective (HR, BLA) and subjective (PE, PRR) markers to evaluate the loads the changes in the organism of players could be specified and the development of their aerobic endurance could be managed better.

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KEY WORDS Heart rate, blood lactate, perceived exertion, perceived readiness ratings, complex training load.

19. MANAGEMENT AND ECONOMICS

O-111 Artificial turf versus natural turf football playing fields: Risks and economics

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OBJECTIVE This paper was based on the premise that leaders and managers of professional football clubs have a tendency to chose and maintain playing surfaces depending on its cost effectiveness, and the players' personal experiences and preferences about artificial turf are ignored. However, a large scale of injuries and safety risks has been associated with artificial turf resulting in loss of key player. The purpose of this study is to do a retrospective examination of studies done about the safety risks and costs of the artificial and natural turf football playing fields, and derive implications for future research.

METHODS Retrospective examination of the relevant literature.

RESULTS It was derived from this study that there were many safety risks inherent in the artificial turf football pitches, and the claims of low maintenance costs of the artificial turf was discredited with cost concerns such as the incidences of burns caused by fans in the stadia, warranty concerns, and the health costs of the injured football players.

DISCUSSION This study examined safety risks and economic concerns associated with the artificial turf versus natural turf football pitches. Future research was needed to examine the incidence of injuries of the professional football players on artificial and natural turf pitches, their perceptions about the two types of turf, and the costs of the artificial versus natural turf in professional football clubs.

KEY WORDS Artificial turf, natural turf, risks, costs, football.

O-112 Sports manager activities in professional and non-professional Portuguese soccer organizations

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OBJECTIVE Currently, soccer implies game and business. Sports Managers (SM) should combine these two complex universes in soccer organizations (SO). It is important to know the managerial work (Danylchuk & Chelladurai, 1999) done by Chief Executive Officer in SO and the tasks and responsibilities he must do to answer future challenges, in a prospective and dynamic view of sport business (Smith & Westerbeek, 2004). This study was concerned with the SM activities in Portuguese professional and non-professional soccer organizations. The issue brought up three fundamental questions: (i) how are SO in Portugal? (ii) what is the Portuguese soccer SM profile? (iii) which is the nature of managerial activities in Portuguese SO?

METHODS An analysis model was conceived to answer fundamental questions. The sample was composed of 69 Portuguese SO to obtain information concerning 124 SM. The data was collected by documentary analysis, interviews and questionnaire. Results were analysed using Mann-Whitney, Kuskal-Wallis tests, and content analysis.

RESULTS The financial management, revenue generation and leadership was considered as the most important activities in opposition to routine activities of liaison and information seeking (Table 1). A positive association was confirmed between the importance and time taken in managerial activities. Top-level SM and intermediate-level SM responsibilities were complementary (high significant and negative association).

Table 1 Relationship between the importance and time taken in managerial activities.

Managerial Activities	Importance	Time Taken	SM top	SM intermediate	Coach
Financial Management	6,50 (0,68) (1)	5,54 (1,08) (1)	66,20 (20,68) (6)	33,47 (20,64) (13)	0,22 (0,79) (18)
Revenue Generation	6,17 (0,75) (2)	5,07 (1,00) (4)	72,27 (19,17) (2)	27,56 (19,03) (16)	0,17 (0,71) (19)
Leadership	6,11 (0,54) (3)	5,23 (0,67) (2)	25,68 (11,56) (16)	35,57 (12,78) (11)	38,61 (9,63) (1)

DISCUSSION In professional and non-professional soccer, the importance of managerial activities was considered to be similar in contrast to time taken in managerial activities. SM human capital was intangible and essential to SO competitiveness and sustainable development. This study showed that Portuguese sport managers were decisive in the sport organizations'' performance improvement, as well as in the strategies, politics and mission definition.

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KEY WORDS Sport manager; soccer organizations; soccer management; soccer manager; professional profile; knowledge management

O-113 Effects of air travel on career longevity in the Australian football league

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OBJECTIVE In the Australian Football League (AFL) there are 16 teams, 10 from one city (Melbourne, Victoria) and 6 from other State capital cities. Teams from Western Australia have to travel (by air) the greatest distances across a season to play away games. As a consequence, several clubs in Melbourne have suggested that players who travel more may have their careers shortened due to travel related cumulative fatigue, in order to entice players back to Victoria (from other states) to continue their careers. This study investigated whether players from the 6 non-Victorian clubs in the AFL have relatively shorter careers than players from Victoria, perhaps due to more regular travelling by plane.

METHODS All players who tallied 150 or more AFL games in 1987-2005 were categorized by club, and also as "non-Victorian, and Victorian players. Longevity was assessed by games played in three categories: 150-199, 200-249 and 250+ games, and tallying the number of players and average total games for each. Percentage of total player games and average games played by 150+ game players was calculated.

RESULTS For number of players with 150+ games, games played by 150+ game players and percentage of total player games played by 150+ game players, two non-Victorian clubs (West Coast and Brisbane) were ranked highest. When club results were pooled to form non-Victorian and Victorian players, .No differences were found for mean games played for 150-199, 200-249 and 250+game players.

DISCUSSION The results showed that "non-Victorian" clubs (West Coast Eagles and Brisbane Lions) were consistently ranked highest and that no differences existed between "non-Victorian" and "Victorian" players in any of the indicators of career longevity. The results of this study showed that regular travel by plane does not have a negative impact on career longevity in the AFL.

KEY WORDS Career length, air travel, Australian football.

O-114 Effect of European football loan system and duration period on football economy

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OBJECTIVES One of the major problems of the forever growing football industry is the football clubs' desire to make themselves well known and more valued with the loan they have been given. Spending more money than they can afford to, puts football clubs in a great deal of danger and this pattern they follow puts a threat on their future success. This paper's aim was to warn the European and Turkish football clubs about the dangers that can occur with those acquired loans and provide appropriate suggestions and solutions to resolve these issues.

METHOD Deductive method was used.

RESULTS Among clubs in Europe, Italy, Spain and England were the most affected countries by the European Football Loan. Clubs in Italy which has the highest level depth had experienced financial problems while trying to compete in the league. The number of fans attending football matches also decreased which result in bankruptcy for some of the soccer clubs who were not able to find the financial support they needed.

DISCUSSION The only way this problem can be solved is by having frequent and thorough inspections as implemented in France. If other countries also could develop such a system the challenge among teams would not be affected that much and huge amount of financial loans would not be given out.

KEY WORDS Football economy, television, sport, transfer fees, football clubs.

O-115 Quality of sports administrators in the 1st and 2nd league football clubs in Turkey (Ankara as sample)

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OBJECTIVES Football has become a market driven industry with the scientific and technical developments. Therefore, it is necessary to determine an effective administration strategy in football. This is only possible with the works of contemporary sports administrators doing the necessities of the time. Thus, this study can be related with on the quality of the sports administration. The aim was to evaluate the opinions of the administrators of the 1st and 2nd league football clubs on "the qualities of staff working in the field of the sports", comparatively in Ankara

METHODS The subjects were the administrators of 1st league (n: 18), and 2nd league(n: 68) football clubs in the Turkey. The instrument was a questionnaire that assessed the ideas and views related to the quality of sports administrators. The reliability coefficient has been found out as $\alpha = 96$. The arithmetic mean (X) and standard deviation (SD) values of the qualities in the every part of the questionnaire have been determined. In the detecting of the difference of opinion, the T test has been used.

Table 1; Most of the sports administrators joining the research have had positive attitudes against the qualities.

The qualities		(1) A.K		(2) K		(3) K		(4) K		(5) KK	
League		1L	2L	1L	2L	1L	2L	1L	2L	1L	2L
The use of the mother language well	n	-	-	-	-	1	--	17	14	24	17
	%					2.4		40	45	57	55
The fluency in the foreign language	N	-	-	1	--	7	1	17	11	17	19
	%			2.4		17	2.4	41	36	41	61
Having a good communication	N	-	-	-	-	--	1	17	9	25	21
	%						3.2	41	29	60	68
Following the latest research	N	-	-	-	-	2	--	23	13	17	18
	%					4.8		55	42	41	58
The knowledge of the technology	N	-	-	-	-	5	--	25	14	12	17
	%					12		60	45	29	55
Attending the congresses	N	-	-	--	1	3	--	27	11	12	19
	%				3.2	7.1		64	36	29	61
Knowing the position of the administrator in the Turkish sports	N	-	-	-	-	1	-	20	17	21	14
	%					2.4		48	55	50	45
Enjoying the matter of administration	N	--	1	-	-	-	-	18	18	24	11
	%		3.2					43	58	57	36

(1)A.K;I never agree;, (2)K;I don't agree; (3)K; Indecisive (4)K;I agree; (5)KK;I strongly agree 1.L; The first football league ; 2.L; The second football league

RESULTS Most of the sports administrators joining the research have had positive attitudes against the qualities of "General Culture" "Sports field knowledge" and "Sports management occupation knowledge" as the table stated. The rate of the necessity of knowing a language was 97% for the 2nd League Football administrators.

DISCUSSION The 1st league football club administrators all agreed with the item "The use of the mother language is well", and the 2nd league football club administrators are wholly agree that evaluate according to Likert scale the administrators are qualified in good communication. The use of the mother tongue effectively, is highly important in having a good communication with the staff.

KEY WORDS Turkcell Super League soccer, second league soccer, the qualities of sports administrators.

20. APPLIED PSYCHOLOGY

O-116 Psychological skill training for the Japanese soccer team in 2005 Universiade games in Izmir

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OBJECTIVES The final soccer match at the 23rd Universiade games in Izmir ended up with the Japanese team's dominance over Italy. The team adopted psychological support and mental training for performance enhancement. These skills were useful to contribute toward overcoming difficulties. Thus, we tried to reveal the role of psychological support and mental training for the Japanese soccer team in this study.

METHODS Relaxation programs such as progressive muscle relaxation, breath control method and meditation with relaxation music were operated by a mental coach. What is more psyching-up programs, morning exercise sessions, and logbook inscriptions were also practiced as parts of the mental training program. Psychological competitive ability of 20 Japanese university soccer players were examined by original questionnaire and DIPCA 3(Diagnostic Inventory Psychological Competitive Ability test which is authorized by Japanese Society of Sport Psychology).

RESULTS According to the data obtained from the original questionnaire and interview, these psychological trainings were effective for team building process. DICPA.3. evaluations revealed high psychological competitive ability with pre-test 186pts on March 2005, to post-test 192pts on August 2005.

CONCLUSION The team made great improvement in emotional stability (patience), self confidence, anticipation, and cooperative attitude through the training camps and tournament. It is suggested that the psychological supports from the mental coach such as mental training skills facilitate to enhance team relationship and team performance.

KEY WORDS: Mental training, soccer, team building.

O-117 Adaptation of self and other versions of the revised power in soccer questionnaire (RPSQ) for Turkish culture

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OBJECTIVES Leadership power has frequently been studied within a theoretical framework known as the basis of social power (French et al., 1959). Wann et al. (2000) pioneered using French and Raven's five interpersonal powers construct in sports and developed the Power in Sport Questionnaires (PSQ-O and PSQ-S). This study aimed at exploration of validity and reliability of the revised versions of PSQ-O and PSQ-S for the Turkish culture related to soccer (RPSQ-O and RPSQ-S).

METHODS PSQ forms were revised and the data was collected from soccer coaches (n=165) and soccer players (n=870) for this second study. Analysis of the Turkish revised forms (RPSQ-O and RPSQ-S) involved confirmatory factor analyses related to the hypothesized, two-factor, three-factor and five-factor (Wann et al., 2000) models.

RESULTS Confirmatory factor analyses of the RPSQ forms revealed that two, three and five-factor models were not fit with the Turkish soccer players (Table 1).

DISCUSSION The analyses described above suggest that both forms of the RPSQ with the two, the three and the five-factor models were not confirmed in soccer related to Turkish culture. It seems that, cultural differences exist to some extent and thus, item eliminations, additional new items and models may be needed for the Turkish RPSQ-O and RPSQ-S forms.

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Table 1. Results of CFA of the Turkish RPSQ-O and RPSQ-S

RPSQ-O RESULTS (SOCCER PLAYERS FORM)									
Models	X2	df	X2/df	RMSEA	RMR	GFI	AGFI	CFI	P
5-Factor	856.10	80	10.70	0.11	0.08	0.88	0.83	0.91	0.0
3-Factor	1121.30	87	12.88	0.13	0.08	0.84	0.77	0.81	0.0
2-Factor	1293.21	89	14.53	0.12	0.08	0.83	0.78	0.87	0.0
RPSQ-S RESULTS (SOCCER COACHES FORM)									
Model	X2	df	X2/df	RMSEA	RMR	GFI	AGFI	CFI	P
5-Factor	316.25	80	3.95	0.13	0.12	0.80	0.69	0.84	0.00
3-Factor	491.13	87	5.64	0.17	0.13	0.71	0.61	0.75	0.00
2-Factor	589.91	89	6.62	0.19	0.15	0.68	0.56	0.69	0.00

KEY WORDS Interpersonal power, power in soccer questionnaire-revised, cultural differences, adaptation, Turkish culture.

O-118 Identifying the relationship between behaviour patterns (Type A - Type B) and discipline points of soccer players

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OBJECTIVES: The success of athletes can be closely related to their personal characteristics. This becomes even more important in team sports since positive or negative behaviours of a player would affect the performance and destiny of the team as a whole. As is well-known, football players can be booked or sent off as a result of misconduct in a match. Referees who control the game use yellow or red card according to the circumstances. They have been trained to evaluate the positions according to the regulations. In this respect, the purpose of this research was to analyze the relationship between the behavioural patterns and misconducts in the field.

METHODS: We tried to determine the personal characteristics of Turkcell Superleague players (A type or B type or in-between). In order to determine type A and type B characteristics, we used the "A/B lifestyle scale" developed by Charlesworth et el.1985 Questionnaires were sent to all clubs in Turkcell Super League 2005, however, the level of respond wasn't satisfactory. 41 questionnaires were replied. After the collection of questionnaires, card statistics between 2004-2006 were taken from "FSTATS" which is the best sport statistics company in Turkey. Data was evaluated with correlation analysis. 2 points were given for yellow cards and 5 points were given for red cards during the calculation of discipline points. Average discipline point of a player has been calculated by dividing total discipline points by the total of the games played.

RESULTS: According to the correlation analysis there is a relationship between behaviour type and discipline points. (r=.31 p<. 05) Type A players were booked and/or sent off more frequently than Type B players.

DISCUSSION: Coaches should be aware of the players behaviour types and manage them according to these facts. All clubs should conduct some tests to evaluate the mental conditions in addition to physical tests. Personal characteristics and mental condition of the players are important as much as physical conditions in modern football.

KEY WORDS: Type A & B Behaviour Pattern, Football Psychology, Organizational Behaviour

O-119 Participation motives of 9-15 years old Turkish soccer players

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OBJECTIVES Understanding the motives for youth sport participation has become an important issue for sport practitioners and researchers in the last decade. This research area has engaged the interest of researchers because the accu-

mulation of knowledge through these efforts will enable youth sport leaders and coaches to design sports program and athletic experiences for participants. The aim of this study was to determine participation motives of 9-15 years old soccer players in Turkey.

METHODS The "Participation Motivation Questionnaire" (PMQ) was administrated to 304 (Mage=12.18 ± 1.18) male soccer players from private and public summer sports school in Ankara. PMQ consists of a list of 30 possible reasons for participating in sports and includes 8 subscales- energy/fitness, achievement/status, team affiliation, friendship, fun, competition, skill development, and movement. Descriptive statistics and t-test were used to analyze the data.

RESULTS Soccer player rated improvement skill as the first in importance according to mean importance ratings. 21.4% of the soccer players rated the team spirit" as the most important participation motive. There was a significant difference in friendship subscale of PMQ between 1-4 years experienced players and 5 or more years experienced players ($t= -2.49$, $p< 0.05$) but no significant difference in subscales of the PMQ.

Table 1. The five highest mean importance rating of soccer players.

PMQ items	M	(SD)
I want to improve my skills	1.04	(0.21)
I like the team work	1.12	(0.37)
I like being on a team	1.12	(0.39)
I want to go to higher levels	1.13	(0.38)
I want to be physically fit	1.14	(0.37)

DISCUSSION Analysis indicated significant differences in friendship subscale of PMQ between less and more experienced soccer players. Soccer players rated "improving skills" as the most important reason for their sport participation. This finding is parallel to studies (Gould et al., 1985; Klint et al, 1987; Oyar et al, 2001) reported skill development as one of the most important reasons for the athletes.

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KEY WORDS: Motivation, summer school participants, sport experience.

O-120 Player position and mental rotation times in Turkish soccer players

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OBJECTIVES The ability to react to sensory impulses is a fundamental physiological process for athletes (Montes-Mico et al., 2000). Especially in soccer, players often require a fast reaction to stimuli, as instantaneous judgment influences their success and game results. Moreover, soccer players react quickly mainly to visual stimuli such as movement of the ball and movement of the other players. In soccer, for various areas in the game, players with different physical and physiological features are required. The purpose of this study was to determine the affects of player position on mental rotation (MR) times in male soccer players.

METHODS Thirty six 17.00±1.00 aged male soccer players, who are playing in regional youth league in Ankara participated in the study. For descriptive purposes, players were divided into the following groups: defence, midfield, and forward. Measurement of mental rotation times were done via computer supported Finger Tapping test tool (Kiziltan et al. 2006).One-Way ANOVA was used to analyse the data.

RESULTS According to the positions of the players (defence, midfield and forward), significant relationships ($P < 0,05$) are determined in MR test parameters. The results showed that forward players had better results in MR-Ttime, MR-AvTime, MR-TTime/True, compared to the defence players, and in MR-TTime/True compared to the midfield players (Table 1).

DISCUSSION Position of players affected the MR time, and forward players responded to stimuli faster than midfield and defence players. With regard to literature indicating that reaction time could be improved in the transition period

from childhood to puberty (Johnson 1989), this study suggested that MR test could be used as a test tool in evaluation and improvement of spatial perception and decision making ability.

Table 1. Mental rotation times of soccer players.

	Defence (N=12)	Midfield(N=16)	Forward(N=8)
MR-Event	25,00	25,00	25,00
MR-True (event)	7,83 (1,40)	6,62 (1,78)	8,00 (2,26)
MR-False (event)	17,00 (1,35)	18,25 (1,77)	17,00 (2,27)
MR-TTime (msec.)	54232,24 (18546,46)	42987,45 (15743,09)	34127,05 (15692,15)*
MR-AvTime (msec.)	2169,29 (741,86)	1719,49 (629,72)	1365,08 (627,68)*
MR-TTime/True (msec.)	7031,14 (2469,68)	6485,88 (1158,91)	4388,50 (1891,37)*+

MR: Mental rotation, TTime: Total time, AvTime: Average time
*Different from defence at $P < 0.05$, +Different from midfield at $P < 0.05$

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KEY WORDS Soccer player, reaction time, mental rotation.

O-121 Relationship between competitive state anxiety and trait state anxiety

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OBJECTIVES Since the conception of an interactional model of anxiety distinguishing trait and state symptoms, considerable understanding of the debilitating effects of anxiety upon sporting performance has been made. A large contribution has come from the development of sport-specific competitive anxiety theory, which states that, in advance of sporting competition, an individuals' competitive trait anxiety. The aim of this study was to examine the relationship between the football players' competitive state anxiety and trait- state anxiety levels in two Turkish Turkcell Super League football teams.

METHODS Volunteer, 41 professional soccer players (Turkish Turkcell Super League football teams) participated in this study. Pearson Correlation has been used for analysing relationships between CSAI-2 and STAI and differences in two teams. Inventories used were the Turkish version of State - Trait Anxiety Inventory (STAI), the Turkish version of CSAI-2. MANOVA was used to analyse CSAI-2 and STAI results.

RESULTS The analysis revealed that state anxiety and cognitive anxiety ($r = -.397$, $p > .05$), state anxiety and cognitive anxiety ($r = -.398$, $p < .01$). Significant relationship was found between state anxiety and self confidence ($r = .478$, $p < .01$). No significant differences were found between CSAI-2 results and STAI results.

Table 1. Correlations between football players' STAI and CSAI-2 results.

	Trait Anxiety	Cognitive Anxiety	Somatic Anxiety	Self- Confidence
State Anxiety	.302	-.397*	-.398**	.478**
Trait Anxiety		.291	-.089	.192
Cognitive Anxiety			.261	-.338*
Somatic Anxiety				-.508**

*Correlation is significant at the .05 level. ** Correlation is significant at the .01level.

DISCUSSION It was concluded that, there was a significant relationship between State - Trait Anxiety Inventory (STAI) results and Competitive State Anxiety Inventory -2 (CSAI-2) results of football players.

KEY WORDS Competitive state anxiety, trait anxiety, STAI, CSAI-2, football.

21. REFEREES AND FANS

O-122 Physical demands and distance at infringements for football referees in international games

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OBJECTIVES Over the last decade, much knowledge has been obtained about the activity profile and physical demands of football referees in national league games as well as international games (Krustrup and Bangsbo 2001; Castagna et al. 2004; Helsen and Bultynck, 2004; Weston et al. 2006). However, the physical demands throughout international games and the relationship between high intensity running and the referees' ability to keep up with play are still to be investigated. The aim of the present study was to investigate the activity profile and physiological demands of referees in international games and to examine possible decrements in total distance covered (TD), high intensity running (HIR) and backwards running (BR) during the game. It was also studied whether the referees' ability to keep up with play was related to the amount of high intensity running.

METHODS Computerised time-motion analyses (Krustrup and Bangsbo, 2001) and measurements of heart rate (HR) were performed on 12 referees during 4 Champions League, 4 UEFA Cup and 4 national games. In addition, five referees had finger prick blood samples taken at half time and after the game for measurements of blood lactate.

RESULTS TD, HIR and BR were 10.30 (0.28) (SEM), 1.87 (0.20) and 0.86 (0.08) km, respectively. Mean HR was 150 (3) bpm. Blood lactate was 4.1 (1.2) and 6.1 (1.6) mmol/l after first and second half. TD and BR decreased ($p<0.05$) by 11% and 48% from 0-15 to 75-90 min, but HIR was unaltered. HIR was negatively correlated with peak5-attacking-zone distances to infringements in both halves ($r=-0.56$ and -0.72, $p<0.05$).

DISCUSSION The present study shows that the physical demands are high for referees throughout international games. Thus, blood lactate values were high after the game, and the distance covered by high intensity running was kept high in the last 15-min period. The study furthermore demonstrated that referees' ability to keep up with play is related to the amount of high intensity running performed.

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KEYWORDS: High intensity running, blood lactate, heart rate, distance at infringements.

O-123 Rugby football as a moral agent

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OBJECTIVES Fair play spirit is supposed to be the most important aspect of football. This paper attempts to clarify the educational value of rugby football through analyzing the educational theory of H. H. Almond (1832-1903) who regarded football as a moral agent. This paper aimed at examining the circumstances in which Almond thought rugby football as an important moral agent for character building in students. In addition to it, this paper attempted to expand the framework of scientific research for football by bringing in moral aspects.

METHODS This paper is a meta-analysis of the fair play spirit. Analyzing in detail H.H.Almond's articles, letters, and so on. The main material is the article, 'Football as a moral agent', Nineteenth Century, 34, 1893.

RESULTS Almond's Loretto School made physical education the essential part of school practice. He thought of football as a moral agent that made students unselfish. Because of the characteristic of rugby football, the game cannot be maintained if players don't have fair play spirit. Almond said that 'There must be a certain amount of bona fides in it, or it soon becomes no game at all. But from the professional player we cannot expect this bona fides.' As IRB playing Charter said, 'Rugby is rightly proud of its ability to retain high standards of sportsmanship, ethical behaviour and fair

play.' Especially, the age which Almond wrote the article, the problem of professionalization is under debate. In this situation, he promoted to build up the fair play spirit of rugby football in students.

DISCUSSION Almond established a regimen of sound living that embraced diet, dress and exercise, which would train the character of students. He also adopted rugby football because it made 'the training-ground of a virtue which is so far modern that it has not yet acquired a distinctive name'. The review of the educational theory and practice of Almond has indicated that rugby football could be correlated with the mode of life of students. In this sense football is not only an exercising tool for the body but also for the soul. Forming of fair play spirit, the character of rugby football was intertwined with the holistic education.

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KEY WORDS: Football and education, moral agent, bona fides.

O-124 Activity profile and heart rate response of referees in Gaelic football

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OBJECTIVES: Distances covered by soccer referees during matches (D'Ottavio and Castagna, 2001) can be greater than those covered by players. Therefore, it is important for referees in football codes to have specific fitness developed through training based on an understanding of the physiological demands of refereeing. To date, the physiological demands of refereeing in Gaelic football have not been investigated. Thus, the purpose of the current investigation was to use global positioning technology (GPS) and heart rate monitoring devices to provide an understanding of the physiological demands of refereeing during Gaelic football matches.

METHODS: Eight referees wore a GPS receiver, the Sports Performance Indicator (SPI 10, GPSports Systems, Australia), which was carried in a padded back-pack just below the neck to provide information relating to the time, speed, distance, position, altitude, direction and heart rate during matches.

RESULTS: Referees performed 51.0 (17.1) bursts of > 18 km/hour covering a mean distance of 15.6m (3.5) during each burst. Mean heart rate of the referees was 164.6 (14.2) beats/min. These results demonstrate that the refereeing of elite-level Gaelic football matches involves intermittent high intensity activity.

DISCUSSION: The mean heart rates and total distances covered were similar to the values reported previously in the literature for soccer referees (Krustrup and Bangsbo, 2001). Moreover, these results provided important data to aid in the development of training programmes to address the intermittent high intensity activity levels of referees in Gaelic football.

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KEY WORDS Referee, work-rate, physiological demands, heart-rate response, motion analysis, Gaelic football.

O-125 Activity profile, heart rate and blood lactate of Futsal referees during competitive games

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OBJECTIVES Futsal has become a popular indoor alternative to football. However, the scientific knowledge regarding the physical demands of Futsal playing is rather limited and so far, no studies have investigated the activity profile and physiological demands of Futsal refereeing. The aims were to investigate the activity profile during competitive games, including number of activity changes, total distance covered (TD), high intensity running (HIR; >15 km/h), sprinting (SPR) and sideways running (SR) and to examine the physiological demands in games by measuring heart rate and blood lactate. In addition, training status of high-level Futsal referees was determined.

METHODS Twelve high-level Portuguese Futsal referees with an average age, height, weight and fat percentage of 33 (5) (SD) years, 1.73 (0.05) m, 73.2 (8.4) kg and 15.7% (5.4) respectively, participated in the study. Their Yo-Yo IE2 performance was 975 (237) (560-1280) m. Video filming (n=6) and heart rate recordings were performed throughout games. Blood lactate was determined at rest and after the game.

RESULTS The number of activity changes was as high as 1771 (314) over ~80 min. TD, HIR, SPR and SR were 5.61 (0.82), 0.93 (0.18), 0.18 (0.07) and 1.00 (0.46) km, respectively. The number of HIR and SPR bouts was 137 (21) and 19 (8), with a mean duration of ~1.3 s. Mean HR was 146 (13) bpm. or 78 (6)% of HRmax. Blood lactate was 1.0 (0.3) and 1.5 (0.5) mmol/l before and after the game.

DISCUSSION The present study showed that Futsal referees performed numerous very brief bouts (1-2 s) of fast speed running and sideways running. The heart rate loading was moderate-to-high during Futsal games. Interestingly, blood lactates were low despite the large number of high intensity running bouts, suggesting that a majority of the anaerobic ATP resynthesis was provided by creatine phosphate breakdown.

KEY WORDS Heart rate, blood lactate, high-intensity running, sprinting, sideways running

O-126 Five-factor model of personality and psychological health of differently identified soccer fans

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OBJECTIVES Social scientist has recently become interested in the relationship between psychological health of sport fans and their identification with the team they supported. Despite the fact that sport fandom is often associated with fanaticism, negative behaviours and aggressiveness; social scientists believe that sport team identification is positively correlated with psychological health. This study was designed to ascertain the relationship among soccer team identification and five faces of the personality of individuals. By examining personality, psychological health of the soccer fans would also be examined in this study.

METHODS 218 male, 238 female university students participated in this study. To assess the level of team identification, Wann's Sport Spectator Identification Scale (SSIS) was used, whilst, personality of the sport fans was examined by shortened Turkish version of the NEO PI-R. Descriptive statistics, correlation analyses and one way ANOVA was conducted to analyze the data.

RESULTS Results of the one way ANOVA analyses indicated that highly identified fans' openness level was significantly higher than the medium level fans $F(2\text{-}449) = 5{,}08$, $p = .007$. The ANOVA was also significant in neuroticism, $F(2\text{-}449) = 4.27$, $p = .015$. Correlation analyses also indicated significant correlation between team ID and Extraversion, and negative correlation between team ID and Neuroticism.

DISCUSSION High scores on extraversion and low scores on neuroticism are strong indicators of psychological well-being (Wann et al, 2004). Results of the analyses showed that highly identified soccer fans had both higher scores on extraversion and lower scores on neuroticism than the lowly identified soccer fans indicating that highly ID fans were psychologically healthier than the lowly ID soccer fans.

Team ID / Personality	Low ID (N = 102)		Medium ID(N = 174)		High ID (N = 176)		DF			
	M	(SD)	M	(SD)	M	(SD)	(B-W)	F	Sig.	Sig. Diff
Extraversion	3,40	(,62)	3,46	(,67)	3,56	(,60)	2-449	2,25	,107	
Agreeableness	3,79	(,53)	3,80	(,46)	3,84	(,49)	2-449	,62	,536	
Conscientiousness	3,38	(,61)	3,41	(,62)	3,46	(,56)	2-449	,56	,57	
Neuroticism	3,05	(,63)	3,05	(,68)	2,87	(,67)	2-449	4,27	,015*	M > H
Openness	3,79	(,52)	3,63	(,56)	3,81	(,53)	2-449	5,08	,007*	H > M

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KEY WORDS Soccer, sport fandom, psychological health, personality, and team identification.

22. PENALTY KICK

O-127 Photogrammetric analysis of penalty kick in soccer

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OBJECTIVES Penalty kick has always been the most exciting moment of the soccer game. Many cups have been won and lost with the penalties. Some players choose focusing on goal keepers movements; some however decide at the shooting point while waiting for the referees whistle. However, the most important factor is the technique of the player. A perfect technique should be executed in order to put the ball in the goal. Thus, the aim of this study was to investigate the kinetic and kinematic features of the penalty kicking technique of professional soccer players.

METHODS Five professional soccer players participated in this study. Markers were placed on the thigh, knee and the ankle of the players. Each player executed 10 instep penalty kicks to the targets. Each kick was recorded on two digital cameras with 60 fps. The cameras were placed approximately 90 degree to each other. Photogrammetric analyses of the pictures were done by Pictra Software.

RESULTS The results revealed that for a successful penalty kick a perfect kinetic chain was needed. The analysis showed that players flexed their knees approximately 60 degrees and laterally rotated their ankles approximately 70 degrees and a follow through were executed by the players.

DISCUSSION In conclusion, in order to execute a perfect penalty kick, body segments should be in a perfect coordination. Players should be aware of their body segments and use technology to analyse their techniques.

KEY WORDS Soccer, penalty kick, motion analysis, photogrammetric.

O-128 Alternatives to penalty shoot-outs

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OBJECTIVES Recent research into penalty shoot-outs indicates that they are not a pure lottery. For example, it is known that younger players are more effective than older ones during penalty shoot-outs (Jordet et al, 2006). Also there are concerns that individuals decide a team sport and that FIFA is considering alternatives (Blatter, 2006). The purpose of this paper was to discover, by drawing on tie-breaks in other sports, key differences in the nature of alternatives that might form a typology for their categorisation. In addition, this paper outlined the criteria that a replacement to penalty shoot-outs should satisfy in order to be a realistic alternative. The criteria were used to evaluate potential alternatives.

METHODS After an analysis of the impact of penalty shoot-outs on the nature of football in major international tournaments, conclusions for the acceptance criteria of alternatives were drawn. Experience in other sports on acceptable tie-breaks was also drawn. Following this, a range of alternatives compared to the acceptance criteria was conceptually categorised.

RESULTS Analysis of other sports shows that there are three distinct forms of tiebreakers (assessment of prior performance, assessment of game performance, and post-game lotteries) and some hybrids. We advocate ten different criteria that a replacement to the penalty shoot-out should satisfy. Our assessment of alternatives suggests that prior performance methods should be tested.

DISCUSSION The analysis suggested that determining the result of the tiebreak before the game starts (e.g. best goal difference, highest number of goals scored in the competition) may improve the quality of the football both in the tied game and in previous games in the tournament. Awarding a minor score to 'woodwork hits' also looks fruitful. These alternatives should be tested.

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KEYWORDS: Football, penalties, goal difference, goals scored, woodwork, alternatives.

O-129 Emotions at the penalty mark: an interview analysis of players performing in international penalty shootouts

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OBJECTIVES: Recent research has demonstrated that stress is closely related to the outcomes of penalty shootout kicks. Knowledge about ways in which football players respond emotionally to penalty shootouts may be used to assist players in coping with stress under such circumstances. This can produce better kicks and ultimately help teams win more matches. An exploratory study was conducted to learn more about manners in which football players experience the minutes leading up to their shots when performing in major international tournament penalty shootouts. The exact objective was to identify the emotions that players experience, their intensity and direction and the specific points in time that they occur.

METHODS: Retrospective video stimulated recall interviews were done with 8 players who took a shot in the penalty shootout between the Netherlands and Sweden in the 2004 European Championship. A 22-item emotion checklist and open-ended interview questions were used to collect quantitative and qualitative data, respectively. Member checking and prolonged engagement served to increase the trustworthiness.

RESULTS: On the checklist, the players indicated experiencing a wide range of intense emotions, both positively and negatively toned, interpreted as facilitative and debilitative to performance. 'Anxious' was most common, reported by all eight players, then 'determined' and 'motivated'. The qualitative data showed that the anxiety peaked in the mid circle.

DISCUSSION: Combined with knowledge about the link between stress and penalty shootout outcomes, the present results highlight the importance of coping with anxiety to achieve success at the penalty mark. Anxiety in the mid circle may come from the powerless feeling of merely watching others perform. Players should include the mid circle when simulating penalty shootouts in practice.

KEYWORDS: Football, penalty, stress, emotions, anxiety.

O-130 "What's the hurry?": A temporal analysis of pre-shot behaviour in international penalty shootouts

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OBJECTIVES: Kicks from the penalty mark (official term for the "penalty shootout") are regularly featured in major football tournaments to determine the outcome of tied matches. Recent research has suggested that players' anxiety in these situations may come from low perceptions of competence and the general belief that outcomes in penalty shootouts are uncontrollable (Jordet et al., 2006). A natural next step for scientists can be to discover ways in which these psychological processes are manifested in players' behaviours. Also, it is important to identify means with which players can increase their odds of coping with these situations. Thus, the objective of this study was to learn about the relationships between stresses, players' pre-shot preparation times and shot outcomes.

METHODS: The data consisted of television images of 251 shots from 26 penalty shootouts held in the World Cup and the European Championships between 1976 and 2006. Preparation times were registered in the period from a player receives the ball to the time of the shot itself (M = 18.32 s, SD= 7.07). Stress was inferred from variables specifying match or shot importance.

RESULTS: The more important a shot was, the less time the players prepared for them. This was demonstrated for tournament ($F = 5.04$, $p < .05$), penalty number ($F = 14.76$, $p < .01$) and shot consequence ($F = 4.41$, $p < .05$). The players with the shortest times also scored less goals (odds ratio = 2.78, $p = .08$), with scoring percentages as low as 58%, compared to 75% for both intermediate and long times.

DISCUSSION: The results suggested that short preparation times could be a sign of stress. It could be that some players tried to escape the stress of the situation by ending it as quickly as possible (avoidance coping). Hurried pre-shot

behaviour also seemed to affect shot outcomes negatively, possibly due to insufficient shot planning. Players are advised to spend a few extra seconds preparing their shots.

REFERENCES
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KEY WORDS: Football, penalty, anxiety, coping.

O-131 Are penalty shoot-outs racist?

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OBJECTIVES The acceptance of penalty shoot-outs in the knockout stages of international football tournaments is based on the belief that they have face validity by involving a football skill, that they have a clear and quick decision criterion that settles the result shortly after the end of the game, and that they do not offer any in-built advantage to either of the competing nations. Following events in the 2006 World Cup, we decided to investigate whether there are grounds to believe that the results of penalty shoot-outs are predetermined. Specifically, we considered whether characteristics of national cultures explain the results of penalty shoot-outs and whether penalty shoot-outs offer an advantage to any nation.

METHODS We gathered data from every competitive international penalty shoot-out (n=182). We included countries who had (1) competed in at least 5 shoot-outs, (2) taken at least 20 penalties, and (3) been involved in at least 2 penalty shoot-outs in major tournaments. Win/lose data from 16 countries were analyzed using the raw national culture scores of Hofstede (1980, 2006).

RESULTS One of Hofstede's four national cultural dimensions – individualism/collectivism – strongly correlated with nations' win/loss record (r =-.600, sig = .014, N =16). A regression analysis produced an Rsq of .395 indicating that this national cultural dimension explains almost 40% of the variance in the results of penalty shoot-outs with collectivism being favoured over individualism.

DISCUSSION These results demonstrated a strong national culture bias in favour of collectivist nations. One explanation is that players from individualist nations are more anxious and under greater stress due to the blame they will attract if they miss. Other explanations are associated with support and self-image. Some may consider that these results indicated that penalty shoot-outs were racist.

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KEYWORDS Football, penalty shoot-outs, iIndividualism, cCollectivism, fairness, racism.

23. SCIENTIFIC COACHING

O-132 Heart rate recording optimization in soccer

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OBJECTIVES Even though coaching is not a science but an intervention practice, both activities share the foundations of decision making on empirical basis. This means that both coaches and scientists try to make their statements based on facts and evidences rather than believes and hopes. We tend to think that the more information we have the better, without taking into account the costs in time and storage it may have. Heart Rate (HR) monitoring is a good example of empirical control of coaching although reliable and effective analysis of data is not always as flexible and quick as it could be. The objective of this research is to assess if longer than five seconds recording intervals affect the variability of data due to its own facets.

METHODS Polar Team System© was used for recording HR from 18 2nd-B league players in 8 pre-season training sessions with the latest available version of Polar Precision Performance SW©. Heart Rate Data Compiler Osasuna 1.0 was designed and created for the compilation of HR files. Statistical analysis were made with SAS 9.1.3© package (VARCOMP and GLM) and GT.

RESULTS VARCOMP and GLM analyses showed that variance components, where the facet interval was included, showed no significant information in order to explain this models' variance. Generizability analysis showed that intervals' facet explained no variance and that recording could be optimized to the maximum.

Table 1. VARCOMP and GLM analysis results for (Players x Sessions x Drills x Intervals) model having HR as dependent variable, GENERALIZABILITY analysis for percentages of variance explain by every facet.

		VARCOMP			GLM		GT
Variance components	**DF**	**Sum of squares**	**Mean square**	**Type 1 estimates**	**F value**	**Pr > F**	**variance explained**
Players	17	12021479	707146	43.63009	2806.68	<.0001	7%
Sessions	7	42449244	6064178	177.59528	24068.90	<.0001	29%
players*sessions	53	9669973	182452	23.28003	724.16	<.0001	7%
Drills	12	44977629	3748136	257.04348	14876.40	<.0001	29%
players*drills	195	11095109	56898	13.11967	225.83	<.0001	7%
sessiones*drills	36	17680546	491126	255.65160	1949.29	<.0001	13%
player*sessio*drills	228	10548027	46263	190.90176	183.62	<.0001	9%
Intervals	5	135.15	27.03	0.0058226	0.11	0.9907	.
players*intervals	85	672.74	7.91	-0.04601	0.03	1.0000	.
sessiones*intervals	35	529.26	15.12	-0.03591	0.06	1.0000	.
player*sessio*interv	265	1613.08	6.08	1.29513	0.02	1.0000	.
drills*intervals	60	1952.31	32.53	0.04425	0.13	1.0000	.
player*drills*interv	975	7581.05	7.77	0.45279	0.03	1.0000	.
sessio*drills*interv	180	4071.55	22.61	-0.03936	0.09	1.0000	.
play*sess*dril*inter	1140	9518.03	8.34	-6.67163	0.03	1.0000	.
Error	174083	43860429	251.95	251.95			

DISCUSSION HR data recorded at different time intervals showed no significant differences. Therefore, both researchers and coaches may optimize their processes of control by reducing the amount of data they must use to a 1/6 at least.

KEY WORDS Heart rate, optimization, variance components, theory.

O-133 The impact of player numbers on the physiological responses to small sided games

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OBJECTIVES High intensity aerobic training can be delivered in a football-specific manner through small group play. Developing or maintaining maximal aerobic capacity through small sided games incorporates a technical as well as a physiological component and therefore constitutes an effective use of training time. The aim of this study was to examine the physiological demands imposed on players during small-sided training games (SSG). The impact of changing both the number of players and the size of the training area on heart rate responses was investigated.

METHODS Average heart rate was calculated during small sided games via short-range radiotelemetry (Polar Sport-tester, Polar Electro, Finland) for nine professional players (mean ± SD: age 17 ± 1.0 years). Recording intervals were set at 5 s. Player numbers increased from 1 vs. 1 to 5 vs. 5 which corresponded with an increase in pitch sizes from 15 x 20 metres to 25 x 30 metres.

RESULTS On a 15 x 20 m pitch mean HR in a 1 v 1 and 2 v 2 was significantly higher than in a 3 v 3 ($P<0.05$). The mean HR on a 20 x 25m pitch for 2 v 2 was significantly greater than for 3 v 3 ($P<0.05$) and 4 v 4 ($P<0.01$). On a 25 x 30m pitch mean HR for both 3 v 3 and 4 v 4 was significantly higher than 5 v 5 ($P<0.01$).

Pitch Size (metres)	**Player numbers**		
15 x 20 m	1 vs. 1	2 vs. 2	3 vs. 3
Mean HR (SD) (b.min^{-1})	**183 (7)**	**179 (7)**	**164 (12)**
20 x 25 m	2 v 2	3 v 3	4 v 4
Mean HR (SD) (b.min^{-1})	**180 (5)**	**166 (9)**	**152 (14)**
25 x 30 m	3 v 3	4 v 4	5 v 5
Mean HR (SD) (b.min^{-1})	**171 (11)**	**165 (5)**	**152 (6)**

DISCUSSION Games with higher numbers of players were not associated with sufficient physiological response to promote development of player's aerobic fitness. The 1 v 1 SSG and SSG in 15 x 20 m pitches imposed the highest physiological response. As player numbers increased, physiological stress decreased.

KEY WORDS Small sided games, high intensity, pitch sizes, player numbers.

O-134 Effectiveness of coaching and scouting in football

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OBJECTIVE Decisions about the effective use of human capital, the players, need not be taken anymore solely on the base of intuition and common sense, but can be supported by advanced systems. Coach & Scout Assistant (C&SA) and Effectively In Action (EIA) (University of Groningen, Neth.) allow clubs to measure and analyze the performance of the players efficiently and allows for sound decision making process. The purpose of this study was to trace the progress of junior players and present the surplus value and best position of scouted players by C&SA, and to generate graphs that reflected the performance of the teams in World Cup 2006 matches.

METHODS C&SA analyzed players on measurable qualities and competencies: technical (e.g. passing, heading, shooting, physical (e.g. speed, power) and mental (pressure resistant, team discipline). EiA calculated the performance of the teams and drew effectiveness graphs.

RESULTS C&SA showed progress curves of players on all eleven positions, and for each non basis player the qualities/competencies for becoming competitive with a basis player were presented. Clicking on the effectiveness graph in EIA, a short video clip is showed around that time in the match. The two systems supplement the expertise of the technical and financial staff with rational arguments and conclusions.

CONCLUSION This study showed that the two computer systems, C&SA and EiA, are complementary tools for analyzing the actual surplus value of individual players in relation to team performance, as well as the development of the effectiveness of players and teams during the match.

KEY WORDS Coaching, football.

O-135 Physiological costs of solo-run in Gaelic football

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OBJECTIVE In Gaelic Football the ball may be carried by the player for no more than four steps without bouncing it or trapping and catching it in a solo-run. These efforts may entail added physiological costs which have not been determined. The aim of the study was to examine the added physiological strain associated with a solo-run in comparison to normal locomotion at the same running speed.

METHODS Thirteen male Gaelic footballers (20.1 ± 2.0 years) participated in the study. They performed 20-m shuttle runs at 9, 10.5, 12 and 13.5 km.h-1 while "soloing" and normal running. Oxygen uptake (VO_2), blood lactate and heart rate (HR) were recorded and perception of effort was monitored at each exercise intensity.

RESULTS The solo-run caused elevations in HR (mean increase from 160 to 181 beats.min^{-1} for running and 167 to 189 beats.min^{-1} for solo-runs between 9 km.h^{-1} and 13 km.h^{-1} respectively). Corresponding increases in blood levels were 4.7 to 18.2 vs 6.1 to 21.3 mM, and VO_2 were 52.0 to 63.6 vs 54.8 vs 65.3 ml.kg^{-1}.min^{-1}. Perceived exertion showed similar trends.

CONCLUSION There is an added physiological cost due to the solo-run that exacts a high proportional use of VO2max. This extra stimulus could be used in a training context.

KEY WORDS Energy cost, heart rate, solo-run.

O-136 Development of an offensive evasion model for training high performance rugby players

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University of the Sunshine Coast

OBJECTIVE The improved defensive ability of rugby players has increased the difficulty for the offence to penetrate defensive lines. However, there is little scientific data on specific evasive techniques adopted by elite players. This paper is the sum of over 10 years of qualitative and quantitative research conducted on some of the world's most high performance players. The purpose of this research was to develop a clear performance model of the evasion techniques utilised by high performance rugby players.

METHODS To ensure both internal and external validity, this model was based on a combination of qualitative assessment, performance analysis research, and advanced three-dimensional kinematics analyses. First, 3D kinematics analyses were undertaking on 22 elite players during an evasion task to test for correlates with performance. Next, evasion KPI's were created following extensive video based qualitative analyses of 70 elite players during evasive play. Finally, the model was tested using 60 international matches via the systemic analysis of offensive play using standard game analysis software.

RESULTS Summary of the numerous statistical analyses used in this research indicate that effective evasion can be expressed by 5 variables. These indicate that the ball carrier should strive to:
1. Accelerate into and through the contact zone.
2. Use positive stepping patterns to avoid direct contact with the defender and maintain running velocity through contact.
3. Offload the ball either prior to contact, or in contact.
4. Avoid going to ground unnecessarily.
5. Be deceptive by disguising intentions.

