SOCCER FITNESS

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SOCCER FIT-FACTS

APRIL 15, 2010

SMALL-SIDED GAMES TO GET YOU FIT THIS SEASON

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On September 19, 1993, after the Brazilian national team had beaten Uruguay in their final qualifying game to secure their place at the 15th FIFA World Cup, being held the following year in the United States, Brazilian reporters questioned Romario, national team superstar and scorer of the two crucial goals that won them the game. Their questions, interestingly, were centered around the star forward's consistent habit of not showing up to the national team's training sessions, specifically the conditioning training sessions aimed at improving the players' fitness levels before the start of the tournament. Romario's response was simple yet poignant. "I don't train, I score goals", he replied, adding, "and soccer is not running".

It took about 13 years, but finally there is some hard evidence to support Romario's claims. In a recent study by Impellizzeri et.al. (2007) researchers in Italy have concluded that small-sided games and running training are equally effective modes of aerobic interval training in soccer.

The aim of their study was to compare the effects of generic (running) with specific (small-sided soccer games) aerobic interval training on physical fitness and objective measures of match performance in soccer. Forty junior players from Italy's Serie A were randomly selected and assigned to either the "generic" (running) or "specific" (small-sided games) groups. The "generic" group performed interval training consisting of 4 bouts of 4 minutes of running around a regular sized soccer field, at 90-95% of age-predicted maximum heart rate, with 3 minute rest periods, 2 days per week, for 12 weeks. The "specific" group performed specific interval training, consisting of 4 bouts of 4 minute small-sided soccer games, at 90-95% of age-predicted maximum heart rate, with 3 minute rest periods, 2 days per week, for 12 weeks (see page 2 for a detailed explanation of the small-sided games used in this study). All other team training was kept the same for both groups, to minimize the chances of errors in the study.

A number of different testing procedures were used to assess the effectiveness of the training programs. The test protocol included maximal oxygen uptake (the maximum amount of oxygen the body is able to deliver to the tissues of working muscles) Ekblom's circuit (a soccer-specific endurance test) and indices of physical performance during soccer games (total distance and time spent standing, walking, and at low- and high-intensity running speed). Both groups were assessed before the start of the training programs, at 4 weeks into their pre-season, and after a further 8 weeks of training during the regular season.

The findings of this study have important implications for youth coaches and fitness trainers.

Firstly, there were significant improvements in aerobic fitness and match performance in both the "generic" and "specific" groups of soccer players, especially in response to the first four weeks of pre-season training. More importantly, however, no significant differences between generic and specific aerobic training were found in any of the measured variables, including the soccer-specific tests.

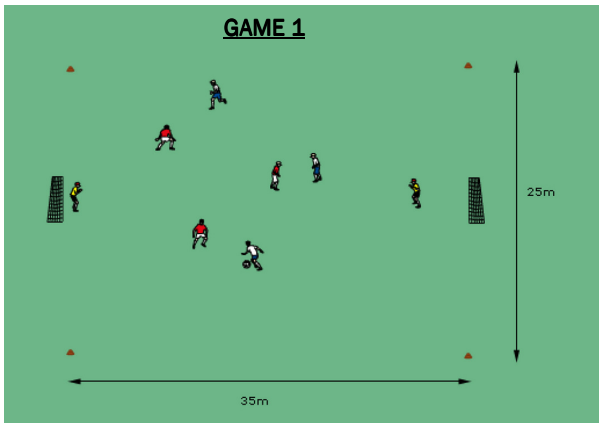
These findings clearly represent that coaches can use a completely soccer-specific training program, consisting of small-sided games, to improve their players' aerobic fitness. Because no differences were found between generic and specific aerobic interval training, the choice to use small-sided games seems to be an appealing one for the following reasons:

