SOCCER FIT-FACTS

JUNE 15, 2009

FIRST WORLD CONFERENCE ON SCIENCE AND SOCCER

INSIDE THIS ISSUE:

LEARN ABOUT IN THIS ISSUE:

- **Age-Specific Fitness Testing**
- **Speed Endurance Training**
- **Functional Knee Strengthening and Injury Prevention**

On May 15-16, 2008, in Liverpool, England, Richard Bucciarelli, and other representatives from ANB Futbol Academy and the University of Toronto Human Physiology Performance Lab attended and presented at the First World Conference on Science and Soccer. This event is aimed at individuals who have a specific interest in the scientific study and/or the practical performance of soccer players at either grass roots or the elite professional level. These include academics, full/part-time coaches, strength and conditioning specialists, physiotherapists, and sports medics. The Conference consisted of seminars, presentations, and workshops covering a wide variety of topics, including youth training and talent identification, sport nutrition, coordination and performance mechanics, testing and evaluation of players, and injury prevention.

Our Presentation: Determining a Recommended Age of Using Repeated Sprint Tests on Canadian Youth Soccer Players:

Our Research:

One fact that was made very clear at the First World Conference on Science and Soccer was the importance of repeated sprint testing and training in elite level amateur and professional soccer players. Top-level players who score well on repeated sprint tests typically are able to perform more frequent bouts of high intensity activities in games, and are able to sustain the speed and power needed in these activities over longer periods of time. The purpose of our research was to try to find out exactly how old players should be before they undergo repeated sprint tests, and also to see if there were any other implications based the relationships between repeated sprint testing and the other fitness components tested.

Our research was conducted at the Country Day School in January, 2008. Richard Bucciarelli, soccer specific strength and conditioning coach, and ANB Futbol Academy staff coach, conducted fitness tests on all ANB Academy players from the U-12 to U-18 age group, with a total of 90 players' test scores used for this project. Players were evaluated on a number of performance measures, including:sit-and-reach (flexibility) standing broad jump (power)10 metre sprint (starting speed)5 x 10 metre sprint (speed endurance) and the beep test (aerobic endurance).

Once the testing was completed, the results were taken to the University of Toronto Human Physiology Performance Lab, where Robert Rupf, Master's student in Exercise Physiology at U of T, analyzed the data from the tests. The findings from this analysis were displayed on our poster, and were presented to delegates on Day 1 of the Conference.

Our Findings:

A typical score or result of a repeated sprint test for an adult professional player would be as follows:very fast first sprint (indicative of good starting speed) slower second - fifth sprints (indicating incomplete recovery from the explosive first sprint) similar times for the second - fifth sprints (indicating good anaerobic recovery between sprints) This is because we know that adult professional players have a high capacity for explosive starting speed, and in addition they are well trained to be able to recover between short sprints, so they should be able to sustain a good short sprint performance over multiple repetitions. When examining the results from players in the ANB U-16 and U-18 age groups, we found that they were very similar to the expected results listed above (fast first sprint, and slightly slower second - fifth sprints, that did not get markedly slower from second - fifth sprint). **Thus, we found that repeated sprint tests are a useful tool to measure performance of elite youth players from the ages of 16-18 years.**

However, when we looked at players from the ANB U-12 to U-14 age groups, they showed no significant difference in their sprint times in the 5 x 10 metre repeated sprint test. This means that in many cases, these players were actually faster on the fifth sprint than on their first one. What this finding indicated is that **repeated sprint testing is not useful for players under the age of 14, as it is not a good indicator of physical ability or performance in this age category. The most probable reason for this is that young players have not yet developed their anaerobic (speed and power) systems to be able to perform and recover from repeated short sprints.**

OUR POSTER PRESENTATION:

DETERMINING A RECOMMENDED AGE OF USING REPEATED SPRINTS TESTS ON CANADIAN YOUTH SOCCER PLAYERS

Rob Rupf[1], Richard Bucciarelli[2], B. Naim[3], Scott G Thomas[1],

Graduate Department of Exercise Sciences, University of Toronto, Canada[1], York University, Canada[2], ANB Futbol Academy, Canada[3]

Introduction and Objectives

In the game of soccer, the ability to perform several consecutive sprints at high intensities (RSA) has been partially associated with increased distances covered during games. Therefore, RSA testing procedures have been developed for soccer players, and have been used at all ages levels in Canadian soccer, specifically in youth training academies. However, RSA testing protocol guidelines have not been well developed for youth players, where differences in energy system recruitment exist. Therefore, the purpose of this study was to determine if RSA testing is suitable for all ages of youth soccer.

Methods

Participants (N=64) were recruited from an elite level Canadian academy, and were selected from U12, U14, U16 and U18 teams. Players from this academy train four days per week throughout eleven months of the year, and participate in inter-academy competitions in an outdoor (six month) and indoor (four month) format.