KEY WORDS Rugby, high performance.

O-137 The transition from player to coach: A case study from rugby league and rugby union

Donna O'Connor
University of Sydney

OBJECTIVE Presently elite players are being recruited into professional coaching roles in both rugby league and rugby union. However, playing ability doesn't necessarily translate into coaching aptitude. According to USA Olympians the ability to teach and the ability to motivate or encourage are the two most important qualities they want in their coach. The aim of this study was to gain an insight into how to assist athletes make a successful transition to coaching. Identifying general strengths and weaknesses will have implications for coach education. Mastery of the identified skills will contribute to the development of the excellence that the Australian athlete and coach are seeking.

METHODS Four former athletes who were in the early stages of their coaching careers were observed and video-taped during a minimum of four coaching sessions. Participants commented on their coaching before and after viewing the video-tape. Semi-structured interviews were also conducted with each coach.

RESULTS Analysis revealed that the coaches were confident with their technical knowledge and skills of the game. They also perceived having played at an elite level as an advantage to their coaching and have all been influenced by their former coach's style. Areas identified for further improvement included: communication, planning, organisation and self reflection. Specific examples will be outlined.

CONCLUSION Results of this study are discussed in relation to literature and coach education programs. Evaluation and feedback can assist the early career coach in their own development. Enhancing generic skills such as effective instruction and teaching skills, specific feedback, comprehensive evaluation skills and good communication will allow for a smooth transition from an elite player to successful coach

KEY WORDS Coach development, video analysis, evaluation.

24. SKILL LEARNING AND MOTIVATION

O-138 Correlation of visual function and performance outcome in premier league soccer

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OBJECTIVE Previously the level of visual function of athletes has not featured as a priority in the assessment of physiological function, however the interest in this area of Sports Science is increasing in English Soccer. Because of the wide variations both in the visual assessments performed and in the professionals performing the assessments, comparisons among research findings proves difficult. The aim of this research was to evaluate the relevance of the total of the individual players' visual ability to the final results over a season. Data was collected from senior players at a Premier League Football Club over 3 years. From this data 4 visual functions were identified as being important to soccer. From this a system was developed to produce a Vision Score for each player.

METHODS The sum of the visual scores of each player in each match in the 2004/2005 league season was calculated. This was analysed in relation to the following variables; the final result of each game, whether the assessed team scored in the first 20 minutes and/or whether they scored in the last 20 minutes.

RESULTS Although the visual ability of the opposing teams was a variable which was impossible to factor out, the statistical analysis of the results showed a correlation and relationship between the total of the visual ability of the team selected and the final score. There appears to be a further correlation between the specific visual function of binocular vision to the overall results.

CONCLUSION Research into Sports Vision tends to analyse combinations of functions such as in Dynamic Visual Acuity which requires the individual to use the functions of motion detection, smooth pursuit eye movements, binocular vision and visual acuity. This study suggested that more information regarding the relevance of visual ability to performance can be achieved if specific individual visual functions are assessed.

KEY WORDS Visual function, binocular vision, soccer, peripheral vision.

O-139 The microstructure of practice: A time motion analysis of practice activities

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OBJECTIVE A common dilemma confronting coaches is how to structure training to optimise skill acquisition (Cobley, 2005; cited in Williams and Ericsson, 2005a). Coaches have a responsibility to manipulate training to ensure both effective and efficient learning. However, current coaching practice remains determined mainly by 'lay' opinion rather than empirical research (Williams and Hodges, 2005b). Research highlights a need to accumulate vast amounts of practice; however the structure of training may be more important than accumulated practice hours. A more formal assessment of what athletes do in practice is needed. We examined the microstructure of practice in soccer by comparing practice activities undertaken by elite, sub-elite and recreational players across three age groups.

METHODS The practice activities undertaken at three clubs across three skill levels (elite, sub elite, recreational) were assessed. Three sessions from each age group (9, 13, 16 years) were filmed (n = 81). Sessions were analyzed using Time Motion Analysis. Percentage time in each activity was calculated and analyzed using Group (elite, sub elite, recreational) x Age (9, 13, 16) ANOVAs.

RESULTS Elite players spent less time in technical practice and more time in conditioned games than sub-elite and recreational players and more time spent in possession games than recreational players, ($p < 0.05$). More time was spent in phase of play activities as age increased for all skill groups ($p<0.05$). No significant differences were assessed among the groups for time spent in all other actions.

DISCUSSION Elite players spent more time playing in 'open' forms of practice compared with their less-elite counterparts who spent more time in 'closed' practice activities. Although the amount of accumulated practice is an important precursor to expertise, the nature of the practice activities and the age at which they are introduced is equally important.

Table 1. Categories and definitions for time-motion analysis.

Activity	Form	Definition
1. Physiological	Training Form	Primary goal of physiological aspects of game, e.g., warm up, cool down, conditioning, stretching, recovery.
2. Technical Practice	Training Form	Individual or with a group, covering isolated technical skills under no pressure.
3. Skills Practice	Training Form	Individual or with a group covering technical elements under opposing pressure.
4. Functional Practice	Training Form	Re-enacting isolated simulated game incidents without focus on any particular technical skills.
5. Phase of Play	Playing Form	Opposed practice using 1 goal to cover the cognitive team strategies used to outsmart opponents.
6. Possession Game	Playing Form	No goals in which ball retention rather than scoring a goal is the primary objective.
7. Conditioned Game	Playing Form	Restrictions/variations to rules, goals or areas of play, but with teams scoring in the same way.
8. Small Sided Game	Playing Form	2 Goals, realistic to regulation rules, with teams scoring in the same way.

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KEY WORDS Skill acquisition, elite performance, coaching, practice, soccer.

O-140 Ocular dominance and soccer

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OBJECTIVE Ocular dominance is a term used frequently in both vision science research and sports science research. There is some confusion between ocular preference and the perceptual phenomenon. May be best described as egocentric and relative localisation, the interpretation of the body's position in space with emphasis on it's relation to other objects. However, the role of this in soccer has not been explored. The aim of this study was to evaluate localisation in soccer players to determine whether the assessment of this phenomenon has any role in soccer sports science

METHODS The localisation of 100 soccer players aged between 15 and 30 years were assessed over 3 years using a modification of a method first described by Romano. This involves taking 5 photographs of each subject. In this method 5 categories have been identified; right, right/central, central, left/central and left. From the photographs each player was allocated to the relevant category.

RESULTS The incidence of dominance in the normal population was reported as being approximately right 'dominance' in 80% of the population, 15% left dominance and 5% central 'dominance'. In the more skilled soccer players, determined by the frequency of first team selection, the incidence of central localisation was 94%. The incidence of central localisation reduced in the younger/less skilled players.

DISCUSSION The high incidence of central localisation found in the skilled soccer players has also been found by the author in netball and hockey but not in sports where carrying the body through space is not a requisite. The reduced incidence of this feature in younger players would suggest that there is a level of plasticity of this function. The assessment of this feature would appear to have relevance.

KEY WORDS Ocular dominance, spatial awareness, egocentric localisation, relative localisation.

O-141 Motivation and self-efficacy in American football players

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OBJECTIVE Motivation, cited as the reason of behaviour, has received too much attention over the past three decades. Within an educational and sport context, researchers have also viewed motivation from a multidimensional perspective

containing intrinsic, extrinsic and a motivational factors. The theory of self-efficacy has been viewed as the most extensively used theory for investigating motivational issues in sport and exercise. The purpose of this study was to explore the relation between Sport Motivation and Self-Efficacy in American Football players.

METHODS The sample was 60 American Football players based on convenience sampling. The Sport Motivation Scale (Pelletier et. al., 1995) and Generalized Self-Efficacy Scale were the instruments. Turkish Sport Motivational Scale included 6 subscales; intrinsic motivation to know-accomplishment, experience stimulation, introjections, identification, external regulation, motivation. Multiple regression analysis was employed to analyze the data.

RESULTS Athletes were found to use mostly intrinsic motivation to experience stimulation (x=5.52) and leastly external regulation (x=3.37) for motivating themselves. Regression analysis showed that generalized self efficacy (β=.33, $p<.05$) was a predictor of intrinsic sport motivation ($F(1,58)=8.07$), however there was no significant relation between self efficacy and extrinsic motivation-amotivation.

DISCUSSION This study suggested that intrinsic motivation toward an activity can be developed by increasing person's belief in his/her self-efficacy. Thus by assessing and recognizing low intrinsic motivation in American football players, sport psychologists might be able to design interventions addressing the enhancement of self-efficacy. Then next step will be to assess how interventions affect performance outcomes.

REFERENCES
Pelletier et al. (1995) *Journal of Sport & Exercise Psychology* **17,** 35-53.

KEY WORDS Sport motivation scale, self-efficacy, American football players

O-142 System of tests used for assessing coordination abilities of soccer players

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OBJECTIVE To assess motor abilities and adroitness of an athlete, deviation is estimated from the optimal way of voluntary movements' execution in standard tasks. This approach considerably increases the efficacy of tests used for controlling athletes' condition in game sports, including soccer, which demand higher level of motor and coordination abilities development. The objective of this research was to develop and validate a system of testing coordination abilities in soccer players.

METHODS National Russian teams (15, 16, 18 yrs) and 2 teams of Russian 1st League participated in the study (n=96). A set of tests was performed in erect position on a stabilographic platform with biological feedback. Sensibility in body movement control; lateral asymmetry; tracking movements; state of the system of motor programs control; and short-term motor memory were assessed.

RESULTS National Russian teams (15, 16, 18 yrs) and 2 teams of Russian 1st League took part in the study (n=96). A comparative analysis of the results of coordination abilities testing demonstrated different features of motor control in soccer players, which depend as on age peculiarities, as on their roles in game. Test results were found reliable at $p<0.05$.

CONCLUSION We have elaborated a system of tests for estimating coordination abilities of soccer players. The analysis of the movement control system operation and specific preparedness of athletes permits to determine general and individual peculiarities of their condition at the moment of testing and to give recommendations concerning corrections to be made in technical and tactical training plans.

KEY WORDS Coordination abilities, testing, stabilography, motor programs control, technical training.

25. FEMALES AND FOOTBALL

O-143 Analysis of morphological features and played team positions in elite female soccer players

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OBJECTIVE Female soccer is very popular in Nordic countries. In 1997 a total of 200 000 players were registered in Sweden, and 40 000 (20%) of them were women, making female soccer the second largest sport in Sweden. The popularity of soccer continues to increase worldwide. In the last 10 years, the number of females participating in soccer has also risen within collegiate institutions in the United States. The purpose of this study was to determine the morphological differences in elite female soccer players based on team positions.

METHODS The sample was comprised of elite female soccer players, members of first league clubs in the Croatian League (n=24). Anthropometrical variables were measured according to the International Biological Program. The differences between team positions (goalkeepers, defenders, forward and midfielders) were analyzed by Manova. Statistical significant was set at $p<0.05$.

RESULTS The investigation showed that the goalkeepers were the oldest and possessed the longest playing experience, while the forwards were the youngest. The goalkeepers were the tallest and the heaviest players in the team, with the longest legs, arms and greatest thigh girth. Multivariate analysis of variance showed no significant differences in any of the selected morphological variables and playing position in female soccer players (Table 1.).

Table 1. Results of multivariate variance analysis of variance.

	F	P
Body mass (kg)	2.0426	0.1402
Body height	0.8746	0.4707
Fat tissue (%)	0.8347	0.4906
Lean body mass (kg)	0.5908	0.6282
Length of the leg (cm)	1.1341	0.3592
Length of the arm (cm)	2.1255	0.1290
Biacromial diameter (cm)	2.8444	0.0636
Bicristal diameter (cm)	2.6371	0.0857
Elbow diameter (cm)	2.7543	0.0976
Knee diameter (cm)	2.5371	0.0957
Upper arm girth (cm)	2.9427	0.0579
Forearm girth (cm)	2.9702	0.0564
Thigh girth (cm)	2.3799	0.1000
Calf girth (cm)	2.9231	0.0590

Wilks' Ratio=0.0388 R=1.2506, p=0.2488

DISCUSSION This study suggested that the morphological characteristics of female soccer players did not differ significantly according to their team positions. Also, the average height and body mass values of the female soccer players were within the normal range just like other elite European female soccer players.

KEY WORDS Morphological differences, female soccer players, team positions.

O-144 Match analyses of Australian international women soccer players using an athlete tracking device

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OBJECTIVE The physiological characteristics of women soccer players have been reported previously (Tumilty., 1993; Davies et al., 1993). The physical requirements of male soccer players have been reported by a number of researchers (Withers et al., 1982; Mohr et al., 2003). Krustrup et al. (2005) also examined the physical demands of women's games in Division One of the Danish League. They reported that the average total distance covered in a game was 10300 m (range: 9700- 11300 m). The preceding studies used video time-motion analysis but advances in technology have generated new methods of match analysis (Larsson, 2003). This study used a global positioning system (GPS), which is an emerging technology, to measure the activity profiles and physical demands of Australian international women soccer players.

METHODS Six players were monitored in four separate international women's soccer games. Each player was fitted with an athlete tracking device which incorporated GPS, triaxial accelerometry, gyroscopes and magnetometers. Players were categorised according to position: defenders (def, n=7), midfielders (mid, n=9) and attackers (att, n=6).

RESULTS Locomotor activity patterns are presented in Table 1. The total distance covered during a game was 9140 m, 2310± 580 m of which was moderate to sprint running. Average distances covered were: def- 9010 (7200- 9760 m), mid- 9640 (7620- 10960 m) and att- 8510 (8490- 9440 m).

Table 1. Locomotor activity profile of Australian international women soccer players.

Speed (km.h^{-1})	Locomotor Description	Match Total Distance	
		Mean (SD)	%
0-5	Slow walking	2400 (120)	26
5-8	Walking	2100 (110)	23
8-12	Low speed running	2330 (190)	26
12-16	Moderate speed running	1410 (160)	15
16-20	High speed running	620 (110)	7
20+	Sprinting	280 (80)	3
Total		9140 (1030)	

DISCUSSION The results of this study showed that Australian international women soccer players covered an average of 9140 m, which is less than the 10300 m reported by Krustrup et al. (2005). Possible reasons for these differences are the: 1) styles of play, 2) methods of analysis, 3) styles of play of the opposition, and 4) physical capacities of the players.

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Mohr et al. (2003) *Journal of Sports Sciences* **21,** 519-528.
Tumilty (1993) *Sports Medicine* **16**, 80-96.
Withers et al. (1982) *Journal of Human Movement Studies* **8,** 159-176.

KEY WORDS Global positioning system.

O-145 Work-rate analysis of elite female soccer players during match-play

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OBJECTIVE The physical demands of high-level male soccer have been studied extensively (Bangsbo et al., 1994; Mohr et al., 2003), however few studies exist (Davis et al., 1993) that have investigated the demands placed on females

during match-play. As the popularity of female soccer continues to grow understanding of the demands placed on female players during match-play would enable trainers and coaches to optimise the physical preparation of players. The purpose of this study was to characterise the work-rates of elite female soccer players during the 2005 Women's European Championships.

METHODS Thirty international female soccer players were filmed for the determination of work-rate profile. The camera was positioned overlooking the pitch, close to the half-way line. Movement categories for work-rate profile were: walk, walk back, jog, jog back, sideways movement, cruise and sprint. Total distance was calculated by the method of Reilly and Thomas (Reilly et al., 1976).

RESULTS The total distance covered during 90 minutes of match-play was 11979±1325m (Table 1). There was no significant reduction in the total distance covered in the second half compared to the first. Activity for the total distance covered during match-play consisted of 45% jogging, 26% walking, 13% cruising, 3% sprinting and 13% utility movements.

Table 1. Total distance covered by playing position for elite female soccer players.

Position (n=30)	Distance Covered M (SD)
Full Back	12636 (419)
Centre Back	11099 (1399)
Midfield	12971 (537)
Forward	11804 (1276)
Mean	**11979 (1325)**

DISCUSSION The distances covered by the players in the present study are similar to those that have been observed in top male players. This study suggests that female players tax the aerobic and anaerobic energy systems like male players, although gender differences for speed and power need to be considered in a future study. This has implications for the physical preparation of female players.

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KEY WORDS Elite female soccer, motion analysis, work rate.

O-146 Differences in physical match performance at two levels in female soccer

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OBJECTIVE Physical match performance and fatigue development in soccer has been studied intensively in professional male players, but information about these aspects of the game in elite female players is limited. The aim of the study was to examine the differences in physical demands and match performance of female soccer players in relation to their level of competition.

METHODS The participants were 19 top-class female national team players employed as professional players in the US top league and 14 moderate level non-national team players from the top Scandinavian league. The players were individually video-filmed in competitive matches in their respective leagues and computerized time-motion analyses were performed.
RESULTS The top-class players ran 28% longer ($P<0.05$) at high intensities than moderate level players and sprinted 24% longer ($P<0.05$). The top-class group had a decline ($P<0.05$) of 25-57% in high intensity running in the final 15 min compared to the first four 15-min intervals, while the moderate level group had a decline ($P<0.05$) in high intensity running in the last 15 min of each half.

DISCUSSION In conclusion, 1) top-class international players work at higher intensities than elite players at a lower level 2) fatigue occurs in female soccer, but seems to develop differently depending on the level of play.

KEY WORDS Female soccer, fatigue development, match performance.

O-147 Differences in movement pattern, heart rate and fatigue development in international versus national league matches of Swedish & Danish elite female soccer players

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OBJECTIVE The match schedule for female soccer has been extended in the last decade. More nations are participating in the qualifying group stage for international Championships, e.g. 30 teams will participate in 2009 European Championships. For club teams there has also been an increase in international matches, 44 teams are participating in the UEFA Women's Cup in 2006. International games (INT) are considered to be more physical demanding than national league games (NLG). However, the physical load of international games has not been evaluated for female soccer players. The purpose of this study was therefore to examine the movement pattern and aerobic loading for a group of Nordic elite female soccer players during INT and compare the results with NLG.

METHODS 11 elite female players (mean±SD,26.7±0.8yrs, 168.2±1.5cm and 61.0±1.4kg) participated in the study. Match intensity was measured by using time-motion analysis of locomotor activities and registering the players' heart rate (HR). The same player was observed individually by video filming up to 3 INT and 3 NLG. The players had the same position on the field in both the international and national game.

RESULTS Total distance covered was higher ($P<0.05$) in INT (mean±SD), 10.0±0.5 km compared to NLG, 9.7±0.6 km. The amount of high intensity running (HIR) was higher ($P<0.05$) in INT vs NLG (1.6±0.4 vs 1.4±0.4 km). There was a reduction of HIR in the last 15 min of both INT and NRG, with a tendency for a greater decline in INT. The HR decreased in the 2nd half did but did not differ between INT and NLG.

DISCUSSION There was a higher physical loading during INT compared to NLG, throughout the international game. It has previously been shown that amount of HIR is related to a player's physical capacity (Krustrup et al., 2005). This may indicate that the players were not physical fit to manage the intensity of INT as there was a tendency for a greater decline in HIR towards the end of INT. This needs to be further investigated.

REFERENCES
Krustrup et al. (2005) *Medicine and Science in Sports and Exercise* **37**, 1242-1248.

KEY WORDS Female, soccer, movement pattern, heart rate

O-148 Muscle strength, kicking and sprinting performance parameters in elite female soccer players

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OBJECTIVE Kicking is the one of the most important skills in soccer, with the full-instep kick and the inside-of-foot-passing shot being the most frequently used ones. Full-instep kick is normally used for generating fast ball speed and this type of kick was used in this study. The relation between muscle strength, sprinting ability and athlete performance on the field (like kicking performance) is a subject of controversy not only in biomechanics, but also in other research fields dealing with muscle power. Objective of this study is to determinant the correlation between kicking and sprinting performance and how strength influence sprinting and kicking performances.

METHODS Twenty-four Croatian female football team members (U-19) (mean (SD) age 17.2 (0.8) years, height 165.6 (5.9) cm, weight 57.9 (8.4) kg) were tested for maximal sprinting ability, leg muscle strength and kicking performance. Kicking performance was evaluated with ball velocity after the full-instep kick performance which was measured by a Stalker Radar Gun,Texas.

RESULTS The mean performance of the sprinting test over 5m (sp5) was 1.54 (0.1) sec, 10m (sp10) 2.35 (0.11) sec, 20m (sp20) 3.79 (0.14) sec and over 30m (sp30) was 5.17 (0.22) sec. Mean ball velocity measured by radar kicking by the preferred and non preferred leg was 82.6 (7.3) and 69.8 (9.3) km/h respectively. Unexpectedly, we didn't find sig-

nificant correlation between kicking and sprinting performance. Sprinting and kicking performance was correlated with strength (1RM).

DISCUSSION In soccer, sprinting performance affects kicking performance and can be influenced by the number of meters in the run up and foot velocity in the moment of contact with the ball. Because of insufficient technique authors' didn't found significant correlation between kicking and sprinting performance. When kicking performance is been tested level of technique must be sufficient.

KEY WORDS Muscle strength, kicking performance, sprinting performance, Croatian female soccer players.

POSTER PRESENTATIONS

26. PHYSIOLOGICAL TESTING OF FOOTBALL PLAYERS

P-001 Yo-Yo intermittent recovery performance test, body composition and biochemistry markers in young soccer players

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OBJECTIVE Some authors have described the importance of the anaerobic capacity for the performance of the soccer athletes. The Yo-Yo intermittent recovery test (BANGSBO, 1996) has been widely proposed to follow the anaerobic capacity of soccer athlete, during the season. The objective of the present study was to verify the performance of young athletes in Yo-Yo intermittent recovery test, body composition and the activity of creatine-phospho-kinase (CPK) in Brazilian young soccer players.

METHODS The subjects (n=24) 16,4 years old aged, were maintained in lodging of team, with daily training. The Yo-Yo intermittent recovery test, body composition and CPK enzyme was performed in the midway of season (August, 2006). The results (Table 1) were expressed as mean ± standard error of mean (SEM).

RESULTS

Table 1. Age (years), Yo-Yo intermittent recovery test (meters), body composition (W=weight, H=height and %BF=body fat percentual) and CPK activity (U/I) of the 24 Brazilian young soccer players in the midway season.

	Age	Yo-Yo	W	H	%BF	CPK
Mean	16,14	467,83	70,78	179,14	13,99	328,1
SEM	0,13	18,16	1,52	1,42	0,56	27,67
Minimum	17	280	86,7	189,5	19,75	150
Maximum	15	640	54,7	163,5	9,87	649

DISCUSSION The evaluation in the midway season showed median values high to CPK and for the %BF, the performance in Yo-Yo test was sustained during the season (previous results). In the global analysis that might be considered as positive because the players during the season was submitted to many matches, intensive training (high CPK) leading to a decreased performance.

REFERENCES
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KEY WORDS Yo-Yo recovery test, Brazilian young soccer players, body composition, creatine-phospho-kinase.

P-002 Oxygen uptake during soccer

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OBJECTIVE So far no study has provided accurate and valid data of measured oxygen uptake (VO_2) during soccer. The physiological demands have been determined mainly by monitoring heart rate (HR). Establishing the relationship between HR and VO_2 in the laboratory subsequently allows calculating VO2 in a game. However, the validity of the HR-VO_2 relationship in intermittent exercise may be questionable Crisafulli et al (2006). According to (Stolen et al. 2005) new gas analysers (~500g) should allow accurate measurement of VO2, but at present no such study has been performed. Therefore the aim of this study was to measure VO_2 with a portable gas analyser during real match play.

METHODS Two healthy amateur soccer players (24 and 25 years, 179 and 178 cm, 77 and 69 kg) participated in this study. During a friendly soccer match, VO2 of each of the two subjects was measured with a portable gas analyser (Cosmed K4, 800g) for one half. HR (Polar) was continuously monitored over the whole time. VO2max was determined by an exhausting 600m-run performed directly after the halves.

RESULTS Subjects obtained a VO_2max of 65.8 and 56.2 ml/(min*kg). The average VO_2's during match play were 37.4±6.8 and 34.3±6.4 ml/(min*kg), corresponding to 56.8 and 61.0% of VO_2max. Average HR's were 167±9 and 176±11 b/min in the first half and 164±10 and 179±11 b/min in the second. Over the whole time average HR's were 166±9 and 177±11 b/min, corresponding to 87.4% and 87.7% of HRmax.

DISCUSSION The intensity of the play, given by %HRmax, was the same as reported by other studies (82-86%Hfmax) (Helgerud et al., 2001). The intensity, given by %VO_2max, in contrast differed from data reported in the literature (70-%VO_2max) (Bangsbo, 1994). However data from literature were only estimates of VO_2 from HR. The results of this study suggested that the accuracy of this method was questionable, thus further work with more players was required.

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Stolen et al. (2005) *Sports Medicine* **35**, 501-536.

KEY WORDS Soccer, oxygen uptake, heart rate.

P-003 Aerobic fitness in futsal players of different competitive level: a preliminary study

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OBJECTIVE Futsal or 5-a-side indoor soccer is a popular team sport played all over the world. However despite its popularity only limited scientific literature is available regarding the physiological demands of the game and players' fitness. The aim of this descriptive research-design was to examine the aerobic-fitness (VO_2max, VT, RE, Pate and Kriska 1984) level of players of different competitive levels in order to study whether aerobic fitness is a discriminative variable in Futsal success, and to establish normative data to be used to guide futsal coaches and fitness trainers, in designing specific training interventions

METHODS Participants were 24 male futsal players randomly chosen from three teams of different competitive levels: A Spanish professional top ranked second division team (PST n=11) a youth Spanish team (YST n=7, and a semi-professional Italian top ranked Third division team (IT, n=6).Treadmill gas analysis were performed using a portable gas analyzer (K4b2, COSMED, Rome, Italy).

RESULTS PST, YST and IT VO_2max was 62.9± 5.34, 68.6 ±6.2 and 55.0±7.1 ml kg^{-1} min^{-1}respectively (YST vs IT, $p<0.05$). RE was 34.1± 2.7, 38 ±3.1 and 32.4± 2.7 for PST, YST and IT respectively (YST vs IT, $p<0.05$). PST, YST and IT attained VT at 70.5± 2.7, 67.9 ±5.2 and 71.3± 5.2% of VO_2max respectively. Results showed that well-trained professional futsal players possessed a VO_2max well above 60 ml kg^{-1} min^{-1}.

DISCUSSION For adult players (PST plus IT) to play successfully seems to require a VO_2max between 55 and 60 ml kg^{-1} min^{-1} (whatever the level is). Percentage of VO_2max at VT seems not to be related to competitive level in Futsal. Once promoted a VO_2max level around 55 ml kg^{-1} min^{-1} training programs should be oriented to other components of performance

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KEY WORDS Training, maximal oxygen uptake, anaerobic threshold, 5-a-side soccer.

P-004 Technical performance during short term soccer specific exercise

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OBJECTIVE During a game soccer players perform intermittent exercise with changes in activity every 3-5 s involving jumps, turns, tackles, high speed runs and sprints. This has been shown to induce fatigue both temporarily during a match and towards the end of a game (Mohr et al., 2003). However, it is unclear to what extent intense short term intermittent exercise affects a player's technical skills. The aim of this study was to examine the technical performance of soccer players during 15 min of specific intermittent exercise resembling intense periods of a soccer game, and relate this to the technical performance without prior intense exercise and to the physical capacity of the players.

METHODS On separate days, a physical-technical test (PT-test) with ten long kicks separated by intense intermittent exercise, a control test (CON-test) with ten long kicks without intense exercise, and the Yo-Yo intermittent recovery test level 2 (Yo-Yo IR2) was performed (n=21). Each kick was evaluated from 0 (miss) to 3 (perfect), and also the relative test result (PT-test/CON-test) was calculated.

RESULTS The summed performance of the first five repetitions during the PT-test was higher ($p<0.05$) than for the last five repetitions (8.4 ± 0.6 vs. 6.9 ± 0.5). The summed performance in the PT-test was lower ($p<0.05$) than in the CON-test (14.8±0.9 (±SE) vs. 22.5±1.2). Thus, the performance difference (PT-vs.CON-test) was greater ($p<0.05$) during kicks 6-10 compared to kicks 1-5 (42.9±0.61% vs. 20.5±0.56%). Neither PT-test nor relative PT-test performance was related to the Yo-Yo IR2 performance.

DISCUSSION This study demonstrated that a player's ability to kick is progressively influenced by intense exercise resembling the most intense periods during a game where fatigue may occur. However, the Yo-Yo IR2 performance (Krustrup et al., 2006) was not correlated with any PT-test performance measures suggesting that the technical performance of a player is not solely dependent on the physical performance

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KEY WORDS Technical performance, kick, Yo-Yo IR2, soccer.

P-005 Reliability of a repeated sprint ability test during simulated team-sport running activity on a non-motorised treadmill

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OBJECTIVE A crucial part of team sports is the ability to repeatedly generate maximal sprints (1-6s) interspersed with brief recovery periods (<21s). Several studies have examined the reliability of repeated sprint ability (RSA) using mainly a 5 x 6s sprint cycle test (McGawley et al., 2006). However, no study has examined the reliability of performing a pre-fatigued 5 x 6s RSA test during team-sport match activity. The purpose of this study was to assess the reliability of a 5 x 6s RSA test in a pre-fatigued state. To achieve a pre-fatigued state each subject completed a 30min team-sport simulation on a non-motorised treadmill (NMT), prior to performing a 5 x 6s RSA test. The protocol was designed to mimic the work profile of most team sports and was based on time-motion data of various football codes.

METHODS Eleven male athletes of various football codes completed three 30min team-sport simulations followed by a 5 x 6s RSA test on a NMT, 6 days apart. Reliability of RSA performance and fatigue variables were analysed using the methods of Bland et al. (1986). Decrement scores were calculated using the following equation: 100–([total sprint performance ÷ ideal sprint performance x 5])x100).

RESULTS Table 1 shows the grand mean value for trials 2 and 3, coefficient of variation (CV), ratio limits of agreement, technical error of measurement (TEM) and intraclass correlation coefficient (ICC) for sprint performance and fatigue variables measured during the 5 x 6s RSA test. No significant differences in sprint performance or fatigue variables were found between trial 2 and trial 3.

Table 1. Measures of reliability of a 5 x 6 s RSA test completed at the end of a 30 min team-sport simulation on a NMT (N=11).

RSA Variables	Grand Mean(± SD)	CV (%)	Ratio Limits of Agreement	TEM	ICC
Performance Variables					
Sprint Distance (m)	155.3 ± 8.2	3.1	1.04 */÷ 1.09	4.6	0.65
Sprint Work (kJ)	19.7 ± 2.1	5.4	1.00 */÷ 1.16	1.0	0.76
MxSP ($m \cdot s^{-1}$)	6.2 ± 0.4	2.5	1.02 */÷ 1.07	0.2	0.85
Fatigue Variables					
Distance Decrement (%)	9.2 ± 4.6	30.2	0.96 */÷ 2.08	2.5	0.71
Work Decrement (%)	16.5 ± 7.7	38.2	1.00 */÷ 2.45	5.7	0.48
MxSP Decrement (%)	8.8 ± 5.0	31.3	1.05 */÷ 2.14	2.7	0.73

MxSP = mean maximal sprinting speed.

DISCUSSION In this study decrement calculations were found to have less reliability than performance variables. This is in agreement with previous research showing poor reliability of fatigue variables in cycling and running RSA tests (Hughes et al., 2006; McGawley et al., 2006). We suggest the use of performance variables such as the total work completed during the pre-fatigued 5 x 6s RSA test to measure and monitor RSA in team-sport athletes.

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McGawley et al. (2006) *European Journal of Applied Physiology* **98,** 383-393.

KEY WORDS Ecological reproducibility, ratio limits of agreement, match simulation, fatigue.

P-006 Comparison of anaerobic tests in young soccer players

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OBJECTIVE Wingate bicycle test and Bosco jump test were widely used to determine the anaerobic power and capacity. A limitation of wingate test was the lack of development and retrieval of stored-elastic energy due to lack of an eccentric phase. On the other hand, Bosco test was attractive for activities that involved repeated use of the stretch-shortening cycle in jumping motions of the lower extremity.The purpose of this study was to determine the relationships among different type of anaerobic power and capacity tests in young soccer players. 12 male young soccer players (age= 15.45 ± 0.45 years) volunteered to participate in the 30 sec wingate bicycle ergometer test (WANT), 30 sec Bosco multiple jump (MJ) and repeated zigzag agility test (RHUFA).

METHODS WANT was determined by Monark 894E cycle ergometer with a load set at 7.5% relative to body weight whereas MJ with hands-on-hips method was conducted on a rectangular switching mat. Sprint time was measured by an electronic chronometer including seven gate in RHUFA test performed on the grass. Blood samples were obtained from each player before and after the tests.

RESULTS There were no significant relationships among peak power, average power and fatigue index obtained from the anaerobic tests. Significant differences were found among the anaerobic tests on the peak and average values of VO_2 and heart rate during the tests. Furthermore, post exercise peak lactate concentration and VO_2 were also significantly different among the tests ($p<0.05$).

DISCUSSION The results of this study revealed that Bosco multiple jump, Wingate and repeated zigzag agility tests, though these tests anaerobic in nature, appeared to determine the different aspects of anaerobic characteristics. Therefore, it was suggested that although the tests had the same durations they could not be used interchangeably to determine the anaerobic performance in young soccer players.

KEY WORDS Soccer, anaerobic power and capacity.

P-007 Anaerobic power of junior elite soccer players: A new performance

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OBJECTIVE Soccer performance depends upon a myriad of factors. Although aerobic metabolism dominates the energy delivery during a soccer game, the most decisive actions are covered by means of anaerobic metabolism. To perform short sprints, jumps, tackles and duel play, anaerobic energy release is determinant with regard to who is sprinting fastest or jumping highest. The purpose of this study was to assess the development of anaerobic power in junior elite players aged between 15-19 years and to validate a performance rating (IP) of anaerobic power qualities.

METHODS 186 players of Belgian junior national teams (U15, U16, U17, U18, U19) were evaluated. Anaerobic power testing session consisted of two mains parts: vertical jumps (countermovement jump (CMJ), countermovement jump free arms (CMJfr) 6 seconds jumping test (6sec) and sprint (20m with sprint times at 5m, 10m and 20m). IP is calculated in the following way: see Figure 1.

RESULTS Vertical jump and sprint time performances of U17 where significantly better than U15 performances (CMJ: +15%, $p<0.05$; CMJfr: +16%, $p<0.05$; Reactivity ratio: +15.6%, $p<0.05$; 20m time: -4.3%, $p<0.05$). Between U17 and U19 teams, only CMJfr showed significant difference (+7.6%, $p<0.05$). Figure 1 presents IP for each category. We observed significant relations ($p<0.001$) between IP and power values(LeGall et al. 2002).

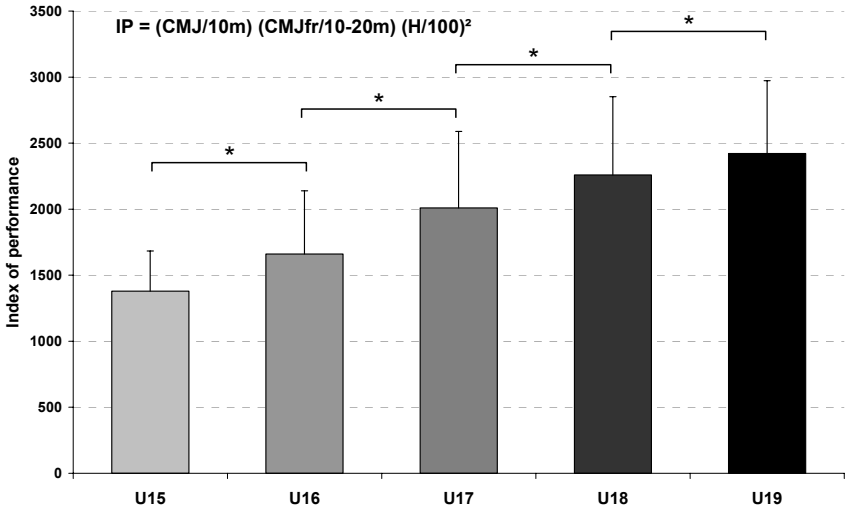

Figure 1. Performance rating (IP) of Belgian junior national teams (U15, U16, U17, U18, U19). CMJ: countermovement jump (cm); CMJfr: CMJ free arms (cm); 20m: 20m sprint (s); H: height (cm). *$p<0.05$.

DISCUSSION The analysis of the evolution of anaerobic power factors in junior elite soccer players between age 15 and 19 showed an increasing progression with the highest increases between age 15 and 17 for all factors. The performance rating, calculated starting from functional and anthropometric variables, appeared to be differential and allowed the identification of players with good anaerobic power potential.

REFERENCE
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KEY WORDS Anaerobic power, performance rating, vertical jump, sprint, junior players.

P-008 Validity of aerobic field tests in young soccer players

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OBJECTIVE Information about aerobic power and capacity generated from the field tests can be used to make appropriate adjustments to a player's training program. Although the aerobic power was accurately determined by indirect calorimeter, this form of assessment has disadvantages in terms of availability, cost, and time. The purpose of this study was to determine the relationships among different type of aerobic power and capacity tests in young soccer players. 36 male young soccer players (age= 16.6±1.2 years, VO_2max= 55.72±4.94 ml.kg-1dk-1) volunteered to participate in the 12 min Cooper test (CT), Conconi test (ConT) and running test with a progressively increased workload protocol (PP).

METHODS All subjects were tested approximately in two weeks during the competition period of young soccer league. VO_2max was measured with Cosmed K4b2 portable oxygen analyser, and earlob-blood lactate concentrations were measured by YSI 1500 lactate analyser. Running velocities (RV) and HR corresponding to fixed lactate concentrations were determined from HR-Workload and Lactate-Workload graphics.

RESULTS There were no significant relationships in VO2max between PP and CT. ConT threshold running velocity was significantly correlated with RV at 4 mMol.L^{-1} during PP. Furthermore, significant relationship was found on HR values between the PP and ConT tests. The highest correlation was found between the maximum distance covered in ConT and RV at 3 mmol.L^{-1} lactate in PP ($r= 0.87$; $p<0.05$).

DISCUSSION The results of this study revealed that VO2max calculated from CT distance was not case sensitive to measured VO_2max during the competition period. In addition, max distance covered in ConT could be better to determine the running velocity at 3 mmol.L^{-1} and 4 mmol.L^{-1} lactate levels compared to the threshold velocity in ConT.

KEY WORDS Soccer, aerobic power, Conconi test, Cooper test.

P-009 Effects on training status and health profile of prolonged participation in recreational football: Heart rate response to recreational football training and match-play

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OBJECTIVE Much knowledge exists about the physical demands of match-play and training for elite football players as well as physiological adaptations to elite football training, whereas little is known about recreational football. A recent study revealed that the aerobic loading was high during recreational 5v5 indoor training (Castagna et al. 2006) and suggested that regular participation would promote cardiovascular health. The present study examined the heart rate (HR) response to recreational outdoor soccer 7v7 training and 11v11 match-play performed at natural grass pitches. The effects of prolonged participation in recreational football on training status and selected health parameters were also investigated. 3 teams (n=12-14 per team) were studies for 3 months (T1+T2+T3), and one team over 2 years (T4, n=12).

METHODS 52 untrained males (31±5 (±SD) yrs, 181±6 cm and 83.3±9.7 kg) participated. T1+T4 trained 2x120-min per week, T2 trained 2x60-min and played one 2x45 min game per week. T3 played two weekly games. HR was recorded during standard training sessions (T1+T2) and match-play (T3). Several anthropometric and physiological measurements were performed before and after the training period (Durnin & Womersley 1973; Eurofit 1988; Krustrup et al. 2004).

RESULTS Mean HR during training was 139±4 (T1) and 159±4 (T2) b.p.m. and match-HR was 157±4 b.p.m. (T3), or 74±1, 83±1 and 84±1% of HRmax. HR was >90% of HRmax for 15±5, 15±3 and 18±4 min. After 3 months, fat% and blood pressure was lower ($p<0.05$). In addition, balance test and Yo-Yo IE2 performance (42%) was better ($p<0.05$). After 2 yrs, body mass, fat% and sprint times (8%) were lower ($p<0.05$). In addition, lean body mass was 3.6 kg higher ($p<0.05$) and Yo-Yo IE2 performance was 133% better ($p<0.05$) (see Table 1).

DISCUSSION The study provided evidence that regular participation in recreational football training and match-play had several beneficial effects on training status and health profile for untrained males. The study also revealed that

match-play and training for recreational soccer players can be characterized as a combination of aerobic moderate and aerobic high-intensity training (Bangsbo et al. 2006).

Table 1. Effects of prolonged participation in recreational football training (A: 3 months; n=37; B: 2 years; n=12).

A:	Body mass (kg)	LBM (kg)	Fat %	Quadriceps mass (kg)	SBP (mmHg)	DBP (mmHg)	Balance(falls in 1min,n)	Yo-Yo IE2 (m)
Before	83.2 (1.7)	64.3(1.0)	22.0(1.4)	2.18 (.05)	146 (2)	87 (2)	5.3 (.9)	790 (68)
After	83.3 (1.7)	66.8(1.1)#	19.2(1.1)#	2.29 (.04)#	136 (3)	73 (2)#	2.9 (.5)#	1126(91) #
B:	**Body mass (kg)**	**LBM (kg)**	**Fat %**	**30-m sprint (s)**	**100-m sprint (s)**			**Yo-Yo IE2 (m)**
Before	82.4 (4.9)	59.2 (1.7)	25.6 (1.7)	4.83 (.13)	16.20(.45)			505 (72)
After	77.5 (3.1)#	62.8(1.5)#	18.2(1.5)#	4.65(.10)	14.94(.36)#			1180(167)#

Values are means (±SEM). LBM = Lean body mass. #: Denotes significant difference from before training. The Yo-Yo IE2 results correspond to improvements in VO_2max of ~15% (3-month group) and ~40% (2-year group).

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KEY WORDS Fat percentage, muscle mass, blood pressure, balance, sprint ability, Yo-Yo intermittent endurance level 2 test performance.

P-010 Physiological effects of playing futsal in professional futsal players

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OBJECTIVE This study aim was to examine the physiological responses to Futsal playing in professional players (n=11, 22.8±1.5 years, weight 75.2±6.2 kg, height 178±7.4 cm, VO2max 62.9± 5.34 ml kg-1min-1).
Futsal is the indoor version of soccer that is officially sanctioned by FIFA and is played at professional, amateur and recreational level all over the world . However despite its current and growing popularity only limited studies have addressed the physiological responses of this indoor game. Furthermore the available literature only addressed amateur or recreational futsal cohorts (Barbero et al 2006, Castagna et al 2006

METHODS Eleven professional Futsal players (Generala IBI, Division de Plata) volunteered to this study. Players trained 10 times a week with a competition played during week-end. Physiological measurements were undertaken during highly competitive training-games (4x10min) and consisted in: game VO2 (K4b2, COSMED, Rome, Italy), game earlobe blood-lactate concentration (random game-sampling) and game heart-rates.

RESULTS Players attained 73.6±8.4 and 89.7±3.1% of VO2max and HRmax respectively. Peak game VO2 and HRs were 96±2.9 and 95±9.1 % of laboratory maximal values, respectively. Average game VO2 was 48.5±3.75 ml kg-1min-1. Players spent 37 and 37.2% of the playing time at exercise intensities higher than 80 and 90% of VO2max and HRmax, respectively. Average blood lactate concentration was 5.3±2.6 mmol l-1.

CONCLUSION These results show that Futsal played at professional level is a high-intensity exercise mode that heavily taxes the aerobic and anaerobic pathways. Maximal aerobic power levels higher than 55 ml kg-1 min-1 are advisable to play Futsal at professional level.

REFERENCES

Barbero et al (2006) *Journal of Sport Sciences*, in press.
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KEY WORDS Physiology, Training, Maximal Aerobic Power, Blood Lactate

P-011 Fitness profile of under-15 Brazilian soccer players by field position

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OBJECTIVE In young Brazilian soccer, the relation of the players' field position with its physiological profile is not well known. The aim of this study was to examine the differences in fitness profile of under-15 male soccer players in accordance to their field position.

METHODS The subjects were 56 Brazilian soccer players of under-15 category. The players grouped by field position as central defenders (n=14), lateral defenders (n=10), defensive midfielders (n=8), offensive midfielders (n=11) and forwards (n=14).The measurements included body mass, height, skinfold, YoYo Intermitent recovery test,30-m sprint, Squat Jump and Countermovement Jump Test.

RESULTS Analysis of variance (ANOVA) revealed that there were no significant differences in the field position for body mass, sum skinfolds, YoYo intermittent recovery test, 30-m sprint, SJ, CMJ. The results indicate that significant differences ($p<0.05$) could be observed in the height between field positions.

DISCUSSION The current findings are similar to those previously reported. Fogelholm (1994) reported daily energy intake of 2131 ± 400 kcal with a 111 ± 450 kcals energy deficit in normal weight female soccer players. Carbohydrate is the primary fuel substrate during soccer, and consequently high dietary intakes of 60-70% of total calorific intake have been recommended for footballers (Schokman et al., 1999). In the present study carbohydrate intake was significantly lower than these recommendations (53.8 ± 6.8%, $p < 0.05$), but fall within the range previously reported for female soccer players 47.8 ± 9.8 to 55.0 ± 7.5% (Clark et al., 2003; Scott et al., 2003).

Table 1. Descriptive parameters for the three groups and the results of the one-way ANOVA.

	Central Defenders	Lateral Defenders	Defensive Midfielders	Offensive Midfielders	Forwards	p
Age (yrs)	15,1(0,3)	14,9(0,4)	15,1(0,2)	14,9(0,3)	14,9(0,6)	0,5690
Body Mass (kg)	64,2(4,3)	61,76(3,3)	64,4(8,0)	62,1(5,5)	63,8(5,3)	0,6907
Heigth (cm)	178,2(3,6)	172,1(2,2)	175,4(6,9)	171,7(5,0)	174,2(7,0)	0,0261*
Sum skinfolds (mm)	16,5(2,3)	15,6(3,1)	16,1(3,5)	15,7(2,5)	18,4(4,8)	0,2364
YoYo (mm)	276,9(59,9)	276,0(47,9)	260,0(56,6)	250,9(44,1)	277,1(59,7)	0,7043
30-m sprint (s)	4,25(0,15)	4,28(0,18)	4,30(0,12)	4,24(0,16)	4,29(0,12)	0,8597
SJ (m)	31,0(2,8)	30,4(5,4)	30,2(2,8)	32,2(2,5)	30,6(3,0)	0,7146
CMJ (m)	34,9(3,6)	33,2(5,9)	34,1(3,5)	35,7(3,0)	34,0(2,8)	0,6251

* $p < 0.05$.