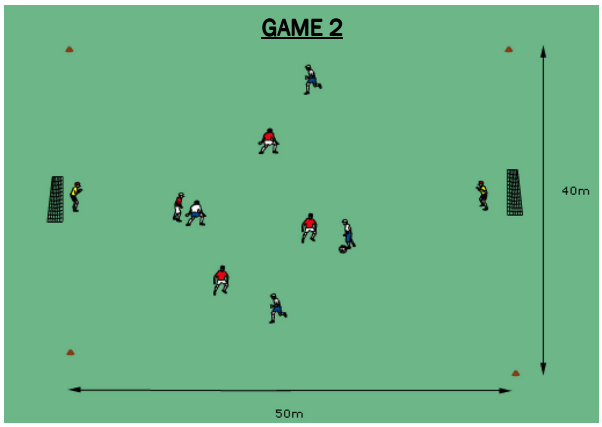
Romario:
"Soccer is not running"

- small-sided games require players to develop and use technical and tactical skills
- Because motor skill development is based on frequency of practice sessions, players will show greater improvement in these skills by practicing more small-sided games
- Small-sided games increase motivation, and make high intensity training more acceptable than running alone

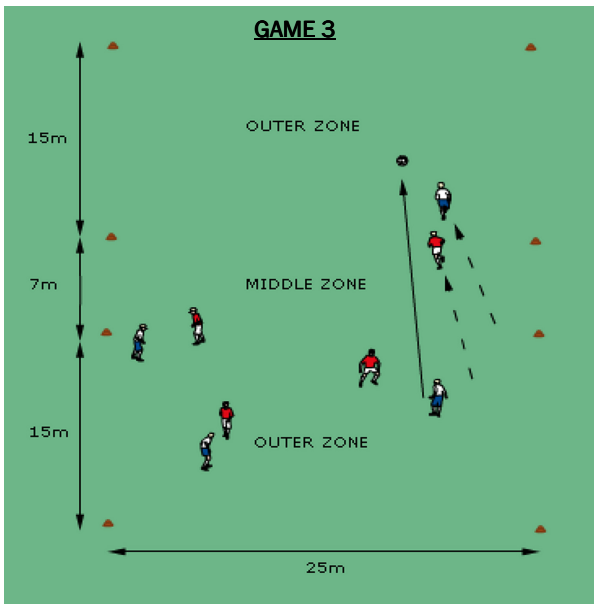
Please see Page 2 of this issue for a detailed explanation of the small-sided games used in this study.

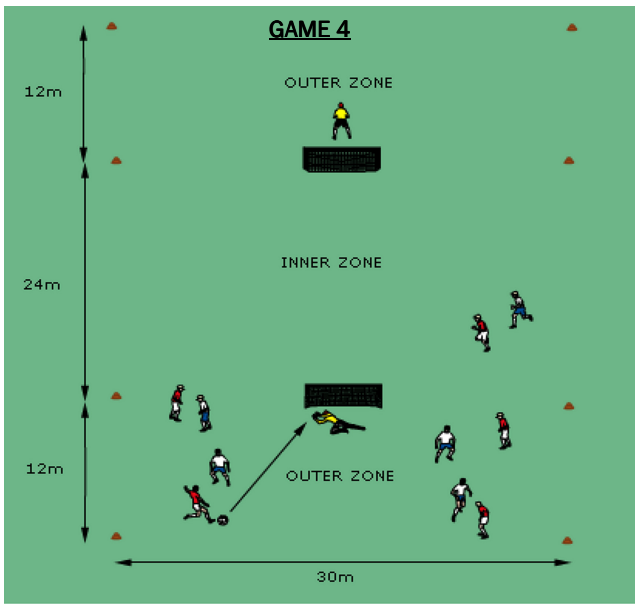
SMALL-SIDED AEROBIC INTERVAL TRAINING GAME DIAGRAMS





Above: Small-Sided Aerobic Interval Training Game 1: 3v3 +2 goalkeepers, 3 ball touches (left) and 2: 4v4 +2 goalkeepers, 2 ball touches (right)





Above: Small-Sided Aerobic Interval Training Games 3: 4v4 +2 goalkeepers, score by playing ball from one outer zone to the other, and no players can touch the ball as it passes through the middle zone (left) and 4: 5v5 +2 goalkeepers, goals placed back-to-back, touches are limited to 2 in the middle zone, and free in the outer zones (right)

EXERCISE SPOTLIGHT— PELVIC BRIDGE KICKS

Exercise Spotlight is a feature of Soccer Fit-Facts, where, in each issue, we will highlight an important exercise that can—and should—be incorporated into the training program of young soccer players. In this issue, we feature pelvic bridge kicks, an exercise which can help build soccer-specific strength, and enhance the function of the gluteal muscles — gluteus maximus and minimus — which play a key role in strength, balance and gait while walking, running and kicking. Strengthening this group of muscles will not only improve performance, it will also greatly decrease the risk of overuse injuries to the hips, thighs and groin.