Each player performed a battery of fitness tests upon entering the academy, including, the Australian Institute of Sport (AIS) Multistage Fitness Test, 10m sprint test, a standing long jump test, and a Repeated Sprint Ability (RSA) test. All tests took place on an indoor turf field.

The RSA test consisted of 5 sprints over a distance of 10m. Sprint times were recorded using a Brower system. A 10s passive recovery period was timed using a stop watch and was instituted between each successive sprint (Figure 1). Distances were selected based on previous studies of sprint distances during games.

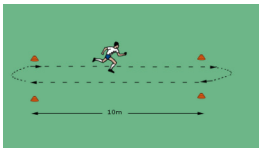


Figure 1. RSA 10m test. Players sprinted from one set of cones to another 10m apart. 10s of passive recovery occurred between sprints, allowing the player to turn around and head back in the other direction.

Predicted VO2 max values were determined using AIS regression equations based on level achieved. Standing long jump values were determined using a standard tape measure. All values were compared amongst age groups using one way ANOVA analysis.

Mean sprint times and the % decrement between the 1st and 5th sprint were used to determine RSA performance indexes. Two way ANOVA was used to compare differences amongst age groups. The Turkey post hoc test was used to identify significances between groups. Significance levels were set to $p<0.05$. Pearson's correlation coefficient was used to determine relationships between aerobic and anaerobic physical characteristics and RSA performance indexes.

Results

Age Group	Predicted VO2 max ($mL \cdot kg^{-1} \cdot min^{-1}$)	10m Sprint Time (s)	Standing Long Jump (m)
U-12	42 ± 6	2.1 ± 0.2	1.63 ± 0.20
U-14	48 ± 6	2.0 ± 0.2	1.91 ± 0.20
U-16	54 ± 3	1.9 ± 0.1	2.23 ± 0.10
U-18	54 ± 3	1.8 ± 0.1	2.33 ± 0.15

Table 1. Aerobic and anaerobic physiological characteristics of different age groups tested.

Results

64 Subjects (N=16 for each age group) were recruited for this study,The average age of the participant was 14.7 ± 2.3.

A demarcation of physical characteristics appeared around the U-14 age group as both the U-16 and U-18 players demonstrated a 25% increased aerobic power, 19% increase in standing long jump power and 16% increase in 10m sprint time compared to U-12 and U-14 players (Table 1).

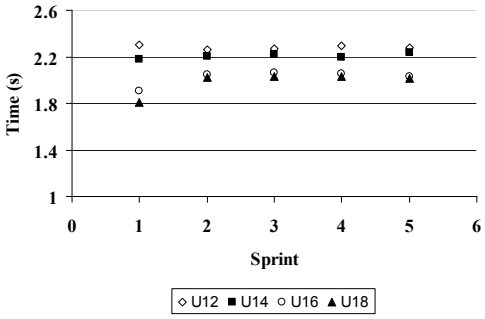


Figure 2. Sprint times for U-12, U-14, U-16, and U-18 age groups over 5 successive 10m sprints.

Significant changes ($p<0.05$) were observed in sprint times over successive sprints for U-16 and U-18 players, however this was not observed for U-14 athletes (Figure 2). Further, an 11% increase in the sprint duration ($p<0.05$) was observed between the first sprint and the second sprint for the U-16 and U-18 age groups. No significant changes were observed between the 2nd and 5th sprint ($p=0.41$).

The relation between aerobic and anaerobic physiological characteristics and performance in RSA testing for U-16 and U-18 players determined that aerobic power contributed to slower sprint times, and less decrement, and faster initial sprint times led to greater sprint times (Table 2). However, the data demonstrates a strong inverse relationship between maximal standing long jump power and the % Decrement in RSA.

	Predicted VO2 Max	Standing Long Jump	10m Sprint Time
Mean Sprint RSA Time	0.67	-0.54	0.78
% Decrement	-0.53	-0.56	-0.43

Table 2. Pearson correlation coefficients determined between RSA performance indexes and aerobic and anaerobic physical characteristics. All values have a p-value < 0.05.

Discussion and Conclusions

Similar to other sprint studies, this study confirmed that RSA testing for age groups less than the age of U-14 does not provide valuable information on the physiological characteristics of soccer players. This study also determined that there is no increase in sprint times after the 2nd sprint. This finding might be related to the fact that only 10m was covered, which leads to a minimal number of steps required to cover the distance. It is recommended that RSA testing be completed on soccer players over the age of 14.

FIRST WORLD CONFERENCE ON SCIENCE AND SOCCER: IMPLICATIONS/RECOMMENDATIONS FOR COACHES:

Implications / Recommendations for Youth Coaches in Canada:

Fitness testing is important for elite level youth players, both at younger (U-12 to U-14) and older (U-16 to U-18) age groups. When conducted properly, fitness tests can give coaches a very accurate and realistic picture of each player's physical strengths and weaknesses, as well as their physical capabilities during a game.