CONCLUSION In conclusion, recommendations for female soccer players are to encourage consumption of carbohydrate-electrolyte beverages to enhance carbohydrate intake and increase fluid intake, and ensure sufficient iron rich foods are included in the diet to meet the DRI.

KEY WORDS Soccer, anthropometry, anaerobic performance.

P-012 Running velocities and heart rate responses to fixed blood lactate concentrations in different divisions of professional soccer players

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OBJECTIVE The purpose of this study was to compare the running velocity (RV) and heart rate (HR) according to the fixed lactate concentrations (2.0, 2.5, 3.0, 3.5, 4.0, 5.0 mmol.l-1) among the elite soccer players playing in Turkish Super League (TSL) and 2nd Division (SDL). Soccer is a game that includes both aerobic and anaerobic activities, demanding s whole energy systems. It is stated that most of the energy requirement (70-80%) is provided from aerobic system during a 90 minutes game. It is pointed out that some physiological parameters like heart rate and lactate (LA) whereas highly correlated with endurance performance.

METHODS 145 male soccer players (10 goalkeeper [GK], 48 defender [D], 53 midfielder [M], 34 forward [F]) from TSL and 141 players (18 GK, 38 D, 61 M, 24 F) from SDL were tested with incremental protocol which was started with 8 km.h-1 and increased 1 km.h-1 every 3 minutes until the players were exhausted. HR and RV responses at fixed LA concentrations were determined from LA-RV and HR-RV graphics.

RESULTS RV of TSL players corresponding to 3.0, 3.5, 4.0 mmol.l-1 [LA] were significantly higher, whereas HR were significantly lower at 5.0 mmol.l-1 [LA] than SD players. HR responses of midfielders from TSL were significantly lower than players at the same position of SD, whereas HR responses of other positions were similar.

CONCLUSION Endurance performances were significantly different at sub-maximal intensities among the players according to playing positions in the two leagues. However, endurance performances of players with different playing positions in the same league were similar.

KEY WORDS Soccer, lactate, heart rate, endurance, playing position.

P-013 Left ventricular hypertrophy by electrocardiographic point scoring criteria in professional soccer players and sedenters

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OBJECTIVE After collapse of 14 years old soccer player during a official match (Iskandar & Thompson, 2004), all media attention has returned to topic of sudden deaths in soccer field which was an terrifying event for either soccer players or spectators. It has become a clinical priority to precociously detect left ventricular hypertrophy by effective, low-cost screening, applicable to the population in general.
The main purpose of this study was to assess left ventricular hypertrophy (LVH) by electrocardiography point scoring criteria in professional soccer players and healthy sedenters. The secondary purpose of this study was to evaluate physiological and biochemical parameters of the professional soccer players.

METHODS Fifty healthy males with a mean age of 24,7±6,0 years old were evaluated. Soccer players were playing in Turkish Priemier League. Physical examination, 12 leads resting electrocariogram and biochemical assays (blood counts, lipids, cholestrol, LDL, VLDL, NA, K and Ca) were examined. Electrocardiographic "point scoring criteria" for determining LVH was calculated according to White-Bock equation (Gasperin et al. 2002).

RESULTS The results of the independent t test analysis of electrocardiographic point scoring criteria (EPSC) scores showed that there were no significant differences between soccer players and sedenters' electrocardiographic pattern in terms of LVH evaluation, t=0,39, p>0,05.

CONCLUSION The electrocardiographic analysis (Gasperin et al., 2002) for LVH showed that professional soccer players did not show increased cardiac dimensions compared with healthy sedenters.

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Gasperin et al (2002) *Arq Bras Cardiol* **78**, 59-82.

KEY WORDS LVH, ECG, biochemical parameters, soccer.

P-014 Yo-Yo intermittent recovery test level 2 in evaluation of physical performance in different groups of athletes

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OBJECTIVE The Yo-Yo intermittent recovery test (YYIR) has been widely used in team sports to assess athletes' abilities to repeatedly perform high-intensity exercise. Specifically, the Yo-Yo IR2 test was shown to be a sensitive tool

to differentiate between intermittent exercise performance of soccer players in different seasonal periods and at different competitive levels and playing positions. The aim of the present study was to compare the YYIR2 performance of different groups of athletes in relation to their competitive level and to the type of sport practiced.

METHODS YYIR2 test performances of several groups of male athletes competing in different sports (Soccer, Badminton, Australian Football (AF), Ice-hockey and Running) and at different competitive levels (Elite, Sub-elite, and Trained) were collected and subsequently examined for mean differences.

RESULTS The YYIR2 performance of elite male badminton players (1020±53m) was the same as elite soccer players (1060±57m), whereas sub-elite AF players had a similar level (720±35m) 1, 2 to sub-elite soccer players (830±44m). Performances of sub-elite ice-hockey players (510±44m) and moderate-trained marathon runners (460±46m) were significantly ($P<0.05$) below the level observed for sub-elite soccer players.

DISCUSSION An athlete's ability to perform intermittent exercise was specific to the type of sport practiced with team-sport players being better than endurance runners. In particular, soccer players were exceptionally skilful in performing repeated high-intensity exercise. In conclusion, the YYIR2 was proven to be specific for the type of exercise observed in intermittent sports.

KEY WORDS Fitness testing, intermittent exercise, team sports.

P-015 Physiological responses of young soccer players to fixed lactate concentrations in playing positions

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OBJECTIVE The purpose of this study was to compare the running velocity, heart rate and oxygen consumption corresponding to the fixed lactate concentrations (2.0, 2.5, 3.0, 3.5, 4.0, 5.0 mmol.l-1) of young soccer players with regard to among the playing positions. Physiological parameters like oxygen consumption, heart rate and blood lactate show differences according to playing position in soccer

METHODS 49 Young soccer players (Age: 17.2 ± 0.7 years) were tested with progressive incremental test with start running speed at 8 km.h-1 for 3 min duration and 1 min rest intervals. Running velocities (RV), VO2 and HR were assessed according to fixed [LA] were determined with third-order interpolation method from HR-workload, VO2-workload and Lactate-workload graphics.

RESULTS Although RV of mid-fielders corresponding to fixed [LA] were higher, no significant differences were found on RV, VO2 and HR at the fixed lactate concentrations among the playing positions. Furthermore, VO2max values of mid-fielder were higher than other positions, but there were no significant differences between positions ($p>0.05$).

CONCLUSION The results of the present study revealed that, the physiological responses of young soccer players were similar at sub maximal intensities for all positions.

KEY WORDS Soccer, Lactate, Heart Rate, Endurance, Playing Position

P-016 Fitness demands of soccer players

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OBJECTIVE The purpose of this study was to measure and compare the university football players' mental toughness and it its sub scales (rebound ability, handle pressure, concentration, confidence and motivation) Doubtlessly physical education and sports differ in terms of? Among other sports football is one of the most popular one with for its beauty, attractiveness and toughness. Sports go through a preparatory phase including physical, technical, tactical drills, how-

ever, football coaches, usually ignore mental preparation. This is why this paper investigated mental variables of football players.

METHODS The sample was ninety male football players, ages 17-25 years who were selected from five universities among 36 south Indian universities. Mental Toughness Questionnaire was administered to measure mental toughness and five specific factors (rebound ability, handle pressure, concentration, confidence, and motivation) before the south Indian competition in 2005.

RESULTS The results showed that all of the university football players were below the average and moderate in mental toughness and its subscales. It seems they need to learn strategies to develop their mental skills, for enhancing optimal performance.

CONCLUSION The results of the study showed that the university football players should learn to stay relaxed under pressure concentrate on the match, and develop their self- confidence systematically. More studies are suggested.

KEY WORDS Mental toughness, football player, competition, preparation.

P-017 The comparison of sprint performances of left and right legged soccer players

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OBJECTIVE Although several tests aim at evaluating agility, there is a lack of information regarding the athletes dominant side to accelerate, decelerate and especially change direction of movement according to the changing requirements of the environment (Chamari et al.2004) Thus the aim of the present study was to investigate the dominant side (left or right leg) on the sprint performance (Özkara 2004). Sprint performance is considered an important fitness component of soccer physical performance and recent studies has shown that sprint performance is correlated to high intensity activity during actual match-play.

METHODS Eighteen male athletes (age 14±2, body mass 52.3±13.7 kg, height 160±1 cm) practicing soccer volunteered in this study. Eighteen male athletes were divided into two groups as left leg and right leg dominant soccer players. All the players performed three trials of 30m sprint test and 30m Hacettepe University Change Direction test with and without ball. The 30m sprint test and change direction test was performed both using right and left leg.

RESULTS According to the results, significant difference was found between left and right legged soccer players according to starting the 30m change direction test by left side and right side simultaneously with and without ball ($p<0.05$).

CONCLUSION The present test aimed at evaluating the athletes' ability react by their dominant side for the different starting procedures in sprint type tests. The test showed the lack of dominant side (right or left leg soccer player) that the starting position had effect on sprint performance depend on change direction types of exercises.

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Chamari et al. (2004) *FieBr J Sports Med* **38**, 191-196.

KEY WORDS Change direction, right and left leg, dominant side, soccer.

P-018 Heart rate and perceptual responses to 2x2 and 3x3 small-sided youth soccer games

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OBJECTIVE During soccer training it is common to reduce the number of players of confronting teams. These small-sided games are common drills used by coaches, allowing to increase the frequency of game technical and tactical ac-

tions and to enhance specific physiologic adaptations (Hoff et al., 2002). Yet, more information on the overall impact of these training tasks in youth soccer is needed. The aim of this study was to examine heart rate and perceptual responses of two small-sided games (2x2 and 3x3), and also the effect induced by three drill modifications (verbal motivation from the coach; two touches per player and man-to-man defense).

METHODS Eight national standard players (age=15±0 years, height=173±6, weight=67±12) were evaluated in the following small-sided games: D1) 2x2 in a 30mx20m pitch with small goals. Players performed 2 reps with 90s of recovery time; D2) 3x3 with 2 reps of 3 min and equal characteristics. Heart Rate (HR) and Borg's Rate of Perceived Exertion (RPE, 6-20) were measured for all drill modifications.

RESULTS No significant differences were found for HR and percentage of maximal HR in both drills. However, there were significant differences for RPE in both drills ($p \leq 0.05$, see Table 1). Scheffe's post-hoc tests revealed differences in the analysed conditions (see Table 1).

DISCUSSION The small-sided games imposed substantial cardiovascular stress in the players. There were differences between the studies of Rampinini et al. (2006) conducted in adult players. The analysed drill modifications did not change the physiological impact of the small-sided games. However, results from RPE suggested that drill modifications did have an effect on overall drill intensity.

Table 1. Descriptive results (x±S.E.), ANOVA and Post-hoc tests

Drill 2x2	**Regular drill**	**Verbal motivation from coach**	**Two touches per player**	**Man-to-man defense**	**p**	**Post-hoc diferences**
RPE	14.1(0.65)	15.5(0.59)	16.8 (0.51)	17.1 (0.53)	≤0.05	all but (2T,MxM)
HR	164.0 (3.43)	169.2(3.73)	164.0 (3.60)	163.1 (2.35)	n.s.	
%HRmax	81.2 (1.24)	83.7(1.44)	81.2 (1.37)	80.8 (0.83)	n.s.	
Drill 3x3						
RPE	14.4 (0.50)	15.8 (0.19)	16.5 (0.46)	16.5 (0.50)	≤0.05	(R,2T) (R,MxM)
HR	160.3 (3.82)	162.2 (3.18)	162.2 (2.55)	162.3 (2.57)	n.s.	
%HRmax	79.8 (1.81)	80.8 (1.70)	80.8 (1.01)	80.8 (1.20)	n.s.	

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Rampinini et al. (2006) *Journal of Sports Sciences*, 1–8.

KEY WORDS Soccer, small-sided games, heart rate, perceived exertion.

P-019 Physical preparedness of soccer players in third and first Russian football leagues

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OBJECTIVE Physical preparedness of a soccer player can be assessed by a number of motor actions performed with sub maximal or higher intensity and their absolute parameters. All these motor actions are realized due to the activity of lower extremities' muscles, the most significant role being played by knee and ankle joints extensors. Objective of this study our work was to assess aerobic and alactic capacities of muscles-extensors of knee and ankle joints in laboratory conditions.

METHODS Soccer players in the 3rd league (n = 35) and the 1st league (n = 50) were studied. All the subjects were examined at the beginning of the preparation period (2 months before the start of the Championship of Russia). The examination was done in laboratory conditions and included anthropometry (height and body mass) and cycle ergometry (progressive exercise test and sprint test).

RESULTS No statistically reliable difference in anthropometric parameters was found. Reliable difference ($p < 0.05$) between players of the 3rd and the 1st leagues was found only in oxygen consumption (OC) at anaerobic threshold (An) and maximal oxygen consumption in forwards and half-backs. Players of the 1st league demonstrated a slightly higher level of alactic power, not statistically reliable ($p > 0.05$).

Table 1. Physical parameters of soccer players at the beginning of the preparation period. Data are means (SD).

	Height (cm)	Weight (kg)	Age (yr)	MAP Wt/kg	OCAn l/min/kg	HR bpm	MOCr ml/min/kg	MOCp ml/min/kg
Third League								
Forwards	183 (5)	77 (8)	24 (4)	11(1)	**37.8 (6.2)**	153 (11)	**60.7 (8.5)**	**71.0 (7.4)**
Half-backs	177 (5)	72 (6)	22 (2)	12 (1)	**31.8 (3.4)**	146 (9)	**52.3 (8.4)**	**71.7 (8.7)**
Defenders	180 (6)	75 (1)	21 (7)	12 (1)	**32.3 (2.1)**	135 (6)	**52.7 (1.1)**	75.0 (10.0)
First League								
Forwards	181 (6)	75 (7)	22 (4)	12 (1)	**53.9 (7.5)**	162 (14)	**70.5 (6.5)**	**81.2 (7.1)**
Half-backs	179 (6)	73 (4)	23 (2)	12 (1)	**54.2 (5.7)**	158 (7)	**77.2 (7.0)**	**84.6 (8.5)**
Defenders	179 (5)	75 (2)	23 (3)	11 (1)	**52.6 (3.3)**	160 (9)	**74.6 (5.7)**	78.5 (6.4)

DISCUSSION This study indicated that a number of accelerations of maximal and submaximal intensity done in a match depended on the level of oxygen consumption at anaerobic threshold and maximal alactic power. Both parameters could be measured using a cycle ergometer in laboratory conditions. The reliability of the difference in these parameters between athletes of different qualification proved their informativeness.

KEY WORDS Physical preparedness, cycle ergometry, anaerobic threshold, maximal alactic power

P-021 Ability to repeat sprint and maximal aerobic power in young soccer players

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OBJECTIVE Maximal aerobic power (VO_2max) and Repeated Sprint Ability (RSA) are considered to be important sport-specific fitness components of young soccer players (Reilly et al. 2000). However research has reported conflicting results on RSA and VO_2max mutuality in adult team players. Furthermore, currently no research is available on the relationship between RSA and VO_2max in youth soccer players. The aim of this study was to investigate the possible relationships between VO_2max and RSA in a group of young regional-level soccer players. As working hypothesis we assumed the existence of a significant relationship between VO2max and sprint decrement during RSA.

METHODS 19 players were randomly drawn from a population of players to participate in this study. VO_2max was assessed with a yo-yo endurance test and gas analyses performed with K4b2 gas analyzer (COSMED, Rome, Italy). RSA was assessed according to Reilly et al. (2000) where the soccer players completed 7x30m line sprints with 20s active recovery between bouts. RSA variables were calculated according to Fitzsimons et al (1993).Data is presented as mean and standard deviation. Relationships between variables were assessed using Pearson's product moment correlation. Significance was set at 5% ($p<0.05$).

RESULTS VO_2max was not significantly correlated to speed decrements ($r=-0.40$, $p=0.12$) and total sprint time ($r=-0.29$, $p=0.26$). Using the median split technique (VO_2max median=56.2 ml $kg^{-1}min^{-1}$) significant correlation was found between VO_2max and fatigue index ($r=-0.77$, $p=0.02$) in the players with low VO_2max (n=9,52.3±3.4 ml $kg^{-1}min^{-1}$).

DISCUSSION Results suggested a mutual influence between VO_2max and RSA in youth soccer players with lower level of fitness (>56.2 mL•kg^{-1}•min^{-1}) and that RSA was possibly developed independent of aerobic-fitness once a threshold level of aerobic power was achieved. The present data also highlighted the importance of testing both VO_2max and RSA performance separately in prospective youth soccer players.

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KEY WORDS Training, fatigue, aerobic fitness, testing, intermittent high-intensity exercise.

P-022 The effects of a 10 week plyometric training intervention on 10 m sprint and vertical jump performance in elite junior professional soccer players

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OBJECTIVE The ability to produce explosive lower body power is an important determinant of performance in soccer. Plyometric training represents an effective method for the development of muscular strength and power. Little information, however, currently exists on the volume of plyometric training needed to induce improvements in performance. To examine the effect of one weekly structured plyometric training session over a 10 week in-season training period on 10 m sprint and vertical jump (VJ) performance in elite junior professional soccer players.

METHODS Twelve soccer players completed a 10m sprint [Limits of agreement (LOA) 0.01 ± 0.09 s) and VJ (LOA 0.7 ± 2.1 cm) test on two occasions, 10 weeks apart. Six players were randomly allocated to an experimental (Exp) or control (Cont) group. Over the 10 week period the Exp group completed one plyometric session per week in addition to normal training whilst the Cont group completed normal training only.

RESULTS The change in 10m sprint performance (Exp -0.04 + 0.02 s, Cont 0.00 + 0.02 s; p=0.04) was significantly greater in the Exp group following the 10 week training period (p=0.011). No difference in VJ performance (Exp 1 + 1 cm, Cont 0 + 1 cm; p=0.028) was observed between the two groups (p=0.155).

CONCLUSION The present findings demonstrate that one plyometric training per week over a 10 week in-season training period leads to significant improvements in 10m sprint time in elite junior soccer players. This training stimulus may act as an efficient training stimulus during the in-season period when training time is limited.

KEY WORDS Plyometric, Speed, Training, Frequency.

P-023 Impact of pre-cooling on soccer-specific exercise (SSE) performed in heat

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OBJECTIVE Hyperthermia is a likely cause of fatigue when soccer is played in the heat, as core temperature reaches a critical value (Nielsen et al., 1993). The principle of pre-cooling is that a reduction in core body temperature prior to exercise increases the margin for heat storage and the time before reaching a critical limiting temperature when a given exercise intensity cannot be sustained. The aim of this study was to examine the effect of pre-cooling on the physiological responses to soccer-specific exercise (SSE) and the subsequent impact on high-intensity exercise capacity when performed in the heat.

METHODS Twelve male soccer players performed SSE in the heat on two occasions (30.5ºC and 42.2% r.h.). On one occasion subjects underwent pre-cooling (wearing a cooling vest for 1h before and during half-time). Core temperature, using heat-sensitive telemetry pills, and heart rate were measured continuously. The SSE was followed by a test of exercise capacity (Cunningham and Faulkner, 1969).

RESULTS Core temperature was significantly reduced following pre-cooling and mean core temperature during the entire protocol (Table 1). Heart rate was significantly lower following pre-cooling (mean heart rate with and without pre-cooling: 158±3 and 164±3 beats.min-1 respectively (Table 1). Run time to exhaustion was significantly longer following pre-cooling (70.1±8s) compared to without (57.1±5s).

Table 1. Heart rate during the soccer-specific protocol with and without pre-cooling. * P<0.05

	Heart rate (beats.min^{-1})					
	1-15 min	**16-30 min**	**31-45 min**	**46-60 min**	**61-75min**	**76-90 min**
Without pre cooling	151.6 (2.8)	161.6 (3.2)	165.7 (3.1)	163.1 (2.2)	168.0 (2.5)	171.8 (2.6)
With pre-cooling	144.3 (2.2)*	157.1 (2.9)	160.4 (3.0)	156.6 (2.9)*	163.2 (2.6)	168.1 (2.3)

CONCLUSION A period of pre-cooling prior to soccer-specific exercise significantly reduced core temperature and heart rate during exercise. In addition, pre-cooling significantly enhanced exercise capacity as indicated by a longer time to exhaustion during the high-intensity running test performed following the soccer-specific exercise. These changes were evident without any impact on metabolism.

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KEY WORDS Soccer-specific exercise, pre-cooling, core temperature, heart rate, exercise capacity.

P-024 Comparison of a new soccer-specific aerobic fitness test to other field and laboratory tests: Preliminary data

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OBJECTIVE The purpose of this study was to measure performance and physiological responses of the SAFT compared to an incremental treadmill test (ITT) to determine VO2max, and the Yo-Yo Intermittent Endurance Test (YYIET).Whilst a number of laboratory and field based tests are available to measure soccer-specific endurance capacity, most fail to represent the intermittent and multi-directional nature of soccer match-play. The Soccer-specific Aerobic Fitness Test (SAFT) was developed to replicate the activity profile of soccer, based on data provided by notational analyses. The test is maximal and incremental with minimal space & equipment requirements.

METHODS Ten University 1st XI players performed the SAFT, the ITT and the YYIET on different days under standardised laboratory conditions. Performance of the tests was measured by VO_2max on the ITT, and distance covered (m) in the SAFT and YYIET. Heart rate was measured during each test. Expired gas analysis was measured using a portable system during the field-based tests in a sample of the subjects.

RESULTS The VO_2max was not correlated with performance of either the SAFT ($r = 0.18$, $P > 0.05$), or the YYIET ($r = 0.36$, $P > 0.05$). There was a moderate association between performance of the SAFT and YYIET ($r = 0.66$, $P = 0.077$). HRmax determined during the ITT, was attained in the SAFT (98.6 ± 2.1 %), but not in the YYIET (97.8 ± 2.2 %; $P < 0.05$). SAFT also elicited VO_2max (106 ± 4.9 % of ITT VO_2max).

DISCUSSION Performance of the field based SAFT was not associated with VO_2max, as expected and indicative of the varied physiological demands of match-play. SAFT performance was comparable with the YYIET. The physiological responses to SAFT (elicits HRmax and VO_2max) demonstrated that the test was both incremental and maximal in nature (Figure 1). The nature of the SAFT enhances its application to squad testing.

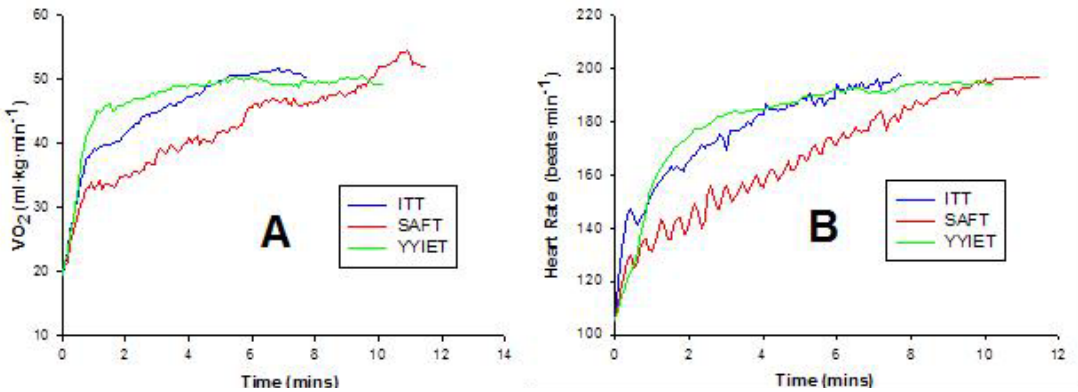

Figure 1. Example of the HR (A) and VO_2 (2) response to ITT, SAFT and YYIET.

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KEY WORDS Field test, soccer, physiological response.

P-025 Playing standard and position-specific differences in performance of a soccer-specific aerobic fitness test (SAFT): Preliminary data

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OBJECTIVE The purpose of this study was to investigate the sensitivity of SAFT to the differences in aerobic training status attributed to playing standard and position. Players were characterised as either centre backs (CB), full-backs (FB), midfielders (MD), or forwards (FD). Whilst a number of laboratory and field based tests are available to measure soccer-specific endurance capacity, most fail to represent the intermittent and multi-directional nature of soccer match-play. The Soccer-Specific Aerobic Fitness Test (SAFT) was developed to replicate the activity profile of soccer, based on data provided by notational analyses. The test is maximal and incremental with minimal space & equipment requirements.

METHODS Twenty professional (PRO) and 12 elite youth players (EY) performed the SAFT in addition to an incremental treadmill test (ITT) to determine maximal oxygen uptake (VO_2max). The tests were randomised and undertaken in standardised laboratory conditions at the same time of day. Performance was recorded as the time to exhaustion (s) on the ITT, and the distance covered (m) in the SAFT.

RESULTS SAFT performance was greater in the PRO than EY players ($P < 0.01$). There were no differences between PRO and EY ITT performance and VO_2max ($P > 0.05$). In PRO, MD showed a higher VO_2max than CB ($P < 0.05$). In the SAFT, MD also covered more distance than FD ($P < 0.05$), and CB (NS; $P = 0.07$). There were no position-specific differences in VO_2max or SAFT performance between EY players ($P > 0.05$).

CONCLUSION SAFT showed differences between playing standard and also playing positions, which were not observed in VO2max. It was also observed that position-specific differences were not apparent in elite players at the age of 16-18. Whilst further data is required, this data suggested that SAFT could be used as a simple, practical and sensitive measure of soccer-specific aerobic status.

KEY WORDS Soccer, playing position, field test.

P-026 Physiological and health variables of sports trainers

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OBJECTIVE Coaching demands individuals with good abilities, which leads them to spend effort on their players. Literature in training field noticed many sudden death cases especially among trainers. As such, the aim of this study was to investigate the problems that confront trainers in different training fields, and identify the disease which attacked them at work.

METHODS Measuring was performed in the sample of 350 male trainers (57 football, 46 basketball, 40 volleyball, 34 handball, 31gymnastic, 34 athletic, 28 swimming, 25 wrestling, 27 karate, and 28 judo) selected by purposive sampling method from some sports activity trainers in Egypt. Subjects were incurred to the questionnaire that included many points like (the scientific level, the practice level, and experience years).

RESULTS The results indicated (Table 1) that the problems confronted the trainers was competitions' irregular 88% sequence the unrecognizing in young players 86.3%. Next, there were not contracts between the administration and trainers 78%. In addition, the disease that confronted the trainers most was the hypertension 38.6%, and diabetic mellitus 31.7%. Also, injures which confronted trainers was the cramp 38.9%.

Table 1. The problems that confront trainers.

Variables	Competitions' irregular	Unrecognizing in young players	Salary's weakling	The parents interpose in trainers' work	Private lessons	There're not a contract between the administration and trainers
% percent	88	86.3	84.3	49.7	53.7	78

DISCUSSION The results indicated that trainers were exposed to many diseases and injures due to physical and psychological stress in the working zone. 278 cases (79.4%) were injured after working in the training field.

CONCLUSION In conclusion, stress comes from the administration, spectators, and did not acquire any achievement. Some injuries like cramp and sprain was may be due to negation of warm up.

KEY WORDS Sports training jobs, injures, diseases.

P-027 Relationships of body composition, anaerobic performance and isokinetic knee strength in American football players

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OBJECTIVE American football is gaining popularity throughout the world and is a game that is dominated by size and strength. Most players are overweight and have high body fat. Body weight, lean body mass and body fat is critical factors relative to anaerobic performance (De Ste Croix et al., 2001). The purpose of the present study was to investigate the relationship between body composition, anaerobic performance and isokinetic knee strength in American football players.

METHODS 28 American football players participated in this study voluntarily. For the determination of body composition, skinfold thickness was measured. Wingate Anaerobic Power Test was used for the determination of anaerobic performance, and peak isokinetic knee extension and flexion torques were determined at 60º, 150º and 240º.s^{-1} (Cybex 770 Norm, USA).

RESULTS Fat mass, (FM) correlated with mean power (MP) (r=.387) and 60º.s^{-1} extension (r=.469). Fat % correlated with 60º.s^{-1} extension (r=.414). Lean body mass (LBM) correlated with peak power (PP) (r=.672) and MP (r=.776), 60 (r=.474), 150 (r=.550) and 240º.s^{-1} extension (r=.580). PP correlated with 60 (r=.491), 150 (r=.559) and 240º.s^{-1} extension (r=.581 and 240º.s^{-1} flexion (r=0.418) while MP correlated with 60 (r=.466), 150 (r=.522) and 240º.s^{-1} extension (r=.502).

Table 1. Body composition, anaerobic performance and peak isokinetic concentric extension and flexion of American football players.

Variables	Means (±SD)
Fat%	15.06 (6.2)
Fat Mass (kg)	13.01 (7.1)
LBM (kg)	69.70 (6.6)
Peak Power (W)	825.51 (133.9)
Mean Power (W)	611.42 (74.9)
Knee extension	
60º.s^{-1} (N/m)	134.78 (15.8)
150º.s^{-1} (N/m)	129.758 (20.8)
240º.s^{-1} (N/m)	125.28 (20.6)
Knee flexion	
60º.s^{-1} (N/m)	97.42 (14.2)
150º.s^{-1} (N/m)	94.64 (15.5)
240º.s^{-1} (N/m)	92.64 (14.5)

DISCUSSION Most of the studies indicate that anaerobic performance and muscular strength are highly correlated with LBM and muscle mass (Bourhard et al 1991).

CONCLUSION As a conclusion, the findings of the present study indicated that LBM and body fat percentage plays important role in anaerobic performance and isokinetic knee strength in American football players.

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KEY WORDS Body composition, anaerobic power and capacity, isokinetic knee extension, isokinetic knee flexion.

P-028 Aerobic and anaerobic fitness indicators in under 20 and elite Qatari soccer players

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OBJECTIVE Qatari National age-group soccer teams success have not been carried on at the Olympic and Full International levels. While objective assessment tools that measure tactical and technical competence would provide valuable insight into player development, the majority of soccer research has focused upon different skill related fitness attributes. A plateau in jump and sprinting performance plateau in Qatari National soccer player's late teens was recently reported. Therefore, the purpose of this study was to quantify and compare the aerobic and anaerobic fitness indicators in soccer players at different competitive levels, specifically at Qatar Under 20 (U20), and Elite (NAT) level.

METHODS Twenty-nine (16 U-20, 13 NAT) male athletes (aged 17-34 y) completed a test battery that included counter movement jumps, with (WAMJ) and without (CMJ) arm swing, six repetitive reactivity calf jumps (6J), a 20 m sprint test, and a Level 1 Yo-Yo Intermittent Recovery test. An independent t-test analysed differences between groups. Data was expressed as mean ± SD with significance set at $p<0.05$.

RESULTS There were no differences in height, weight or body mass index. CMJ (U20, 37.8 (4.5); NAT, 40.0 (5.4) cm), WAMJ and 6J performance was similar between groups. No differences in sprinting performance were noted at 2.5, 5, 10, and 20 m. The final stage and total distance (U20, 1762.5 (522.2); NAT, 1769.2 (342.2) m) completed in the YYIRTL1 test did not differ between the groups.

DISCUSSION Results revealed the aerobic and anaerobic fitness indicators in the Qatari players between the two competitive levels. Both groups had similar results in performing high intense intermittent exercise indicating similar high rate of aerobic and anaerobic turnover.

CONCLUSION In conclusion, the U20 players were in similar fitness category as their NAT counterparts.

KEY WORDS Soccer, field testing, physiological development.

P-029 Pre-season aerobic performance of elite Japanese soccer players

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OBJECTIVE Laboratory and field tests are useful to examine players' aerobic capabilities for performance. Most aerobic tests are continuous, whereas, in field sports such as soccer, exercise is intermittent and performance is related to the athletes' ability to repeatedly perform intense exercise. Therefore, field tests provide specific results and are more valid than laboratory tests for coaches. The aim of the present study was to employee two field tests to determine player position specific aerobic fitness indicators for 31 male elite Japanese soccer players (aged 21-29 y), who were all regular members of the national "A" squad of the Japan Football Association. A secondary aim was to make a comparison with other corresponding level data.

METHODS Players were allocated in goalkeeper (GK), defender (DF) and midfield (MF) groups. Strikers were evaluated, but not included in the analysis. The (45:15 sec) Intermittent Field Test (INT), and the Yo-Yo Intermittent Recovery Test Level 2 (YYIRTL2) were used to evaluate aerobic fitness. An ANOVA assessed between group differences. Data was expressed as mean ± SD with significance set at $p<0.05$.

RESULTS No differences were seen between groups in INT test in the maximal aerobic velocity. The total distance completed by GK in the YYIRTL2 test was significantly lower than the DF and MF (GK, 760.0 ± 117.8; DF, 1062.2 ± 98.2; MF, 1068 ± 181.4 m). HR recoveries were similar between groups following both aerobic tests. No correlation existed between the INT and Yo-Yo tests ($r^2 = 0.22$).

DISCUSSION Japanese players appeared to have similar aerobic characteristics as other international players.

CONCLUSION In conclusion, these results may suggest that specific individualised fitness/skill training for the various positions revealed similar outcomes in terms of aerobic fitness levels. More research is necessary to provide fitness test data for elite players to streamline training specifically and elicit higher fitness levels.

KEY WORDS Soccer, field testing, intermittent exercise.

P-030 Physiological responses to submaximal and maximal exercise intensities: Field versus laboratory

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OBJECTIVE Physiological parameters such as oxygen consumption, blood lactate and heart rates may differ in lab and field situations, which can influence the relative intensity of endurance training. Although Lab situation provides valid and accurate responses to standard running velocities, soccer players perform endurance training in the field situation. The purpose of this study was to examine the physiological responses such as heart rate (HR) and blood lactate concentration (La) to submaximal and maximal exercise intensities which were obtained from treadmill (TR) and field running tests (FT) in young soccer player.

METHODS 14 male soccer player (Age: 17.5±0.5 years) participated in two running tests with a progressively increased workload protocol. All tests were performed separately in random order with two days interval. HR was recorded by Polar S610 throughout the tests whereas earlobe-blood lactate concentrations were measured by YSI 1500 lactate analyser within one minute rest intervals between the workloads.

RESULTS No significant differences were found in resting and peak La, resting and maxHR. Running velocities (RV) corresponding to 4 mmol.L^{-1} in lab test were significantly higher whereas HR responses to 3.5 and 4 mmol.L^{-1} [La] were significantly lower than the field test. During the field test the La values in RV of 14-17 km.h^{-1} were significantly lower than those which were measured in the laboratory test.

CONCLUSION The results of the present study revealed that the physiological responses of lab and field test with same protocol were conflicting when assessing the endurance performance in young soccer players.

KEY WORDS Soccer, blood lactate.

P-031 Validity of a group intermittent-high-intensity test for repeated sprint ability

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OBJECTIVE Repeated sprint ability (RSA) has been suggested as an important component of team sport performance (Spencer et al., 2005). However, the RSA assessment requires testing protocol that are difficult to implement and are time consuming. The aim of this pilot study was to examine the validity of a new field intermittent high-intensity group test developed to assess RSA (GRSA) in soccer players. GRSA consisted in progressive speed 2x15m shuttle running bouts with 30s of passive recovery. Starting speed was 18 kmh-1 with 0.5 km h-1 increments every 8 bouts. GRSA performance was considered as the total distance covered during the test.

METHODS Eighteen amateur soccer players (age 21.8 (4.8) years) were tested in a random order for RSA (8x2x15m shuttle running with 30s recovery using photocells) and GRSA at least two days apart. Fingertip blood lactate concentration was assessed at rest and three minutes after the end of both tests. Heart rate was monitored throughout the tests using short range telemetry.

RESULTS RSA Total time and best sprint performance were significantly correlated with GRSA performance (r=-0.83, and r=-0.77, respectively p=0.002). Posttests Blood Lactate concentrations were not significantly different (13.25 (3.14) and 13.57 (4.34) mmol L-1 for GRSA and RSA respectively, $p<0.05$). Peak HR were 93 (3.4) and 93 (3.0) % of HRmax for GRSA and RSA, respectively ($p<0.05$).

CONCLUSION The results of this study showed that GRSA test might be considered as an interesting test to assess RSA performance in groups of amateur soccer players without the operative limitation usually encountered during usual running RSA protocols.

REFERENCES
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KEY WORDS Sprinting, field testing, shuttle running, soccer, fitness assessment.

P-032 Assessing aerobic and anaerobic power from a 90-s all-out isokinetic test versus the Wingate test in young female soccer players

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OBJECTIVE While the majority of energy during a competitive soccer match is provided aerobically, anaerobic energy production is essential for high-intensity efforts (Reilly, 1997). The 30-s Wingate test (WAT) has traditionally been used to provide anaerobic power indices to estimate anaerobic capacity (Inbar and Bar-Or, 1986). However, there is no evidence that WAT performance elicits VO_2peak, as derived from a standard incremental test. Since a 90-s all-out test provides a valid measure for VO2peak with adolescents (Williams et al., 2005), 90 s may be a more appropriate duration than 30 s for assessing energy system interaction. By comparing 90-s all-out cycling performance with the WAT, the aim of the present study was to develop a single, short test that would assess both aerobic and anaerobic power in young female soccer players.

METHODS Eight female soccer players (mean (SD): age 11.9 (0.5) y; height 149.6 (7.8) cm; mass 40.8 (8.8) kg) performed an incremental test to exhaustion, a WAT and a 90-s all-out isokinetic test (ISO) in a random order using cycle ergometry. During each of the tests expired air was analysed breath-by-breath, HR and power indices were recorded and blood [La-] was measured pre- and 3-min post-exercise.

RESULTS Physiological and performance data are reported in Table 1. Power profiles for WAT and ISO are shown in Figure 1. Peak power (PP) was similar for the two sprint tests (P>0.05); mean power (MP), end power (EP) and fatigue index (FI) for WAT were similar to the corresponding values measured after 30 s during ISO (ISO_30) (P>0.05). VO_2peak values correlated across all three tests (r>0.85, P<0.01).

Table 1. VO_2peak, HRpeak, the change in blood [La-] (Δ[La-]) and power indices measured during the incremental test, the Wingate anaerobic test (WAT), after 30 s during the 90-s test (ISO_30) and at the end of the 90-s test (ISO_90)

	Incremental	WAT	ISO_30	ISO_90
VO2peak (L·min^{-1})	1.98 (0.35) *	2.08 (0.26)	-	2.17 (0.34)
HRpeak (beats·min^{-1})	195 (11) *	184 (11)*	-	190 (9)
Δ [La-] (mmol·L^{-1})	4.90 (1.5)	4.75 (1.11)	-	5.38 (1.48)
Peak power (W)	-	340 (105)	-	306 (47)
Mean power (W)	-	271 (80) *	252 (51)*	179 (37)
End power (W)	-	201 (65) *	200 (55) *	127 (31)
Fatigue index (%)	-	42 (8)*	39 (9)*	58 (9)

* significantly different from ISO_90 (P<0.05)

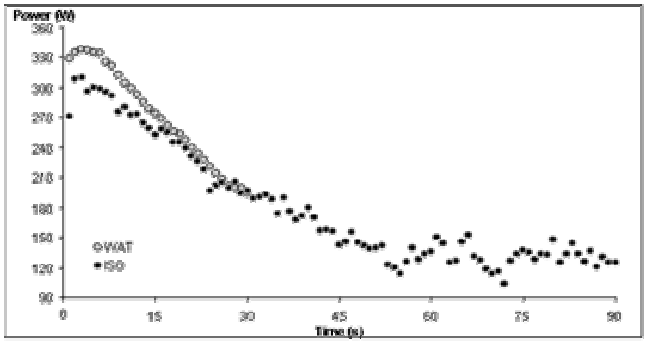

Figure 1. Typical power output profiles for one individual performing the WAT and the ISO.

DISCUSSION The data showed that ISO was able to provide the power measures conventionally derived from WAT to assess anaerobic performance. Unlike data previously reported for men and boys (Carter et al., 2005), the 90-s test elicited a greater VO_2peak than the incremental test.

CONCLUSION It is concluded that a 90-s all-out isokinetic test was able to assess aerobic and anaerobic power in young female soccer players in one single test.

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Carter et al. (2005) *Journal of Sports Science and Medicine* **4,** 437-445.

KEY WORDS Maximal oxygen uptake, energy system interaction, exercise testing, cycling.

P-033 Season variation in repeated sprint ability of futsal players

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OBJECTIVE High-level futsal is an intense intermittent team sport that requires a well developed ability to repeatedly perform intense exercise. The repeated-sprint ability (RSA) is one of the most important fitness components of this activity (Barbero-Álvarez et al., 2006). However, there is no scientific information regarding futsal players' RSA across the sport season. In order to understand training effects in RSA performances, this study aimed to identify the RSA variation across the futsal season (pre, mid and post season), using a 10 maximal repeated sprints protocol of 24,2 m with a change of direction interspersed with 15s of active recovery.

METHODS Eight semi-professional players completed the test (age=21 (2), height=174 (4), weight=71 (6), 6h training/week). The three evaluations were performed after the first month of training (pre), after three months (mid) and after three months (post-season) since the beginning of the season. A 3 (season period: pre, mid, post) X 10 (trials) repeated measures ANOVA was carried out on subjects sprint times.

RESULTS The main effect of sprint trial was statistically significant, $F(9, 189)=2.65$ $P < 0.001$. Mean sprint times following the fourth trial became significantly slower. The main effect of season was non-significant, $F(2, 21) = 0.91$ P = n.s. The two main effects were qualified by an non significant season X sprint trial interaction, $F(18, 189) = 0.75$ P = n.s.

Sprints / Season	Sprint 1	Sprint 2	Sprint 3	Sprint 4	Sprint 5	Sprint 6	Sprint 7	Sprint 8	Sprint 9	Sprint 10
Preseason	4,96 (0,10)	4,88 (0,10)	4,96 (0,10)	4,95 (0,10)	5,09 (0,10)	5,10 (0,13)	5,12 (0,10)	5,06 (0,11)	5,10 (0,10)	5,02 (0,09)
Midseason	4,89 (0,10)	4,95 (0,10)	4,97 (0,10)	4,94 (0,10)	5,13 (0,10)	5,13 (0,13)	5,05 (0,10)	5,12 (0,11)	4,98 (0,10)	5,07 (0,09)
Postseason	5,12 (0,10)	5,14 (0,10)	5,15 (0,10)	5,09 (0,10)	5,15 (0,10)	5,10 (0,13)	5,26 (0,10)	5,18 (0,11)	5,26 (0,10)	5,13 (0,09)

DISCUSSION Obtained results seem to suggest that futsal training: (1) maintained anaerobic capacity across the season but (2) was not efficient in delaying fatigue across the sprint trials.

CONCLUSION Coaches should be aware that this test can play an important role in repeated-sprint ability evaluation.

REFERENCES
Barbero-Álvarez et al. (2006) 11th Annual Congress of the European College of Sport

KEY WORDS Futsal, repeated sprint ability, sprint test, semi-professional players.

P-034 Quantifying energy expenditure of dribbling a soccer ball in a field test

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OBJECTIVE The Hoff test has been used both as an aerobic training intervention program and a method for determining VO_2 max (Hoff et al., 2002)However, the extra energy cost associated with the soccer specific nature of the Hoff test has never been quantified. The study aimed at determining the extra energy cost associated with dribbling a soccer ball during a modified version of the Hoff Test, by examining various movements.

METHODS Skilled male players completed six trials of a modified Hoff Test. Each trial lasted eight minutes at 3 target speeds. Trials at each TS consisted of movement without a ball (NB) and with a ball (WB). The portable Cosmed K4b2 was used to measure the O_2 uptake and heart rate (HR) after 2 minutes of continuous work. Running speeds were verified from Global Positioning Satellites (GPS) data.

RESULTS Multivariate analysis identified a significant difference in oxygen consumption of NB and WB movements across all TS ($p<0.001$). Oxygen consumption during running at 2.0m•s^{-1} averaged 43.8 and 36.6 mL•kg^{-1}•min^{-1} WB and NB respectively. Linear regression illustrates that the difference between NB and WB movements increases with speed of execution (Figure 1).

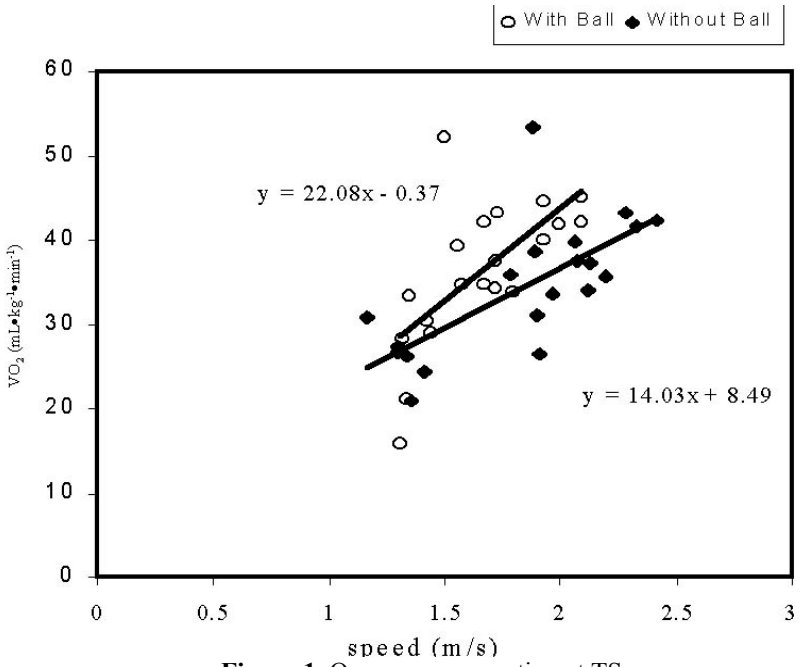

Figure 1. Oxygen consumption at TS.

CONCLUSION Oxygen consumption increases rapidly with running pace in the Hoff Test. Dribbling a soccer ball significantly increases the energy that players expend and more so at higher speeds. This may be due to changes in gait characteristics, at high speed running. This study also demonstrates that running with the ball in the Hoff Test raises O2 consumption providing an effective training stimulus.

REFERENCES
Hoff et al. (2002) *British Journal of Sports Medicine* **36,** 218.

KEY WORDS Oxygen consumption, Hoff Test, aerobic training.