To perform this exercise, lay on your back, with your knees bent and feet flat on the floor. Contract the transverse abdominus (deep abdominal muscles) by pulling your belly button down towards your spine, while staying relaxed and maintaining a regular rate of breathing. Keeping your deep abdominals contracted, raise your hips off of the floor, until they are in line with your knees and your back is straight. Holding this position, slowly extend one leg, until the knee is straight, and the leg is in line with your hips (see Figure 1). Hold the extended leg for 3 seconds, then repeat with the opposite leg, before slowly lowering your hips back to the floor.

This exercise can be added to the beginning of your training sessions, following a good warm-up and dynamic stretch. For optimal results, perform 2-3 sets of 10 repetitions with each leg, 2 days per week.

Figure 1: Pelvic Bridge Kick

PHYSIOLOGICAL AND PERFORMANCE CHARACTERISTICS IN MEN'S NCAA DIVISION I SOCCER

A common goal among male youth soccer players in Canada is to attain an athletic scholarship at an American NCAA Division I university, which provides young student-athletes with the opportunity to receive a free or partially subsidized education, as well as a chance to play soccer at the highest (Division I) amateur level in North America.

What exactly are the fitness levels required for young athletes to achieve this goal? And does body composition, or, an individual's percentage of body at in relation to their percentage of lean muscle, have any effect on their physical performance in soccer at this level of play?

In their recent study, titled *Body Composition and Physical Performance in Men's Soccer*, Silvestre, West, Maresh et al. attempted to answer some of these questions, by examining the relationship between body composition and tests of speed (10 and 40 yard sprints), power (vertical jump, maximal power tests), and endurance (estimated VO2Max) in a men's NCAA Division I soccer team. A secondary purpose of the study was to asses how body composition and physical performance differed among positions, and among starters and non-starters on the team. 27 players from the University of Connecticut Men's Soccer Team were chosen for this study. Since 1997, the UCONN Men's team has ranked in the top 25 collegiate Division I teams in the country, and has also earned a national semi-final appearance (1999) and a national championship (2000) during this time.

Table 1 (below) shows a complete summary of the results of the study. With regards to body composition, goalkeepers (GK) had more body mass than their teammates, and a higher percentage of body fat than defenders (BS) and midfielders (MI). Defenders were the heaviest (average mass of 79kg), of all the outfield players. Forwards (FW) had the highest percentage body fat (average of 15%) while midfielders had the lowest average body mass (73.7kg) and percent fat (11.7%). An increase in body weight and percent body fat in defenders and forwards may be advantageous in challenging for the ball in the penalty area. The low percent fat and body mass levels of midfielders can be explained by the greater total distance covered by midfielders in games, especially in linking attack to defense (and vice-versa).

In physical performance variables, the results were slightly less predictable. Goalkeepers had the lowest scores in vertical jump (54.0 cm), speed (1.8, 5.3 seconds), endurance (VO2Max 56.3), and power production (538 watts). Although all three of the outfield positions had fairly similar test scores, defenders had the highest vertical jump scores (64.2 cm), and were fastest in the longer (40 yard) sprint test (4.9 seconds). Midfielders were the slowest of the on-field players in both the 10 and 40 yard speed tests (1.7, 5.0 seconds), but had the highest endurance (VO2Max 60.7) and power production (546 watts) scores. Forwards, conversely, were second best in vertical jump (61.3 cm), speed (1.7, 4.9 seconds), and power production (509 watts) and third best in endurance (VO2Max 56.6).