Coaches should spend time researching which fitness tests are appropriate for the particular age group they are coaching. Our research has demonstrated that repeated sprint tests are not a useful tool to evaluate the physical abilities of players from the ages of 10-14. **Coaches working with athletes in the 10-14 year old age groups should develop a program of fitness tests that focuses on assessing speed, power, and aerobic endurance, and they should not spend time testing anaerobic or speed endurance.**

Specific Implications / Recommendations for Youth Training:

We know from previous research studies that players who perform well in soccer-specific endurance tests (such as beep tests) are able to do more high intensity work during games. Through our study, we determined that players who performed well on our repeated sprint tests also performed well on the beep test. **This means that players who are able to perform repeated short sprints at a high speed during training, as well as recover well between those short sprints, will be able to perform more high intensity work during games.**

Speed endurance training, which involves performing repeated short sprints without full recovery, is the recommended method of training to improve players' physical performance during games. **Coaches should develop fitness training exercises that incorporate short sprints, with and without the ball, in realistic game situations.**

> "Speed endurance training ... is the recommended method of training to improve players' physical performance during games."

PREVENT KNEE INJURIES IN 1 HOUR A WEEK

Soccer is a sport that places high physical demands on the body. Of all the joint structures in the body, the knee, and specifically the meniscus (cartilage) and anterior and posterior cruciate ligaments, are frequently injured. Damage and injuries to this area of the knee occur often in soccer due to the frequent cutting and pivoting movements, as well as contact to the joint itself.

Strengthening the knee joint, and the tendons, ligaments and muscles that surround it on all sides, is an excellent way to prevent injury, as well as to hasten the rehabilitation of an injured knee. A proper strengthening program should address common causes of knee injuries, including alignment, stability, and muscle strength imbalances.

Alignment of the knees while exercising can have a definitive impact on the likelihood of injury to the knees. A valgus alignment (knees pointing inwards) is generally considered to be associated with an increased incidence in knee injuries. Stability while moving, specifically landing from jumps and strides and changing directions, must be addressed in detail in a knee strengthening program.

On Page 4 is a program designed to provide functional strengthening of the knee and its surrounding structures, with emphasis on preventing injury to the cartilage and cruciate ligaments.

Having strong and stable knees on all sides is vital to preventing injuries to the cartilage and crucite ligaments in soccer players

We are on the Web!
www.soccerfitness.ca

SOCCER FITNESS TRAINING

24 HARRISON ROAD
NORTH YORK, 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.**

KNEE STRENGTHENING EXERCISES (CONT. FROM PAGE 3)

.**Squat Jump:**

Fitness Components: power, strength, alignment

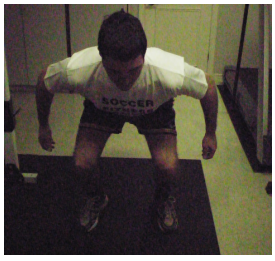
Muscles Targeted: gluteals, hamstrings, quadriceps

Focus On: explosive jump (power) and controlled landing (alignment)

Stand upright with your shoulders relaxed. Slowly lower your body by bending at the hip and knee, keeping your knees facing forwards, and your heels on the ground.

Once you reach a 90 degree bend in your knees, explosively extend your hips, knees and ankles, and jump as high as you can.

When landing, make sure your feet hit the ground with your toes pointing forward, and do not let your feet or knees rotate inwards at all. Slowly lower yourself and repeat the jump. Do 2 sets of 10 jumps, with 1 minute rest in between sets.



Stability Ball Squat:

Fitness Components: strength, stability, alignment

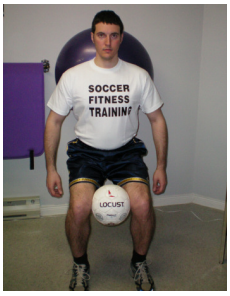
Muscles Targeted: gluteals, hamstrings, inner quadriceps (cartilage and cruciate ligaments)

Focus On: controlled descent (eccentric strength) form (alignment)

Stand with the middle of your back against a stability ball, which is touching a wall behind you. Place a soccer ball (size 5) between your knees. Your feet should be about 1 ½ - 2 feet in front of your hips.

Slowly lower your body by bending at the hip and knee. Keep your knees straight by lightly squeezing on the medicine ball as you descend.

Once you reach a 90 degree angle in your knees, raise your body by pushing into the floor with your heels. Do 2 sets of 15 repetitions, with 1 minute rest between sets.



Moving Flexed 747:

Fitness Components: stability, strength

Muscles Targeted: gluteals, hamstrings, quadriceps (knee tendons and ligaments)

Focus On: maintaining balance (stability) maintaining knee bend (isometric strength)

Stand on one leg, keeping your knee and toe facing forwards, and your other leg straightened in front of you. Extend your arms at your sides.

Bend at the hip and knee, until your knee is at a45-60 degree angle, and even with or slightly in front of your toe on the ground.

Keep your knee bent, and maintain your balance, while slowly and alternately touching your toes with one hand, then the other hand. Perform 10 toe touches with each hand, then repeat the sequence standing on the other leg. Do 1 set of 10 toe touches each.