P-035 Explosive strength performance of under-20 soccer players in different field positions

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OBJECTIVE The explosive strength used in soccer appears in some fast movements, fast direction changes, jumps, kicks and dribbles that are high intensity activity. By studying some soccer players, including some high intensity results obtained during a soccer match, it was suggested that the average of some races in a match was between 15 and 17 meters (Mohr et al., 2003). Explosive strength determines performance in soccer players and these magnitudes might change according specific function in game. The aim of this study was to analyze the explosive strength performance in different positions of backwards (BWD), left and right-backs (LRB), back middle fields (BMF), middle fields (MF) and forwards (FWD) for under-20 soccer players.

METHODS The sample was made by 44 male elite Brazilian soccer players grouped as: 9 BWD, 8 LRB, 8 BMF, 9 MF and 10 FWD. Explosive strength (ES) and elastic explosive (EES) was studied. The performances were assessed by SJ and CMJ tests (Bosco, 1994) in a contact carpet Jump Test. All results were analyzed through the descriptive statistic, one way ANOVA and Post-hoc LSD. The significance level was $p<0,05$.

RESULTS Among the field places it was possible to verify some important differences to ES ($p=0,037$) and EES ($p=0,006$). In multiple comparisons of averages some differences were analyzed in ES between LRBxBMF ($p=0,010$), LRBxFWD ($p=0,033$) and BMFxMF ($p=0,017$); and EES between LRBxBMF ($p=0,004$), LRBxFWD ($p=0,015$), BMFxMF ($p=0,003$) and MFxFWD ($p=0,011$).

Table 1. Explosive strength performance description in the different field positions for under-20 soccer players.

Variables	BWD (n=9)		LRB (n=8)		BMF (n=8)		MF (n=9)		FWD (n=10)	
	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD
ES (cm)	34,40	(3,33)	32,05[ab]	(3,88)	36,69	(2,16)	32,43[a]	(4,23)	35,83	(3,82)
EES (cm)	38,36	(3,16)	36,54[ab]	(3,32)	41,36	(1,85)	36,35[ab]	(3,81)	40,51	(3,83)
EI (%)	11,72	(3,91)	14,56	(8,12)	12,85	(2,96)	12,46	(3,82)	13,22	(4,37)

a= statistically different from back middle fields; b= statistically different from forwards; EI= Elasticity Index.

DISCUSSION The results showed the existence of inferiority to the performance for left and right-backs explosive strength in relation to middle fields and forwards and also from the middle fields to back middle fields. Also, inferiority was noticed from left and right-backs elastic explosive strength performance and middle fields in relation to back middle fields and forwards.

CONCLUSION This data suggest that explosive strength is mobilized in different forms to perform high intensity actions depending of soccer player position.

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Mohr et al. (2003) *Journal Sports Science* **21,** 519-28.

KEY WORDS Soccer, explosive strength, elastic explosive strength, under-20 athletics.

P-036 Effects of intermittent hypoxic exposure on haematological and performance in soccer players

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OBJECTIVE The present study observed the changes in haematological index and performance after intermittent hypoxic exposure in soccer players The purpose of this study was to investigate the effects of intermittent hypoxic exposure using normobaric hypoxic house on haematological changes and performance in soccer players.

METHODS 16 male soccer players of a physical education department were randomly and equally divided into two groups of intermittent hypoxic training (IHE) and normoxic normbaric control (NNC).

RESULTS Haematological parameters were red blood cell (RBC), hemoglobin (Hb) and hematocrit (Hct), while performance included maximal O_2 uptake (.V O2max) and Yo-Yo intermittent endurance test (Yo-Yo test). After acute hypoxic exposure for 10 hours, no significant changes were found in RBC, Hb and. Hct. One week later of the hypoxic exposure, RBC ($P<0.05$) and Hb ($P=0.074$) increased.

DISCUSSION 4 weeks of intermittent hypoxic exposure improved performance, distance of Yo-Yo test in trained soccer players, in part, dependent on the increases of haematological changes and VO_2max.

KEY WORDS Intermittent hypoxic training; hypoxic house, haematological change, VO_2max, Yo-Yo test.

P-037 Effect of knee muscle strength on level of professionalism in soccer players

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OBJECTIVE In contact sports, which involve intense physical effort, the training environment appears to have a direct impact on athletic success. Richer football clubs have more resources for training equipment. The purpose of this study was to investigate whether football players at professional league level were associated with differences in isokinetic muscle strength in the knee.

METHODS The knee extensor and knee flexor strengths were measured isokinetically (60 °/s) in left and right knee with an Isomed 2000 isokinetic system in three groups of male soccer players (Turkish Super League, n = 16; Turkish Second League, n = 18) and a group of nonsoccer players (sedentary males, n = 15). Differences between the groups were evaluated statistically with the independent samples t-test.

RESULTS Isokinetic strength was found to be greatest in the Super League soccer players in all comparisons, but no significant differences were found between the Second League players and the control group in any of the comparisons ($p<0.05$).

Table 1. Knee isokinetic muscle strength (Nm) in the three groups of participants.

	Flexion		Extension	
Groups	**RightMean (SD)**	**LeftMean (SD)**	**RightMean (SD)**	**LeftMean (SD)**
Super League	158.38 (35.78)	151.25 (40.59)	233.88 (54.81)	212.81 (70.37)
Second League	93.76 (13.15)	93.32 (14.09)	147.47 (18.41)	153.89 (17.69)
Control group	87.8 (38.25)	102.8 (31.65)	157.27 (71.66)	161.27 (61.24)

DISCUSSION These results were consistent with the possibility that levels of physical training differ by professional league level. One explanation for this is that Super League players generally have more highly organized and intensive training programs.

KEY WORDS Football, exercise test, physical fitness.

P-038 Anthropometric parameters and manifestations of strength and speed in soccer players in ages of formation

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OBJECTIVE This study is a functional valuation of soccer players in ages of formation (under 13,under 15 and under18) with the purpose to observe the relations between some anthropometric parameters (total muscular weight and muscular area of thigh) and manifestations of strength (explosive-elastic strength and explosive-elastic-reactive) and

speed (acceleration capacity). The purpose of this study was to make a conditional characterization in the categories of youth soccer and to describe the relation between the anthropometric parameters and the manifestations of strength and speed.

METHODS The strength was evaluated with Ergojump Boscosystem, making the measurement of the explosive strength (SJ), the explosive-elastic strength (CMJ) and the explosive-elastic-reactive strength of quadriceps (ABALAKOV). Speed of 30 m. with exit from unemployed and a delayed foot were measured with infrared photoelectric cells (Byomedic System). Only the best of the two tests was retained.

RESULTS Based on the age, significant differences (** $p<0.01$) in the weight, the stature, the muscular percentage, total the muscular weight, the muscular area of thigh and the capacity of acceleration. These differences also are observed in the manifestations of strength between U-14 and U-15 (** $p<0.01$), but significant differences between U-15 and U-18 are not appraised.

DISCUSSION Data reflect the inadequate thing to use, like parameters of control of the training in ages of formation, data that come from adult professional soccer players. In relation to the age, a progressive growth of strength and speed was observed, that was accelerated between 15-16 years. The results suggested that the stage of formation corresponding to the category under 15 was decisive.

KEY WORDS Youth soccer, anthropometric, strength, speed.

P-039 Changes in speed, explosive strength and anaerobic power after application of two different training methods in soccer players

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OBJECTIVE High-level soccer requires a great amount of endurance, speed, agility, and power. Research has identified the intermittent high-intensity exercise as predominant and fitness improvements to this activity pattern have been defined as power endurance (Siegler et al., 2003). However, no studies were conducted to assess the effect of power endurance training on players' physical fitness along the season. The aim of this study was to assess the effect of the power endurance training method on semi-professional male soccer players' speed, explosive strength and anaerobic power as measured by the 15m and 30m speed tests, the Squat-Jump and Counter Movement Jump and the Bangsbo Modified Sprint Test (Wragg et al., 2000).

METHODS Forty semi-professional Portuguese players were divided in 2 groups: power endurance training group (PEG, n=20, age=27 (5), height=175 (5), weight=73 (5)) and continuous training group (CTG, n=20, age=27 (5), height=175 (6), weight=73 (7)). The evaluations were performed during the first training session of the season, six and twelve weeks after the beginning of the training program.

RESULTS Factorial ANOVA (group: PEG, CTG x moment: W1, W6, W12) showed that PEG was always faster than CTG in the 15m, 30m and Bangsbo Modified Sprint Test (see Figure 1); recovered better from intense efforts than CTG. Additionally, PEG showed higher values than the CTG in the Squat Jump and no significant differences were found in the Counter Movement Jump (see Table 1).

DISCUSSION The results suggested that both training modalities were able to maintain initial values of speed and explosive strength. However, the PEG exhibited higher improvements in anaerobic power. Therefore, the power endurance training (intermittent high intensity exercise) may be more beneficial to prepare soccer players according to the game cardiovascular and metabolic specific determinants.

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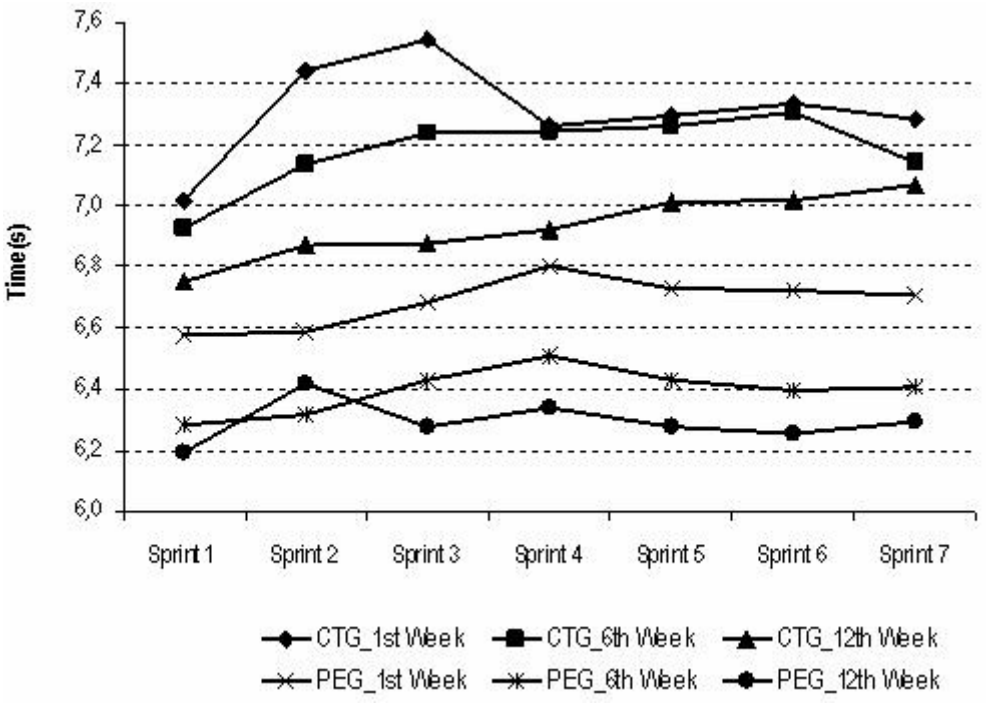

Figure 1. Sprint test results.

Table 1. Descriptive results (mean ±SD) and Factorial ANOVA.

Test	Group Moment	1st Week	6th Week	12th week
15 m Speed *	CTG	2.30 (0.81)	2.31 (0.90)	2.30 (0.09)
	PEG	2.19 (0.08)	2.19 (0.06)	2.16 (0.05)
30 m Speed *	CTG	4.23 (0.25)	4.23 (0.25)	4.20 (0.26)
	PEG	4.02 (0.11)	4.03 (0.15)	3.97 (0.13)
Squat-jump *	CTG	39.9 (1.3)	38.6 (1.5)	39.1 (1.4)
	PEG	42.0 (1.3)	42.6 (1.4)	44.1 (1.3)
Counter-movement jump	CTG	38.3 (1.3)	40.2 (1.4)	40.1 (1.1)
	PEG	39.3 (1.2)	41.6 (1.3)	43.6 (1.0)
Bangsbo Modified Sprint Test *	CTG	7.31 (0.34)	7.19 (0.35)	6.93 (0.39)
(Average time from 7 sprints)	PEG	6.69 (0.20)	6.39 (0.19)	6.28 (0.20)
Bangsbo Modified Sprint Test *	CTG	0.48 (0.09)	0.44 (0.08)	0.37 (0.04)
(Fatigue índex)	PEG	0.34 (0.08)	0.25 (0.07)	0.18 (0.04)

KEY WORDS Soccer, speed, explosive strength, anaerobic power.

P-040 Assessment of anthropometric characteristics and sprint velocity in soccer players from 5 different age groups

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OBJECTIVE There are many studies investigating similarities and differences in anthropometric characteristics and motor capacities of athletes of various age groups. In soccer, some of these studies were developed to provide a better interpretation of the aspects related to growth and maturation and their influence on those who practiced this team sport

regularly. The main objectives of this study were to identify the pattern of the anthropometric characteristics and sprint performance of Brazilian soccer athletes and to compare the values of these variables from a group of subjects divided according to their age in 5 different categories.

METHODS 753 athletes from the Londrina Esporte Clube were assessed between the years 2000:2005, including Anthropometric and motor variables: Height, Body mass, BMI, sum of 7 skinfolds (mm), and linear sprinting performance(s) recorded by a light electronic timing system placed at 0, 10 and 40 m intervals. The 5 categories were: Under 14 (N:100); 16 (N:87); 18(N:169); 21(N:167) and professionals (N:230).

RESULTS The results revealed that the only variables that showed means statistically significant among the five categories were BMI and Body Mass (Table 1). When analyzing the variables Height, Sum of 7 skinfolds and sprints for 10 m and 40 m the five categories presented significant differences among them.

Table 1. The results of anthropometric and motor variables.

Categories	Height (m)	Body mass(kg)	Bmi (kg.m^2)	Sum7skf (mm)	Sprint 10 m(s)	Sprint 40 m(s)
Under 14	1.57 (0.10a)	46.12 (8.61a)	18.50 (1.64a)	64.47 (23.05a/e)	1.78 (0.20a)	6.21 (0.40a)
Under 16	1.71 (0.83b)	61.08 (7.63b)	20.75 (1.54b)	56.15 (15.35b/d)	1.83 (0.44b/c)	5.65 (0.37b)
Under 18	1.74 (0.07c)	65.29 (7.12c)	21.44 (1.58c)	54.51 (13.31b/c/d)	1.79 (0.10b/c/e)	5.50 (0.23c)
Under 21	1.79 (0.06d/e)	71.02 (7.00d)	22.07 (1.61d)	53.49 (13.02 b/c/d)	1.71 (0.14d/e)	5.31 (0.26d/e)
Professionals	1.78 (0.06e)	73.73 (6.43e)	23.15 (1.61e)	60.38 (16.81a/b/e)	1.74 (0.11c/d/e)	5.31 (0.20e)

DISCUSSION The results demonstrated that aging showed significant differences among the five categories in both test and measurements. It seemed that the characteristics and the performances of the athletes were strongly influenced by maturational aspects, the pattern of growth and development as well as the time spent on the regular practice of soccer.

KEY WORDS Brazilian soccer athletes, anthropometric and motor variables.

27. SPORTS AND MEDICINE

P-041 Efficacy of rehabilitation in soccer players undergoing ACL repair using hamstring tendon grafting

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OBJECTIVE Anterior Cruciate Ligament (ACL) injury is a frequent knee injury problem. Recently, hamstring tendon grafting has had a very widely usage among orthopaedic surgeons due to its advantages. The main goals of rehabilitation for ACL injuries are to improve power, endurance and flexibility deficiencies, and re-establish functions by ensuring a safe return to pre-injury level. The purpose of this study was to investigate the outcomes of a rehabilitation program applied to soccer players undergoing ACL reconstruction using hamstring tendon grafting.

METHODS 16 soccer players undergoing ACL reconstruction using hamstring tendon grafting participated in this study. Soccer player's pain (VAS), range of motion, edema and function (Lysholm-II), were evaluated in the first and twelfth weeks. Soccer players underwent a 12-week rehabilitation program (cold application, electrotherapy agents, exercise- proprioception training, and manual therapy) for 5 days per week

RESULTS Physical therapy and rehabilitation resulted in a significant reduction in pain severity and knee edema, ROM and improvement in function ($p<0.05$). Lsyholm-II score consisting of claudication, support, deadlock, instability, pain, edema, stair climbing and squating dimensions were increased from a pre-treatment value of 16.87 (9.94) to a post-treatment value of 92.12 (8.42) ($z=-3.51$, $p<0.05$).

Tablo 1. Before and after treatment result (n=16). Data are means (SD).

	Before Treatment	After Treatment
VAS Resting	5.15 (1.17)	0.28 (0.40)
VAS Aktivity	7.21(1.01)	1.34 (0.72)
Knee Flexion Degree	68.12 (7.93)	138.43 (3.01)
Knee Flexion Degree	24.06 (3.75)	0.06 (0.17)
Knee Circumference Measurement	1.15 (0.43)	0.12 (0.22)
Lysholm-II score	16.87 (9.94)	92.12 (8.42)

DISCUSSION This study showed that rehabilitation applied after a successful surgery of ACL with hamstring tendon grafting had an important role in restoration of joint functions and improvement of function in soccer players. Further research is needed for computing the effects of other treatments for the discussion of the findings.

KEY WORDS Anterior Cruciate Ligament injury, soccer, physical therapy and rehabilitation.

P-042 Relationship of daily changes in salivary secretory immunoglobulin a and appearance of upper respiratory symptoms during soccer training

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OBJECTIVE It is well known that highly trained athletes suffer from a high incidence of upper respiratory tract infections (URTI). Secretary immunoglobulin A (SIgA) is major effectors of mucosal surface protection against micro organisms causing URTI. Although several studies have investigated the relationship between falls in SIgA levels and appearance of URTI symptoms, the relationship is not yet clear. The purpose of the present study was to determine whether changes in mucosal immunity were associated with appearance of URTI symptoms in collegiate soccer players.

METHODS Salivary SIgA levels were measured, and the relationship between daily changes of SIgA in the non-infection period and at the time of appearance of URTI symptoms was examined.

RESULTS Five of 12 subjects exhibited URTI symptoms during the study period. The SIgA level did not significantly decrease before appearance of URTI symptoms. However, the saliva flow rate decreased significantly 3 days before the appearance of URTI symptoms compared to that in the non-infection period ($p < 0.05$). The SIgA secretion rate 3 days before appearance of URTI symptoms also tended to decrease.

DISCUSSION This study did not show a significant relationship between falls in salivary SIgA levels and appearance of URTI symptoms. However, the saliva flow rate was significantly decreased and the SIgA secretion rate tended to decrease at 3 days before appearance of URTI symptoms compared to the non-infection period. Therefore, monitoring mucosal immunity may be useful to assess the risk of URTI.

KEY WORDS Soccer, SIgA, upper respiratory tract infections.

P-043 Effects of leisure exercise on blood paraoxonase and arylestarese activities and relationship with paraoxonase 1-192 polimorphism

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OBJECTIVE Aerobic exercise is well known to have beneficial effects on classical risk factors of atherosclerosis as blood lipid and lipoproteins. However, the relationships of leisure-time aerobic jogging and basically anaerobic soccer exercises with blood paraoxonase (PON1), arylesterase activities (AE) and PON1-192 polymorphism (PON1P) which are regarded as new risk factors have not been fully investigated. This study was designed to determine the interactions or the effects of jogging and soccer training on new risk factors as PON1, AE and PON1P.

METHODS The males aged 40-55 participated in the study. The two leisure-time exercise groups were selected from joggers (JG, n=20) and soccer players (SG, n=20) who had trained since many years regularly and the control group (CG, n=20) consisted of sedentary persons. Serum basal PON1, salt-stimulated PON1 (SSPON1) and AE were analysed by kinetic methods, determined some blood lipids and lipoproteins.

RESULTS Phenotype subgroups of PON1P were determined using SSPON1 / AE ratio. The best lipid profile was that of JG in three groups. No significant differences were obtained for PON1 and AE between JG, SG with CG ($p>0.05$). The improving effect of exercise on HDL-C was significantly better in R carriers (QR+RR) as compared to the QQ phenotype ($p<0,05$).

DISCUSSION There was no effect of exercise on blood AE. But the exercise led to increase in PON1 activity in QQ phenotype, in contrast to a decrease in R carriers ($p<0,05$). These findings were probably due to an interaction between exercise and PON1-192 polymorphism.

KEY WORDS Leisure-time exercise, paraoxonase, arylesterase, Paraoxonase1-192 Polimorphism, blood lipids and lipiproteins.

P-044 Relationship between potassium and free radicals in a soccer competition half-season

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OBJECTIVE The blood levels of potassium and free radicals could be connected with the intensity and volume of training process. On the other side, some studies showed that their changes could be one of the indicators of overreaching or overtraining. The aim of this study was to evaluate the possible relationship between plasma levels of potassium and free radicals during a half season soccer competition.

METHODS The professional soccer players (30) from a football club were recruited in this study. A half competition season of 6 months were divided in three periods when the measurements were conducted in three points: the week at the beginning of conditioning phase, the week of tapering before competition phase and the week after the competition phase.

RESULTS There were significant differences of plasma levels of potassium and free radicals between three periods of training process during the competition half-season. At the same time, there were some significant correlations between plasma levels of potassium and free radicals.

DISCUSSION These findings indicated that elevated plasma levels of potassium and free radical at the end of competition phase were maybe connected with fatigue. On the other side, these changes could mean dysadaptation. Without relevant performance tests and their relationships with these changes, possible overreaching or overtraining was uncertain and unconfirmed.

KEY WORDS Soccer, potassium, free radical, overreaching, overtraining.

P-045 Laboratory and on the field follow up of training process of professional soccer players using blood lactates

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OBJECTIVE The following up of improvement of training process with determination of lactate curve and anaerobic threshold is known, but there aren't enough data about using blood lactates during the specific designed soccer training on the field, in different phases of training process. The aim of this study was to evaluate the blood lactates on the filed during specific designed high aerobic productive and intermittent soccer training in different phases of training process and correlate them with blood lactates on each stage of maximal treadmill exercise test.

METHODS The professional soccer players (30) from a football club were recruited in this study. One half competition season of 6 months were divided in three periods when the measurements were conducted in three points: the week at the beginning of conditioning phase, the week of tapering before competition phase and the week after the competition phase

RESULTS There were significant differences of plasma lactate levels between three periods in laboratory and on the field. There were significant correlations between plasma lactate levels in laboratory and on the field.

DISCUSSION The findings suggested that the training process for the next season would be necessary to be redesigned. The construction of high aerobic productive specific soccer training could be changed according to the findings of plasma lactate levels on the field. The findings of plasma lactate levels in laboratory showed some signs of depletion of glycogen storage.

KEY WORDS Soccer, lactate, anaerobic threshold.

28. SPORT INJURIES AND PREVENTION

P-046 Visual enriched presentation of football related injuries

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OBJECTIVE In the recent years, both, professional and amateur football became high physical performance demanding and battling sports, causing different sorts of injury. Football injuries vary enormously in nature, mechanism and prognosis. Being good acknowledged about injuries may help for their evaluation and to decrease injury rates, diagnostic pitfalls, financial loss and to develop treatment strategies. The aim of the present work was to evoke interest in and to briefly inform about football injuries by showing a set of football injuries presented with high quality informative photographic material.

METHODS The presented material was collected in 12 years from a series of injuries occurred in different times, with different mechanisms and at different levels of the game. 14 injuries were presented. The graphics were either owned by the authors or copied from public media. The medical content was reviewed from main textbooks, which contained classically accepted general information about such medical cases.

RESULTS A total of 14 injuries and their prognosis were presented. Two of the injuries were career ending. The rest of the presented cases recovered in a time span of 0,5-12 months totally and fully return to football was achieved.

DISCUSSION The very broad spectrum of football related injuries require a good expertise and experience of related person. Not only the physicians but also everybody involved, need to be familiar with injury situations and cases.

CONCLUSION Most of the football injuries result in total recovery, but none of them are negligible and one must keep in mind that any football injury can be career ending or life threatening.

KEY WORDS Football, soccer, injury, radiology, injury mechanism

P-047 Creatine kinease and testosterone cortisol ratio in a competition soccer half-season

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OBJECTIVE The changes of creatinee kinease plasma levels and testosterone cortisol ratio in some studies are claimed as the first indicators of overreaching or overtraining. The few recent studies have speculated that at the end of competition soccer season in 10-30% of soccer players there were some signs of overreaching or overtraining. The aim of this study was to evaluate the possible relationship between creatine kinease plasma levels and testosterone cortisol ratio during competition soccer half season.

METHODS Before and after a maximal exercise treadmill test the venous blood was taken. Serum levels of testosterone and plasma levels of cortisol were determinate by RIA method and plasma levels of creatine kinease by DEROM method,before and after the maximal exercise test. Descriptive statistics, ANOVA and correlations were used.

RESULTS There were significant differences of plasma levels of creatine kinease and testosterone cortisol ratio between three periods of training process during the competition half-season. At the same time, there were some significant correlations between plasma levels of creatine kinease and testosterone cortisol ratio.

CONCLUSION These findings indicated that there was some disadaptation, especially at the end of competition season. Without tests of specific soccer performances, it couldn't be concluded that these results showed some signs of overreaching or overtraining.

KEY WORDS Soccer, creatine kinease, testosterone, cortisol, overreaching, overtraining.

P-048 Knee functions in soccer players after anterior cruciate ligament reconstruction

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OBJECTIVE Isokinetic measurements and functional tests are often used to assess knee functions following anterior cruciate ligament (ACL) reconstruction using the opposite leg as a control (Nakayama et al., 2000; Pigozzi et al., 2004). The purpose of this study were to examine the relationship among isokinetic knee extensor strength in 60°/sec, hop and vertical jump strength tests, and to determine differences between the involved and uninvolved leg in soccer players after ACL reconstruction.

METHODS Twenty-one soccer players (mean age: 25.16 ± 6.5 years) undergone with arthroscopic ACL reconstruction using bone-patellar tendon-bone at a 1 year follow-up participated to isokinetic measurement in 60°/sec (CYBEX 6000), hop and vertical jump (VJ) strength tests including involved and uninvolved leg. Mean time for testing was 26 weeks following surgery.

RESULTS There were significant differences between 60°/sec extensor peak torque (PT) and hop test results ($r= .42$ ($p<0.05$), $r= .39$ ($p>0.05$), respectively)and 60°/sec extansor PT and VJ test ($r=-.27$ ($p>0.05$), $r= .42$ ($p<0.05$), respectively)with involved and uninvolved legs. The mean quadriceps muscle strength of the injured side was 75 % of that of the uninjured side.

CONCLUSION The results of this study suggested that knee extensor strength and hop tests of both sides were effective in the functional performance of the lower limb following ACL reconstruction up to 26 weeks postoperatively. Knee functions tests were suggested as a reference guide for the outcome of rehabilitation programme.

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KEY WORDS Isokinetic, muscle strength, soccer players, vertical jump.

P-049 Injury statistics in a competitive football team

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OBJECTIVE The increased number of trainings and matches, evaluated in concordance with the increasing physical demands of modern football have increased the number and severity of football related injuries. Some football institutions have developed strategies and research projects to elicit scientific data bases to understand the injury mechanisms, incidence of injuries, and anatomic sites mostly involved. The objective of this study was to obtain a statistical survey of injuries of a high level competing professional football team.

METHODS The subjects involved in the study were professional players of a high level competing team. Injury sites, types, mechanisms and durations are noted along the 2005-06 season starting from the first practice of the preparation period until the last game of the season. Injury rates were calculated number per 1000 hours of activity (trainings and matches). Frequency analysis was used for statistical evaluation.

RESULTS A total of 127 injuries were recorded in 2005-06 season. The most and least involved injury site and mechanisms were knee (20,75%), head/face/neck (3,77%), strain (31,25%), fracture&dislocation (1%, 0%) respectively. Injury rate was 14/1000 h.

CONCLUSION The results of this study differed from some previously published studies in injury risk (rate), mechanism, and involved site statistics. It was concluded that the variation of external conditions (climate, training programs, study period, etc.) was the reason most responsible for the difference. Standardization of the studied methods may lead to increased reliability of the results.

KEY WORDS Football, soccer, injury statistic, injury mechanism, injury risk

P-050 Effect of long term soccer on spinal mobility and lumbar spine degeneration

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OBJECTIVE A new computerized devise for measuring sagittal spinal range of motion was used for to detect the effect of long term playing soccer. The purpose of this study was to evaluate the effect of playing soccer for long term on spinal mobility, and to analyse the relationship between spinal mobility and lumbar spine degeneration (LSD).

METHODS There have been twenty-two participants in this study (6 active soccer players & 6 controls, 5 veteran players & 5 controls). The assessment of the spine was performed in the upright position and at maximal flex/ext by means of the Spinal Mouse®. Plain lateral radiographs were taken to determine the degenerative change of lumbar vertebrae.

RESULTS Findings of this study demonstrated that there was no significant difference among studied groups in terms of spinal mobility ($p<0.05$). However, spinal mobility showed significant correlations with spinal degeneration scores ($p<0.05$).

CONCLUSION In conclusion, long term playing soccer had no effect on spinal mobility.

KEY WORDS Spinal Mouse, spinal mobility, soccer, degeneration

P-051 Biofeedback for improving weight-bearing following lower limb football injuries: A new assessment and rehabilitation device

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OBJECTIVE One of the primary objectives of early rehabilitation in soccer and football players who have undergone lower limb trauma or surgery is to return them to full weight- bearing as quickly as possible. Even though biofeedback systems give more reliable, accurate and objective data compared to clinical examination and scales, they have so far not been utilized in sports rehabilitation. The purpose of this study is to present and test a new weight-bearing auditory and visual biofeedback insole device using numerous case studies in order to assess the feedback responses in sports persons with lower limb football injuries.

METHODS Patients, who had undergone various orthopaedic surgeries following football trauma were tested using the new insole device. If a weight-bearing discrepancy was noted on evaluation, the new patient-customized auditory feedback device was employed in order to attempt to restore equal weight-bearing in bilateral limbs.

RESULTS Whilst using the new patient-customized auditory feedback device, accurate weight-bearing comparisons between bilateral lower limbs were recorded. After a single session utilizing the feedback device, weight-bearing values were objectively and statistically improved and in some cases maintained without the feedback device being further employed.

CONCLUSION Soccer and football players need to return to full weight-bearing rapidly following injury or surgery. Use of the new patient-customized auditory feedback device provides a more accurate and rapid rehabilitation tool than previous methods. In this study it was demonstrated that audio biofeedback was useful in stimulating added weight-bearing in cases with significant load difference between the affected an

KEY WORDS Biofeedback, gait rehabilitation, lower-limb trauma

P-052 Percutaneous headless screw fixation in surgical treatment of jones fracture in professional football players

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OBJECTIVE Jones fracture is most frequently related to chronic stress, especially in the athlete. The fracture has been treated operatively and nonoperatively. Operative treatment is often recommended for the athlete (Quill 1995). But the optimal surgical treatment has not been determined. Intramedullary screw fixation is popular because of return to competitive sports. The purpose was to present a case of a professional football player with Jones fractures who was treated with percutaneous Acutrak screw fixation. It was hypothesized that surgical fixation of acute Jones fractures would result in shorter times to union and return to athletics compared with cast treatment.

METHODS A case study was conducted with a professional football player (age:26) who underwent internal fixation using Percutaneous an Acutrak screw under local anaesthesia with the aid of fluoroscopy.

RESULTS Clinical healing was obtained at a mean 6 weeks postoperatively. Radiographic consolidation occurred at a mean 8 weeks. Patients returned to their preinjury activity levels at 11 weeks postoperatively. No postoperative complication was set.

DISCUSSION Jones fractures was first described by Kavanaugh et al in 1978 since. Then high success rates have been produced in many studies to minimize the risk of non-union, delayed union, and possible refracture, and to decrease the return time to athletic activity (Reese et al. 2004). The Acutrak system is made from titanium alloy and is a fully threaded, self-tapping, cannulated screw and tapered headless screw (Faran et al. 1999).
CONCLUSION The screw head problems were encountered in the more traditional AO screw techniques. However, Acutrak didn't irritate to skin due to a headless screw. The results suggested that Acutrak may be the treatment in professional football players with Jones fractures. In spite of factors such as ease of implementation, cost, and resistance to bending also needs to be considered.

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KEY WORDS Jones fracture, intramedullary screw fixation, surgical treatment, Acutrak secrew

P-053 Injury evaluation of Turkish national men's football team

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OBJECTIVE National Teams are squads composed by the most elite players of countries. The public interest for the national games is also very high. In addition to these two factors, the level of the game played between national teams is very demanding in the nature. So, injury and its treatment has become very important determining factors for the success of the teams. The aim of the study was to demonstrate the incidence and general characteristics of injuries experienced in Turkish National Football Team between years 2000 and 2005.

METHODS The affected body part, type of injury and applied treatment procedures during official and friendly games and their preparation periods were recorded by the medical staff on a daily basis. The data reveals a six years period between 01.01.2000 and 31.12.2005. Cross tabulation, frequency analysis, descriptive statistics and Chi-Square tests are used for statistical evaluations.

RESULTS Along the study period, 208 trainings and 52 matches were recorded. The averages of 108 total injuries per match and training were 1.0 and 0.27, respectively. 80.6 % of the injuries affected lower extremities. The most common

injury area was thigh with 25 %, the most common injury type was contusion with 32 %, and the treatment was mostly (PTR) (89.8 %). 37 % of the injuries recovered in 1-3 days.

CONCLUSION Being a considerable long follow up period of injuries (6 years) in National Football Team and being followed and documented by the same medical staff, statistical data presents valuable information about incidence, affected body part, type and severity of injuries in European football. The data may serve as a reference for the subsequent research studies.

KEY WORDS Football, injury incidence rate, Turkish National Team.

P-054 Enthesis pain and growth height velocity curve in junior high school soccer players

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OBJECTIVE The enthesis pain, which occur frequently among young athletes, may be caused by an imbalance in physical growth. The purpose of this study was to examine the relationship between the growth height velocity curve and enthesis pain of the lower extremity among the junior high school soccer players.

METHODS The subjects were 107 male students from soccer clubs of 3 junior high schools (47, 23, and 37 students, respectively) in Gunma prefecture. The enthesis pain and the onset time was investigated by interview. The heights measurements from the 1st grade of elementary school to the grade at the time of this study were collected. The phases of height growth velocity curve were determined according to Murata's classification (1996). The phase at the onset time of enthesis pain was investigated.

RESULTS Eight subjects were in phase I at the time of measurement, 48 subjects in phase II, and 48 subjects in phase III. The number of enthesis pain was 32 subjects (31%). The onset time could be confirmed in 29 of the 32 subjects who reported enthesis pain. The phase at the time of onset was I in 5 subjects, II in 19, and III in 5, showing that enthesis pain most frequently occurred in phase II.

CONCLUSION In phase II, height rapidly increased and the growth of bones and muscles/tendons were imbalanced. Promotion of the evaluation of development age using the height growth velocity curve, and calling attention to the possible occurrence of enthesis pain and adjustment of the training level, particularly for players in phase II, were important to prevent sporting injuries during the growth period.

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KEY WORDS Growth period, enthesis pain, injury prevention

P-055 Learning condition and effectiveness of stretching in junior high school soccer players

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OBJECTIVE Frequency of overuse injuries is higher than traumatic injuries of soccer players in growth period and the injury of the lower extremity is higher than upper extremity for the characteristic of soccer. Stretching is widely performed because it is considered to be effective in prevention of the injuries. However it was reported that stretching wasn't performed correctly. The purpose of this study was to examine the possibility of preventing the injuries in growth period by guiding stretching for long term and checking the learning condition and effectiveness of the stretching.

METHODS The subjects were 39 male junior high school soccer players. They were guided and checked for performing the stretching and measured muscle tightness once a month for 6 month. The learning condition of the stretching was checked into three steps A: correctly stretched, B: stretched by wrong way, C: not stretched. Frequency of step A was examined and the paired t-test first and each measurement muscle tightness was used.
RESULTS As the result of paired t-test first and each measurement, a significant difference was observed in bilateral ilio-psoas, adductors, hamstrings and gastrocreminus. The subjects perform who performed stretching at home was 33, (85%). The frequency of step A subjects at first were: iliopsoas 20%, adductors 50%, quadriceps and hamstrings 47% and finally iliopsoas 72%, adductors 64%, quadriceps 69% and hamstring 51%.

CONCLUSION Necessity of guiding stretching continuously was suggested, because the number of step A subjects was in proportion to the times of guidance. The learning condition differd from each muscle, so that stretching of adductors and hamstrings should be performed carefully about pelvic position. Continuous guided stretching was suggested to prevent the injuries in the growth period.

KEY WORDS Growth period, stretching, prevention of injuries

P-056 Medical support in Gunma Football Association U-18 tournaments: Role of physical therapist

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OBJECTIVE Although it is reported that sports damage incidence of a soccer player is high, there are still a few senior high schools where a trainer corresponding to them belongs to exclusive belonging (Sakamato et al. 1998). We arrange contents of medical support by (PT) in four Gunma Senior High School soccer competition meetings of 2004-2005 and clarify a future problem.

METHODS In collaboration with the Gunma Football Association, a total of 189 school teams (246 games) in the four Gunma Football Association U-18 tournaments in 2004 - 2005 were provisioned with medical support.

RESULTS A total of 205 physical therapists took part, a total of 514 players received medical support, and 847 cases were handled in all. Taping, ice therapy, stretching, homeostasis, diagnosis of injury and exercise guidance were the most frequently required services, with taping being dominant.

DISCUSSION Taping of the ankle joint was common, a pattern seen in past injury investigation reports, suggesting the future direction of medical support. It was suggested that PT may lead in damage prevention and improvement of self-care of players It was further suggested that there was a need to plan cooperation with supervision and coach, player and PT with time through medical support.

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KEY WORDS High school soccer, medical support, injury prevention

P-057 Effect of leg cooling at half time breaks on performance of soccer-simulated exercise in hot environment

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OBJECTIVE It is well known that precooling improves exercise performance due to the reduced physiological strain in hot environment (Quod et al., 2006; Drust et al., 2000). Although it has been reported that precooling is of no significant benefit for intermittent exercise (2), it is not clear whether performance of intermittent exercise in the second half

is affected by body cooling at half time breaks. The aim of this study was to examine the effect of leg cooling at half time breaks for soccer-related performance in the hot environment.

METHODS Five college soccer players completed two trials on separate day, involving leg cooling by water immersion for 5 min (LC) or no leg cooling (NC) at half time breaks. Heart rate, concentration of blood lactate, intra-ear temperature, RPE, thirst level, and body water loss were measured . Performance of skill and physical tests were also evaluated in soccer-simulated exercise protocol every 5 min.

RESULTS Environmental condition was 32.11 +/- 0.41 degree C in WBGT. La, Tie, and sweat rate were not different between two trials, but heart rate in second half was significantly lower in the LC compared with in the NC. Although there was no difference in technical performances between two trials, result of time of 30 m sprint in second half was significantly better in the LC compared to NC.

CONCLUSION The results of this study suggested that leg cooling for only 5 min at half time breaks reduced cardiorespiratory strain and improved sprint performance in second half. The ability to sprint at high velocity was essential for performance in soccer. Therefore, it was recommended that leg cooling should be encouraged at half time breaks.

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KEY WORDS Soccer, cooling, performance.

P-058 Magnetic resonance image in athlete with groin pain

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OBJECTIVE Although groin pain is common in athletes, it is difficult to be diagnosed. In order to reveal unknown aetiology of groin pain (Brennan 2005), the imaging study has been applied to the athlete complaining of groin pain (Meyers 2005).The aim of this study was to clarify the prevalence of the abnormal sign in MR findings of the athlete with groin pain.

METHODS 18 athletes with groin pain were included in the study. All patients were male. The average age was 17.6 years old. The athletes underwent MRI (coronal T1-weighted, T2-weighted, and short inversion time inversion-recovery (STIR) imaging, and axial T2-weighted and STIR imaging) to the body of the pelvis. Any abnormal sign in the image was detected by two different orthopedic surgeons.

RESULTS The secondary cleft sign and bone marrow oedema were found in 52 % and 48 % of patients, respectively. The linear high intensity signal along the inferior margin of the pubic ramus was depicted in 32 % of the patient in T2-weighted and STIR imaging.

DISCUSSION Since more than half of cases showed secondary cleft sign (Brennan 2005), it may be one of significant markers for groin pain. This sign was probably due to inflammatory changes caused by micro-avulsion at the enthesis of adductor muscles under the prolonged traction force. Further investigation is needed to clarify the discrepancy between symptoms and the MR findings.

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KEY WORDS MRI, groin pain, secondary cleft sign, bone marrow oedema.

P-059 Athletic rehabilitation of soccer players with groin pain

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OBJECTIVE Groin pain is a common symptom (Holmith et al. 2004; Nozaki 2006) among soccer players; however an appropriate rehabilitation program for groin pain is unclear. An athletic rehabilitation program was introduced for groin pain with observed dynamic alignment.

METHODS Athletic rehabilitation was applied to 19 male soccer players who complained from groin pain syndrome until they returned to the game (mean age: 16.3±3.3). Balance training and coordination training aimed at improving the dynamic alignment were stressed and real athletic movements were introduced gradually.

RESULTS Regarding dynamic alignment, a knee-in position from a lunge motion, or Trendelenburg's sign, was positive during single leg standing in all patients. 98.6±81.3 days in average were required before their return to the game.

CONCLUSION Balance training and coordination training of the whole body were applied throughout the rehabilitation program. In all patients, groin pain disappeared and dynamic alignment improved, therefore all patients were able to return to playing soccer. Moreover, since groin pain and muscle tonus always changed, the condition of the subjects should be carefully observed.

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KEY WORDS Groin pain, athletic rehabilitation, dynamic alignment

P-060 Effects of injury related de-training on gross motor performance in elite soccer players

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OBJECTIVE Soccer is a dynamic contact sport with a high incidence of injury. When injured, players experience a reduced or altered training stimulus compared with normal training. Such loads may lead to de-training and a subsequent inability to fulfil the technical, tactical and physical demands of the sport on return to competition. This may increase the potential for re-injury. To identify the potential for de-training to occur for a professional soccer team by quantifying the length of absences associated with injury. To evaluate changes in gross motor performance on a soccer-related test battery following injury induced alterations in training.

METHODS All attendance and absence from training were recorded using a daily register throughout the 2004-2005 season for all professional players (N = 27). Injury severity was categorised according to the total number of days players were unavailable to train. All players also completed a soccer-related test battery when fit and following injury immediately prior to re-joining normal squad training.

RESULTS Absences of 7-14days (n=36), 15-28 days (n=9), 29-60 days (n=10) and >60 days (n=4) was noted. No significant difference on any test performance was observed for absences of <15 days. Absences of >14 days resulted in reductions ($p<0.05$) in agility (pre 6.2±0.3; post 6.3±0.3s), repeated sprint (pre 7.4±5.5%; post 8.3±6.3%) and estimated aerobic fitness (pre 56.1±5.2; post 54.5±4.9 ml/kg/min).

CONCLUSION Absence from training of >14 days leads to a reduction in performance in anaerobic and aerobic fitness. Absences of this length may occur up to 23 times per season. As a consequence players may be required to compete with reduced fitness levels following injury. This data suggests that careful consideration should be given to both rehabilitation and the time for players to return to competition

KEY WORDS Injury, de-training, test performance.

P-061 Influence of soccer specific fatigue on knee joint kinematics during dynamic landings

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OBJECTIVE Epidemiological data suggests that more soccer injuries occur during the latter stages of match-play, with fatigue cited as a contributing factor. Primary non-contact injury mechanisms include landing and turning. Single legged hopping tasks are often used to investigate the mechanisms of injury, but typically in the rested state with no

consideration given to the influence of fatigue. The aim was to investigate the time-course of soccer-specific fatigue on knee joint kinematics during single legged hopping tasks (inversion cut, eversion cut and planar hop for height). The exercise protocol was based on notational analyses of match-play. The hopping tasks were representative of the multi-directional nature of soccer, and the pre-habilitative work conducted during training.

METHODS Eight professional soccer players completed a 90 min treadmill protocol, comprising six repetitions of a 15 min activity bout and a 15 min passive half-time interval. At rest, and subsequently at 15 min intervals, each player completed the three hopping trials in randomised order. Frontal and sagittal plane knee joint kinematics were quantified during landing using automated motion analysis.

RESULTS Knee joint kinematics at touchdown were characterised by flexion (~30°) and varus (~7°). Knee flexion at touchdown was not affected (P≥0.05) by exercise duration, but varus tended to increase during the simulated match. The increase in varus during the landing phase was greatest in the inversion hop. Knee varus during the planar hop for height was affected by the passive half-time interval.

Table 1. Knee joint angle (degrees) at touchdown during simulated soccer match-play.

Time	*Inversion Cut*		*Eversion Cut*		*Planar Hop*	
(min)	Flexion	Varus	Flexion	Varus	Flexion	Varus
0	29.95(12.99)	4.68(4.87)	28.19(4.73)	7.40(4.42)	26.75(5.58)	5.83(3.90)
15	31.69(5.51)	8.11(7.01)	29.09(3.64)	8.81(5.77)	28.63(5.00)	7.34(6.18)
30	34.99(7.22)	8.64(7.66)	28.47(5.59)	9.92(5.12)	30.80(5.16)	8.58(5.75)
45	30.83(5.03)	7.90(7.62)	29.74(3.80)	10.66(5.69)	27.77(6.36)	9.13(6.19)
60	34.84(9.14)	8.70(5.63)	31.32(7.07)	9.48(6.76)	30.42(5.85)	7.40(5.74)
75	35.95(7.90)	10.36(7.64)	26.11(4.90)	8.42(6.92)	32.08(9.30)	9.19(6.54)
90	28.25(5.97)	10.27(7.60)	30.10(4.98)	10.50(5.54)	27.51(5.28)	8.63(6.45)
105	31.73(9.46)	10.60(8.57)	27.67(4.52)	10.37(4.91)	27.18(5.95)	8.65(5.59)

DISCUSSION Joint flexion serves as a protective mechanism during landing, but knee varus increases the risk of injury. The data suggests a predisposition to knee varus in these professional players, and the influence of fatigue further increases the risk of lateral knee instability. The temporal pattern of kinematic modifications supports epidemiological observations of injury incidence during match-play.

KEY WORDS Soccer-specific fatigue, knee kinematics, inversion and eversion cutting.

P-062 Influence of soccer-specific fatigue on kinematics of kicking

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OBJECTIVE Kicking is a primary mechanism for muscular strain injuries in soccer. Injury incidence has been observed to increase during the latter stages of match-play, with fatigue cited as a contributing factor. Yet, whilst there are many biomechanical analyses of kicking, few have attempted to examine the influence of soccer-specific fatigue on changes in technique and the implications for injury (Apriantono et al., 2006). The aim of the study was to investigate the time-course of soccer-specific fatigue on the kinematics of a maximal velocity soccer kick. The exercise protocol was based on notational analyses of match-play. Kicking performance was quantified as foot speed at ball contact, with technique considered as the contribution of the stretch-shortening action, proximal-distal sequencing, and long-axis rotation.