Higher percentages of body fat were found to have a positive impact on speed in the 40 yard sprint, and a negative impact on endurance and vertical jump tests. Finally, the values for both body composition and performance were similar in starters and non-starters.

Taken together, this data demonstrate that there are several similarities between both the physiological, and performance characteristics of different outfield players (defenders, midfielders and forwards) as well as between starters and non-starters, in men's NCAA Division I soccer. These results have two main implications for coaches. Firstly, **training regimens for aspiring collegiate soccer players, with the exception of goalkeepers, should be structured and based on the improvements of individual weaknesses, rather than training for specific positions. Speed, power and endurance are all important and necessary components of a fitness training plan for aspiring collegiate soccer players.**

Secondly, **physiological measurements, such as body mass and percent body fat, appear not to be suitable performance indicators, and cannot be used reliably by coaches for talent identification and selection purposes.**

"Higher percentages of body fat were found to have a positive impact on speed, and a negative impact on endurance and vertical jump".

TABLE 1. Descriptive characteristics for the entire team and by positions.*

Variable	Team (n = 27)	GK† (n = 4)	BS (n = 9)	MI (n = 10)	FW (n = 4)
Age (years)	19.9 ± 1.3	19.4 ± 1.0	19.4 ± 1.4	20.4 ± 1.1	20.2 ± 1.7
Height (cm)	177.6 ± 6.3	182.8 ± 6.8	179.9 ± 3.4	174.6 ± 6.1	174.8 ± 7.6
Body mass (kg)	77.5 ± 9.2	86.7 ± 10.8	79.0 ± 4.9	73.7 ± 6.0	74.0 ± 16.1
BMI	24.5 ± 2.0	25.9 ± 2.2	24.4 ± 1.5	24.2 ± 1.4	24.1 ± 3.8
Total lean mass (kg)	63.2 ± 4.9	64.4 ± 5.4	66.1 ± 3.3	62.0 ± 4.0	58.8 ± 7.1
Total fat mass (kg)	10.6 ± 5.8	18.4 ± 7.1	9.3 ± 3.3	8.4 ± 2.8	15.2 ± 8.5
%fat	13.9 ± 5.8	21.8 ± 6.4	12.2 ± 3.7	11.7 ± 3.3	15.2 ± 10.9
%lean	86.1 ± 5.8	78.2 ± 6.4	87.8 ± 3.7	88.3 ± 3.3	84.8 ± 8.5
Trunk lean tissue (kg)	35.5 ± 2.9	36.9 ± 2.3	36.7 ± 2.1	35.1 ± 3.2	32.6 ± 3.7
Legs lean tissue (kg)	23.5 ± 2.2	23.4 ± 3.0	25.0 ± 1.5	22.6 ± 1.2	22.3 ± 3.4
Total score	394.9 ± 42.1	364.6 ± 29.2	396.0 ± 38.1	398.2 ± 53.6	411.5 ± 19.2
VJ (cm)	61.6 ± 7.1	54.0 ± 5.6	64.2 ± 6.5	61.3 ± 5.9	63.8 ± 9.1
9.1 m/ 10 yrd (sec)	1.7 ± 0.1	1.8 ± 0.1	1.7 ± 0.1	1.7 ± 0.1	1.7 ± 0.1
36.5 m/ 40 yrd (sec)	4.9 ± 0.2	5.3 ± 0.1	4.9 ± 0.2	5.0 ± 0.2	4.9 ± 0.2
Lower body power (watts)	488.0 ± 45.5	488.0 ± 61.4	473.0 ± 52.4	500.2 ± 41.3	491.8 ± 23.5
Total body power (watts)	524.3 ± 90.7	538.8 ± 134.5	500.0 ± 61.4	546.4 ± 83.0	509.5 ± 90.2
Estimated V_{O_2}max (ml·kg^{-1}·min^{-1})	59.4 ± 4.2	56.3 ± 3.1	60.4 ± 3.0	60.7 ± 2.9	56.6 ± 7.7

* Values expressed as mean ± *SD*.
† BMI = body mass index; GK = goalkeepers; BS = backfielders; MI = midfielders; FW = forwards; VJ = vertical jump; V_{O_2}max = maximal oxygen uptake.