METHODS Eight professional soccer players completed a 90 min treadmill protocol, comprising six repetitions of a 15 min activity bout and a 15 min passive half-time interval. At rest and subsequently at 15 min intervals, the player completed a maximal velocity kick. Segmental kinematics describing each of the three mechanisms contributing to performance were collected using automated motion analysis.

RESULTS Foot velocity at ball contact was maintained (~ 20 m•s-1) during the protocol. However, the duration of the stretch-reflex mechanism increased during each half, and the thigh segment became increasingly dominant in the proximal-distal transfer at the expense of shank rotation. This alteration was facilitated by increased pelvic rotation suggesting greater contribution from long-axis rotation.

CONCLUSION Whilst kicking performance was maintained, a fatigue affect was evident as a kinematic alteration in technique. Specifically, the duration of the stretch-reflex mechanism, the range of thigh rotation, and the range of pelvic

rotation all increased to facilitate the maintenance of performance. These kinematic modifications in the fatigued state increased the risk of injury across multiple sites.

Table 1. Time-history of kicking mechanisms descriptors during simulated soccer match-play.

Time(min)	Foot speed at contact ($m \cdot s^{-1}$)	Stretch-Reflex duration (s)	Range of thigh rotation (^{o})	Range of pelvic rotation (^{o})
0	18.77 (0.92)	0.021 (0.017)	34.02 (10.31)	8.49 (6.10)
15	18.83 (1.32)	0.029 (0.015)	34.28 (9.32)	8.18 (4.01)
30	19.69 (1.28)	0.029 (0.021)	38.97 (11.52)	9.17 (5.56)
45	19.03 (1.44)	0.039 (0.008)	38.35 (13.80)	10.20 (5.06)
60	19.60 (1.77)	0.026 (0.015)	37.33 (11.94)	8.34 (5.06)
75	18.53 (1.11)	0.030 (0.010)	31.86 (13.77)	8.15 (5.24)
90	18.18 (1.24)	0.032 (0.008)	33.77 (13.01)	7.62 (7.34)
105	18.45 (1.28)	0.021 (0.017)	37.38 (9.00)	8.52 (4.76)

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KEY WORDS Soccer-specific fatigue, muscular strain injuries, kicking

P-063 Injury survey of young competitive football players

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OBJECTIVE Injuries in youth football is a big concern. The increased number of trainings and matches of young players most probably also increases the number and severity of injuries. Experiencing injuries of various seriousness at the beginning of their football career, young talents may retire earlier than expected, or the game is no longer fun. The objective of this study wais to elicit a scientific data base and create a frame work to understand the injury mechanisms, incidence of injuries, anatomic sites mostly involved, etc.

METHODS Injury sites, mechanisms and exposition events of 94 young male players (age:16,03±1,72) of a high level competing club, were evaluated through registered injury cases along 2004-05 season . The exposure time was calculated by multiplication of training times with the number of attending players. Injury rates were calculated number per 1000 hours of activity (trainings and matches). Frequency analysis was used for the statistical evaluation.

RESULTS 202 injuries were recorded. Young players of different competitive groups had trained 33840 hours in total. The injury rate was 5,97/1000 h. The most and least 1), injured sites were ankle and head&neck (35, 17,33 %; 4, 1,98 %), 2), recorded mechanisms were contusion and others (66, 32,67 %; 7, 3,46 %) respectively. 24,75 % of injuries occurred during match situations and the rest were during training.

DISCUSSION The injury rate/risk was lower, injury site and classification ratios also differed in comparison to some previously published older group studies. Injuries during a match were approximately 1,5 fold more then trainings, which is much less then in comparison with older group study results. So, injury risk, site and mechanisms differ in young players and further studies are required.

KEY WORDS football, soccer, young player, injury, injury mechanism.

P-064 Spondylolysis in adolescent and pediatric soccer players

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OBJECTIVE Low back pain is a common problem in young athletes (Gregory et al., 2004; El Rassi et al., 2005). Sports which cause repeated flexion and hyperextension and forced rotation of lumbar spine may cause spondylolysis. Additionally a high velocity kick may cause acute onset of the symptoms. The purpose of the study was to retrospectively examine adolescence soccer players who were diagnosed as sypondylolysis and discuss the symptomathology, diagnostic methods, treatment and recovery period.

METHODS Players who played in Spanish Soccer Association Catalan Delegation and who have been diagnosed for spondylolysis between 2000-20004 were analyzed retrospectively. Age, gender, level and side of the lesion duration of the symptoms, treatment and recovery time were assessed. 34 patients were followed minimum 18 months. All patients were male. Radioraphic assesment was made by X-Ray and Gamma-SPECT.

RESULTS In 70.5% of the patients spondylolytic lesions were located at L5.61.7% patients were bilaterally injured.6 was right and 7 were left sided. Mean duration of the symptoms from onset to the first clinic visit was 3.4 months(1 week-24 months). All the patients were stopped playing soccer after the diagnosis for 7.26 months(3-20). 44%(15) of the patients had antilordotic toracolumbosacral orthosis.

DISCUSSION Spondylolysis may be presented as false negative in 23.5% of the patients on X-Rays and further investigations should be considered. It was suggested that the physician should be aware of all diagnostic tools and carefull about the timing of return to sports.

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Gregory et al. (2004) *British Journal of Sports Medicine* **38,** 737-742.

KEY WORDS Spondylolysis, soccer, low back pain.

P-065 Prevention of non-contact injuries in soccer

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OBJECTIVE The classifications, pathologies, conservative and surgical treatments of injuries in soccer have undoubtedly formed the mainstay of medical literature over the past decades. Despite the rapid increase in the incidence and medical costs involved in these injuries, little attention has been placed on their prevention. This systematic literature review presented the current available evidence regarding the mechanisms of non-contact injuries, as well as the reported methods of prevention and their success in the reduction of these injuries.

METHODS A comprehensive literature search was conducted using the Cochrane Musculoskeletal Injuries Group's specialized register, MEDLINE, PubMed, EMBASE and CINAHL. Video clips were utilized in order to visually highlight the mechanisms involved as well as present the methods employed to prevent these injuries.

RESULTS Significant reductions in the incidence of non-contact knee injuries have been shown in various studies. These have included perturbation techniques, plyometric and sportmetric activities, as well as skill and neuromuscular rehabilitation.

DISCUSSION Not all non-contact knee injuries could be prevented, however there was strong evidence that prevention programs that focused on preparatory muscle activity through muscle strength training, perturbation training, endurance, plyometrics, and skill training could be effective in reducing these injuries in soccer. The outcome of these prevention programs may ultimately result in a more skilled and more biomechanically sound athlete.

KEY WORDS Prevention programs, plyometrics, skill training.

29. PSYCHOLOGY APPLIED TO FOOTBALL GAMES

P-066 Motivational traits of Iranian elite soccer players

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OBJECTIVE Motivation is a one of the important psychological traits, but limited researches have been directed toward defining the competitive specific motivational profile of elite soccer players (Heyman, 1992; Raglin, et al., 1990; Stewart & Meyers, 2004). Exploring the psychological nature of elite soccer players may contribute to either the appropriate selection of athletes or, more importantly, the development of specific training methods designed to take advantage of motivational attributes deemed essential for optimal performance. The purpose of this study was to describe Iranian elite male soccer players' motivational characteristics.

METHODS 61 soccer players of senior, youth U-19 (under 19 years old) and U-23 (under 23 years old) national teams who were selected purposively completed the sports attitude inventory (Willis, 1982). The data were grouped by age and primary position played, and were analyzed by descriptive statistics.

RESULTS On the basis of results, the elite players' motivation to achieve success (70.5) was twice as much their motivation to avoid failure (34.6) (Figure 1). Moreover, senior national team players (149.2) and midfielders (147.2) had more competitive motivation than other players.

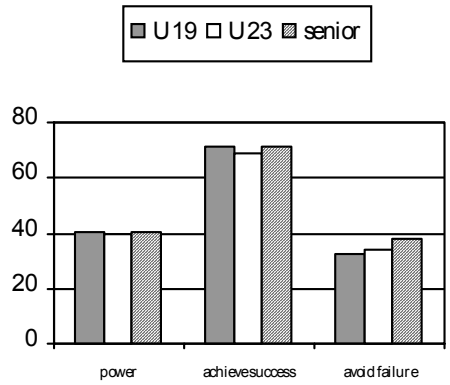

Figure 1. The mean of power motivation, motivation to achieve success, and motivation to avoid failure.

DISCUSSION The fact that older players of senior national team scored higher than younger players on motivation to avoid failure subscale indicated a tendency to be more sensitive to what adults (their coaches) thought than the younger players

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KEY WORDS Competition, elite, motivation, soccer.

P-067 Concentration performance of soccer referees

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OBJECTIVE The ability to direct soccer referees' full attention to appropriate cues in the match is very important for good performance. The precision and the efficacy of their evaluations are based on concentration skills as well as other

factors such as knowledge of rules, their physical fitness levels. The aim of this study was to determine concentration performance of soccer referees and compare their concentration performance with regard to league status.

METHODS 213 male soccer referees (Mage=29.19± 4.94) from six status (professional league, PL; professional assistant, PLA; A status, AS; B status, BS; C status, CS; & C assistant status, CAS) participated in this study. d2 Test of Attention was administered to 213 soccer referees to measure their concentration performance. d2 test yields concentration performance (CP) & error percentage (E %) scores.

RESULTS The mean CP & E% scores of referees were 191.1(41.3) & 7.8(5.4). The mean CP scores of referees at different league status were ranged from 183.3(35.3) to 198.5(40.2). The highest mean E% was 8.7(5.2). Table 1 shows distribution of referees to quartiles of concentration performance. ANOVA indicated no significant differences in referee's concentration performance among different league status.

Table 1. The distribution of referees with regard to quartiles of total concentration performance

RefereeStatus	**< 25th**		**25th-50 th**		**50 th -75 th**		**75 th <**	
	f	%	f	%	f	%	f	%
PL n= 29	8	27.6	5	17.2	6	20.7	10	34.5
PLAn=44	9	20.5	13	29.5	11	25	11	25
AS n= 20	5	25	4	20	8	40	3	15
BSn=40	8	20	9	22.5	11	27.5	12	30
CS n=40	12	30	12	30	10	25	6	15
CSAn= 40	11	27.5	11	27.5	7	17.5	11	27.5

DISCUSSION In summary, concentration performance of soccer referees is classified as good and did not differ with respect to league status. The concentration scores of referees are higher than 20-34 years old Turkish athletes (Caglar, 2003) & German population (Brickenkamp et al, 1998). Future studies should examine the concentration performance of soccer referees by using sport specific concentration tests.

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KEY WORDS Concentration, soccer referees.

P-068 Cognitive component of competitive state anxiety in semi professional soccer: A case study

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OBJECTIVE A case study approach was used to examine the cognitive component of competitive state anxiety in relation to a 26 year old, male, semi-professional soccer player. There has been a great deal of study in the area of competitive state anxiety which is quantitative in nature. This study sought to use a qualitative approach to examine a player's individual competitive state anxiety perspective and compare the findings to relevant literature.

METHODS A semi-structured interview was conducted following a pilot study in line with Breakwell's (1995) five-stage method. Subsequently, inductive content analysis (Patton, 1990) was employed to categorise and analyse the emergent themes.

RESULTS A wide range of topics of cognition including performance, preparation, other (internal) and other (external). The timing of these cognitions was listed as occurring pre-match, during the match and post-match. The last major category was about how the player attempted to change any negative thoughts into positive (fig1.).

DISCUSSION Three distinct themes emerged from the results of this study. The participant experienced cognitions about a wide range of performance related topics, most regarding preparation. The topics were mostly time dependent in relation to the next/last match. The player focused from team preparation to individual preparation as the training week progressed towards the next match.

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KEY WORDS Anxiety, coping, semi-professional soccer, qualitative approach.

P-069 Cognitive styles of elite and non-elite women soccer players

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OBJECTIVE The cognitive capability of soccer players for present situations is one of the important factors which determine performance. Some studies that investigated the cognitive styles of soccer players from "the field independence" and "the field dependence" perspective (Witkin et al., 1977), reported that the elite players had a tendency for the field dependence, compared to non-elites. The purpose of this study was to investigate the cognitive style of women soccer players.

METHODS To determine the cognitive styles of women soccer players Group Embedde-Figures Test (GEFT) was conducted. The subjects were separated into four different groups according to their performance level and their age as national team under 19 years old (N-U19, (n):18), national team of all universities (N-Univ, (n):20), general high school team (G-U19,(n): 18), and general university team (G-Univ, (n): 22).

RESULTS Table 1 shows the mean score of GEFT in each group. ANOVA showed that the elite players (N-U19 and N-Univ) score significantly low ($F(1/74)=8.88$, $p<0.005$) compared to the non-elite players (G-U19 and G-Univ). The U19 players scored significantly lower than the university players ($F(1/74)=6.54$, $p<0.05$).

Table 1. Mean score of GEFT.

Groups	Mean (± SD)
N-U19	14.61(3.65)
N-Univ	17.55(2.65)
G-U19	17.83(2.33)
G-Univ	18.32(3.01)

DISCUSSION The results revealed that the higher the performance levels of women soccer players were, the more they had the tendency towards field dependent cognition. Soccer players needed to recognize various situations that corresponded to the surrounding players and pitch situations. As the results of this study indicated, GEFT is effective to evaluate the cognitive style of women soccer players.

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KEY WORDS Field-dependence/independence, embedded figure test, women soccer, performance level.

P-070 Motivational tendencies and competitive anxiety in second league football teams

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OBJECTIVE Football requires not only a high level of physical performance but psychological skills. Spielberger (1966) trait anxiety is a predisposition to perceive certain situations as threatening or non-threatening and to respond to those situations with varying levels of state anxiety. Martens (1977) defined competitive trait anxiety as the relatively stable disposition of an individual to perceive threat in situations. The aim of this study was to examine the relationships between football players' competitive anxiety and motivational tendencies. Besides, it was carried out to identify differences in somatic anxiety, cognitive anxiety, self confidence and Sport Competition Anxiety Test (SCAT-A) results of teams.

METHODS A voluntary sample, 51 professional soccer players (Turkish Football League Second Division) participated in this study. Pearson Correlation was used to analyse the relationship between SCAT-A results and CSAI-2 and SMS results, MANOVA was used to analyse the differences between SCAT-A (Sport Competition Anxiety Test), CSAI-2(Competitive State Anxiety Inventory-2) and SMS (Sport Motivation Scale) results of the two teams.Turkish versions of CSAI-2, SMS, SCAT-A .

RESULTS Correlational analyses performed using Pearson correlational coefficient revealed that cognitive anxiety and SCAT-A (r =.592,p<.01),somatic anxiety and SCAT-A (r =.510,p<.01), somatic anxiety and amotivation (r =.318,p <.05),self confidence and SCAT-A results (r =.445,p <.01),self confidence and amotivation (r = -.404,p<.01). No significant differences were found between SCAT-A and CSAI-2.

Table 1. Correlations between football players' anxiety and motivational tendencies.

	Somatic Anxiety	Self-confidence	SCAT-A	Intrinsic Motivation	Extrinsic Motivation	Amotivation
Cognitive Anxiety	.472**	-.487**	.592**	-.010	.139	.254
Somatic Anxiety		-.446**	.510**	.013	-.042	.318*
Self- Confidence			-.445**	.175	.051	-.404**
SCAT-A				.060	.076	.137
Intrinsic Motivation					.791**	-.062
Extrinsic Motivation						-.092

*Correlation is significant at the .05 level. ** Correlation is significant at the .01 level.

DISCUSSION It was concluded that, there was a significant relationship between competitive anxiety and motivational tendencies of football players.

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KEY WORDS Motivation, anxiety, CSAI-2, SCAT-A, SMS, football.

P-071 Competitive anxiety and concentration levels of football players

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OBJECTIVE Concentration is defined as directing one's attention to something. In soccer this will be the specific task at the moment. Concentration is measured by how long the individual can maintain this attention and by how resilient s/he is against negative attention breaking forces or situations. It's expected that when the anxiety levels of players' increases their concentration levels will decreases. The purpose of this study was to examine the relationship between football players' competition anxiety and concentration levels. Also, it aimed to examine the differences in competitive anxiety of football players whose concentration times were less than 300 sec. and upper from 301 sec.

METHODS Subjects were voluntary 119 football players from two second league teams and three from super league teams. Pearson Moment Correlation was used to analyze the relationship between concentration and anxiety, and MANOVA was used to analyze the differences in competitive anxiety of football players whose concentration times were less than 300 sec. and upper from 301 sec. Instruments were CSAI-2 and GRID.

RESULTS Significant relationship was spotted between self- confidence and concentration level (r = -.197, p< .05). Besides, there wasn't a significant difference between the concentration and CSAI-2 results.

Table 1. Correlations between football players' CSAI-2 results and concentration levels.

	Somatic Anxiety	Self- confidence	Concentration
Cognitive Anxiety	.372**	-.361**	.110
Somatic Anxiety		-.428**	.145
Self- confidence			-.197*

*Correlation is significant at the .05 level. ** Correlation is significant at the .01 level.

DISCUSSION It was concluded that there was a negative relationship between self- confidence and concentration level. When self confidence of athletes is decreased, their concentration levels are increased.

KEY WORDS Concentration, anxiety, CSAI-2, GRID, football.

P-072 Corporal punishment in football

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OBJECTIVE Sports leaders have an important role in promoting good practice in children's sport. Certain types of coaching require a "hands on approach" i.e. it may be necessary to support a child in order to physically demonstrate a particular technique. Instructors combine positive and negative approaches. Sport psychologists agree that the predominant approach should be positive. Before mentioning corporal punishment in football, it is necessary to explain the means of corporal punishment Corporal punishment is the use of physical force with the aim of not injuring but hurting the child in order to control or to straighten out the child's behaviors. In the literature there is not much research considering corporal punishment among coaches in football. Psychological communities in a large-scale looked at both positive and negative behaviors in children that were associated with corporal punishment. The act of corporal punishment is different across parents, varying in frequency, force, and emotional arousement The objective of this study was to analyze the used punishment method, frequency of punishment, how and in which circumference the corporal punishment was used in football.

METHODS The early prepared and tested questionnaire was applied on 200 players. that investigated age, the number of performed years, socio-economic status and education level of the parents and trainers of the players and whether they had received any corporal punishment at home, at school or in club teams. Who gave corporal punishment at home, at school or in club teams, the first and last time it was received, its frequency, form and severity was also asked. Additionally, the players were asked whether they had received any other punishment besides corporal punishment.

RESULTS The significance of the collected date was analyzed using standard statistical method. The results showed a direct relation between social economic level of players and frequency of the corporal punishment received at home. In the football teams the trainers used the corporal punishment as a tool of motivation very frequently. There was no difference of age for the players concerning the age, at all age they are subjected to the corporal punishment. The trainers are not aware about the destructive effects of the corporal punishment on the players.

DISCUSSION As a conclusion, Football sports leaders should use positive altitude rather than punishment to motivate the players. Raising the children without giving them corporal punishment will cause both parents and children to experience less stress; therefore, cause the family relations to be calming. Not using corporal punishment in football will serve the real aims of sport; sharing, developing self-esteem, taking responsibility, controlling ambition, and fair-play. During the education of the trainers the damages of corporal punishment should be explained.

KEY WORDS Football, corporal punishment.

P-073 Penalty kicks and stress

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OBJECTIVE Point of No Return (PNR) was studied in a laboratory simulation of a soccer penalty kick and the moment beyond which the probability of the kicker to respond to an early goalkeeper dive - was <50% (Morya et al 2003). PNR, in quiet and ideal laboratory conditions, was around 250 ms before kicker-ball contact. Although motivation was generally considered to be critical in the performance of professional players in a stressful penalty situation, this problem has been rarely addressed (McGarry and Franks, 2000). The purpose of the study was to investigate the effect of a noisy and participative audience on the performance of volunteers in a simulated penalty kick task.

METHODS 21 undergraduate students performed the simulated penalty task as part of a practical on motor control. The image on the computer screen to which participants responded was visible to >70 student spectators, in real time,

on a large screen. Participants were divided in two teams, competing as if in a penalty shootout. The audience was encouraged to support or boo participants as they performed.

RESULTS As expected, the PNR backed up (from 250 to 290 ms before ball contact). Unexpectedly, performance under stress saturated at 70% (Fig. 1); i.e. even if the goalkeeper moved a full 100 ms sooner than necessary for perfect performance in the laboratory, participants under stress seemed unable to show 100% performance, putting the ball on the same side as the goalkeeper on about >30% of the trials.

DISCUSSION Failure rates in actual penalties in official games were around 25-35%, remarkably close to the result obtained in this laboratory simulation. There may have been a link between stress and imagining failure, and that imagining failure inevitably may have contributed to imperfect motor planning, leading to a certain error rate difficult to avoid, at least without adequate preparation.

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KEY WORDS Anticipation, goalkeeper, penalty kick, point of no return, soccer, stress.

30. NUTRITION

P-074 Lifestyles and nutritional habits of footballers from North Cyprus Football League

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OBJECTIVE Due to high energy expenditure in competitive sports activities proper nutrition and lifestyle preferences are expected to be important for football players. Lack of information on this matter regarding local footballers in North Cyprus allowed us to analyze food and some behavioral preferences of mentioned athletes from Turkish Cypriot Football Leagues. Total amount of 232 footballers from 14 local teams of North Cyprus were included in this research.

METHODS All 232 football players were questioned about their eating, drinking and smoking habits along with strategies to cope with stress.

RESULTS The results shown that 55.2 % (128 footballers) of participants were regular smokers and 52.4% (n=119) consumed alcohol. Besides, 8.2% of participants accepted drinking as the best way to solve their problems. In cases with eating habits 26.7% of respondents avoided fatty foods and only 29% (n=68) avoided salty foods.

DISCUSSION This study indicated that one out of two local footballers, participated in this survey smoked or consumed alcohol but was careful about eating habits. The study also revealed that only 30.6 % of the subjects could cope with stress without unhealthy habits and 24.2% of all participants took precautions against things that could cause stress.

KEY WORDS Nutrition, lifestyle, football.

P-075 Effects of nutrition patterns in soccer players

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OBJECTIVE Soccer is one of the performance sports that needs the power and endurance for more than 90 minutes. Each successful player needs an individual eating plan, which should, as far as possible, take into account his personal requirements, the intensity of training sessions, the season and his level of football or soccer. Soccer players should have a balanced, varied diet that ensures they consume sufficient quantities of iron, copper, manganese, magnesium, sodium, zinc and vitamin A, C, E, B6 and B12, which are particularly important for health and performance. The most important point in nutrition for soccer players is the sufficient amount of calories consumed. That is why this study investigated the way of storage and maintenance of energy for players in the literature.

METHODS One study showed that 24 hours after a soccer match players had still not recovered their glycogen levels. Even world class players was found to take in only 47% of their calories as carbohydrate, far less than their recommended level of 60% plus. Based on the new researches, muscular and skeletal systems needs of players must be carefully considered.

RESULTS The study showed that 1.5 gram carbohydrate per kg of body mass must be used 4 hours before the match. 1.4 to 1.7 gram protein per Kg of mass body must be used in the diet. It is better to be from high quality resources like the white eggs, milk product, lean meat, drinking the water during the match. Extra fluids should be used with day match breakfast, lunch and 10 to 15 minutes before the match.

DISCUSSION This study indicated that soccer players who ate or drunk carbohydrate soon after exercise sustained maximum restoration. Besides, the need for restoring the fluids consumed during the match was very important, and adequate fluid intake, especially water before, during and after soccer games could help to avoid the negative effects of dehydration.

KEY WORDS Nutrition, soccer, eating plan.

P-076 Nutrition before, during and after soccer

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OBJECTIVE Nutritional strategies before, during and after competition may help to delay or reduce the factors that cause fatigue and loss of performance including dehydration, depletion of fuel store, hypoglycemia, electrolyte imbalance and gastrointestinal disturbances.

Nutrition before soccer: One of the biggest concerns among soccer players relates to when and what they should eat pre-exercise. Players, pre-match food intake should include easily digested high-carbohydrate foods that are familiar and psychological satisfying. Athletes should be advised to experiment eating and drinking strategies on training days to avoid any possible negative consequences

Nutrition during soccer: The main aims of nutritional strategies during exercise are to provide a source of carbohydrate to supplement the body's limited stores, and to provide fluid to delay dehydration. For quick energy during soccer, players should be advised to consume a moderate amount of sugar to maintain their blood glucose level. Dehydration hurts performance so players must drink at every possible opportunity, limited and often. Electrolyte replacement during soccer is not generally necessary but may become important when sweat losses is very high.

Nutrition after soccer: The most immediate nutritional priority after exercise is rehydration closely followed by repletion of body's carbohydrate stores. Fluid replacement after soccer is an essential part of recovery. Athletes should be encouraged to consume carbohydrate rich foods as soon as play stops and to maintain consumption over the next two hours.

KEY WORDS Soccer, nutrition, competition.

P-077 Fluid and electrolyte requirements of soccer players

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OBJECTIVE Dehydration impairs exercise capacity and prevents the soccer players from making the best use of their skills. Exercise in the dehydrated status leads to the rapid elevation of body temperature and offset of the heat illness. Thus, drinking fluids before, during and after playing soccer is essential for top athletic performance and can help to avoid the negative effects of dehydration.

Unfortunately, soccer players tend to underestimate of fluid replacement as an integral part of their sport diet. Opportunity for fluid intake during the game is limited so it is essential to ensure adequate hydration before the game begins, especially in hot and humid conditions, extra fluid should be taken with breakfast and lunch on match days and 10-15 minutes before the game begin.

Players should experiment during training to find out the type, amount, and frequency of drinks that best meet their needs. In hot and humid weather, fluid intake should be increased.

There is probably little need to try to replace the electrolytes lost in sweat during a soccer match but fluid replacement after the game is an essential part of recovery. Measurement of body weight before and after training and competition allow an estimate of fluid loss and hence of fluid replacement.

Adequate electrolyte intake is necessary to replace losses but this can usually be met from the normal food intake.

KEY WORDS Fluid, soccer, electrolyte.

P-078 Soccer and nutrition

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OBJECTIVE Soccer is a high intensity, intermittent activity that requires both strength and endurance over a period of 90 minutes. Soccer training and competition result in an increased energy demand so nutritional strategies designed for soccer players should include adequate calories to support training and competition. Recommendations for energy intake should be based on the needs of each player.

Soccer is a glycogen-depleting activity. The level of muscle glycogen prior to a match will influence performance towards the end of a game. Glycogen depletion, a potential factor contributing to fatigue, may seriously limit player's ability to maintain high-intensity work output, particularly during the late stages of the game.

The specific energy demands of soccer make carbohydrate the predominant and most important source of fuel in the player's diet.

A training diet aimed at maximizing muscle glycogen and glucose availability needs to contain between 8 to 10 g cho/kg body weight or 60% to 70% of total energy. Good sources of carbohydrate are rice, bread, potatoes, pasta, breakfast cereals, confectionary, cakes and sport drinks.

Soccer players would be likely to benefit from protein intakes above current recommendations not only because of their potential to enhance strength, but also to provide energy during training and competition. It appeared that intake of 1.4 to 1.7 g/kg body weight per day should be adequate for soccer players. Good sources of protein are meat, poultry, fish, milk and dairy products and eggs.

KEY WORDS Soccer, nutrition, training.

P-079 Yo-Yo intermittent recovery test in a young soccer team of Brazil before and after protein supplementation plus carbohydrate

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OBJECTIVE Some authors has described the importance of the anaerobic capacity for the performance of the soccer athletes. The Yo-Yo intermittent recovery test has been widely proposed to follow the anaerobic capacity of soccer athlete, during the season. The physical activity can increase dietary protein needs. The objective of the present study was to verify the performance of young athletes in Yo-Yo intermittent recovery test before and after different forms of protein supplementation with carbohydrate.

METHODS The subjects (n=24) 16,4 years old aged from Brazil championship, were keeping in lodging of team, with daily training. The subjects were supplemented with isolated (WPI) or hidrolisated whey protein (WPH) or casein during 8 weeks, 1 g/kg-1/dia-1 of protein plus 0.4 g/kg-1/dia-1 of de carbohydrate -sucrose. The Yo-Yo intermittent recovery test was performed before and after the supplementation.

RESULTS Yo-Yo intermittent recovery performance test of the Brazilian young soccer players before and after protein supplementation with whey protein isolated (WPI) or hidrolisated (WPH) or casein (CAS), 1 $g/kg^{-1}/dia^{-1}$ of protein plus 0.4 $g/kg^{-1}/dia^{-1}$ of de carbohydrate (sucrose) are presented in Table 1.

Table 1. Yo-Yo intermitant recvery performance test results before and after protein supplementation.

	WPH	WPI	CAS	WPH	WPI	CAS
Mean	382,86	445,71	434,29	413,33	440	510
SEM	31,3	37,47	28,19	13,33	21,38	25,17
Maximum	480	600	480	440	520	560
Minimum	280	280	280	360	360	440
n	7	7	7	6	7	4

DISCUSSION The performance was sustained during the season with protein supplementation. This could be considered to be a positive outcome, as the players participated in a lot of matches in a season that would have resulted in the reduction of physical training.

KEY WORDS Whey protein, casein, protein, sucrose, carbohydrate, soccer, supplementation, Yo-Yo intermittent recovery.

P-080 Relationship of pre-match hydration status to match performance, injury and body mass changes in elite Australian Rules Football

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OBJECTIVE Hypohydration has been shown to reduce athletic performance (Shirreffs, 2005). To minimize deleterious effects of hypohydration on performance, many top Australian Rules Football (ARF) teams now monitor hydration status with urine specific gravity (USG) and changes in body mass (ΔBM) during a match. To date, no study has examined the practical usefulness of these measures in an elite football team environment. The objective of this study was to determine if relationships existed between pre-game urinary measures of hydration status and match performance indicators, match ΔBM and match-related injuries in elite ARF.

METHODS 34 elite ARF players participated in this study (age: 22.8±3.7 years; BM: 89.4±8.6 kg; height: 188±6 cm). USG (N=415) was measured prior to 22 matches during an entire season. Performance statistics (work rate and efficiency), injuries and match ΔBM were also recorded. Pearson's correlations were used to assess the relationships between these variables. Alpha was set at 0.05.

RESULTS Pre-game USG were 1.005±0.004mg/L. The match ΔBM was 1.13±0.68%, with wide individual player variability (range: 0.0-3.62%). There was no relationship between pre-game hydration status and injuries when the USG was <1.020mg/L. Further, there were only significant relationships between match ΔBM and performance measures when ΔBM was >3%. There were only relatively few cases (2%) of high ΔBM (>3%).

DISCUSSION USG results demonstrated that all players were well-hydrated prior to each game and that most commonly, only mild levels of ΔBM occurred. However, the high variability in match ΔBM in this study suggested that monitoring of ΔBM and USG should be done on an individual basis. These results could be used to guide future hydration monitoring strategies for elite ARF players.

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KEY WORDS Australian Rules Football, elite level, hydration, urine specific gravity.

P-081 Effects of creatine supplementation on speed in soccer

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OBJECTIVE The aim of this study is to investigate the effect of creatine supplementation on performance of speed and speed continuity.

METHODS The research groups of our study are consisted of 14 soccer players called creatine group and still playing soccer in 1st Amateur League of Erzurum City (age = 24.64 ± 3.97 years, length = 1.77 ± 4.40 meters, body weight = 73.28 ± 4.93 kg) and 14 male persons called control group (age = 23.07 ± 2.89 years, length = 1.76 ± 6.19 meters, body weight = 69.32 ± 5.99 kg). Before loading and after loading, to define the performance of speed and speed continuity, the both of groups are performed the speed test of seven repetitions (sprint distance: 34.2 meters).

RESULTS According to data acquired from both groups during before loading and after loading, body weights are that in creatine group (73.28 ± 4.93 kg - 74.79 ± 4.97) and in control group (69.32 ± 5.99 kg - 68.98 5,82). Also, according to both groups, period of sprints are that in creatine group (6.43 ± 4.93 - 6.32 ± 3.76) and in control group (6.78 ± 7.15 -

6.77 ± 8.05). Nevertheless, leg power is that in creatine group (127.14 ± 4.46 -143.92 ± 4.60) and in control group (132.50 ± 5.46 - 135.71 ± 6.01). There is significance ($p<0.001$ and $p<0.05$). However, ratios of heart rates are that in creatine group (162.10 ± 8.96 - 162.55 ± 9.02) and in control group (172.21 ± 8.66 - 172.18 ± 7.93). There isn't a significance ($p>0.001$).

DISCUSSION Results found in our study are shown a similarity with the results of other researcher previously performing on this subject. The results found in both our study and the other studies, are shown that using creatine in long period has influence on speed performance and muscles strengths of soccer players.

KEY WORDS Creatine, speed, soccer.

31. SCIENTIFIC COACHING

P-082 Opinion of soccer players about off- season in Turkish super league

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OBJECTIVE The period when soccer players detrarining at the end season is very important because it is not known how soccer players spend this period. The purpose of this study was to search opinions of soccer players about off season in Turkish super league.

METHODS 144 soccer players from Fenerbahce, Trabzonspor Denizlispor, Samsunspor, Genclerbirligi, Ankaragucu, Diyarbakırspor and Caykur Rizespor participated in this study. A questionnaire was developed, with 18 items. The reliability of quastionnaire was 0,84. The following evalations were used in 5 point Likert Scale a)disagree totally, b)disagree, c)not sure, d)agree, e)agree totally

RESULTS Soccer players had some physological and phycholigical loses in off season. They should rest actively and their taining should be descreased. It is necessary to give information to soccer players on how much strenght they lose during off season, and soccer players should spend off season accordingly. Soccer players want to rest and get healed from injuries during off season. At the same time they want to get psychological support. Soccer players don't accept big losses in off season in off season while starting preparation period before season, and they think thet preparation period before season is a waste of time.

DISCUSSION At the end off this research, soccer players in Turkish super leauge evaluated that off season was not an inactive and holiday period. Soccer players have enough information on doing various sport activities and physical preparation in off season period.

KEY WORDS Soccer, off season, player.

P-083 Impact of playing in Champions League on National League results

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OBJECTIVE In this paper, the impact of playing a Champions League match on the Spanish Football League match scores was analysed of given teams. According to the results of a logit multinominal regression, playing in the European Champions League did not decrease the probability of winning in the National Championship. The objetives of this study were to analyze the influence of playing in the European Champions League on the scores of Spanish Football League teams, and to examine if this impact was different for teams making debut in the European competition.

METHODS The sample consisted of the 184 matches of the Spanish Football League Seasons 2003-2004, 2004-2005 and 2005-2006 of those teams playing the European Champions League. The dependent variable was the scores obtained by teams. Five independent variables were included. The difference in the level among teams, playing at home or away, to play or no a match of the CL and if the team was a newcomer.

RESULTS As it can be seen in Table 1, playing in the European Champions League did not reduce the probability of winning in the National Championship. The variables playing at home and level were statistically significant and had the expected coefficient. According to the results displayed in Table 1, playing in the European Champions League did not reduce the probability of winning.

Table 1. The results of teams in the Spanish Football League: the influence of playing the European Champions League

Independient Variable	*Defeat vs Win*	*Defeat vs Dra.*
Level (LEV)	0.07 (0.03)*1	-0,23 (0,44)
Playing at home (PH)	0,95 (0,40)**	0,01 (0,03)
Champions League (CL)	0.46 (0.40)	0,29 (0,44)
Intercept	-0,30 (0,34)	0,03 (0,34)
Number of observations 172LR Chi^2 (6) 21,15*Pseudo R^2 0,06		

Notes: Estimation is by maximun-likelihood. Robust Standard Errors in parenthesis.*p<0.01 **p<0.05

DISCUSSION The findings of this empirical analysis showed that playing in the European Champions League did not reduce the probability of winning in the Spanish Football League. In contrast with the general prejudice, playing in the European Champions League did not decrease the probability of winning in the Spanish Football League for teams making debut.

KEY WORDS Result, soccer, champions league, logit multinomial, Spanish football league.

P-084 Influences of ball possession on team performances in FIFA World Cup Germany 2006

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OBJECTIVE In this paper, the effects of the possession of the ball on performances of teams in the FIFA World Cup Germany 2006 were analyzed. The research was based on linear regression analysis. Results pointed out that possession was a relevant variable for explaining the performance obtained by teams in matches. The objective of this paper was to examine the effects of the possession of the ball on performances of teams in the FIFA World Cup Germany 2006.

METHODS The sample consisted of 64 matches played in the FIFA World Cup Germany 2006. The dependent variable was the performance obtained by teams. The independents variables were the possession of the ball, the difference in the level of teams and the round of the competition. A linear regression model was used to analyze the influence of the performance on the points obtained by teams.

RESULTS All the variables were statistically significant. Possession is statistically significant at the level 0.01. In accordance with the results of the regression model a one-unit increase in possession caused an increase in 0.54 on the performance obtained by teams. The variables level and round were statistically significant at the 0.01 level and had the expected coefficient.

Table 1. Determinants of the performance in the FIFA World Cup Germany 2006.The role of the possession of the ball.

Independent variable	Model
Posesión	0.54*(0.09)
Level	1.57*(0.34)
Round	-16.65**(9.74)
Possession x Round	0.33**(0.19)
Intercept	-26.73*(2.111)
R^2	0.53
Number of observations	128

DISCUSSION The main findings of this paper suggested that possession was a relevant variable for explaining the performance obtained by teams in the matches of FIFA World Cup Germany 2006. The influence of the possession on the performance was different in the two rounds of the competition, and the higher the difference between teams the higher the performance for the best team was.

KEY WORDS FIFA World Cup Germany 2006, performance, possession of the ball, football.

P-085 Changes in running economy after two different resistance training programs in soccer players

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OBJECTIVE Maximal strength training for neural adaptations has been shown to improve running economy in soccer players (Hoff and Helgerud, 2002). Although the concept that improvements in strength influenced aerobic endurance performance was widely studied, there is little knowledge regarding the effects of resistance training using other loads on running economy. The purpose of the present study, which had Ethical Committee approval, was to examine the

effects of two different resistance training programs (3 times/week, 6 weeks) on running economy and maximal oxygen uptake (VO2max). One program was designed to promote muscle hypertrophy (H, 4 sets x 12 reps, with 70% 1RM) and the other aimed to increase maximal strength (S, 4 sets x 5 reps, with 90% 1RM).

METHODS Twenty male soccer players (age: 22.5±1.1 yrs, body mass: 74.1±1.9 Kg) were divided in two equal groups. VO2max was measured before and after training using an incremental treadmill running test and running economy was calculated at the speed corresponding to the individual ventilatory threshold (VT). Aerobic fitness was also assessed using Hoff's dribbling track test (DTT).

RESULTS Running economy improved by 10.6±4.7% in the S group but was unchanged in the H group (Table 1). However, VO_2max and VT were unchanged in both groups. Speed at VO_2max was increased by 4.5±2.2% and 7.1±1.8% in the H and S groups and performance in the DDT was similarly increased in both groups (by 9.4±0.8%).

Table1. Aerobic performance parameters before (BT) and after training (AT) in the hypertrophy (H) and the maximal strength (S) training groups. * P<0.05, ** P<0.01 from before training

	VO_{2max} (ml/kg/min)		Ventilatory threshold (ml/kg/min)		Speed at VT (kph)		Dribbling track test (m)	
	H	**S**	**H**	**S**	**H**	**S**	**H**	**S**
BT	51.7(2)	51.6(1)	38.7(1.2)	37.8(1.3)	11.7(0.2)	11.5(0.1)	1627(33)	1725(33)
AT	53.6(2)	53.4(1)	38.8(0.8)	38.3(1.8)	12.5(0.2)**	13.2(0.3)**	1777(34)**	1886(30)**

DISCUSSION The results suggested that strength hypertrophy training was not a sufficient stimulus for an increase in running economy. The improvement of running economy in the S group may be explained by a possible enhancement of muscle coordination induced by neural adaptations resulting from maximal strength training (Almasbakk & Hoff, 1996).

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KEY WORDS Running economy, efficiency, resistance training.

P-086 Beneficial effects of four months of street football practice on training status and health profile for homeless males

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OBJECTIVE It is well-established that physical activity is important for musculoskeletal function and cardiovascular health. However, little is known about the health promoting effects of recreational soccer, as most scientific studies have investigated the effects of jogging, swimming and bicycling. The present study investigated the effects of street football training performed twice a week for four months as preparation for the Homeless World Cup 2006 in Cape Town, South Africa. In addition, the heart rate (HR) response to ordinary street football training for this group was determined.

METHODS Thirteen players (19-44 yrs) took part in two weekly 90-min street football training sessions for four months (4v4, pitch 16x22m). Heart rate was recorded during one training session. Body mass, fat percentage (Durnin & Womersley, 1974), fat free body mass, quadriceps muscle mass (Krustrup et al. 2004) and blood pressure were measured and the Yo-Yo IE2 test and 1-min non-dominant leg balance test (Eurofit, 1988) were performed before (BT) and after the intervention (AT).

RESULTS Mean HR was 154±4 bpm or 84±1% of HRmax. HR was 80-90% and >90% HRmax for 30±2 and 31±4% of the time. Body mass was unaltered, but fat free body mass was 2.3 kg higher ($p<0.05$) and fat percentage tended to be lower after the training period. Diastolic blood pressure was 5 mmHg lower ($p<0.05$), quadriceps mass was 12% higher ($p<0.05$) and Yo-Yo IE2 performance was 54% better ($p<0.05$) after training (Table 1).

DISCUSSION This study characterized street football as aerobic moderate and high intensity training (Bangsbo et al. 2006) and provided evidence that regular participation in street football has beneficial effects on training status and health profile for a group of homeless males. Players with poor aerobic power, low muscle mass and mild hypertension, had their physical health profile normalized after 4 months of training.

CONCLUSION In conclusion, players with poor aerobic power, low muscle mass and mild hypertension, had their physical health profile normalized after 4 months of training.

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KEY WORDS Heart rate, muscle mass, fat percentage, blood pressure, Yo-Yo intermittent endurance level 2 test.

P-087 Effects of low intensity aerobic training program to maintain aerobic capacity of elite soccer players in mid-season transition period

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OBJECTIVE The athlete loses training benefits within short time. The speed of detraining varies from several weeks to several months. Researchers have noted a sizeable decrease (6-7%) in maximum volume of oxygen, physical working capacity, and total hemoglobin and blood volume following just one week of complete rest. The aim of this study was to investigate effects of two weeks of aerobic low intensity training program on physical charecterisitcs of elite soccer players during mid-break transition period.

METHODS Mid-Break Transition period aerobic low intensity training program (see Table 1) was given to all of the players (n=25) except two injured players. Lactate and heart rate data from the tests at the end of first part of the season on December were used to design individual training programmes for each player.

Table 1. Elite soccer players training program for two weeks mid-break transition period.

Days	Warm-up	Training	Cool-down
1		Rest	
2		Rest	
3		Rest	
4	10 min. warm-up	35 min. 2 MMOL	10 min. stretching
5	10 min. warm-up	35 min.2 MMOL	10 min. stretching
6		Rest	
7	10 min. warm-up	35 min. 2 MMOL	10 min. stretching
8	10 min. warm-up	40 min. 2 MMOL	10 min. stretching
9		Rest	
10	10 min. warm-up	40 min. 2 MMOL	10 min. stretching
11	10 min. warm-up	45 min. 2 MMOL	10 min. stretching
12		Rest	
13	10 min. warm-up	2x 20 min. 2.5 MMOL	10 min. stretching
14	10 min. warm-up	2 x20 min. 2.5 MMOL	10 min. stretching

RESULTS Findings indicated that there were no significant differences between athletes' aerobic capacity before and after mid-break transition period.

CONCLUSION Low intensity aerobic training during mid-break transition period attempted to help elite soccer players maintain a degree of aerobic fitness during this period, and whilst the lack of any significant difference between end of the first part of season and beginning of second part of season preparation suggested that two weeks of low intensity aerobic training programme may have been effective.

KEY WORDS Low intensity aerobic training, mid-break transition period.

P-088 Intermittent exercise performance evaluations in soccer players using Yo-Yo intermittent recovery test level 2

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OBJECTIVE Due to its specificity and practicality, the Yo-Yo intermittent recovery test 2 (YYIR2) has been extensively used in soccer to assess players' abilities to perform repeated high-intensity exercise. Studies have shown its sensitivity in discriminating players' performances at various competitive levels, between different playing positions, and after periods of different types of training. The aim of the present study was to examine the changes in physical condition that may occur during a season in soccer players and to evaluate the effectiveness of the YYIR2 in order to detect such changes.

METHODS Twelve elite male soccer players belonging to a team taking part in the league's top division performed the YYIR2 at the beginning of the pre-season preparation and after ten days of preparation, as well as at the Start of the competitive season and during Mid season. Performance data was subsequently analyzed for mean and individual seasonal variations.

RESULTS The YYIR2 performances were 1160±39 and 1068±52m at Start and Mid season, which were 23.4 and 13.6% better respectively ($p<0.05$) than After 10 days of preparation (940±40m). In Mid season the YYIR2 performance tended to be lower (-7.9%) compared to Start. However, large individual variations were observed (CV=8.2%) since two players improved whereas six had a drop in performance (Figure 1).

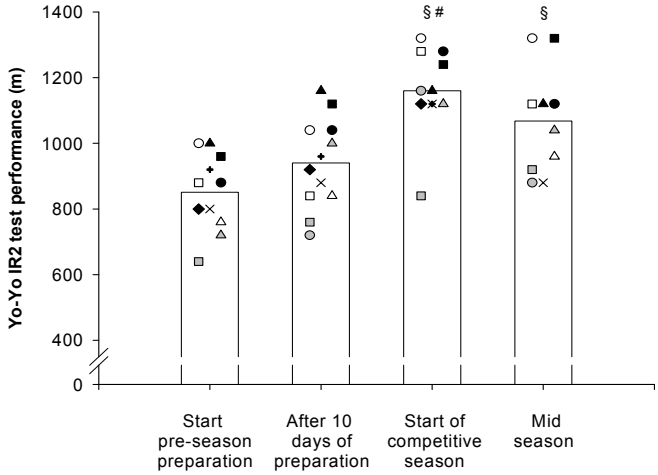

Figure 1. Individual and mean seasonal changes in the Yo-Yo IR2 test performance expressed in metres for 12 elite male soccer players. Values are means ± SEM. §: Significantly different from Start pre-season preparation ($p<0.05$); #: Significantly different from After 10 days of preparation ($p<0.05$).

CONCLUSION Players' abilities to perform repeated high-intensity exercise varied considerably in pre-season, whereas levels were on average lower during the season. However it is not possible to generalize since there are major individual variations. These results also illustrate that the Yo-Yo IR2 test is sensitive enough to detect changes in players' performance levels during the season

KEY WORDS Testing, intermittent exercise, physical condition, seasonal changes.

P-089 Effects of age and playing position on Iranian elite soccer players' competitive motivation

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OBJECTIVE It is generally accepted that a competitive mindset is advantageous for success in sports (Heyman, 1992; Raglin, et al., 1990; Stewart & Meyers, 2004). Motivation is one of the most important psychological traits that have considerable implications on sport programs for which appropriate selection of athletes or motivational attributes are deemed essential for optimal performance. Too often, even the most experienced football coaches ignore the benefits of exploring the personality or psychological state of their athletes. Therefore, the purpose of this study was to investigate the effect of age and the position played on the Iranian elite male soccer players' competitive motivation.

METHODS 60 soccer players of senior, youth U 19 and U 23 national teams who were selected purposively completed the sports attitude inventory (Willis, 1982). The data were grouped by age and primary position played and analyzed by MANOVA.

RESULTS The statistical analysis indicated a significant effect by age ($p<0.05$), but not by playing position ($p>0.05$). According to the results of post hoc tests, players of senior national team were more motivated to avoid failure than youth U 19 national team players ($p<0.05$).

CONCLUSION The results were consistent with Stewart & Meyers3. The fact that older players of senior national team scored higher on the motivation to avoid failure subscale than younger players indicated that those players may have had a tendency to be more sensitive to what adults (their coaches) thought than the younger players.

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KEY WORDS Competitive motivation, elite, player position.

32. FITNESS ASSESSMENT

P-090 Dynamic balance and posture in visually impaired soccer players

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OBJECTIVE Soccer is the most popular sport in all over the world, not only for the sighted people but also for the visually impaired. Visually impaired people can do almost all kinds of sports like their sighted peers unless they have other disabilities. However, they may have some postural and balance problems due to lack of vision. The purpose of this pilot study was to investigate the relationships between dynamic balance and posture of visually impaired soccer players.

METHODS 7 visually impaired soccer male players (mean ages 21.42) voluntarily participated in this study. Spinal mouse device was used to measure the number of abnormal vertebrates of players. MED-SP 300 Dynamic Stability Measurement Platform used a circular platform that was free to move in the anterior-posterior and medial-lateral axes to obtain stability index. Spearman's Statistical analysis was used.

RESULTS The results of this study indicated that there was no significant relationship between stability index scores (balance scores) and the number of abnormal vertebras (Spearman's rho = -.13; $p > 0.05$).

CONCLUSION There was no significant relationship between stability index scores and the number of abnormal vertebras. Although soccer for visually impairment players is a new sport in Turkey, it was suggested to perform this study with a bigger sample in the future, smaller sample size hold the risk of non-detection of moderate treatment effects.

KEY WORDS Dynamic balance, visually impaired soccer player, posture

P-091 Motion skills on soft sand and conventional surface in beach soccer

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OBJECTIVE The increasing popularity of beach soccer puts a series of questions about the profile and the motion peculiarities of the beach soccer player. This kind of analysis seems to be necessary for the trainers to recognize the consequences of training performed on sand and on conventional surface. The aim of this study was to investigate the motion skills of beach soccer players on soft sand and conventional surface. Particularly, through the analysis of some performing parameters, it was checked if there were any quantity and quality differences in the running and jumping gestures, when performed on sand and on hard surface.

METHODS The two tests of jump are respectively been performed on platform of strength and on a thickness of 4 cms of sand below which the platform of strength has been situated. Aerobic performance was estimated through Lèger shuttle test,while jump(CMJ)was assessed using twin plates (Globus Italia)with a related software to analyze the different biomechanical parameters on 10 subjects belonging to the Italian beach soccer national team (30±5,8yrs,75,8±5,4Kg,181,8±5,5cm).

RESULTS The CMJ jumping test rates on hard surface and on sand was respectively (average ±sd): 37,7±1,5 cm and 32,8±2,4 cm: the decrease of about 14% showed a statistical reliability of $p<0,01$.Lèger test rates performed respectively on hard surface and on sand showed VMA rates were respectively 13,0±0,5 km/h and 11,1±0,5 km/h.Percent decrease has been about 15% ($p<0.01$)

DISCUSSION The results of this investigation were similar to what was already observed in literature with active subjects. When compared with these ones, which have shown a decrease of about 25% when shifting from hard surface to sand (Bisciotti, 2003), the national team's players are able to reduce such a performance disadvantage, probably because of a better specific suitability to this sport.

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KEY WORDS Sand test, CMJ Léger test beach soccer.

P-092 Seasonal changes in aerobic fitness of circumpubertal football players

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OBJECTIVE Short periods of aerobic and football specific training (Impellizzeri et al., 2006) have been shown to improve soccer performance during a match. However, less is known about the effect of football training on the cardio respiratory fitness during prolonged periods of time and its development during different puberty stages. The aim of this study was to describe the impact of one year of training on cardio-respiratory fitness parameters in young football players.

METHODS Thirty three football players performed a treadmill incremental test to exhaustion to determine VO2max, maximal aerobic speed (MAS), velocity at ventilatory threshold (vVT1) and respiratory compensation point (vRCP), and 6-min constant-load exercise at vVT1 to determine running economy (RE). Age at peak height velocity (APHV) and time until/from APHV(TPHV) were estimated from anthropometrical data.

RESULTS TPHV was significantly different between G13, G14 and G15 (respectively, -1.2 ± 0.8, -0.2 ± 0.9 and 0.8 ± 0.5 yr, $P < 0.001$) whereas PHV was similar (14.4 ± 0.7, 14.4 ± 0.8 and 14.4 ± 0.5 yr). In addition, G13, G14 and G15 changed in a similar pattern their MAS (Table 1).

Table 1. Results before (Pre) and after (post) one year of football training in 3 different groups of circum-pubertal groups.

	G13		G14		G15		Interaction#
Dependent variable	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	
MAS ($km.h^{-1}$)	14.7(1.3)	16.2(1.1)	15.0(1.3)	16.2(0.9)	15.9(1.5)	16.7(1.4)	p=0.185
VO_2max ($ml.kg^{-}.min^{-1}$)	56.0(3.1)	52.9(3.3)	54.9(5.4)	54.8(5.6)	54.7(5.5)	54.9(7.4)	P=0.201
vVT1 ($km.\ h^{-1}$)	8.0(0.9)	8.5(0.8)	8.5(1.1)	9.5(0.9)	9.0(1.1)	10.1(1.4)	P=0.485
vRCP ($km.\ h^{-1}$)	11.6(1.1)	12.2(1.3)	11.9(0.9)	12.6(0.9)	11.7(1.3)	13.1(1.4)	P=0.608
RE ($ml.kg^{-1}.km^{-1}$)	266(7)	232(27)	287(28)	247(18)	294(22)	246(21)	P=0.202

MAS, maximal aerobic speed; VO2max, maximal oxygen consumption; vVT1, velocity at ventilatory threshold; vRCP, velocity at respiratory compensation point; running economy; #, group x time interaction of a 2-way RM ANOVA.

DISCUSSION One year of football training improved MAS to the same extent in circumpubertal boys one year younger, at or one year older than their predicted age at PHV. This is contradictory with previous findings of Philippaerts et al. (2006) who reported that cardio-respiratory endurance peak development was optimal at APHV. The improvements in RE, vVT1 and vRCP might partly explain the increase in MAS.

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Philippaerts et al. (2006) *Journal Sports Science* **24**, 221-30.

KEY WORDS Physiological testing, maturation, cardio respiratory fitness, football

P-093 Changes in fitness variables of professional Brazilian soccer players in pre-season

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OBJECTIVE In Brazil, very few studies have focused on repeated measurements in professional soccer.These studies are important for knowledge of the phenomena occurred in the Brazilian' pre-seasons. The purpose of this study was to evaluate the changes in fitness profile in a Brazilian professional soccer team in pre-season.

METHODS The subjects were 26 Brazilian professional soccer players.The measures were obtained in two separated stages during pre-season for Brazilian championship (June and July). The battery of tests included measurements of body

mass, height, sum of skinfolds (triceps and subscapula), YoYo Intermitent recovery test, 20-m sprint, Squat Jump Test and Countermovement Jump Test.

RESULTS The pretraining (T1) and post-training (T2) results were compared with paired Wilcoxon Tets. The players were following training programs designed to increase in general fitness. The sum of two skinfolds showed decrease, statistically significant, by the second test occasion. The entire physical test showed increase, statistically significant,in the performance by second test occasion.

Table 1. Descriptive parameters in the two stages.

	T1	T2	p
Age (yrs)	25,0(4,3)	25,1(4,5)	
Body Mass (kg)	73,6(7,6)	73,4(7,1)	0,116
Heigth (cm)	177,6(6,3)	177,6(6,4)	0,443
Sum skinfolds(mm)	17,0(4,6)	15,31(3,1)	0,004
YoYo (mm)	515,4(109,9)	630,8(138,2)	0,000
20-m sprint (s)	2,97(0,10)	2,94(0,08)	0,010
SJ (m)	35,5(3,6)	36,9(3,5)	0,000
CMJ (m)	40,6(4,3)	41,9(4,3)	0,000

CONCLUSION The results demonstrated that the elite Brazilian soccer players experienced significant improvements in body composition, ability to recover after intense exercise, speed and explosive muscular strength in 6 weeks of pre-season.

KEY WORDS Soccer - pre-season - fitness - anthropometry.

P-094 Follow-up of the training process of a macedonian first league professional soccer team with heart rate and blood lactate monitoring

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OBJECTIVE Intermittent loading improves functional capacity of soccer players. High intensity interval loading includes a short exercise period that is long enough to improve the performance of athletes. Such training recycles lactate at active muscles after high intensity loading. The primary objective of this research was to determine the dynamics of: Pulse frequency, maximal oxygen usage, blood lactate, muscle mass, and body fat percentage of professional football players of Macedonian first league football players at three different time periods.

METHODS Anthropometric measurements were conducted using international methods. VO_2 max was measured on a treadmill according to Bruce protocol. Heart rates were recorded using Polar watches. To measure the bioenergical threshold, the Conconi test was utilized. Plasma lactate levels were recorded using the colorimatic enzymatic method described by Lange.

RESULTS Significant statistical difference was found for relative fat at under skin tissue measurements. Differences were observed between periods I and III, and II and III. Significant statistical correlation was found between variables VO_{2max} and KLA3 in pre-preparation period at phase I measurement.

CONCLUSION Morphological variables of Macedonian soccer players and other nation's soccer players were similar. Body fat percentage of Macedonian players was slightly different. Macedonian soccer players had low level of education on nutrition and recovery methods that directly affected their sports performance. Friendly games and insufficient strength training sessions during the preparation period lead to a decrease in muscle mass of soccer players.

KEY WORDS Soccer, interval training, heart rate frequency, lactate

P-095 Effects of concentrated charges of strength training on anaerobic variables and body composition of professional soccer players

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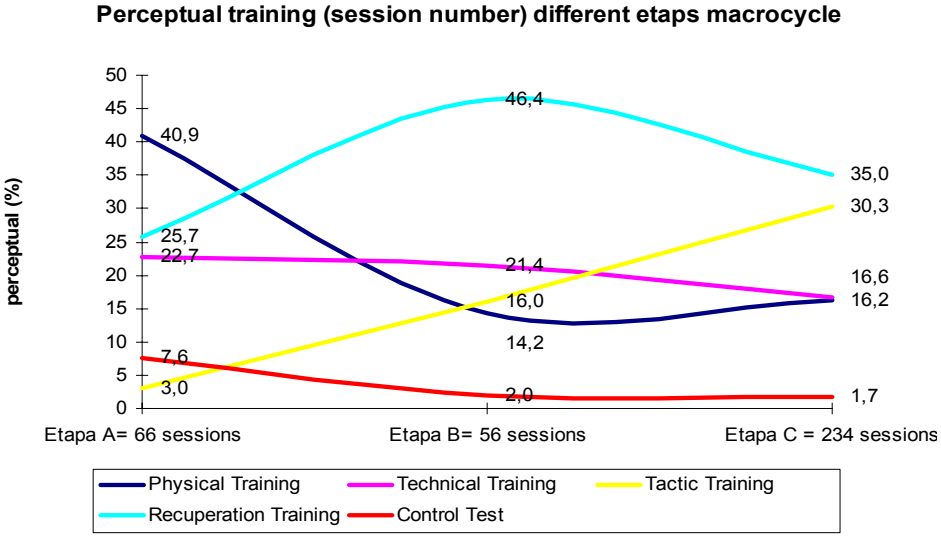
OBJECTIVE Soccer is characterized by interaction of intense and short duration movements, which show the importance of physical preparation for the performance in the game. The aim of this study was to analyze if the contemporary methodology of concentrated charges of strength training modified anaerobic variables and the body composition of the professional soccer players subjected to four evaluations in different moments of the training macrocycle.

METHODS Twenty-one professional Brazilian male soccer players, mean age 23,6± 2,1, and weight 76,6± 8,6 kg participated. The concentrated charges of strength were used as the strength training protocol. The Wingate test (Bar-Or, 1987) was used and to assess body composition (Faulkner, 1968). The training macrocycle lasted six months.. Statistical analyses were ANOVA One Way, supplemented by the Tukey HSD post hoc test ($p<0,05$).

RESULTS The variables PA, PR has got statistically significant positive alterations in moments 1 to 4, 2 to 4 and 3 to 4. The variable MCM has got significant positive alterations in moments 1 to 2 and 1 to 4. The variable (%G) has got significant positive alterations in moments 1 to 2, 1 to 4 and 3 to 4.

Table 1. Descriptive evaluation anaerobic and anthropometric variables included measures of central tendencies and scattering, and the variation analysis Anova One Way for repeated measures, supplemented by the Tukey HSD post hoc test.($p<0,05$) (n=21).

	1	2	3	4	p
absolute anaerobic power (Watts)	900,2(172,3) b	899,2(157,7) c	955,6(153,4) d	955,5(190,83)	0,003*
anaerobic power relating to the body mass (W/kg)	11,90(1,30) b	12,0(1,12) c	12,14(1,11) d	12,60(1,60)	0,008*
fatigue Index (%)	50,7(9,6)	50,52(7,20)	51,33(8,9)	50,80(10,80)	0,84 (n/s)
body mass (kg)	61,60(5,61) ab	62,63(5,60)	62,25(4,91)	63,0(5,0)	0,0001*
body fat percentage (%)	11,30(1,64) ab	10,70(1,30)	10,94(1,50) d	10,46(1,20)	0,0000*



CONCLUSION The significance level which was effective, once that it made possible a punctual subsequent lasting effect of the training (EPDT) manifestation in the final moments of the competition, in the variables PA, PR, MCM and %G. The variable IF was the only one, which didn't present statistically significant positive alterations in the different moments of the evaluation.

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KEY WORDS Soccer, anthropometry, anaerobic capacity and power, Wingate test, control of training process.

P-096 The effect of sprint exercises on serum superoxide dismutase, catalase and malondialdehyde levels in soccer players

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OBJECTIVE This study was carried out on 18 soccer players who do sports activities, healthy and have not take in antioxidant supplement.

METHODS The levels of superoxide dismutase (SOD), malondialdehyde (MDA), and catalase (CAT) were established before and after the exercise and training effects on the antioxidant system were investigated.

RESULTS According to test results before the training programme. While SOD levels were at 1.74 ± 0.13 U/mL, these levels were measured as 2.50 ± 0.13 U/mL after the exercise. This increase in the SOD levels were found statistically considered as significantly ($p<0.05$). While MDA levels were at 4.8369 ± 0.99 mmol/L these levels were measured as 3.68 ± 0.77 mmol/L after the exercise. These decrease in MDA levels were not statistically considered as significant. ($p>0.05$). While CAT levels were at 0.16 ± 0.01, U/mL These levels were measured as 5.26 ± 0.47. U/mL. These decreases in MDA levels were statistically considered as significant ($p<0.05$). While The SOD levels were at 1.67 ± 0.36 U/mL before the test, these levels were measured as 0.89 ± 0.20 U/mL after the sprint test. These decreases in SOD levels were not statistically considered as significantly ($p>0.05$). While MDA levels were at 16.39 ± 2.68 mmol/L these levels were measured as 29.10 ± 2.62 mmol/L after the exercise. These increases in MDA levels were statistically considered as significantly ($p<0.05$). While CAT levels were at 2.89 ± 0.85 U/mL these levels were measured as 8.43 ± 0.08 U/mL. These increases in CAT levels were statistically considered as significant ($p<0.05$).

CONCLUSION As a result, exercise may improve the antioxidant defence system; at least, it may induce antioxidant production.

KEY WORDS Free radicals, andioxidants, soccer, sprint.

P-097 Methodic of speed endurance development by professional soccer players

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OBJECTIVE The characteristics of competitive loads in professional soccer present that speed endurance abilities are among the main factors for sucsess in the game. The high level of these abilities during the whole year is one of the most important problems in management of training process. The aim of this research was to establish a method for the development of speed endurance abilities and realize it in annual training program by professional soccer players.

METHODS The methods of the research were: literature review; modeling; experiments; HR changes and blood LA concentration measurements; control testing; conventional mathematical methods of data systematization.Subjects were 23 professional soccer field players from PFC "ZCKA" – Sofia, Bulgaria with 26 + 4 years old.

RESULTS The example of structure of weekly training program, which included interval trainings, was presented on Table 1. The example of dynamic of some of control test parameters, measured by Vame Vall test, was shown on Table 2. Total time of loads increased from 17 + 0.4 min to 18 + 0.5 min, or stabilization of maximal HR level from 196 to 198 beats per min during the test. Increasing of speed endurance abilities reflected positive over the match results of PFC "ZCKA" – Sofia in year 2006. In period from 20.08.2006 to 15.10.2006 the team played 18 games of which 15 were won.

Table 1. Structure of weekly training program.

Day / Tr.sesions	M	T	W	T	F	SA	S
I	B	S	Δ	Δ	Δ	T	*
II	T	T	B	T	B	B	match

Δ - interval training; B – break; S – strength training; T – technical training

Table 2. Dynamic of tests parameters.

Player	Parameters	Days of testing	
		03.10.2006	**10.10.2006**
A	Duration of load	17 min 30 sec	18 min 40 sec
	HR (max)	196 b/min	197 b/min
	LA	13.5 $mmoll^{-1}$	13.1 $mmoll^{-1}$
B	Duration of load	16 min 30 sec	17 min 15 sec
	HR (max)	198 b/min	198 b/min
	LA	11.8 $mmoll^{-1}$	11.1 $mmoll^{-1}$

CONCLUSION The analyses presented that content of interval training method was a chain of special soccer exercises with duration loads of 4 x 2 min. The breaks between exercises were 2 min. and between the series – 10 min, by number of series 2 to 3 in one training session.The results established tendency of significant development during the whole year

KEY WORDS professional soccer, speed endurance, methodic, training program.

33. STRENGTH AND SPEED

P-098 Effects of strength training and practice on soccer throw-in performance

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OBJECTIVE The long throw-in when performed to a high standard, can reach a maximum horizontal range (MHR) of around 30m and is largely a more accurate skill than the corner kick. This means that a teammate can be picked out for a goal scoring opportunity more easily when within range. The improvement of soccer throw-in performance is therefore an important issue but has been neglected in the scientific literature. The aim of this paper was to examine the effects of two performance enhancing programs on throw-in performance.

METHODS A total of 13 male and 10 female university soccer players were allocated to one of three groups (control group N = 7, strength group, N= 9 and practice group, N= 7) and instructed to perform 5 throw-ins while standing and 5 throw-ins with a run-up. All trials were video filmed at 50 Hz and the horizontal range recorded.

RESULTS For the running throw-in both strength training (17.05m–18.27m, $F1,14 = 6.21$, $p < 0.05$) and practice (16.40m-17.81m, $F1,12 = 7.29$, $p < 0.05$) were found to significantly increase performance over 6 weeks while the control group did not (17.93m-18.03m, NS). For the standing throw-in, there was no significant change (practice group:-14.31m-15.24m; strength group:-14.83m-14.43m; control group:-15.33m

CONCLUSION In conclusion, the present study showed that both strength training and practice can improve soccer throw-in performance in male and female soccer players with strength training providing the largest increase. For future studies a combination of these two types of training would be worth investigating

KEY WORDS Strength training, soccer, throw-in, biomechanics

P-099 Power output during repeated maximal sprints is better maintained after maximal strength training compared to hypertrophy training in soccer players

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OBJECTIVE The ability to perform in repeated maximal bouts with short recovery is of extreme importance in soccer. Since power depends on the ability to produce force at fast speeds, strength training is frequently used to improve short sprint performance (Hoff & Helgerud, 2004). The influence of resistance training type on fatigue during repeated sprinting bouts with short recovery has not been tested. The purpose of the present study, which had Ethical Committee approval, was to examine the effects of two different strength training programs (3 times/wk, 6 weeks) on power output during repeated sprints on cycle ergometer.

METHODS Twenty male players (age: 22.3±1.1 yrs, mass: 74.6±2.0 Kg) were divided in two equal groups that followed two different programs. One program was designed to promote muscle hypertrophy (H, 4 sets x 12 reps, with 70% 1RM) and the other aimed to increase maximal strength (S, 4 sets x 5 reps, with 90% 1RM). Optimal braking force (Fopt) was determined for each player with a test consisting of 5 6s maximal sprints on a Monark cycle ergometer against different loads (Arsac et al, 1996). Ten 6s sprints separated by 24s of recovery were performed before and after training, with a load equal to 60% Fopt.

RESULTS There was no improvement in power output parameters in the H group (Table 1). The drop of peak power output over the 10 sprints was similar in both groups before and after training (~37%). However the drop in MPO was 8.9±2.8% lower in S group after training (Table 1), and a better maintenance of power output during the 5 final bouts was evident (Figure 1).

DISCUSSION Hypertrophy training may increase local aerobic capacity and performance recovery (Tesch, 1992). However, this was not seen in the H group. The better maintenance of power output in the S group may be explained by more efficient muscle fiber recruitment during the later stages of the sprint test as a result of neural adaptations after maximal strength training (Almasbakk and Hoff, 1996).

Table 1. Peak (PPO) and mean power output (MPO) during the 1st and 10th sprint and drop in MPO from the 1st to the 10th sprint before (Bt) and after training (At). LLV: lean leg volume. †: different from "before training", P<0.05.

	PPO1.LLV^{-1} (W.L^{-1} LLV)		PPO10.LLV^{-1} (W.L^{-1} LLV)		MPO1.LLV^{-1} (W.L^{-1} LLV)		MPO10.LLV^{-1} (W.L^{-1} LLV)		Drop in MPO (%)	
	H	S	H	S	H	S	H	S	H	S
Bt	159(6)	166(5)	99(4)	100(4)	129(4)	131(4)	80(3)	79(3)	38(2)	39(2)
At	154(7)	166(4)	99(5)	103(4)	125(5)	132(3)	79(3)	85(3)†	36(3)	36(2)†

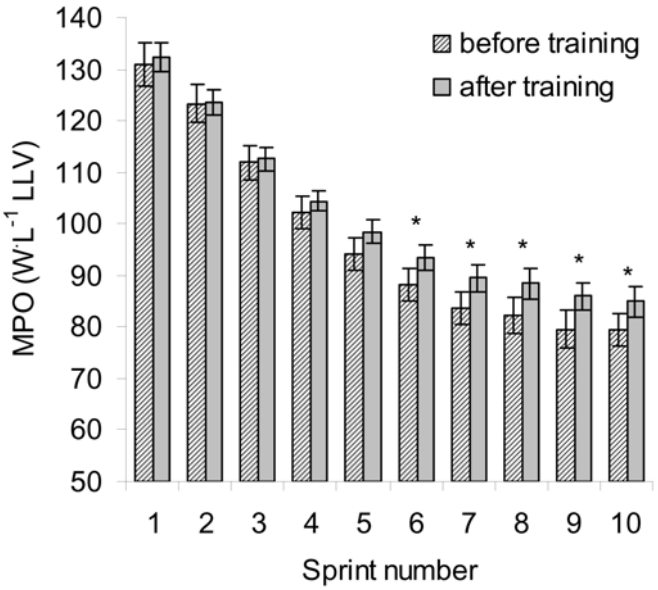

Figure 1. Sprint results.

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KEY WORDS Repeated sprints, fatigue, strength training

P-100 Developing effect by eccentric – concentric contraction in two directions on speed components of soccer and basketball players

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OBJECTIVE Different forms of take off are considered to be the direct way of plyometric work that the prime mover muscles for legs under coiling muscle flows strong explosive contraction that it reverses good coordination of muscles to overcome the body weight. To increase the muscular effectiveness, There were a shortage in plyometric exercises which compatible with dynamic performance path and generation the power in this two directions we need in soccer and basketball, in addition, formation suitable training load doses for this two direction (horizontal – vertical). The research investigated the development effect for the groups of legs muscles through eccentric – concentric contraction in the vertical and horizontal directions on level of speed components. The difference between the two directions of training was recognized on research variables (speed components).

METHODS The sample consisted of 26 active soccer and basketball players (14 soccer & 12 basketball) of Mansura university teams .The researchers had the experimental method with pre-post measures for 5 tests (10 , 30 meters sprint

– vertecal jump - 5 series of take off test – 120 yards to mearuser release speed , maximum speed and speed endurance) was used.The training program continued for 8 weeks with four exercises that was chosen with height intensity to be done in the vertical and horizontal directions

RESULTS The main results was that the two groups level of speed components improved in 10 , 30 meters sprint (V group 10 meters pre test 2.232 ±0.080 post test 2.150 ±0.075 & 30 meters pre test 4.539 ±0.107 post test 4.449 ±0.072) (H group 10 meters pre test 2.234 ±0.073 post test 2.179 ±0.071 & 30 meters pre test 4.531 ±0.108 post test 4.419 ±0.008), 5 series of take off test (V group distance pre test 11.471 ±0.391 post test 12.407 ±0.895 & time pre test 4.383 ±0.913 post test 3.631 ±0.261) (H group distance pre test 11.486 ±0.381 post test 13.611 ±1.098 & time pre test 4.458 ±0.919 post test 3.590 ±0.137) – release speed (V group pre test 5.803 ±0.395 post test 5.429 ±0.281) (H group pre test 5.853 ±0.405 post test 5.471 ±0.238) – maximum speed (V group pre test 4.631 ±0.115 post test 4.451 ±0.103) (H group pre test 4.650 ±0.115 post test 4.426 ±0.114) –vertical jump (V group pre test 43.143 ±4.511 post test 48.750 ±2.158) (H group pre test 43.446 ±4.541 post test 46.064 ±2.420), but not improved in speed endurance
In the first group (H direction) had improved than the other group (V direction) in 5 series takeoff test. The second (V direction) group had improved more than the other group (H direction) in vertical jump.

DISCUSSION There was a significant difference between two groups of improvement levels as a result of direction difference in exercises. The cause of non significant improvement may due to the shortage of program time. Using plyometric exercises with different intensities for long time would relatively affect the speed components. We can use this program for other activities by must know the main direction of movement .sing the tests of the research on other activates and other ages

KEY WORDS Plyometric, 5 series takeoff test, release speed, maximum speed, vertical jump.

P-101 Change of explosive muscle strength in sub-20 soccer players in a season

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OBJECTIVE High speed actions during soccer competition can be categorized with actions requiring acceleration, maximal speed or agility (Lıttle and Wıllıamas, 2005). Starting with these characteristics, it is possible to see that muscle force associations with high speed actions are fundamental for the performance of soccer players (Stolen, 2005). The aim of this study was to describe the changes in explosive strength performance of soccer players of the sub-20 age group during a season.

METHODS 28 Brazilian soccer players (18,18±0,41years, 75,09±6,31kg, 178,33±5,75cm), competed in the 2005 season, participated in this study. The data were collected before and after pre-season, in season, season during of 16 weeks.The performances of these variables were measured by tests of squat jump (SJ), countermovement (CMJ) and the continuous jump the 5 seconds (CJ5s) done according to the procedures described by Bosco (1994).

RESULTS Significant increase in the performance of the variables of SJ (5,56±1,85%; p=0,0167) and CMJ (5,65±2,88%; p=0,0004) after the pre-season, however significant changes was not observed in the performance of the CJ5s (-0,18±1,40%; p=0,9268). In Season was possible to see increases in the performance of CJ5s (4,63±2,39%; p=0,0034) , and no changes were observed for the SJ and CMJ (-0,54±3,98%; p=0,7705, -0,60±2,96%; p=0,7587, respectively). Significant changes were observed after the season for all variables, showing increases in the performance of SJ, CMJ and CJ5s (4,66±5,57; p=0,0461, 5,40±3,17; p=0,0081, 4,41±3,35; p=0,0482, respectively).

DISCUSSION According to these results in soccer players, there is a tendency for the occurrence of increases in all muscle explosive strength manifestation after the season, thus, during the period of training different behaviour in the performance of strength were observed. This seemed to be due to adjustments in the factors of strength production that expressed behaviour under different ways in season.

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KEY WORDS Soccer, strength training, periodization.

P-102 Change in physical performance of sub-20 soccer players submitted in maximal strength training program

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OBJECTIVE The maximal strength of the muscle should be understood as a manifested strength that influences all other components and for this reason is located in an upper hierarchical level (Schmıdtbleıcher, 1992) The strength training possibility changes of the able factors of force production that increases in the agility and speed performance of the soccer players. The aim of the study was to verify the changes in the physical performance of sub-20 soccer players submitted in a six week training program of a maximal strength over the changing of agility and explosive strength performance.

METHODS Participants were twenty-two Brazilian soccer players, all competed in the 2006 season in the Paulista Juniors Championships, Brazil. The measurements were before and after pre season of 6 weeks of the training program of maximum strength. The physical exercises were based in the methods to improve rate force development (Schmıdtbleıcher, 1992). These tests were squat jump (SJ), countermovement (CMJ) (Bosco, 1994) Illinois Agility (Mıller et al 2006) and maximum strength.

RESULTS The results showed increases in the performance of the Fmax after the training programme (33,59±10,08%; p=0,0000). Observing other variables there were significant increases after the training program in the performance of the variables of explosive strength (8,56±4,14%; p= 0,0283) and agility (2,88±1,65%; p= 0,0011). However, there was no significant change for elastic explosive strength, even indicating increases in its performance (7,53±6,80%; p= 0,0894).

Table 1. Changes in physical performance.

Variables	Before training		After training		Pre Season	
	mean	s	mean	s	% dif	p
Fmax (kg)	266.47	12.34	328.51	19.28	33.59(10.08)	0.0000
SJ(cm)	35.44	3.35	37.89	2.91	8.56(4.14)	0.0283
CMJ (cm)	39.59	4.01	42.46	4.05	7.53(6.80)	0.0894
Agility(sec)	16.77	0.73	16.32	0.63	2.88(1.65)	0.0011

Fmax= maximal strength

CONCLUSION The increase of the maximal strength performance of the muscle results increased over agility, and the level of strength produced. So, the adjustments in the factors contributing to the production of power expressed behavior over different forms, therefore, showed the necessity of right after the maximal strength training insert the program of training with plyometric.

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KEY WORDS Soccer, strength training, periodization.

P-103 Biomechanical symmetry differences in the goalkeeping diving save

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OBJECTIVE This study focuses on the biomechanical aspects of elite football goalkeepers' making diving saves at different heights and to different sides of their body in order to identify potential weaknesses in goalkeeping performance. The object of this study was to identify and quantify the kinematic and kinetic parameters for a goalkeeper's diving saves. Due to a paucity of research particular attention was paid to symmetry differences made between dominant (preferred kicking leg) and non-dominant sides of the body (non preferred kicking leg) (Lees, 1996; Tsai, 2005).

METHODS Six national squad members performed six diving saves to stationary suspended balls at three different heights to both their dominant and non-dominant sides while watching a projected video image of ball being kicked. Synchronised three-dimensional biomechanical data was captured using a Vicon Motion Analysis System (kinematic) and a Kistler Instrumented Force Platform (kinetic).

RESULTS The kinetic profile was similar from dominant to non-dominant sides. Kinematic differences were observed to the non-dominant side with a higher COM (centre of mass (p=0.03)), greater hip flexion (p=0.01), higher amount of pelvis rotation (p=0.02), higher amount of thorax rotation (p=0.003) evident. Results also indicated that the COM projected in a less direct line towards the ball during saves made to the non-dominant side at all heights (p=0.001).

Table 1. Peak force (bw), COM height (cm), hip angle, pelvis angle and thorax angle (degrees).

	Peak Force (bw)		COM Height (cm)		Hip Angle (degrees)		Pelvis Angle (degres)		Thorax Angle (degrees)	
	Dom	**NDom**	**Dom**	**NDom**	**Dom**	**NDom**	**Dom**	**Ndom**	**Dom**	**NDom**
Low	1.30	1.34	790.9	837.1	27	33	1	19	27	38
Medium	1.52	1.53	913.2	967.2	22	36	6	14	27	34

DISCUSSION This research found that dives made to the non-dominant side showed an initial over rotation of the pelvis and thorax. This combination reduced the capacity of the COM to travel its most direct path to the ball. It was concluded that goalkeeping performance showed asymmetry with the non-dominant side displaying a reduction in performance which was linked to joint movements in the transverse plane.

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KEY WORDS Diving save, goalkeeper, kinematics, kinetics, dominant.

P-104 Aerodynamic factors in soccer: A comprehensive review

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OBJECTIVE Many football fans will remember the free kick taken by the Brazilian Roberto Carlos in a tournament match against France in 1997. The ball curved to the left and entered the top right-hand corner of the goal to the amazement of players, the goalkeeper and the media alike. But for the physicist, the motion aerodynamics of football has to be discussed in order to understand this movement of the ball. The purpose of this study was to discuss Reynolds number, drag coefficient, boundary layer and magnus effect in order to understand the motion aerodynamics of football.

METHODS Carlos kicked the ball with the outside of his left foot to make it spin anticlockwise as he looked down onto it. Conditions were dry, so the amount of spin he gave the ball was high, perhaps over 10 revolutions per second.

RESULTS Kicking hard with the outside of foot allowed the ball to reach a velocity of 108 km/h. This speed was over the critical velocity (Figure 1). The flow of air over the surface of the ball was turbulent with the separation points at the back, which gave the ball a relatively low amount of drag that was a function of velocity as much as depended on the shape of the object.

CONCLUSION Some way into its path around the 10 m mark the ball's velocity dropped such that it entered the laminar flow regime. This substantially increased the drag on the ball, which made it slow down even more. This enabled the sideways Magnus force, which bent the ball towards the goal, to come even more into effect.

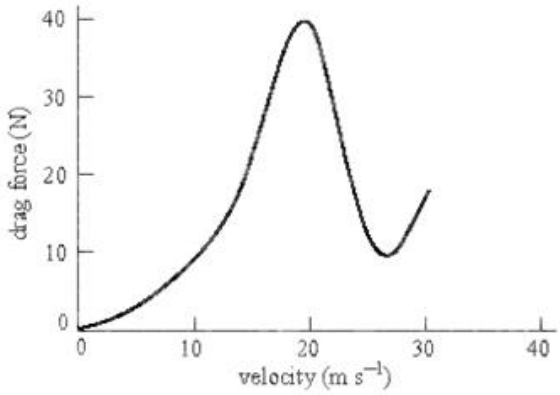

Figure 1. The variation of drag force with football speed.

KEY WORDS Aerodynamic Factors, Soccer.

34. FEMALES AND FOOTBALL

P-105 Sports injuries in woman soccer players

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OBJECTIVE In recent years, several researchers have investigated sports injury in woman soccer players. They reported that the ratio of injuries at the leg joint and the knee joint was high. Moreover, compared to male footballers, it was reported that the rate of front cross ligament damage and compression fracture (stress fracture) were higher. However there is little research that investigated sports injury in woman football players continuously. The purpose of this study is to clarify the characteristic of sports injury about woman soccer players. In addition, prevention of their sports injury was discussed from a viewpoint of their knowledge about the First aid.

METHODS 365 university woman soccer players(20.2±1.25 years) participated in this study. In the questionnaire, injured experiences including the injured situation were investigated throughout their career. They reported about all the sports injury which interruptted their training in the past. Their knowledge about of first aid was also investigated.

RESULTS Percentage of the injury on leg joint and knee joint was notably high. Injuries at the moment of non-contact were higher than contact moment's. The injury rate increased until after age 18 remarkably. Half of the players recognized first aid method after 18 years. Although recognition of "Rest" and "Ice" were high level, "Compression" and "Elevation" have not fully been recognized and executed.

Table 1. The injured region and age.

Region	AGE					
	-12	13-15	16-18	19-24	total	(%)
head, Face, Neck	1	3	7	8	19	(2.9)
arm・forearm	0	1	1	3	5	(0.8)
shoulder, clavicle	1	1	2	5	9	(1.4)
elbow	0	1	1	3	5	(0.8)
hand	4	0	9	19	32	(4.9)
trunk	0	8	9	21	38	(5.8)
hip	0	0	1	6	7	(1.1)
thigh	0	4	18	37	59	(9.0)
knee	4	3	37	69	113	(17.3)
leg	1	5	16	15	37	(5.6)
ankle	3	17	104	187	311	(47.5)
foot	1	2	6	11	20	(3.1)
total	15	45	211	384	655	
(%)	(2.3)	(6.9)	(32.2)	(43.5)		(100.0)

CONCLUSION The results indicated that most of the injuries occurred on the lower extremity and took place at the moment of non-contact in woman soccer. It became clear that sports injury increased in high school, when performance level and training load increased. However, the results indicated that the university woman players were not fully recognized the knowledge of first aid method.

KEY WORDS Women soccer, sports injury, first aid.

P-106 Countermovement jumping genre differences in soccer

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OBJECTIVE Investigation into the different movements involved in jumping appears to be directly linked to previous injuries of the anterior cruciate ligament (ACL) in female sports. Nowadays female team sports follow the same evolution as male ones and are practiced at increasing executive speeds and competitive levels (Pettineo, 2004). Using tests

from some biomechanical parameters this work verified if there were both quantitative and qualitative differences in the movements involved in jumping in male soccer players (n=12, age 24,7±5,9, weight 74,2±6,7 kg., height 180±7 cm) and female soccer players (n=12, age 23,2±4,7 , weight 60±7,2kg., height 170±5 cm),so as to find potential injury risks.

METHODS To evaluate different movements involved in jumping two separate force spring-boards were used (Twin Plates- Tesys Globus Italia) each with its own software containing tests related to their different biomechanical parameters. The software connected to the two disjointed spring-boards provided the quantitative data which referred to temporal parameters of different movements involved in Counter Movement Jump (CMJ).

RESULTS According to the results lifting the cog distinctly gave the female and male groups the values of 20,33±2,15 cm and 31,83±3,35 cm ($p<.01$).Regarding strength values expressed during coupling time, statistically significant differences were found in the comparison between female and male (left $p<.05$right.01)

DISCUSSION & CONCLUSION The reduced length of the overstretching phase in females explained the strategies which were carried out by subjects with less strength values to use the miotattic reflex in order to improve jumping performance. Female soccer players' protective attitude was further confirmed by the strength peak during coupling time that was another very important parameter regarding the effectiveness of CMJ.

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KEY WORDS CMJ, neuromuscular differences, overstretching phase, female soccer.

P-107 Sleep, pre-game fatigue, and game performance in female college soccer players

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OBJECTIVE Soccer is a demanding sport that requires both mental and physical readiness for optimal performance. Sleep and perceived levels of mental and physical fatigue before a game may be related to game performance. Soccer coaches and trainers can easily collect these data before games to monitor the mental and physical state of players and subsequently take action to minimize players' pre-game fatigue (Figure 1). The purpose of this study was to investigate the relationships between sleep duration (SD) the night before a match, pre-game perceived levels of head alertness (HA) and leg quickness (LQ), game outcome (GO) and 6 game performance variables (GPV) among female college soccer players.

METHODS The participants were 21 female college soccer players (age 20.3 ± 1.4 yrs; height 1.69 m ± 4.32 cm; weight 64.32 ± 6.18 kg). SD and pre-game perceived levels of HA (mental fatigue; scale of 1-very dull to 5-very sharp) and LQ (physical fatigue; scale of 1-very slow to 5-very quick) were collected before 21 season games. The GO and the 6 GPV were also collected for each game. A Pearson correlation analysis was used to investigate the relationships between these variables.

RESULTS Descriptive statistics of the variables were: SD (8.99 ± 0.62 hrs); HA (3.98 ± 0.22); LQ (3.79 ± 0.25); and GO (14-5-2). The Pearson correlation analysis revealed a significant positive relationship between SD and HA; significant negative relationships between SD and GO, and SD and GPV; and no correlation between SD and LQ. HA was positively related to LQ but negatively related to GO and GPV. No significant association was found between LQ and GO, and LQ and GPV (Table 1).

DISCUSSION & CONCLUSION More SD the night before a game was related to higher levels of pre-game HA (less mental fatigue). Higher HA also resulted in higher LQ ratings (less physical fatigue). These findings agreed with previous studies that show that sleep deprivation impairs cognitive performance (Reilly, 2003; Walters, 2002) and post-exercise recovery (Reilly and Ekblom, 2005). Thus, we encourage players to sleep about 8-10 hrs before competition.

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Table 1. Pearson correlation results.

Variable	r	Sig
SLEEP DURATION		
Head Alertness	0.488*	0.025
Game Outcome	-0.508*	0.019
Game Performance Variables		
Goals Difference	-0.576**	0.006
Assists Difference	-0.605**	0.004
Points Difference	-0.599**	0.004
Shots Difference	-0.500*	0.021
Shots on Goal Difference	-0.506*	0.019
Corners Difference	-0.543*	0.011
HEAD ALERTNESS		
Leg Quickness	0.787**	0.000
Game Outcome	-0.457*	0.037
Game Performance Variables		
Goals Difference	-0.464*	0.034
Assists Difference	-0.466*	0.033
Points Difference	-0.475*	0.030
Shots on Goal Difference	-0.434*	0.049
Corners Difference	-0.504*	0.020

*. Correlation significant at the 0.05 level (2-tailed)**. Correlation significant at the 0.01 level (2-tailed). N = 21 games.

Collection of player's sleep duration and perceived levels of head-alertness and leg quickness before a game.

KEY WORDS Sleep, pre-game fatigue, head alertness, leg quickness, game performance, female college soccer.

P-108 Game characteristics of Asian Women's Rugby

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OBJECTIVE The development of Women's Rugby contributes not only directly but also indirectly to the development of Rugby itself as a global sport. Recently Women's Rugby in Japan has broadly developed and the national team has taken part in the Women's Rugby World Cup from the 1st game in 1991 to the 4th game consecutively. The purpose of this study was to clarify the game characteristics of Asian Women's Rugby in comparison to the World level Women's Rugby as well as the World level Men's Rugby.

METHODS The games of the top 4 teams of Asian qualified games for 2006 Women's Rugby World Cup held in Thailand and the games of the top 4 teams of 2006 Women's Rugby World Cup held in Canada were analyzed. Based upon the 2003 IRB game report, the numbers of try, penalty goal, line-out, scrum, in-play time, maul/ruck, pass, kicking were adopted as the parameters for the game assessment.

RESULTS Compared to the 2003 IRB WRC game report, the ball possessions at line-out time and scrum time, in-play time, the number of maul/ ruck in Asian Women's Rugby were significantly lower than those parameters obtained in Men's Rugby. The numbers of penalty goals and kicking were obtained lower than Men's Rugby as a result.

DISCUSSION & CONCLUSION Though the superiority of physical fitness in men is obvious, the skill levels of Men also were superior to those of Women. The reason for the lower levels of ball possession and ball continuity with the lack of each individual and unit skill was identified. However, further investigating of these results is required to arrive at a more precise conclusion.

KEY WORDS Women's Rugby, game analysis.

P-109 Effects of pre-cooling and warm-up intensity on soccer-specific intermittent exercise performance in heat

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OBJECTIVE International soccer tournaments are frequently held in the heat (35-40°C). Therefore moderating factors that impact on thermal strain have important implications for performance. Warm-up and pre-cooling strategies influence exercise performance. Though their impact on prolonged intermittent exercise performance in the heat have yet to be fully investigated. The aim was to examine the effects of a reduction in warm-up intensity and upper body pre-cooling on repeated sprint performance during a 90 min soccer-specific intermittent exercise protocol (SSIEP) in the heat (35ºC, RH 50%, air velocity 1.2-1.4 m/s).

METHODS Six international female soccer players completed a 90-min SSIEP on a non-motorised treadmill following three different warm-up strategies; 1.Simulated match warm-up equating to 80% of maximum heart rate (HRmax)(HIW) 2.Low intensity warm-up (60% HRmax)(LIW) and 3.HIW with pre-cooling (COOL). Performance was determined from mean power output during each 3.3.s sprint (Coefficient of variation 5.8%).

RESULTS Rectal temperature was lower after LIW compared to HIW ($p=0.034$). Thermal comfort (TC) and rating of perceived exertion were lower following LIW and COOL compared to HIW ($p<0.05$). Mean sprint performance during the SSIEP was higher in LIW (573+11 W) and COOL (569+13 W) compared to HIW (548+11 W)($p=0.001$). Mean skin temperature and TC were lower during the SSIEP in COOL compared to HIW ($p<0.05$).

DISCUSSION & CONCLUSION Repeated sprint performance is improved throughout the duration of a 90-min SSIEP in the heat when the intensity of warm-up is reduced or a cooling vest is worn throughout the warm-up period. The structure of the pre-event preparation strategy should therefore be considered when competing under high environmental temperatures.

KEY WORDS Warm-up, pre-cooling, intermittent, non-motorised treadmill.

P-110 Physical status of elite female soccer players

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OBJECTIVE The rapid growth of female soccer requires the determination of the physical status and capabilities of female soccer players. Few studies to date have examined the physical and physiological profile of female soccer players (Stolen et al, 2005). Previous studies (Bellew and Gehrig, 2006; Soderman et al, 2000) have investigated the bone mineral density (BMD) status of female soccer players, however, none in an elite cohort, and matches this with the group physical status. The aim of the present study was to provide a physical profile of elite female soccer players.

METHODS Fourteen international female soccer players (age 23.2±3.0 years; mass 64.8±3.7kg) completed a series of physical assessments. Players were assessed for height, body mass, whole body BMD and body fat percentage (using a Dual-Energy X-ray Absorptiometry (DEXA) scanner), aerobic endurance performance (via 20m multi-stage shuttle run), 10m and 20m sprint times, and vertical jump.