SOCCER FITNESS

24 Harrison Road
Toronto, Ontario
M2L 1V4

Phone: (647) 829-4360
E-mail: richard@soccerfitness.ca

Soccer Fitness was created to help coaches at all levels of the game improve their knowledge and practical skills in training their athletes. With huge and growing numbers of players registered in Canada at the youth level, it often seems that there are just too many players and not enough qualified fitness trainers. Today, most clubs in Ontario have Club Head Coaches and Technical Staffs, whose primary responsibility is to help train, educate their club's "rep" or competitive coaches, and ensure that they are able to plan and deliver appropriate technical and tactical training to their respective teams. Physical training of soccer players, however, seems to be the missing link in most clubs' overall training programs. **Soccer Fitness is a company that aims to help coaches in understanding and implementing appropriate physical training programs for their athletes.**

SOCCER FITNESS AT THE SECOND WORLD CONFERENCE ON SCIENCE AND SOCCER: OUR ABSTRACT

Having recently received confirmation that our abstract from the study titled *Speed and High Intensity Running Characteristics of Canadian youth women's soccer players of different standards,* has been accepted for presentation at the Second World Conference on Science and Soccer in Port Elizabeth, South Africa, in June of this year, we at Soccer Fitness decided to share the actual abstract with you! The study shows a comparison in soccer-specific fitness tests of women's soccer players at various different levels of play in Canada, including club, college, provincial, and national teams.

Speed and High Intensity Running characteristics of Canadian youth women`s soccer players of different standards.

Rupf, R[1], Bucciarelli, R[2], , Pacione, P[3], Yang, P[4], Vescovi J[1,5]

[1]*Canadian Sports Centre Ontario, Canada;* [2]*ANB Futbol Academy;* [3]*Ontario Soccer Association, Canada Canada;* [4]*Department of Rehabilitation Sciences, University of Toronto, Canada,* [2] *School of Kinesiology, York University, Canada;*

High intensity running has been shown to be an important determinant of elite level female soccer players. Further, research has shown that elite players attain faster velocities than non elite players. However, little information exists on speed and high intensity running on youth female soccer players. The purpose of this study was to characterize speed and high intensity running in female youth soccer players and to examine differences between elite and sub-elite level players.

Female subjects (n=106) were recruited from local club teams (LOWER, n=47), and regional and national teams (HIGHER, n=59). Subjects were divided into three age groups; 14 years and younger (U14, n=39), 17 years and younger (U17, n=34), and 18 years and over (SR, n=33). Each subject performed three tests; a maximal 20m sprint (SPRINT), 10 sprints of 20m with 10s of recovery (RSA) with the average speed recorded, and the Yo Yo Intermittent Recovery Level 1 test (YOYO). A One way ANOVA was used to compare standard of play and age.

	SPRINT (km/hr)	RSA (km/hr)	YOYO (m)
U14–LOWER	19.7±0.8	17.7±0.7	642±144
U14–HIGHER	20.6±0.7	18.6±0.8	840±322
U17–LOWER	19.6±0.9	17.7±0.8	754±221
U17–HIGHER	21.8±1.2	19.5±0.8	1206±329
SR–LOWER	20.0±0.9	17.7±0.9	672±265
SR–HIGHER	21.3±0.6	19.8±0.8	1267±216

Table: Female Sprint Characteristics

There were significant differences between HIGHER and LOWER ($p<0.01$) and between U14 HIGHER and SR HIGHER for all three tests ($p<0.01$). There were no significant differences ($p>0.1$) between age groups in LOWER and between U17 HIGHER and SR HIGHER.

This study demonstrates that differences exist in sprint and high intensity running between elite and non elite levels in youth soccer. These differences appear to be at a maximum around the U17 age group and remain steady in the senior age group. This information can be used to help training programs for youth female soccer players.

For more information on the Second World Conference on Science and Soccer, visit: http://www.nmmu.ac.za