RESULTS Mean height and body composition values were 165.4±4.2cm and 20.1±1.9% fat, respectively. Mean predicted maximal oxygen uptake (VO2max) was 53.4±3.8ml.kg-1.min-1. The mean times in the 10m and 20m sprints were 1.83±0.08s and 3.18±0.13s, respectively. The mean vertical jump height was 37.7±3.9cm. All players had higher total body BMD values than reference values for age-matched females.

DISCUSSION & CONCLUSION Physical activity, particularly high impact, was associated with greater bone density, which was apparent in this cohort. One player was only slightly higher, which suggested that the beneficial effects of training and match-play was may be negated by some athletic women. Monitoring of menstrual status and nutritional intakes in relation to BMD was warranted for future studies.

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Stolen et al. (2005) *Sports Medicine* **35,** 501-536.

KEY WORDS Physical status, bone mineral density, elite female soccer players.

P-111 Iron status in elite female soccer players

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OBJECTIVE FIFA estimates that in the year 2010, there will be more women playing football than men (Davies, 2005). Despite growing interest, few studies have examined the iron status of elite female soccer players. The impact of iron deficiency anaemia on performance is well documented. However, it is also recognised that iron deficiency without anaemia may also have adverse effects on performance (Brownlie et al, 2004). The aim of the present study was to determine the prevalence of iron deficiency and iron deficiency anaemia in elite female soccer players.

METHODS Thirty-six international female soccer players (age 21.1±3.3 years) had venous pre-prandial blood samples collected. Samples were collected in an international training camp prior to the start of the competitive playing season. Samples were analysed within 24 hours for haemoglobin concentration and ferritin stores.

RESULTS The average haemoglobin and ferritin values were 127.0±8.0g/l and 39±19µg/L, respectively. Of the female soccer players assessed, 42% had iron deficiency and 14% iron deficiency anaemia, as diagnosed by the team doctor.

DISCUSSION & CONCLUSION The prevalence of iron deficiency and iron deficiency anaemia in the current study was lower than in studies of elite female soccer players (Landahl et al, 2005), and higher than values for general female population . This suggested that elite sport places extra demands on females to maintain adequate iron stores. Regular monitoring of haemoglobin and iron status should be employed.

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KEY WORDS Iron deficiency, anaemia, elite female soccer players.

35. TALENT IDENTIFICATION

P-112 General and special physical fitness levels in young football players

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OBJECTIVE In football training special and multifaceted motor abilities have direct impact on the special fitness of the football players. Depending on the needs, they can be helpful as a selection criterion and useful for the evaluation of the progress in the player abilities. The aim of this paper was to define the level of general and special physical fitness of football players in the key stage of sports training – transition from learning to training, and investigate the correlation between general and special fitness of young football players, and their playing position.

METHODS 20 selected football players with 6-year training experience constituted the subjects of this research. International Fitness Test was used to evaluate general physical fitness, and Football Abilities Test was used to evaluate special fitness.

RESULTS The analysis of the results showed that according to the classification of International Fitness Test's norms, the players were placed in the 320 – 480 point bracket, that defined their general physical fitness as medium. In the special fitness test the strikers definitely dominated, whereas the defensive players gained the poorest results.

DISCUSSION & CONCLUSION This research confirmed the need to conduct similar tests as methods controlling the training effects and it lets one to draw the following conclusions:
1. Spearman's rate correlation indicated statistical significance ($p<0,05$) in some tests.
2. Research on the special and general physical fitness confirm interdependence rate and the influence on the level of football player.

KEY WORDS Football, general physical fitness, special physical fitness, tests, training.

P-113 Talent identification in soccer players aged 10-12 years

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OBJECTIVE There is increasing emphasis on clubs to detect players and nurture and guide them through the talent identification process. Moreover, different factors may contribute to performance prediction at different ages. Thus any such model would need to be age-specific (Reilly et al, 2000). The aim of this research was to determine anthropometic, physiological profiles and soccer-specific skills that could be used for talent identification in players aged 10-12 years.

METHODS Data was obtained by a questionnaire. To establish the best of these profiles,a factor analysis was conducted.

RESULTS It was found that,in order to weigh physique and height related to anthropometic profiles;speed,agility and quickness related to physiological characteristics;coordination (neuro-muscular),passing and shooting related to soccer-specific skills were more important for talent identification among players aged 10-12 years.

DISCUSSION & CONCLUSION Despite difficulties in predicting long-term success in young players, the age-based model may be useful in establishing baseline reference data to select and develope talent in soccer players.

REFERENCES
Reilly et al. (2000) *Journal of Sport Sciences* **18,** 695-702.

KEY WORDS Anthropometry, physiology, soccer-specific skill.

P-114 Characteristics of selected and non-selected elite junior Australian footballers

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OBJECTIVE Previous research in successful elite junior Australian Rules football (ARF) players across a number of junior teams, has identified that successful players poses certain key anthropometric and performance characteristics (Pyne et al. 2005) as important selection variables. The aim of this study was to investigate and identify anthropometrical and physical performance differences between players who were selected in the final squad of one junior ARF club to those who were not selected.

METHODS Fifty four junior ARF players were assessed using a battery of ARF standard anthropometric, height and weight, and physical performance tests, 20m straight-line speed, planned agility course, vertical jump power, and 3km endurance time-trial. Comparisons were made using MANOVA (significance $p<0.05$). Further analysis was completed to investigate if age was an influencing factor in selection.

RESULTS MANOVA showed significant differences between selected and non-selected players when height, mass, sprint, agility, and vertical jump were considered collectively (Table 1). However, univariate analysis revealed that the vertical jump was the only significant individual test differentiating between selected and non selected players. Further, age was not a factor as players selected were younger.

Table 1 Descriptive results.

	Selected		Non-selected		
	Mean	**SD**	**Mean**	**SD**	**p**
Height (cm)	182.57	7.95	178.73	6.63	0.64
Mass (kg)	77.43	10.31	73.60	8.60	0.15
Speed - 20m (metres/sec)	6.26	0.26	6.17	0.19	0.16
Agility (metres/sec)	2.57	0.13	2.52	0.12	0.14
Vertical jump (cm)	60.70	5.82	57.38	4.99	0.31
3km Endurance (sec)	738.60	62.08	734.20	73.94	0.82

DISCUSSION & CONCLUSION Contrary to previous research on junior ARF players suggesting specific performance indicators (Pyne et al. 2005), the findings from this study suggest successfully selected players in this sqaud showed consistent performance across all tests in comparison to non-selected players who performed well in one or two tests only. However, samples examined may account for differing results observed.

REFERENCES
Pyne et al. (2005) *Journal Science Medicine Sport* **8,** 323-345.

KEY WORDS Australian Rules Football, junior players, selection.

P-115 Impact of playing level on skill performance in early pubescent Irish soccer players

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OBJECTIVE Soccer is played in a dynamic environment in which players are continually required to execute skills in response to verbal or visual stimuli. Consequently, it is surprising that soccer skill testing accounting for the cognitive and perceptual constraints of match play has received little attention for the purposes of talent identification. The aim of this present study was to determine if performance on two tests of dynamic soccer skill, the Loughborough Soccer Passing Test (LSPT) and the Loughborough Soccer Shooting Test (LSST), distinguished between sub-elite and novice early pubescent soccer players.

METHODS Eight sub-elite and 9 novice players (aged 11-12 years) performed adolescent versions of the LSPT and the LSST. The LSPT required 16 passes to be completed, in a circuit of grids and cones, in a set trial order as quickly as

possible. The LSST evaluates shot accuracy, shot speed and the time taken to complete a specific shot sequence.T-tests were used to compare the differences between the groups.

RESULTS The sub-elite group demonstrated superior passing skill than the novice group with significantly lower penalty (6.8 vs. 16.2 s; t= -3.63, p<0.005) and overall performance time (68.2 vs. 81.4 s, t= -3.04, p<0.05) on the LSPT. However, the LSST did not significantly discriminate between the two groups.

DISCUSSION & CONCLUSION This present study supported the construct validity of the LSPT and highlighted its potential value in identification of talented soccer players. Future research is required to establish the reliability and validity of both the LSPT and LSST using a larger cohort of young soccer players.

KEY WORDS Soccer, skill, talent identification.

P-116 Possible predictor of talent identification of professional soccer players

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OBJECTIVE Recently there have been a lot of studies concerned with the talent identification of soccer players. However, the explanation of this issue is not clear yet due tolack of prospective research. Moreover, the large difference of biological maturation compared to their chronological age in adolescents complicates this issue. The purpose of this study was to investigate the talent identification of professional soccer players from physical, physiological and biological standpoints. Then the training programs for preadolescent soccer players to develop their careers were examined.

METHODS The subjects of this study were thirty-one adolescent soccer players. They were divided into Elite (N=18) and Sub-elite groups. The players of the elite group were also divided into Pro (7) and Amateur (11) subgroups. The height, weight, skeletal age, stepping speed, stepping endurance and choice reaction time were measured. Then all measurements between each group were compared prospectively.

RESULTS Comparing the elite and the sub-elite groups, significant differences in physical and stepping abilities could not be found. On the other hand, elite members had significantly faster choice reaction time in all years (Table.1). However, comparing the Pro and Amateur groups, this tendency was not clear.

Table 1 Means and SD of all measurements. In each column, an upper line shows the values youth group and below line show the region's values. *p< .05, **p< .01 (Students t-test).

Measurement	1st year	2nd year	3rd year
Chronological age (CA: yrs.)	12.6±0.4	13.7±0.4	14.7±0.4
	12.7±0.4	13.7±0.5	14.7±0.5
Skeletal age (SA: yrs.)	13.1±1.0	14.1±1.0	14.8±0.8
	13.4±1.0	14.3±1.1	15.2±1.0
SA-CA (yrs.)	0.5±0.8	0.4±1.0	0.1±0.8
	0.7±0.8	0.6±0.8	0.5±0.7
Height (cm)	157.6±7.0	164.2±5.7	169.4±3.8
	158.2±9.4	163.4±7.5	167.1±6.8
Weight (kg)	47.8±8.2	54.7±7.4	59.7±6.6
	47.3±9.4	53.2±8.6	58.7±6.6
Complex RT (msec.)	657±117*	583±68**	547±48**
	757±82	669±76	624±71
Foot RT (msec.)	601±90*	543±50*	558±45*
	674±82	593±55	592±33
Hand RT (msec.)	519±81	481±53	472±47*
	556±58	507±56	508±46
Stepping speed (rep./sec.)	10.8±1.2	11.5±1.2	11.9±0.8
	10.3±1.1	11.6±0.8	11.6±0.9
Stepping endurenace (%)	84.4±5.0	85.1±5.3	85.4±3.9
	82.9±5.1	81.9±3.6	84.2±8.0

DISCUSSION & CONCLUSION The findings suggested that adolescent soccer players with faster choice reaction time had the possibility to become professional soccer players. Consequently, evaluating this ability enabled coaches to reduce the short-term dropout players. Moreover, it was suggested that during preadolescence coaches should train players to develop their reaction abilities rather than speed and endurance.

KEY WORDS Talent identification, adolescent, choice reaction time, skeletal age.

P-117 Heart rate and match analysis of Finnish junior football players

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OBJECTIVE The fatigue caused by football and the resulting decrease in physiological performance have been well documented (Mohr et. al., 2005). Most of the research concerning the intensity during a football game (Reilly, 1997) and match analysis (Luhtanen, 1993) has been done with elite male players. Much less information is available on junior players in different age groups. The purpose of this study was to perform match analysis and examine work intensity of junior players at 10, 12 and 14 years of age in a 90 minute, 11-per-side football game on full-sized field.

METHODS The subjects of this study were 10 (n= 13), 12 (n=16) and 14 (n=14) years old male football players. Each age group played a normal game on full-sized football field wearing Suunto T6 heart rate monitors. The games were analyzed using Dartfish Team Pro software. The reference values were measured from adult players. The differences were analyzed using the One-way Anova, T-test and Pearson.

RESULTS RESULTS Average HR (HRavg), average HR relative to maximal HR (HR%max), average oxygen consumption (VO_2avg), average VO_2 relative to VO_2max (VO_2%), energy expenditure (MJ), percentage of time under aerobic[AnT]threshold as well as match analysis were assessed. Data are presented in in figure 1 Furthermore, the physical load of the game is expressed with EPOC. Aerobic energy consumption of 10 years old male football players was higher than that of the other age groups.

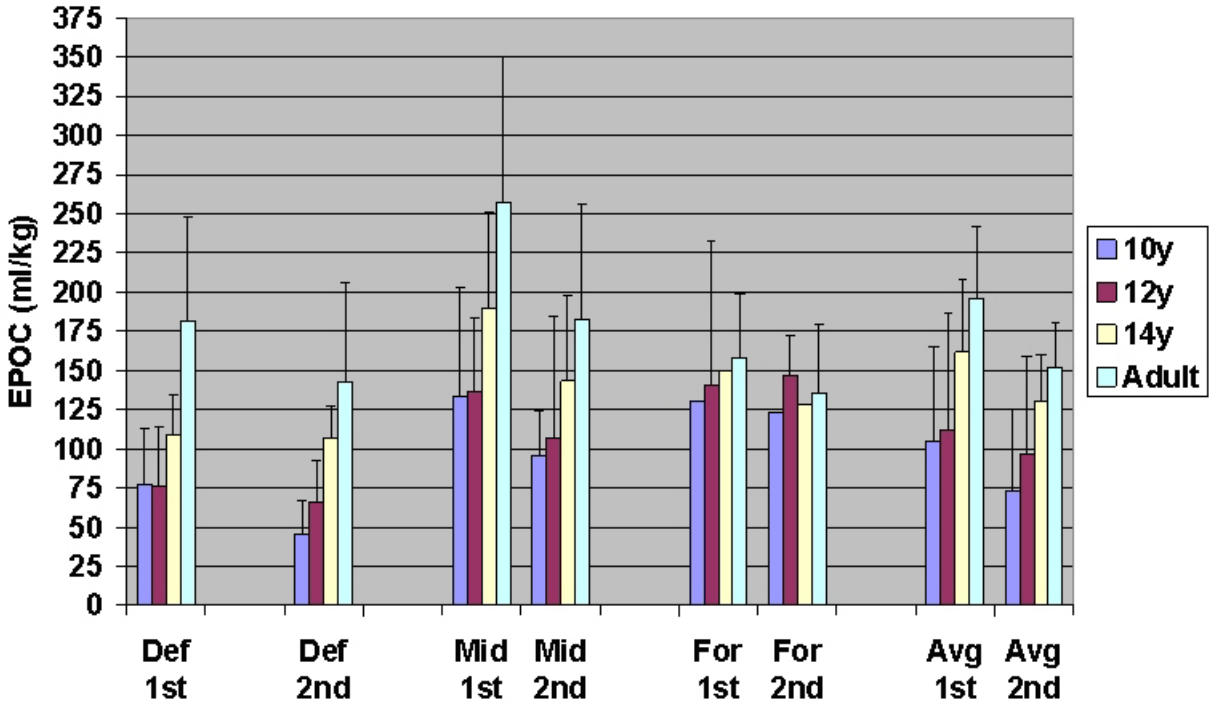

Figure 1. EPOC results.

DISCUSSION From the results of this study it can be concluded that before puberty, children rely on aerobic energy production more than adult players and that the playing position has marked influence on the physical load of the game.

A wide range in the intensity demanded from various playing positions should be considered in youth football to avoid a discrepancy in training effects.

REFERENCES
Luhtanen (1993) *Science and Football*, 215-220.
Mohr et al. (2005) *Journal of Sport Sciences* **23,** 593-599.
Reilly (1997) *Journal of Sport Sciences* **15**, 257-263.

KEY WORDS Football, children, heart rate, match analysis.

P-118 Career development of youth football players in J-League Academy: Focus on occupational identity

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OBJECTIVE Professional sport has been proliferated in the Japanese society and has been the inspiration of child dreams. Although little number of players can be successful in reality, a larger number of children desire to become a professional player. It is interesting to investigate those young players' psychological development at the young stage. It is the identity formation that can be seen as the central element of psycho-social development and that can be synchronized with the formation of the occupational identity. This study analyzed the relationship between the career orientation and the identification of occupation made by young football players.

METHODS The subjects of this research were 261 youth football players from 11 different J-League academies. Occupational Identity Scale (Melgosa: 1987), which comprises of four statuses: achievement, moratorium, foreclosure and diffusion, was used to measure attributes, future career orientation and occupational identity.
RESULTS ANOVA revealed that professional-career oriented players had significantly higher achievement [$F(2,258)=4.05$, $p<0.01$] and low moratorium [$F(2,258)=9.34$, $p<0.001$] , and oriented towards higher education have lower achievement [$F(2,258)=4.30$, $p<0.01$] and high moratorium [$F(2,258)= 12.25$, $p<0.001$].

DISCUSSION Occupational Identity Scale was reflected from the work by Marcia (1966), which argued four ego-identity status, and analyzed the career decision through understanding crisis and commitment. It was understood from this research that young players who committed to be professional players had higher attributes to crisis and commitment.

REFERENCES
Melgosa (1987) Journal of Adolescence **10**, 385-397.

KEY WORDS J-league academy youth football players, career development, career orientation.

36. SKILL LEARNING

P-119 Backward cutting in soccer players

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OBJECTIVE The specific movements in soccer include not only forward movement, but also various movements to different directions such as backward running, side step, cutting and so on. Defenders specifically respond to attack from offensive players by backward cutting, which is rather difficult skill on soccer game. However, the intensive study about a backward cutting was not found in previous researches. The aims of this study were to analyze the important factors of the backward cutting with the ordinary two- dimensional motion analysis system and to analyze the backward cutting of the real game situation with a new model-based imaging matching technique.

METHODS Seventeen male in collegiate soccer players performed front-step cutting and back-step cutting. Time and cutting motion on each cutting trial was recorded. A defensive soccer player was recorded, especially the response with backward cutting to offensive attacks, by three DV cameras in game situation. The landmark of surroundings and the skeleton model were conformed to the video footage (Figure 1).

Figure 1. Matched skeleton model to the background video footage.

RESULTS The recorded time and the ground contact time of cutting phase in back-step cutting were much longer than those in front-step cutting. Also, a lack of stability of upper body was observed in back-step cutting compared with in font step cutting (Table 1). With the model-based image matching technique, joint angles trajectory of a backward cutting could be obtained even in the real game situation.

Table1. Amount of tilt change of upper body on frontal plane (°).

	impact absorption phase	**propulsion phase**
front-step cutting	1.8±1.1	8.5±5.9
back-step cutting	7.2±6.3 *	9.1±6.5

* Indicated significant ($p < 0.01$) from front-step cutting

DISCUSSION The ground contact time in back-step cutting had the tendency to depend not on the muscle power but on the core body balance. This result indicated that the stability and balance training of the body and upper extremity may improve the skill of the backward motion of the players. In addition, a model-based image matching technique would be useful to get in-depth data about sports performance in real sport scenes.

KEY WORDS Backward cutting, skill, motion analysis.

P-120 Microstructure of effective practice: nature of instruction process in soccer

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OBJECTIVE Effective instruction is crucial to the pursuit of optimal sporting performance. Researchers have shown that coaches use similar behaviours when dealing with elite performers (Potrac et al,, 2002). However, few studies have examined how coaches altered their behaviour due to the learner's age, skill level or form of the practice activity. This study examined the coaching behaviours employed on players of different age and skill levels during various forms of practice activities.

METHODS Instructional behaviours of coaches were assessed at three skill levels (elite, sub elite, recreational). Coaching sessions (n = 81) covering three age groups (9, 13, 16 years) were analysed. Behaviours were analysed using a validated observation instrument. Percentage and rate per minute were calculated and analysed using Group (elite, sub elite, recreational) x Age (9, 13, 16) ANOVAs.

RESULTS Coaches used praise more often with elite players and were less likely to be silent when working with sub-elite and recreational players. Elite players received less concurrent instruction compared to recreational players, $p < .05$.The use of management behaviours, pre instruction, and silence increased proportionally with player age, $p < .05$.

Table 1. Behaviour categories and definitions of the behavioural categories

Activity	Definition
1. Pre-Instruction	Initial information given to a player(s) preceding the desired action to be executed. It explains how to execute a skill, play, or strategy.
2. Concurrent Instruction	Cues or reminders given to a player (s) during the actual execution of the skill or play.
3. Post Instruction	Correct, re-explanation, or instructional feedback given after the execution of the skill or play.
4. Management	Verbal statements related to the organisational details of practice sessions, not referring to cognitive strategies or skill-based fundamentals.
5. Modelling	Provision of a demonstration of correct or incorrect performance of a skill or playing technique.
6. Questioning	Any question to player concerning strategies, techniques, assignments, and so forth associated with the sport.
7. Praise	Verbal or non-verbal compliments, statements, or signs of acceptance towards the players.
8. Scold	Verbal or non-verbal compliments, statements, or signs of displeasure towards the players.

DISCUSSION At the elite level, players were provided with a positive environment, where provision of constructive instruction was limited. Coaches used more pre-instruction and management with older age groups, although this may be due to increased task complexity. The amount of information presented was reduced with age, possibly implying a more 'hands off' (Williams and Hodges, 2005) approach, especially in game orientated practices.

REFERENCES

Potrac et al. (2002) *Sport, Education and Society* 7, 183-202.
Williams et al. (2005) *Journal of Sports Sciences* **23**, 637-650.

KEY WORDS Skill acquisition, elite performance, coaching behaviours, practice, soccer.

P-121 Effects of technical training on skill development in non-dominant legs of young soccer players

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OBJECTIVE In today's soccer with game systems that are changing, the movement fields of soccer players are quite narrowed; for soccer players to make safe ball control in these narrow fields, shoot passes that reach their aim and dribble safely without losing the ball to opponents, they have to learn the basic skills of soccer using both legs systematically (Haaland and Hoff 2003). The purpose of this study was to investigate the effect of special technical training on the skill development in non-dominant legs of young soccer players of two different age groups.

METHODS 65 volunteer soccer players from 4 young soccer teams participated in the study. Teams were separated randomly into the experimental and control groups of 12–14 years and 16–18 years. Basic ball drills to work only the non-dominant leg were carried out following the warm up for 10 weeks, 3 days/week. (maximal heart rate % 50-60) 7 skill test (Volley kick, Single Passing Hit, Short Passing Hit, Ball Counting, Short dribbling, Long dribbling, Johnson Test) proper to soccer were applied to both dominant and non-dominant legs of soccer players in pre-test and post-test during 10 weeks.

RESULTS This study revealed that the development of physical characteristics of experimental and control groups were parallel. There were no significant differences in the non-dominant legs of the both control groups but except the ball counting skill in 16-18 age groups there were significant differences in the non- dominant legs of experimental groups in the skill development of ($p<0,05$) $p<0,01$) levels.

Table 1. The comparison of the physical characteristics of subject and control groups.

	Variable	SubjectGroup	Control Group	Difference	t	P
12–14 Age Subject Group (N=17) Control Group (N=16)	Age (year)	13,00(0,70)	13,00(0,63)	0,00	0,00	1,00
	Sport Age(year)	1,73(0,39)	1,75(0,36)	0,02	0,11	,913
	Height (cm)	154,32(10.67)	156,06(8,60)	1,74	0,51	,610
	Weight (kg)	42,62(8,86)	44,93(7,53)	2,30	0,80	,428
16–18 Age Subject Group (N=16) Control Group (N=16)	Age (year)	17,00(0,73)	16,93(0,92)	0,07	0,21	,834
	Sport Age(year)	5,18(1,22)	5,31(0,94)	0,13	0,32	,749
	Height (cm)	172,33(6,06)	174,15(2,84)	1,81	1,09	,284
	Weight (kg)	61,98(7,71)	62,43(5,19)	0,44	0,19	,850

Table 2. The comparison of differences of first and pre-test and post-test result for dominant and non-dominant legs of experimental and control groups (12-14 age groups)

12-14 Age Variable	Subject-Control	Subject Group N: 17	Control Group N: 16	Difference	t	P
Voley kick	D.L	7,64(3,77)	8,00(4,16)	0,35	0,25	,800
(point)	N.D.L	8,94(3,13)	0,43(3,18)	8,50	7,73	,000**
Single Passing Hit	D.L	2,64(1,90)	2,81(1,72)	0,16	0,26	,795
(quantity)	N.D.L	3,23(1,09)	1,00(0,81)	2,23	6,62	,000**
Short Passing Hit	D.L	3,17(1,07)	3,25(0,93)	0,07	0,21	,835
(point)	N.D.L	3,00(0,79)	0,62(1,45)	2,37	5,87	,000**
Ball Count	D.L	0,70(1,35)	0,43(0,72)	0,26	0,70	,489
(quantity)	N.D.L	4,17(4,23)	1,12(3,15)	3,05	2,33	,026*
Short dripling	D.L	-0,24(0,39)	-0,37(0,40)	0,12	0,86	,396
(sn)	N.D.L	-0,92(0,56)	-0,01(0,33)	0,91	5,60	,000**
Long dripling	D.L	-0,96(0,89)	-0,59(0,42)	0,36	1,49	,145
(sn)	N.D.L	-2,23(1,22)	-0,10(0,63)	2,13	6,24	,000**
Johnson Test	D.L	7,47(3,44)	6,06(2,48)	1,40	1,33	,191
(quantity)	N.D.L	9,41(3,33)	1,00(1,89)	8,41	8,82	,000**

Tablo 3. The comparison of differences of first and pre-test and post-test result for dominant and non-dominant legs of experimental and control groups (16-18 age groups).

16-18 Age Variable	Subject-Control	SubjectGroup N: 17	Control Group N: 16	Difference	t	P
Voley kick	D.L	2,43(6,72)	4,12(2,70)	1,68	0,93	,359
(point)	N.D.L	7,93(3,60)	1,31(2,82)	6,62	5,78	,000**
Single Passing Hit	D.L	1,75(1,43)	2,37(0,88)	0,62	1,48	,149
(quantity)	N.D.L	2,93(0,77)	0,75(1,00)	2,18	6,92	,000**
Short Passing Hit	D.L	1,62(2,18)	1,68(1,77)	0,06	0,08	,930
(point)	N.D.L	2,68(1,62)	0,68(1,13)	2,00	4,03	,000**
Ball Count	D.L	0,87(2,52)	0,37(1,50)	0,50	0,68	,500
(quantity)	N.D.L	4,37(3,68)	2,31(2,52)	2,06	1,84	,075
Short dripling	D.L	-0,24(0,19)	-0,38(0,17)	0,14	2,16	,038*
(sn)	N.D.L	-0,74(0,37)	-0,03(0,18)	0,71	6,81	,000**
Long dripling	D.L	-0,43(0,28)	-0,42(0,38)	0,01	0,02	,984
(sn)	N.D.L	-1,23(0,45)	-0,17(0,36)	1,06	7,25	,000**
Johnson Test	D.L	2,12(2,91)	3,37(1,36)	1,25	1,55	,131
(quantity)	N.D.L	6,43(2,09)	1,62(1,25)	4,81	7,87	,000**

DISCUSSION It was witnessed that there was much more skill development in the experimental group of 12–14 years than the experimental group of 16-18 years.

REFERENCE
Haaland et al. (2003) *Scandinavian Journal of Medicine Science in Sports* **13**, 179-184.

KEY WORDS Soccer, training, skill, non-dominant leg.

P-122 Effect of memory recall on perceptual-cognitive skill in elite soccer: Development of long term working memory

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OBJECTIVE According to Ericsson and Kintsch (1995), Long Term Working Memory (LTWM) can be used to circumvent limitations in short-term memory, enabling skilled performers to acquire better encoding/retrieval methods, promoting rapid access to information and improved memory recall. These skills are thought to contribute to superior recall ability in skilled players when compared to less skilled players. In this study the ability of two groups of elite soccer players of varying levels of perceptual-cognitive expertise and a group of novice players to recall aspects of matches in which they had participated were examined.

METHODS The perceptual-cognitive skills of elite (n-24) and novice (n-12) soccer players were assessed. The elite groups were stratified based on performance (perceptually excellent, perceptually average). Retrospective memory recall was examined for individual, team and opposition events using a recall questionnaire. Sportscode Pro software® was used to obtain match statistics.

RESULTS Elite players had superior perceptual-cognitive skills compared with their novice counterparts, $p>0.01$. Players were more accurate in recalling individual events rather than those involving team mates and the opposition, $p>0.05$. There were no difference in the accuracy of memory recall between the two groups of elite players, $p<0.05$.

DISCUSSION Memory recall was not shown to be a determinate of anticipation and decision-making skill in elite soccer players. These finding suggested that other factors may have led to the development of perceptual excellence in elite players rather than memory recall. In future, researchers could collect verbal reports after matches to elicit more detailed information in relation to memory retrieval and encoding.

REFERENCES
Ericsson et al. (1995) *Psychological Review* **2**, 211-245.

KEY WORDS Energy perceptual expertise, memory recall, long-term working memory.

P-123 Educational approaches in coaching applications in youth professional soccer

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OBJECTIVE Educational approaches are important to determine how to teach new skill to youth teams players. There are different ideas between educational approaches training applications of trainers who work with youth players of professional soccer teams. The purpose of this study was to analyse the educational approaches training applications of trainers who work with youth players of professional soccer teams.

METHODS The participants of this study were 50 coaches, who worked in youth teams of the professional league, second league A and second league B and third league teams. A Sample (Martens, 1987) with the 5 scale Likert type 21 questions, composed of two sections was used. The first section was consisted of demographics and the latter analysed the training of the football coach's training applications. The plausibility coefficient of the survey of the study is determined with α: .80. T-test and one way ANOVA, ($p<0.05$) were used for the analyses.

RESULTS According to the results of the study, 59,2 % of the trainers had their coach license from Turkish football federation (TFF) and 40.8 % from the universities. The training experience of the coaches was 25.7 % 1-5 years, 29.8 % 6-10 years, 44.6 % 11 years and more. The coaches shared the view of the analyses of the educational approaches A (X=3.69).According to the foundation of the trainer license of the trainer (TFF or university), "succeeding of the group and submitting feedback of the positive or negative of the correcting, preventing of the enjoying of the sportsmen and a positive communication with them" and comparing in these subjects, there are expressive differences $p<0.05$. The result is for the trainer, which gained their license from the university. Coaches depended on the time of training occupation have also differences between ""theoretical information submitting and often feedback of the coaches, the division of the movement into parts and variance analyze; $P<0.05$. Result is for the coaches, which are training since 1–5 and 6–10 years. Coaches depended on the time of training occupation have also differences between ""theoretical information submitting and often feedback of the coaches, the division of the movement into parts and variance analyze $P<0.05$. Result is for the coaches, which are training since 1–5 and 6–10 years.

Table 1. The number of the participant soccer clubs and the coach

The participant clubs	League	Number of trainer
Ankara Spor	1	7
Gençlerbirliği	1	11
MKE Ankaragücü	1	8
Türk Telekom	2.league A	7
Ankara Demirspor	2.league B	5
Gencler Birligi Asasspor	2.league B	4
A.B. Kızılcahamam Belediyespor	3 league	2
Bugsas Spor	3 league	2
Çubukspor	3 league	2
Etimesgut Sekerspor	3 league	2
	10 teams	50

DISCUSSION The study showed that the coach with license from the university was better in correction and submitting of the information and obtaining of the enjoyment of the sportsmen of the training and in the positive better communication as the trainer with license of the TFF.

REFERENCES
Martens (1987) *Coaches Guide to Sport Psychology,* 6-46.

KEY WORDS Coaches of youth teams, educational approaches, feedback.

P-124 Motor coordination abilities and technical actions of junior football players

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OBJECTIVE Success gained in team games including football depend on definite links (players) in a team as well as their cohesion (good team work in a formation and among particular formations). Effective actions in one-on-one play

require from the players great technical skills, making use of physical conditions as well as of motor and coordination abilities. The aim of this paper was to define, what influence has motor coordination abilities on the fundamental element of the game, namely one-on-one play, where the complexity of movement with a ball, that is: dummy runs and passes, body play, dribbling, constitute the most difficult technical element.

METHODS The research material constitutes the results of measurements conducted among 20 football players, who trained regularly ca. 3- 4 times, with average 5 years training experience? For the evaluation of motor coordination abilities particular tests were used (Ljach, 1998). One-on-one play was conducted with everybody separately according to the original scenario.

RESULTS The level of tests' results evaluating motor coordination abilities indicated great diversity within a group which is shown by relatively high values of variable indices. The results of analysis determining correlation between the level of MCA and effective 1x1 plays prove their significant interdependence. Out of 11 correlation 9 turned out to be statistically significant (level P<0,05).

DISCUSSION The results indicated that young players who possessed high level of motor coordination abilities were able to act effectively in 1x1 situations. On this basis it can be concluded that there was close correlation between the indices of MCA and effective 1x1 play. The most significant interdependence was observed between 1x1 play and motor adjustment.

KEY WORDS Football, tests, motor coordination abilities, one-on-one play, young football players.

P-125 Differences in Muscularity of Psoas Major and Thigh Muscles in Relation to Sprint and Vertical Jump Performances in Elite Young and Professional Soccer Players

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INTRODUCTION Sprinting and jumping are the most essential abilities in attaining high-level soccer playing standards. Many efforts were made in identifying biomechanical and physiological factors requisite for establishing a more specific and efficient approach for the development of young players. In particular influence of muscular strength has been extensively studied, but remains controversial.

OBJECTIVES Muscular strength was basically determined by muscle cross-sectional area (CSA). Recently we reported CSA of psoas major and thigh muscles correlated with the best 100-m record in junior sprinters2). The purpose of the study was to compare high-level youth and professional soccer players in sprint and vertical jump performances with regard to muscularity of the muscle groups.

METHODS 30 professional (PRO) and 24 youth (YNG) players from the same club in Japan participated. The CSA of quadriceps femoris (QF), hamstrings (HAM) and adductors (ADD) and psoas major (PM) were determined from the MRI. 20-m sprint time was measured using infrared photocell sensors at every 5-m. Vertical height of squat jump (SJ) and counter jump (CJ) were measured by filming with height calibration.

RESULTS Table 1 shows the differences and effect size (ES) between PRO and YNG. Stepwise multiple regression analyses produced prediction equations in the sprint times with independent variables of the CSA of PM and ADD at mid-thigh and ratio of QF at the upper and mid-thigh. In SJ and CJ, only QF at the upper thigh was selected as a significant explanatory variable in the regression models.

Table 1. Differences between PRO and YNG.

	Sprint (sec)				VJump (cm)		Body Comp		Muscle CSA (cm^2)			
	5m	10m	15m	20m	SJ	CJ	Fat(%)	FFM(kg)	Qf_{mid}	HAM_{lo}	ADD_{up}	PM
PRO	.99	1.72	2.36	2.96	42.8	57.1	7.7	66.5	83.4	42.8	66.2	19.9
	(.02)	(.04)	(.05)	(.06)	(3.8)	(4)	(2.3)	(5.5)	(6.9)	(5.3)	(5.9)	(1.8)
YNG	1.02	1.78	2.45	3.08	38.4	50.6	8.8	58.0	74.5	36.5	57.8	16.5
	(.04)	(.04)	(.05)	(.07)	(3.7)	(4.1)	(2.5)	(4.6)	(7.3)	(4.5)	(4.3)	(1.7)
Diff.	-.03	-.06	-.09	-.12	4.4	6.5	-1.1	8.5	8.9	6.3	8.4	3.4
ES	-1.1	-1.6	-1.7	-1.8	1.1	1.6	-0.5	1.6	1.2	1.2	1.6	1.9

VJump: Vertical jump, Comp: Composition, CSA: Cross-sectional area, SJ:squat jump, CJ:counter jump, FFM:fat-free mass, QF_{mid}:quadriceps femoris at middle of thigh, Ham_{lo}: hamstrings at lower thigh, ADD_{up}:adductors at upper thigh.

DISCUSSION & CONCLUSION The CSA of PM, showing the largest ES between PRO and YNG, was selected as the first significant contributor to predict the sprint time at 10, 15, 20-m. This was a similar result for junior sprinter2), indicating the predominant development of specific muscle groups influence, in part, sprint and vertical jump performances, and the training of these muscles is essential for younger players.

KEYWORDS MRI, cross-sectional area, sprint,jump, multiple regression analysis.

P-126 Effect of different approach velocities in soccer kick

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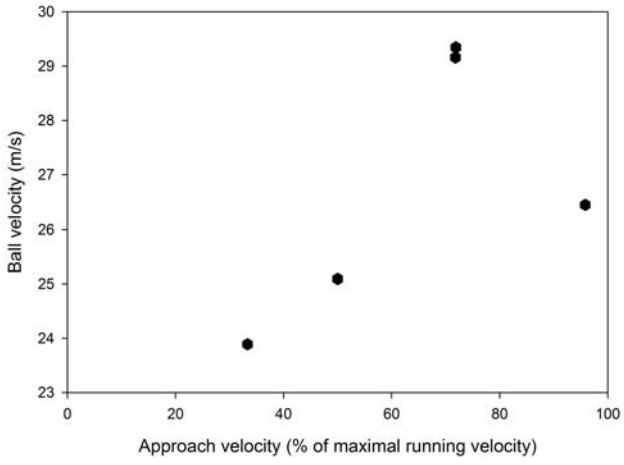
OBJECTIVE The soccer kick is a proximal-to-distal movement pattern, in which the aim is for the most distal segment to achieve the highest possible speed at impact. Usually, this movement pattern is only analysed for two segments (thigh and shank-foot). However, the pelvic movement influences the movement of the whole leg. Accordingly, acceleration of the hip will influence the movement of the whole leg. This case study investigated the effect of different approach velocities on ball velocity in maximal instep soccer kicks. Furthermore, the parameters that were important for this effect were described.

METHODS One male elite-subject performed the experiments; maximal soccer kicks with approach velocities of 1/3, 1/2 and over 90% of the maximal running velocity. Furthermore, kicks at a self selected approach velocity were performed before and after. The trial with the highest ball velocity in each group was selected for further analysis. 240Hz video was recorded and inverse dynamics calculated.

RESULTS The results showed that the maximal ball velocity was reached at the self selected approach velocity. The maximal ball velocity was 29.16 m/s and the self selected approach velocity was 71.88% of the maximal running velocity. Table 1 presents the work performed on the shank from the different movement dependant moments.

Table 1. The work performed on the shank from the different movement dependant moment

	$V_{approach}$ (%)	V_{ball} (m/s)	W_{muscle} (%)	W_{omega_thigh} (%)	W_{alfa_thigh}(%)	$W_{hip\_acceleration}$(%)	$W_{gravity}$(%)
Trial:							
Self selected 1	71.8	29.16	53.71	20.70	2.48	17.30	5.77
Low	33.2	23.89	47.69	21.12	1.68	23.59	5.89
Medium	52.1	25.09	45.58	21.75	0.15	25.40	7.09
High	95.8	26.44	50.04	19.92	1.92	22.19	5.91
Self selected 2	71.9	29.34	53.69	20.12	1.44	19.05	5.67



DISCUSSION The study revealed that the approach velocity influences the ball velocity. An approach velocity below or above the self selected approach velocity would contribute to a lower ball velocity. The present results indicated that this was mainly caused by less work produced by the knee extensor muscles and not by factors related to the hip acceleration. For future studies more subjects are needed to verify the results.

KEY WORDS Soccer kicking, biomechanics, approach velocity

37. COMPUTER SCIENCE AND MATCH ANALYSIS

P-127 Analysis of actions ended with shots at goal in Women's European Football Championships

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OBJECTIVE Female football is quite a young sport; hence it still requires understanding and constant observations. Important contests, among which the European Championships undoubtedly hold a crucial place, give an opportunity to notice changes and tendencies initiated by teams representing the highest level in this field. Actions of players, ending with shots at the goal, are of particular importance. The aim of this study was to analyse in detail offensive actions from their beginning stage till the final one – a shot at the goal. Detailed objectives deal with a structure of quick attacks and positional attacks and topography of characteristic activities with a ball.

METHODS The research material consists of observations of 15 games played during Women's European Football Championships held in England in 2005. 353 offensive actions were analysed during which 50 goals were scored. The course of offensive actions ended with a goal was coded from a video record with the help of author's observation sheet.

RESULTS Due to multidirectional analysis of offensive actions ending with a goal, it was demonstrated that the place of their beginning stages is usually within an area of attack of a football field (41,6%) and a central area (41,2%). Most of the actions were short, after a quick, lasting up to 5 seconds (56,9%), attack after individual attack (30,3%) and conducted by two players (18,4%).

DISCUSSION The small amount of the treatises over the characteristics of the game of women proved the necessity of further research, because the game of women and men are different. Recognition of women's activities with and without the ball would make the programming of women's training process more effective.

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KEY WORDS Football, women European football championships, match analysis.

P-128 Ulti-camera wide-angle video recording and analysis

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OBJECTIVE Automatic analysis of soccer videos for various purposes requires tracking of the position of the players and the ball on the field. Tracking across changing scenes (cameras), poses some challenges since there are discontinuities in the player and ball trajectories across different camera views. We proposed construction of a mosaic view of the field on PC by patching views from different cameras. In this study a multi-camera video recording and display system was developed to view the entire field of a soccer match, and propose new game analysis procedures. A camera acquisition and display system was designed to simulate the actual viewing experience in a stadium.

METHODS The capture system involves N-cameras and twin SVGA or a HD display with a PC. Each camera view was compressed individually on-board the camera, and then sent to a PC, which drives a twin SVGA or HD display.

RESULTS Initial results of soccer analysis are successful.

DISCUSSION The multi-camera video recording and display system developed in this study can be applied to the video recording of the soccer matches for better analyses.

KEY WORDS Wide angle complete field video recording, automatic soccer game analysis.

P-129 A critical survey of football rating systems

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OBJECTIVE Rankings have now become an important part of many sports. Three football codes currently issue regular rankings, which are posted to the appropriate websites and published in the media. These are international soccer, U.S. college football and international rugby union. Both the FIFA world soccer rankings and the BCS system used in college football have made significant changes following heavy criticism. The rationale behind these systems needs to be understood. In this study two main objective rating procedures were defined and explored, accumulative rating procedures and adjustive rating procedures. After tracing the history of sports rating systems, a detailed description of rating procedures that have been used for football codes was made with the aim of critically assessing their validity.

METHODS Details of the rating systems to be analyzed are available from the websites of the governing bodies concerned. These are FIFA, the International Rugby Board (IRB) and the BCS. An alternative to the FIFA system for soccer is also considered, the Elo ratings. The main features of these systems are described and discussed in the context of the framework introduced by Stefani (1997; 1999).

RESULTS FIFA uses an accumulative system which takes into account strength of opponents and game importance but ignores home advantage. The BCS uses both subjective rankings and adjustive computer ratings, combined in a way which often changes from year to year. The IRB rugby and the Elo soccer ratings are both adjustive and take into account strength of opponents, game importance and margin of victory.

DISCUSSION FIFA's new system is an improvement, but raises several questions, especially by not incorporating home advantage and by treating all losses as equal regardless of the opponents. The way in which the BCS system combines its components lacks logical rationale. In contrast, the IRB rugby and Elo soccer ratings have theoretical justification, include all relevant factors and should produce fair rankings.

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Stefani (1997) *Journal of Applied Statistics* **24**, 635-646.
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KEY WORDS Rankings, ratings, football, FIFA world rankings, BCS.

P-130 Has soccer changed in the last three world championships?

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OBJECTIVE A common characteristic in the Observational Methodology is that we can only observe the behaviour partly. That is the reason why we need to know if the observed variance is related with the individuals, the measuring tools, the place or other facets. This study focused on the Football World Championship facet. The study investigated if there was a significant difference in the way soccer was played along the last three World Cups.

METHODS 56 professional matches were registered with the taxonomic tool SOCCAF, 24 of them were played in France ’98, 20 in Korea – Japan ’02 and 12 in Germany ’06. In total, more than 150.000 multievent sequences were registered. An analysis of 4 facets was performed; World Championship (3 levels), result (7 levels), area (5 levels) and categories (48 levels). A variance components analysis was done.

RESULTS The result of the analysis was demonstrated in Table 1. The variance assumed by the World Championship facet is 1%, this is, by means of the chosen facets, the teams have played almost the same way.

DISCUSSION Using the variance and Generalizability studies, we can obtain more information than just a description of ‘here’ and ‘now’. Would we obtain the same results if we had registered 20 more matches? And using a different category system? What would happen if we divide the field in more areas? Variance analysis models give us information about the variance of each chosen facet.

Table 1. Results of the analysis including four facets.

Word Championship*Result*Area*Category			
$r^2 = 0.7877$			
Facets	**g° de l**	**Pr > FType III SS**	**Variance%**
World Championship (M)	2	<.0001	1
Result (R)	6	<.0001	4
World Championship*Result	12	<.0001	2
Area (Z)	4	<.0001	1
World Championship*Area	8	0.5482	0
Result*Area	24	<.0418	1
World Championship*Result*Area	48	1.0000	0
Category (C)	47	<.0001	16
World Championship*Category	94	0.1090	2
Result*Category	191	<.0001	6
World Championship*Result*Category	382	1.0000	4
Area*Category	188	<.0001	35
World Championship*Area*Category	376	1.000	5
Result*Area*Category	764	0.9999	15
World Championship*Result*Area*Category	1528	1.0000	9
R Z C / M		e2 = 0.916Ω = 0.914	

KEY WORDS Observation, generalizability theory, variance analysis, world championship, soccer.

P-131 Movement analysis of elite junior Australian Rules Football: Comparison to elite senior results

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OBJECTIVE To date, no published research on the movement activities and demands exists in elite junior Australian Rules football (ARF) with junior ARF coaches relying on senior research data to prepare their developing players. Collection of movement activity data in elite junior ARF players and compared our results to previous research in elite senior ARF players (Dawson et al., 2004).

METHODS Thirty athletes (17.07±0.89 years) participated in the study. All on-field positions were tracked over seven home games during the 2006 Victorian U18 ARF season. Post match analyses involved reviewing each tape, calculating number of efforts, duration of efforts, and distance covered for each position. The data from the positions was then compared to elite senior data by Dawson et al. (2004).

RESULTS Across all playing position categories, elite senior athletes completed a greater number of efforts over the course of an entire game (ranging from 226-387) and subsequently a greater estimated total distance covered compared to the elite junior athletes. Similarly, elite junior players recorded less game time (2-13mins) than their senior elite equivalent (Table 1).

DISCUSSION Although further research is required at both junior and senior levels to further understand game demands and optimize training regimes, the results from this Australian first study will assist junior elite ARF coaches to plan specific training programs for their junior players whilst developing them in preparation for elite senior competition.

REFERENCES
Dawson et al. (2004) *Journal Science Medicine Sport* 7, 278-291.

Table 1. Comparison results of the junior and senior soccer players.

Position	Movement	Time (min)		No. of Efforts		Distance (meters)	
		Senior	Junior	Senior	Junior	Senior	Junior
Small Foward/Back	Standing	21	16	210	103	-	-
	Walking	66	58	397	287	7029	4917
	Jogging	32	31	379	276	6188	5303
	Running	6	8	164	103	2342	2360
	Sprinting	1	1	31	25	719	582
	TOTAL	127	115	1181	794	16278	13163
Midfield	Standing	13	9	143	86	-	-
	Walking	58	54	381	336	5422	4927
	Jogging	41	42	434	369	8652	7683
	Running	7	10	186	128	2532	2791
	Sprinting	1	1	24	23	359	504
	TOTAL	119	117	1168	942	16976	15905
Ruck	Standing	18	12	154	88	-	-
	Walking	59	54	407	312	4775	5002
	Jogging	44	34	462	276	8708	5393
	Running	5	13	162	145	1628	3345
	Sprinting	1	1	17	22	283	527
	TOTAL	127	114	1202	843	15393	14268
Centre Half Forward/Back	Standing	13	26	161	138	-	-
	Walking	58	60	413	321	5560	5573
	Jogging	41	28	407	274	8266	4545
	Running	5	7	147	105	1902	1947
	Sprinting	1	1	18	21	278	485
	TOTAL	118	123	1146	859	16005	12550
Full Foward/Back	Standing	29	33	180	159	-	-
	Walking	67	55	369	291	6217	5757
	Jogging	23	23	312	205	5270	3270
	Running	4	5	128	76	532	1308
	Sprinting	1	1	30	21	595	531
	TOTAL	125	116	1019	752	13614	10419

KEY WORDS Movement analysis, comparison.

P-132 Kinematical analysis of Brazilian professional soccer players using an automatic tracking

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OBJECTIVE Kinematical analysis of soccer players in play can provide useful information about their performance and it can be used for planning better subsequent training periods or evaluating the player performance during competitions. In previous studies, a method for automatic tracking of soccer players was developed (Figueroa et al., 2006). The aim of the present study was to do a kinematical analysis of Brazilian professional soccer players measured with an automatic tracking system.

METHODS Four regular Brazilian First Division Championship matches between different teams were filmed using four digital cameras. A novel computer vision system (DVideo) was used as a solution for tracking simultaneously all

players during entire games. Evaluations of uncertainties, data filtering and data analysis were addressed. The trajectories of 112 different players were tracked and analyzed.

RESULTS The results of controlled tests showed that uncertainties to determine positions in the field were around 0.3 meter. The mean distances covered and the distribution of velocities were analyzed and compared to data in the literature. The trajectories of players were presented in various ways and modelled as a function of time.

DISCUSSION The kinematical analysis showed the reduction of performance as a function of time. The distances covered by Brazilian soccer players were not different than that reported in the literature. The novel method used has proved to be reliable and less labor-intensive than previously reported methods and should constitute an important tool for supplying data about the performance of players.

REFERENCES
Figueroa et al. (2006) *Computer Vision and Image Understanding* **101**, 122-135.

KEY WORDS Soccer; tracking; distance covered; biomechanics

P-133 Offensive and defensive characteristics of 18th FIFA World Cup

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OBJECTIVE The world cup games of level is the top-flight in the world. The character of the offence and defence reflect the development of football. All teams in the 18th FIFA world cup attached importance to the defence and carried out the golden rule of offence based on good defence. The characteristics of balance were represented fully by the goals in the modern football games. This research aimed to reflect the basic characteristics of the offence and defence in the 18th FIFA world cup, and to put forward some useful references to improve the level of Chinese football.

METHODS The materials were the video tapes of the 16 games of the top 16 teams engaged in the semi-quarter- final of the 18th FIFA world cup. The method included the literature method, observation method, statistics method etc.

RESULTS There were differences in every field's offence of goals, but the offensive effect was nearly same. All teams attached importance to the defence and carried out the golden rule: The interception was main way to get the ball controlling in every zone defence, The characteristics of balance was represented fully by the goals in the modern football games.

DISCUSSION Results demonstrated that the offence comparatively less but most threatening. According to vertical analysis, the offence points were widely scattered in different zones as well as the characteristics of flexible point offence. It is generally accepted that the guideline for football match is the offence based on a good defence. Based on analysis, the changes that goals rule in average each match are 2-3 are objective.

KEY WORDS 18th world cup, football, offence, defence, analysis

P-134 Home advantage in Turkish professional soccer

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OBJECTIVE Home advantage is an important factor in determining the results of soccer games although its precise causes are not clear (Pollard, 2006a). In national leagues worldwide an average of 61% of points are won by the home team, although marked regional variations exist (Pollard, 2006b). Building on previous work by Seckin (2006), a detailed analysis of home advantage in Turkish soccer is made. The first part of the study assessed the magnitude of home advantage in different situations in the Turkish Super League, and in League A, compared with other countries. The second part made use of match performance data to quantify and explain differences in performance among home and away teams. For both parts a comparison is made with similar studies from the Premier League in England.

METHODS Results of all games played in the Turkish Super League for the 12 seasons since 1994-95 are used together with the last 4 seasons of League A. Comparisons in home advantage are made over time, between the leagues and as a function of distance travelled. Match performance data is used for the 2005-06 season from which home and away teams are compared in relation to many performance variables.

RESULTS Overall home advantage in the Super League was 62%, similar in League A and declining over time. It was lower for games played between the Istanbul teams, but much higher for games involving Vanspor (76%). Home teams took 26% more shots than away teams, and made 11% more successful passes in the scoring zone ($p<.01$), but there was no significant difference in tackles, fouls and yellow cards.

DISCUSSION Home advantage in Turkey is similar to the major leagues in Europe. A high figure for the team from Van is consistent with a remote location, at altitude with harsh weather. Differences for attacking performance variables are similar to those in England. However the lack of differences in the aggressive variables, fouls and cards, contrasts with England where they are higher for the away team.

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Pollard (2006b) *Journal of Sports Science* **24**, 231-240.
Seckin (2006) *Paper presented at ECOMOD conference in Hong Kong.*

KEY WORDS Home advantage, Turkish Super League, match performance.

P-135 Analysis of offensive playing patterns in soccer

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OBJECTIVE Competition in soccer is the most important source of data to extract tactical conclusions. Studying the goals allows defining the offensive and defensive tactics in the soccer teams. Different offensive patterns can be used, although their criteria of successes are different. Coaches must know more effective tactics to construct training programs. Describe patterns in offensive play. Extract conclusions to tactical training programs

METHODS This was an indirect observational study about goals scored during 220 matches in the Spanish leagues of First and Second division in 04/05 season. Passing sequence was defined in terms of sequence length. Analysis data includes descriptive and logistic regression.

RESULTS Goal-scoring: 2.44 goals per match, 33.4% in actions to stopped ball. In dynamic play, direct play (40.2 % goals per match) is more effective than possession play (32.6%) or contra attack (27.1%)
Sequences 1-4 passes/possessions are more effective than longer possessions.

DISCUSSION In Spanish modern soccer, effective static play (stopped ball actions) and smaller or rapid passing sequences define successful teams. In longer possession attack, defence had more opportunity to minimize surprise and dislocation. Coaches must use this information to improve tactical training.

KEY WORDS Performance analysis, offensive playing patterns, modelization of training.

P-136 Techno-tactics and running distance analysis by camera

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Universidade de Évora

OBJECTIVE The purpose of the present research was to identify the energetic strategy and the relation with the techno-tactic options used by soccer players during a game. The objective was to find a relation between the energy-functional capacity (distance traversed, speed of displacement) and the actions techno-tactics carried out by the players during the game. The objective was to find a relation between the energy-functional capacity (distance traversed, speed of displacement) and the actions techno-tactics carried out by the players during the game. For collecting the techno-tactics information we elaborate a table contain all the important actions propose by the coach before the game.

METHODS Three soccer players of Portuguese first league, representatives of three different sectors were analysed using video analysis during nine games of the Portuguese first league. For the calculation of the distances traversed and speed, we used elaborate software for the effect named by "TACTO" that has collected the coordinates of the players later to be transformed to real measures through parameters DLT.

RESULTS The middle-fielder was the player that traversed bigger distance (14198,87m) with an average speed of 2,46 m/s, followed by defender (12958,53) with a speed of 2,91 m/s, and finally the forward (11224,77) with a speed of 2,65 m/s. Only the middle-fielder presented significant differences in the reduction of speed of the 1st half for the 2nd half.

DISCUSSION The players did not present significant differences in the reduction of the adequate actions to the processes (offensive and defensive), of the 1st for the 2nd half. The defenders carried out more adequate defensive actions than offensive ones, in the middle-field had been registered approached values, as well as forwards.

CONCLUSION In conclusion, recommendations for female soccer players are to encourage consumption of carbohydrate-electrolyte beverages to enhance carbohydrate intake and increase fluid intake, and ensure sufficient iron rich foods are included in the diet to meet the DRI.

KEY WORDS Soccer, time motion analysis, running velocities.

P-137 Analysis of successful scoring situations in football matches

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OBJECTIVE In the contemporary world, objective research and analysis are the basis of effective work and success. Getting familiar with match analysis in the football world constitutes a supportive insight into the training process. Thus it is of great importance to systematically and carefully gather data on players' performance on the field. This paper investigated the characteristics of successful scoring situations in the most prestigious matches. The questions raised were as follows:
1. What are the main characteristics of the scoring situations?
2. From which areas in the football pitch most goals are scored?
3. What kind of shots at the goal are the most successful?

METHODS The analysed material consisted of the recording goals in 76 most prestigious football matches: 27 in World Cup 2002, 16 in Euro 2004, 17 in Champions League 2004/05 and 16 in World Cup 2006. The analysis of the video recordings of football matches was conducted with filling in observations sheets, on which the information concerning the pre-scoring situation was recorded.

RESULTS The time of the scoring situation did not exceed 15 seconds (76%) and most often two (16,7%), three (25%) or four players (22,9%) were involved. Most goals were scored from between the goal area and the penalty line (62,4%). The most effective were both goals scored after the shot without receiving the ball (38.8 %) and goals scored with using the technique of kicking the ball with the front part of the instep and with the inside of the foot (30.3 %-30.8 %).

DISCUSSION The research results indicated that actions ended with a goal lasted up to 15 seconds and in the most actions 2-4 players were involved playing small number of passes. The goals were scored mainly from the penalty area and there were the most effective after the shot without receiving the ball and with using the technique of kicking the ball with the front part of the instep and with the inside of the foot.

KEY WORDS Football, championships, match analysis, scoring situations, goals.

P-138 Performance indicators distinguishing matches between regions in World Cup

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OBJECTIVE Performance indicators (PI's) (Hughes and Bartlett, 2002) have been used to analyse performances rationally and efficiently. The optimal number of performance indicators to be used can be determined through statistical techniques (Choi et al., 2006). The aim of this study was to identify an optimal set of performance indicators for World Cup 2002 and 2006 and compare matches of regions in terms of predetermined performance indicators.

METHODS Data of all matches (n=128) from the FIFA web site was entered into MS Excel. And the absolute difference of two teams' performance was used to determine the performances. Mann-Whitney U tests were used to compare matches of teams from regions and ranking levels.

RESULTS Between the 2002 and 2006 data, 12 indicators ($p<0.05$) in the matches of Africa vs Europe and Europe vs South America regions were significantly distinguished. And 5 indicators ($p<0.05$) in Asia vs Europe, 6 indicators ($p<0.05$) in Europe vs Europe were distinguished the 2002 and 2006 world cup. Additionally, free kicks to goals and direct free kicks distinguished the all regions.

DISCUSSION The PIs distinguishes regions of teams used outcome indicators related to scoring opportunities. No PIs related to tactical style or patterns of play had a significant effect.

REFERENCES
Choi et al. (2006) *World Congress of Performance Analysis of Sport* **7**, 124-127.
Hughes (2002) *Journal of Sports Sciences* **20**, 739-754.

KEY WORDS Construct validity, performance indicators.

P-139 Regional comparisons of team performances in World Cup 2002 and 2006

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OBJECTIVE Performance indicators (PI) are used to represent team performances (Hughes et al., 2002). In the 1990 World Cup, regional origin was found to influence the playing style of teams (Yamanaka et al, 1993). The purpose of the current study was to compare teams of different regions using the 256 performances within the 128 matches of the 2002 and 2006 World Cups.

METHODS Data were collected from different tournament web sites and regions compared in terms of 48 significant PIs using Kruskal Wallis H tests with post-hoc Mann-Whitney U tests.

RESULTS There are significantly differences found in ranks (23.6 ± 16.6, $p<0.05$), goals (1.1 ± 0.6, $p<0.05$), goals conceded (1.3 ± 0.8, $p<0.05$), shots on goal (5.2 ± 1.5, $p<0.05$), crosses (20.5 ± 5, $p<0.05$), corner kicks (5.1 ± 1.7, $p<0.05$) and bookings (2.7 ± 1, $p<0.05$).

DISCUSSION This study has showed that, rather than disappearing, regional differences in patterns of play have emerged between 2002 and 2006. The findings presented there are significant differences between the regions, but no same results were found in each comparison of regional differences.

REFERENCES
Hughes et al. (2002) *Journal of Sports Sciences* **20**, 739-754.
Yamanaka et al. (1993) *Science and Football* **2,** 206-214.

KEY WORDS Performance indicators, regional factors, construct validity.

P-140 Relevance of penalty kick methods and scoring ratio in World Cup 2006

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OBJECTIVE Four different types of penalty kicks were derived according to parts of the foot used: instep kick; outside of instep kick; inside of instep kick; and inside of foot kick. Furthermore, the trajectories of the ball were grouped into 5 groups: power shots, swerve balls, push passes, chips, and trick shots. Fake moves done by the kicker to trick the keeper were also included in the analysis. The objective of this research is to reinforce existing literatures on the strategy of penalty kicks. By using the data of WC2006, it was expected to construct an analytic model that identifies the relevance between penalty kicking methods and their scoring ratio, thus, providing coaches and players more scientific assistance on penalty kick strategies.

METHODS Using a digital recorder, the videos of all 50 penalty kicks in the 64 matches of the FIFA World Cup 2006 were recorded and analyzed. The chi-square ($\chi 2$) test was used to analyze those penalty kicks.

RESULTS 34 penalty kicks went in and the other 16 were either saved or missed. The numbers of penalty kicks were categorized according to the kicking methods used into: instep kick, 10; outside of instep kick, 2; inside of instep kick, 34; and inside of foot kick, 4.

Table 1. Results of the analyzed penalty kicks.

	Place of Kicking				
Result	**Instep Kick**	**Outside of Instep Kick**	**Inside of Instep Kick**	**Inside of Foot Kick**	**Sub Total**
Goal	6	0	27	1	34
Missed/Saved	4	2	7	3	16
Sub Total	10	2	34	4	50

DISCUSSION It was found that different methods of taking a penalty did make a significant difference in the result-the inside of instep trick kick had the highest scoring ratio; the inside of instep swerve ball was second. However, the latter contributed to the most goals scored from the penalty spots in WC2006. The lowest scoring ratio was the outside of instep power shot.

KEY WORDS World Cup, penalty kick, instep kick, outside of instep kick, inside of instep kick, inside of foot kick.

P-141 Comparison of corner kicks of host and visitor teams in 2005-2006 Super League and 3rd League matches in Turkey

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OBJECTIVE Dead Balls such as corner kicks are more important in today's soccer games than ever before as they have started to give more importance to tactical strategies in the corner kicks to score goals. Therefore, it is the effectiveness of corner kicks that determines the results of the soccer matches that needs to be better analyzed. The purpose of this study was to analyse the effectiveness of the corner kicks used by the host and visitor teams in the matches of Denizlispor and Denizli Belediye Spor soccer teams in Denizli, Turkey.

METHODS The corner kicks within the penalty area were evaluated in 32 matches in Denizli, specifically Denizlispor and Denizli Bld.Spor. The penalty area was divided into six areas and the player by sending the ball to their teams' players in the corner kicks is the foundation stone of the effective corner kicks.

RESULTS Per match, to send within the penalty area and effective corner kick means by used the host teams were found more values according to visitor teams. The host teams have scored 5 out of 49 goals from the corner kicks. But, visitor teams scored 3 out of 31 goals. Among the six areas, 2nd area was where most of the corner kicks of the host and visitor teams were received.

DISCUSSION The percent of the effective rates of the corner kicks were % 36,93 for host teams and % 32,49 for visitor teams. In terms of the effectiveness rates the Super League teams gained more points than the 3rd League teams. These results could be explained by the soccer player's quality.

CONCLUSION In conclusion, recommendations for female soccer players are to encourage consumption of carbohydrate-electrolyte beverages to enhance carbohydrate intake and increase fluid intake, and ensure sufficient iron rich foods are included in the diet to meet the DRI.

KEY WORDS Soccer, corner kick, effectiveness.

P-142 Heart rate data files compiling for coaching control and research: HRDC Osasuna 1.0

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OBJECTIVE Heart rate (HR) monitoring during practice and competition is the only way that soccer coaches can objectively assess the organic response of the players without the assistance of medical staff. In addition, it can be a profitable way of getting continuous information about players and practice drills in terms of money and time, even though Polar Precision Performance SW© results of limited help for bigger sets of data or for the provision of record sets for advanced statistical analysis. Moreover, in soccer coaching HR data must be contextualized within the specific drill and moment they are produced. The purpose of this piece of work was to develop HRDC Osasuna 1.0, a software application that allows to access HR data in a totally free way.

METHODS HRDC Osasuna 1.0 has been written using Visual Basic .net Express edition©.

RESULTS HRDC Osasuna 1.0 let coaches and researchers to create as many record sets as they needed. This software put together three types of information: HR data, players' profiles and coaching diaries. Besides, several filters could be applied according to the needs of the staff (recording interval and time limits). Output could be a text file or other formats through ODBC protocol.

DISCUSSION This application can be very useful for coaches and researchers if they need to deal with more than a few HRM files or want to know if HR response is linked to the play action in any way.

KEY WORDS Heart rate, soccer.

P-143 Activity patterns in professional futsal players using global position tracking system

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OBJECTIVE Futsal is played at professional, amateur and recreational levels all over the world. However despite its current and growing popularity only limited studies have addressed the physical demands of this indoor game. Furthermore the available literature only addressed amateur or recreational futsal cohorts (Castagna et al., 2006; Barbero et al., 2006). The aim of this study was to investigate game activity-pattern of professional Futsal players (age 22.5±1.7 years, body mass 75.3±7.3 kg, height 177.8±8.7 cm, and VO2max 64.6± 5.23 ml kg-1 min-1) in order to gain information for the development of training strategies.

METHODS Eight professional players (Generala IBI, Division de Plata) volunteered to this study. Players trained 10 times a week with a competition played at the weekend. Game activity was tracked and recorded during highly competitive outdoor training-games (4x10min) using GPS technology (SPI 10, GPSports, Canberra, Australia) in order to quantify physical demands.

RESULTS During the game players covered 118±7.5 m min-1 of which 22.2±5.4 % (10±3% of game time) were performed at high intensity (>15 km h-1, HI). Players performed 3.4±1.1 HI bouts min-1 (i.e. every 17.6 s). During the last period of the game HI distance (-28.4% and -26.9%) and HI (-27.8% and -37.8%) bouts significantly ($p<0.01$) decreased compared to first and second periods, respectively.

DISCUSSION These results showed that Futsal played at professional level is a high-intensity exercise that induces activity decrements across the game possibly due to fatigue. Given the documented decrement in sprint attempts the ability to repeat sprints may be regarded as a Futsal-specific ability.

REFERENCES
Barbero et al. (2006) *Journal of Sport Sciences,* in press.
Castagna et al. (2006) *Journal of Science and Medicine in Sport*, in press.

KEY WORDS Physical demands, training, GPS tracking system, intermittent exercise.

P-144 Home advantage in Asian football leagues

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OBJECTIVE Existence of home advantage has been established for all major professional team sports in the world. The role of home advantage in determining the result of a football match was found to be greatest in soccer (Pollard, 2006). The aim of this study was to investigate the effect of home advantages in Asian Football Leagues.

METHODS The number of wining, losing and scores (at home and away games) of 17 teams from the Asian countries including two zones of West and South West and East and South East of Asia, were analyzed.

RESULTS The results showed that the home advantage on East and South East of Asia was 3.1 percent more than West and South West (52/4‰ vs 49.3‰). In West and South west Asian Countries, this phenomenon had the highest effect on Saudi Arabia (60.6‰) and lowest on Bahrain (50.3‰). In East and South East countries the highest effect was observed in Indonesia (65.3‰) and lowest effect in Hon Kong (55%).

DISCUSSION It can be concluded that home advantage has been effective in Asian Football Leagues.

REFERENCES
Pollard (2006) *Journal of Sports Sciences* **24**, 231-240.

KEY WORDS Football, away games, winning, losing.

P-145 Heart-rate and activity-speed of professional soccer players in match

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OBJECTIVE Although there are limitations in using heart rates (HR) to assess intense intermittent activity HR monitoring is suggested to be a valid measure to determine ball-drills intensity or competition demands.However no information are available about the relationship between HR and match-activty speed in soccer. The aim of this study was to examine whether HR reflected match-activity speed in professional soccer players.

METHODS Match HR responses (short range telemetry) were coupled with time-motion analysis using GPS technology (SPI Elite, GPSports, Canberra, Australia) in 4 professional players during friendly matches (45 min). Comparisons were made dividing game duration into 3 minutes periods (n=15).

RESULTS Average match-speed (MS) and HR were 7±0.5 km h-1 and 165±7.1 b min-1 respectively. No significant correlations were found between HR and MS (r=0.43 p=0.11) or distance covered (r=0.46 p=0.10). Likewise, no significant correlations were found between HR and distance covered at high intensity (r=0.25 p=0.37).

DISCUSSION These results show that HR cannot be considered as a reflection of match-intensity in soccer. Therefore HR and time-motion analyses should be coupled together in order to assess match or ball-drill demands in soccer.

KEY WORDS Physical demands, competition, GPS Tracking System, intermittent exercise

38. REFEREE AND RULES

P-146 Analysis of between-half work rates in English Premier League soccer referees

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OBJECTIVE The analysis of between-half distance coverage can reveal the occurrence of fatigue and/or refereeing strategies; both of which would be classified as determinants of overall physical match performance. However, the literature presents conflicting evidence with regards to this aspect of physical match performance in referees. The aim of the present study was to examine the influence of first half activity on the physical match performances of English Premier League soccer referees during the second half of matches.

METHODS Match analysis data was collected using the Prozone® match analysis system from 19 full-time, professional soccer referees during a total of 254 matches in the 2004-2005 football season. Physical match performances were classified into two separate categories: 1) total distance covered (TD); 2) high-intensity running distance (running speed > 5.5m/s-1, HIR).

RESULTS The referees covered less TD during the 2nd half of the match (5790±416 vs. 5832±389m, p=0.04). HIR was consistent between halves (391±139 vs. 396±142m, p=0.54). When the TD and HIR data set were divided into three subsets ('High', 'Medium' and 'Low') according to score rankings on the basis of distances covered in the 1st half significant interactions were found for the 1st half distance x time.

CONCLUSION The results of this study appear to support the observation that referees moderate their behaviour during a match to avoid fatigue. Further examination is required as to whether reduced physical performances in the second half of matches are a consequence of referee fatigue, tactical strategies on behalf of the referee or reduced player match activities resulting in a slower tempo of match.

KEY WORDS Association football, match analysis, fatigue, intermittent exercise, referee

P-147 Interpretation and application of the laws of the game in football incidents leading to player injuries

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OBJECTIVE Previous research has shown that the majority of the injuries occurring during competitive football (soccer) matches are caused by physical contact (Junge et al., 2004). In this respect, it is the match referee who is responsible for interpreting and implementing the laws of the game in an appropriate way, thereby protecting the players from a potential risk of injury through unfair challenges. The objectives of the present study were 1) to assess whether the laws of the game adequately protected players from injury in player to player contact situations, and 2) examine if there was a need for an improvement in the standard of refereeing. This study also investigated how various groups involved in professional football interpreted the laws of the game to sanction foul play.

METHODS The FIFA refereeing department determined a reference decision for 60 player-to-player contact incidents from the 2002 World Cup, all resulting in a player injury. This reference was compared with the decision of the match referee. Four expert panels (players, coaches, medical staff and referees) also assessed all incidents and expressed an appropriate sanction (nonfoul, foul, yellow or red card). The level of agreement was calculated between the FIFA reference and the match referees decision and with the different panels.

RESULTS The results showed that the FIFA reference decision indicated that the laws of the game were adequate for the majority of the situations (70%). Secondly, the match referees' decision was in agreement with the reference in 57% of the incidents. Finally, the level of agreement between the referees' panel and the FIFA reference decision was higher than with any other panel (Figure 1).

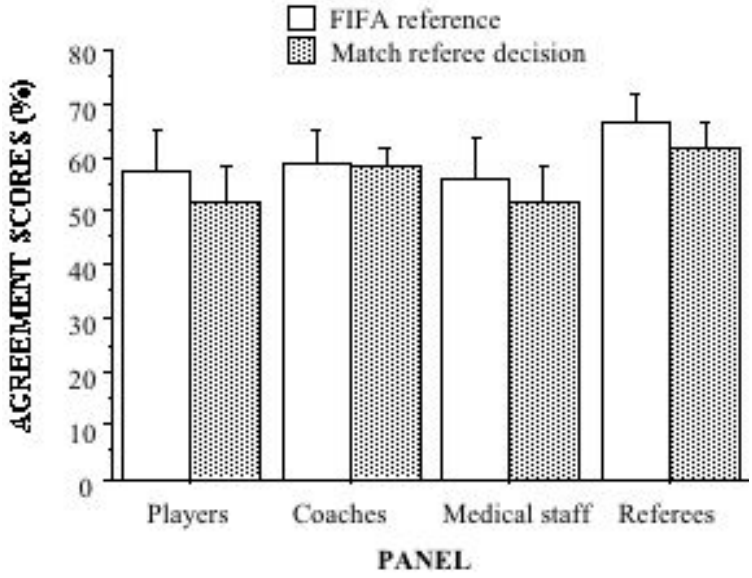

Figure 1. Agreement scores (%) between the different panels and both the FIFA reference and the match referee decision.

DISCUSSION The results showed that in a vast majority of the incidents, the laws of the game could deal with foul play. The discrepancy that was observed between the FIFA reference decision and the interpretation and application of the laws of the game by the actual match referee clearly has implications for post-match disciplinary procedures based on video replays in major football competitions.

REFERENCES

Junge et al. (2004) *American Journal of Sports Medicine* **32** (Suppl.1), 23S-28S.

KEY WORDS Contact injury, foul play, decision making.

P-148 Offside decision-making process in association football using recall paradigm

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OBJECTIVE During the FIFA World Cup 2002, assistant referees (ARs) assessed, on average, 5.3 offside situations per match (Helsen et al., 2006). On a total of 337 offside situations, there was an error percentage of 26.2%. To reduce the number of incorrect offside decisions, it is important to fully understand the underlying mechanisms that may impact on the correctness of offside decisions. This study investigated the offside decision-making process in computer animations using the recall paradigm (Chase & Simon, 1973). The purpose of this paradigm was to objectively record if the attackers were perceived ahead of their actual position, and if so, to what extent.

METHODS FIFA ARs (n=23) and Belgian elite ARs (n=21) assessed 2 sets of 32 computer-based offside situations. The position of the attacker relative to the offside line was experimentally manipulated. The ARs had to judge the offside situations and also had to recall the positions of the attacker and second-to-last defender who were involved in the offside situation on a replication of the field of play.

RESULTS In terms of response adequacy, FIFA ARs (72.9%) performed significantly better than the Belgian elite ARs (63.2%). FIFA ARs were also more accurate in recalling the positions of the attacker and second-to-last defender than the Belgian elite ARs. Interestingly, all ARs marked the attacker less ahead of his actual position the more the attacker was positioned closer to the offside line.

DISCUSSION The results of the recall showed that ARs perceived the players ahead of their actual position. This may be explained by the flash-lag effect (Baldo et al., 2002). Therefore, ARs should be aware of the perceptual processes that come into play when judging offside situations. Alternative training tools such as video clips and computer animations may be considered to improve offside decision-making.

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Chase et al. (1973) *Cognitive Psychology* **4**, 55-81.
Helsen et al. (2006) *Journal of Sports Sciences* **24**, 521-528.

KEY WORDS Offside decision-making, perception, assistant referees, recall paradigm.

P-149 Job satisfaction in Turkish football referees

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OBJECTIVE The referees have responsibility for control of players' behaviour and game during competitive football and implementing the rules of the game. When governing a football match, referees should give true decisions in seconds. If their job satisfaction isn't enough, their decisions may be affected. The purpose of this study was to investigate and determine the job satisfaction of the Turkish football referees and their expectations of the headquarters of referee committee.

METHODS Research is made up of assigned 100 referees (super league assistant, II. league A, II. league B, III. League C, C assistant) who participated in a course given by the headquarters of referee committee in Edirne in 2004. Questionnaire was used that asses the opinion and observation of football referee. Paired-samples t test was used to compare between the opinion and observation of the referees at significant level of $p<0,05$ and $p<0,01$.

RESULTS Referees' answers showed that they like to be a football referee. However, there are significant differences between the opinion and observation of football referees. The questions about money, transportation, security, equipment and facility are significantly different at level of $p<0,01$. Nevertheless, the questions about referee committee and its honesty are significantly different at level of $p<0,05$.

DISCUSSION The referees have responsibility for control of everything in the football area. Referees should get enough education about football, to manage the matches more efficiently. In addition, video training is discussed as an additional method for improving match officials' decision making. Referees would be protected from the outer factors before the match that would effect their decisions, provided that they have enough self-confidence.

KEY WORDS football referee, job satisfaction

P-150 Deconstructing referee

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OBJECTIVE The introduction part of this paper considers the status of referee in today's football game. The first part of the paper deals with deconstruction. The theory of deconstruction, as presented by famous philosopher Jacques Derrida, is explained in detail. How deconstructions work? The main philosophical concern of deconstruction and the way it uses history of philosophy is presented.

METHODS Second part of this paper is based on the resemblances between referee and priest. The first resemblance is from the clothing. The second argument will be the argument of reference. The third part is the Church and the FIFA resemblance argument. "In what ways are the wrong decisions of referee and priest are subject to penalty?" are presented in this third argument.

RESULTS Third part of this paper is based on the decision and undecidability concepts of Derrida together with the concept of "aporia". In this part the decision making process of the referee is discussed together with the resemblances and differences between referee, priest and judge. The conclusions of this discussion are compared with the case of referee.

CONCLUSION In the conclusion part of this paper the pressure on the referee is re-defined and re-examined with respect to the jobs that are put into analysis, lawyer and priest. This pressure together with the explanation of the

Church argument is also defined from the perspective of FIFA. What is needed for future is the main question of this conclusion part.

KEY WORDS Soccer referee, deconstructing referee.

P-151 A research on sprint and vertical jump capabilities of professional football league referees in Turkey

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OBJECTIVE Nowadays soccer is being played faster than before. It is getting increased soccer player's speed. It is so important for soccer referees capabilities of speed, quickness and quick strength to keep up with playing tempo. The purpose of this research was study speed, vertical jump, age, training age and levels of level referees.

METHODS This research was made on all levels of football referees (556) in Turkish Professional leagues in 2005-2006- season. 30 meter speed test were measured 1 meter from behind line by photocell with 0,01 sensitivity. Vertical jump test were measured by jump meter steadily. Average of arithmetical and value of standard deviation of age, training age, height, weight, speed and vertical jump of soccer referees:

Table 1. Information on football referees.

N	Age	Training age	Weight	Hight	Vertical Jump	Speed
556	27,62 (3,94)	11,59 (5,55)	74,806 (6,48)	178,05 (4,76)	55,67 (9,08)	4,44 (,26)

RESULTS Corelation and anova results between ages, levels, training ages and vertical jump, speed of soccer referees Level C was faster than assisting level C. It was observed that younger referees with high training age were faster and higher in vertical jump. As a result, younger referee is with high training ages have beter speed and vertical jump capabilities. There was a statistically significant relation in a research on sprint capabilities of different level soccer referees in Ankara (Kayısoglu and Koz) Speed of referees is very important in 105x68 meter soccer field. Sprint capabilities of referees can not be thought independently from sprint capabilities of soccer players. Soccer players avarage of 30 meter sprint capability in Turkey is 4,00-4,22 second (Taskın, 2006).

Table 2. Values of referees.

Soccer Referees	N	Vertical Jump		Speed	
		P	F	P	F
Levels	556	,462	,774	,599	,513
Training age	556	,027	1,637	,402	1,047
Age	556	,000	-,164	,004	,121

DISCUSSION There was a weak, negative and significant relation between age and vertical jump. As age increased, vertical jump values decreased. There was a positive, weak and significant relation between age and sprint capabilities. As age increased, sprint values increased. Vertical jump values according to different levels. Level B has lower jump level compared to level C and assisting level C. Level C has a higher jump level compared to assisting level C. Speed values according to different levels. Level B is slower than assisting level C and faster than level C. Sprint and vertical jump capabilities of soccer refrees are significant in choosing refrees and determing their levels.

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Taskin (2006) *Ankara University Journal of Physical Education and Sport Science* **4**, 49-53.

KEY WORDS Referee, speed, level, verticaljump.

P-152 Career development of youth football players in J-League Academy: Case of career formation and career orientation

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OBJECTIVE Majority of professional players have gone through the competitive market and forced out of sport to choose the second career in some years. While more research is available on career transition, most of the previous works focused on the after-retirement career, and thus little is known to understand how the young football players perceive their career throughout their developmental phase. By focusing on the perceptions of male young footballers this research intended to examine initial and later involvement in football (socialization process as a football player) and the future career orientation and choice.

METHODS The subjects of this research were 261 young football players from 11 different J-League youth teams. A questionnaire was constructed around their attributes, the factors of their construction of career paths as football player, their satisfaction of their current surroundings and future career orientation.

RESULTS More than 90% of players started playing football before the age of 9. Their own decision was the biggest motive for involving in playing football, followed by the recommendation from friends, brothers, and parents in order. To continue playing football, future plan for higher education and job-hunting appeared to be the players' biggest anxieties and concerns (46.4%).

DISCUSSION The youth players in J-League teams were influenced by parents, brothers and peer groups and watching matches with a desire to become professional player. More than half of players were concerned about their future academic and occupational career. Nevertheless, the older they got, the higher career orientation with the specific aim for becoming professional player they drived for.

KEY WORDS J-League Academy youth football players, career development, career orientation.

P-153 Analysis of strategic planning in Asian institute of rugby

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OBJECTIVE The development of Rugby in Asia will spread rugby to a global level. Asian Institute of Rugby (AIR) will link the rugby working for the development of Asian and world Rugby. The purpose of this study is discussed about the advantage of rugby in Asia and about development of human resources.

METHODS Direct interviewing with the key persons of AIR was conducted to make a discourse analysis of the qualitative structure of the strategic planning of AIR.

RESULTS Some supporting activities like 'kit aid' and 'consulting the Asian International competitions' have occurred in 2006. Until 2006, all activities were from Japan to the other unions, but the cooperative works have been gradually increased.

DISCUSSION The cognition of AIR could be extended in Asian Unions step by step. There are some planning of scientific conference or practical seminar. And International Rugby Board (IRB) deepens recognition gradually.

KEY WORDS Rugby Union, strategic planning, Asia, management.

39. MANAGEMENT AND ECONOMICS

P-154 Global football talent and distribution analysis of players at Germany 2006 World Cup finals

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OBJECTIVE Football talent of players in the World Cup 2006 finals' were assessed.

METHODS Tallent idedntification was made using questionnaires defined in literature and statistical analysis was conducted.

RESULTS Talent of 2006 world cup finals players was unequally distributed. Most of the top level football players with high talent make their living in the European football leagues ahead of AFC, CONCACAF, OFC, CAF and CONMEBOL. In England Premier League Clubs, there are 79 world cup final foreign football players. This number is ahead of Germany, France Italy and Spain.

DISCUSSION Many factors that influence the distribution of football talent in the world do exist. These factors include economics, politics, culture and religion. For the under developed countries, it is a good opportunity to improve football match management experience in advanced countries. Improved football technologies and strategies including talent are also available in football developed countries.

KEY WORDS Talent, global, 2006 World Cup final, football player.

P-155 Soccer team identification levels of university students; gender and supported soccer team differences

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OBJECTIVE Understanding sport fandom is the first step in defining and classifying individuals' involvement in the consumption of sport. Besides, highly identified sport fans have been reported to spend more money on team merchandise, and game tickets (Wann, 2001). Ascertaining the levels of team identification levels of with regard to gender of sport fans shall be helpful in marketing segmentation efforts of sport clubs. The purpose of this study was to analyze the university students' levels of soccer team identification as well as examining the differences among different gender, and supported sport club.

METHODS Participants were 456 (218 male, 238 female) university students. Wann's Sport Spectator Identification Scale's (SSIS) was used to assess the level of team identification of sport fans. Independent samples t-test analyses and one way ANOVA was conducted to analyze the data.

RESULTS Results of the one way ANOVA analysis indicated that there was no significant team identification level difference among the supporters of different soccer clubs (BJK, FB, GS, and others). Whilst, male's fandom level was found to be significantly higher than female's. 54% of the males were found to be highly identified fans whereas only 24% of the females appeared to be highly identified fans.

DISCUSSION Team ID is a very strong predictor of attending a game, buying game tickets and merchandise. Results of this study indicated that majority of the university students are either medium or highly ID soccer fans. Marketers of the sport clubs should make use of this high level of team ID by applying more marketing efforts for university students to buy their products.

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KEY WORDS Soccer, team identification, gender differences, sport fans.

P-156 Ticketing in 2002 and 2006 FIFA World Cup

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OBJECTIVE When trying to attract a sports event of a large magnitude, a heavy burden, financially and otherwise is placed on the host country and the cities involved. However the hosts hope to benefit by the merits of increasing their economic growth and revitalizing the sports activities of their residents. One method of achieving this is to provide the opportunity to watch a sports match of high degree. The purpose of this research was to make the difference in the ticketing process, such as distribution, in both tournaments and their respective venues clear. The research of the venues was divided into two areas: the host country, and the host cities.

METHODS From the official announcement from the organizing committee of the 2002 (especially about JAWOC) and 2006 (OC 2006) World Cups, four main areas were surveyed and analyzed. The four main areas of interest were the principle of ticketing, the organization in charge of the business aspects, the selling methods, and measures taken against the black market.

RESULTS The principles of ticket marketing were the same for 2002 and 2006. In the 2002 tournament, 50% of all the available tickets were distributed to the residents of the host country. On the other hand, for the 2006 tournament, only 9% of all the tickets were distributed among citizens of the host country.

DISCUSSION The number of distributed tickets to the host country and its residents was significantly lower in 2006 in comparison to 2002. Appeal of OC2006 to procure tickets and the resulting active response by the residents of the host cities for the 2006 tournament led to the increased opportunity for the residents to attend the games. This was the largest difference in comparison with the 2002 tournament.

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JAWOC Official site. http://jawoc.or.jp/
OC2006 Official site. http://fifaworldcup.yahoo.com/06/en/index.html

KEY WORDS Ticketing, FIFA World Cup, host.

P-157 Trainers' reflection styles of leadership characteristics to players

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OBJECTIVE Trainers created different groups and have various statues, they have to develop information, discriminations, critics and evaluations about team. This creates a trainer profile who have conscious, gentlemen and accepting success and unsuccessful. The purpose of this study is to determining the approaching ways of trainers according to leadership characteristics and proposes some suggestions.

METHODS The sample of the study is created from A-B-C licensed and goalkeeper trainers. The 5 likert type questionnaire had developed by taking suggestions from experts of this area. The questionnaire sent to trainers by Turkish Football Federation. 788 questionnaires of 1100 had evaluated which had returned. The reliability coefficient of questionnaire had found as 0,73.

RESULTS According to the result of Tukey HSD multiple comparison test A-licensed (X=1,95) trainers opinions average and B-licensed (X=2,09) trainers opinions average has a significant difference to C-licensed (X=2,20) trainers in a positive way.

DISCUSSION It may be that trainers and players relations' expectations occur negative or positive. In this point it could be said that the opposite expectations may caused confusion and inner conflict unavoidable. As a result; when football trainers' approaching styles to players had observed according to their licensed levels, B-licensed trainers have more liberal approaching styles according to A-licensed trainers. Also C-licensed trainers have more and more liberal approaching style to others.

KEY WORDS Football, trainer, football player, approach style.

P-158 Opinions of amateur and professional football club administrators on problems related to sports administration in Ankara

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OBJECTIVE The spread of the sports which is very important on the life of the people and the countries and the success be gained in the international field are related to a strong and resistant management and organization. In some parts of the sports management, there are some problems arising from the structure of the organization. Today's soccer clubs have entered into a managing period with many problems. The aim was to determine the opinions of the amateur and professional football club administrators on the problems related to sports management in Ankara.

METHODS The subjects of the research consisted of the amateur and professional football club administrators in Ankara. The research was carried with the contributions of 50 club administrators. This questionnaire (prepared with researchers) was applied. The reliability coefficiency of the questionnaire was set at Alfa; 96. In the analysis of the data the percentile ranking and ANOVA was used.

RESULTS Most of the administrators don't accept the sports associations and the sports centres as sufficient and they believe that the scientific criteria have not been paid the close attention in the planning, using and the construction of those sports centres, and they also believe that the law of the clubs is a great obstacle in supplying source to the clubs; therefore, the company is essential. The administrators also support the common organizations of the volunteer organizations. In the end, the difference between the opinions of the administrators in terms of the statute of the administrators, their level of the education and the seniority, has not been found out meaningful.

DISCUSSION This study revealed that the sports centres in Turkey were not enough for the ones who want to play sports and there hasn't been paid close care on the planning of those centres, and on scientific criteria and regional needs. The structuring of the sports organisations according to local management principles was highly supported.

KEY WORDS Football, club administrators, sports management.

P-159 Homophobia in sports: What university level fans think about homosexual athletes?

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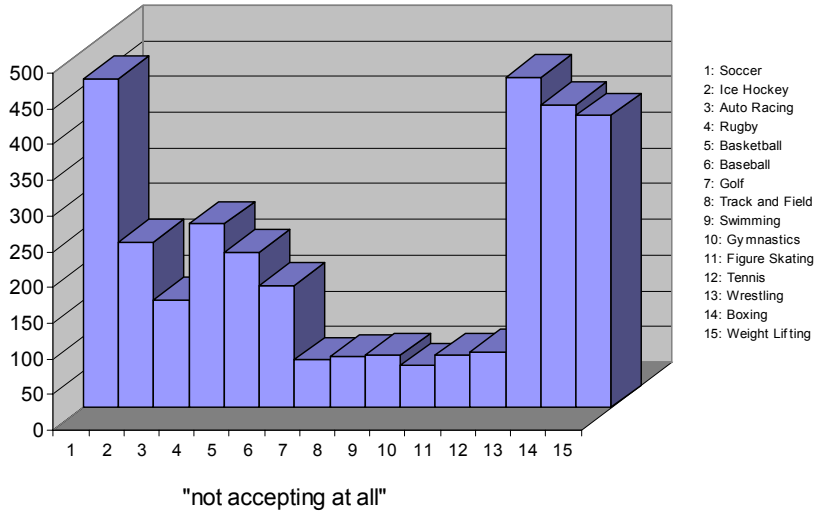
OBJECTIVE In sports most of the people have ignored homosexuality, and demonstrated their intolerance (ASC, 2000). These negative attributes have caused gay and lesbian athletes stay silent (Demers, 2006) or declare their homosexuality after retirement (GLSEN, 2000). It was also reported that no professional football player in the United Kingdom declared their homosexuality not to be outsiders (EGLFS, 2003). In order to guarantee the respect for human rights in sports area, homophobia should be investigated thoroughly. This study aimed to explore the attitudes to homosexual athletes in university students as sports fans.

METHODS Three hundred sixteen male (mean age = 22.59, SD = 1.30) and two hundred fifty one female (mean age = 21.80, SD = 1.35) university students (3rd grade n= 244, 4th grade n= 323) participated in this study. Turkish version of Fans Attitudes toward Homosexual Athletes Scale (TFAHAS) was used to collect data (Sarac, 2006). Frequency and percentile ranking were used to analyze the data.

RESULTS Majority of the participants stated that they would not change their opinion if favourite male (n=370, 65%) and female (n=380, 76%) athlete revealed that he/she was homosexual (Figure 1). On the contrary, they thought that other sports fans would have a much less favourable opinion toward the homosexual athlete. Additionally, participants mostly labelled homosexual athletes as honest (51.50%), courageous (62.43%), being himself (53.26%), and publicity seeking (30.86%). Results demonstrated that, participants did not tolerate homosexual athletes in soccer (81.30%), wrestling (81.48%), boxing (74.77%), and weight lifting (72.13%).

DISCUSSION Current study revealed that even in the university level sports fans some homophobic attitudes toward homosexual athletes existed. Homophobic attitudes were mainly seen in sports that were assigned to males such as soccer, wrestling, weight lifting, and boxing. Findings of the study may help curriculum developers to recognize the integration of topics related with human rights and the existence of homosexuality.

Figure 1. Level of acceptance towards athletes in various sports who reveal their sexual orientation



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KEY WORDS Athletes, sexuality.

P-161 Importance of educational games in making the football skills gained in primary schools

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OBJECTIVE It's known that educational games are effective in making many different skills gained. Football was a popular and current sports branch. The aim of this research was to improve the football skills through educational games.

METHODS 24 subjects (12 girls, 12 boys) and 24 of control group (12 girls, 12 boys) of age 12 in primary school participated in the research.

DISCUSSION When the 1. and 2. Measurements of subjects and control group were compared in "Shoot wall test" a meaningful difference was seen both in girls and boys. A meaningful difference was seen between the 1. and 2. Measurements of control group girls in "Moving the ball changing direction". A meaningful difference was seen in "Moving the ball making slalom" in both boys and girls.

Table 1. Comparing the second measurements of shoot wall test of male-female subject and control.

Gender	Group	n	X	SD	Xi-Xii	t	p
Female	Control	12	9.33	2.34	-1.67	1.420	0,186
	Subject	12	11.00	1.67			
Male	Control	12	12.33	2.58	-5.50	3.365**	0.007
	Subject	12	17.83	3.06			

KEY WORDS Football skills, primary schools.

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