

LEVEL 2 SUBMISSION

HIGH INTENSITY INTERVAL TRAINING IN YOUTH SOCCER PLAYERS – USING FITNESS TESTING RESULTS PRACTICALLY

Tim Mosey

INTRODUCTION

Soccer, as with most competitive team sports, is an intermittent based game (1, 5, 7). Performance in intermittent based sports has been linked to speed, power, strength, agility and the ability to repeat short high intensity bursts throughout a match, rather than the capacity to maintain a steady submaximal work rate (1). Hence training modalities must reflect this, with coaches prioritising training time to improve these physiological variables predictive of good performance (9). High intensity interval training can develop maximal oxygen uptake and enhance a players' ability to repeat high intensity bouts (3). Since maximal oxygen uptake may influence game performance and total high intensity running distance during a soccer match (8), methods to improve these levels should be factored into training cycles. High intensity interval training sessions should be programmed into weekly periodised conditioning blocks directed at improving maximal oxygen uptake. An effective and practical way of delivering these sessions, in order to improve physiological variables of players, is by using the prescription variables derived from the 30-15 Intermittent Fitness Test (IFT).

Background

The Tasmanian Institute of Sport boys' soccer team comprises 13 young men aged between 14 and 16. They are in a part-time program, and as such undertake a part-time training load on a weekly basis, outside of school hours (Table 1). Due to the part-time training load and athletic stage of development, intensity and duration of sessions reflect their developmental stage of training. Resistance training sessions focus on improving joint range of motion, limb mobility, exercise technique competency and general strength, rather than focussing on

an undulated periodised program to specifically develop maximal strength, force and power production. Once the athletes are competent and proficient in lifting techniques – future training cycles can then focus on improving rate of force development and maximal strength within periodised programs. Training to improve maximal oxygen uptake, and the physiological variables that enhance the athlete's ability to repeat high intensity bursts, was conducted during one session per week. Although two or more high intensity interval training sessions per week has been shown to improve maximal oxygen uptake and maximal aerobic speed (6), the time constraints and lack of facility available for the squad, meant only one session could be allocated for conditioning per week. The needs analysis conducted on the players in early pre season identified aerobic capacity as an area of concern. With assistance from the head coach, a schedule was constructed that included a testing battery to be allocated into the fifth week of pre season training. Players were given the first four weeks as a re-introduction to fulltime training demands, following the down period over Christmas. During this period a general development and mobility resistance training cycle was implemented, along with higher volume lower intensity conditioning sessions. These sessions aimed at returning players to a general aerobic base from which the high intensity interval training cycle could be launched from. Although it has been shown that players cover different distances at different intensities during match play (2, 10), it was determined - in consultation with the head coach and following the needs analysis of the players - that all players (including goal keepers) needed to improve their maximal oxygen uptake and aerobic capacity. Having all players participating in the same conditioning activity made facilitating sessions logistically more practical as well as being easier to monitor and coach.

Table 1 – Weekly Training Outline Of Pre Season Training For Men's Soccer

| | Session | Duration (mins) |
|-----------|------------------------------|-----------------|
| Monday | Skills | 90 |
| Tuesday | Resistance Training, Agility | 70 |
| Wednesday | Skills | 90 |
| Thursday | Conditioning | 70 |
| Friday | REST | - |
| Saturday | REST | - |
| Sunday | MATCH | 120 |

Program and Testing Outline

Players reported for training on Thursday 12th February, aware that the session would be used for testing. The 30-15 IFT was chosen as the “fitness” test because: it involves intermittent high intensity intervals that replicate match play more closely than continuous fitness tests, accurately measures peak oxygen uptake and ventilatory threshold and more importantly from a practical application viewpoint, the results of the test can be used directly for interval training prescription (3, 4). The test involves players performing repeat shuttles within a 40m in length

grid. Players spend 30 seconds running with 15 seconds passive recovery. Velocity increases incrementally by 0.5km/h each stage (similar to the continuous beep test). Termination criteria apply when the player fails to reach the 3m end zone on three separate occasions. Because the players have to run for a designated time, not distance (as per continuous beep test), three start lines (A,B and C) are present (Figure 1). During the test, players are instructed which line to begin at – depending on where they finish their running – via voice on the CD.

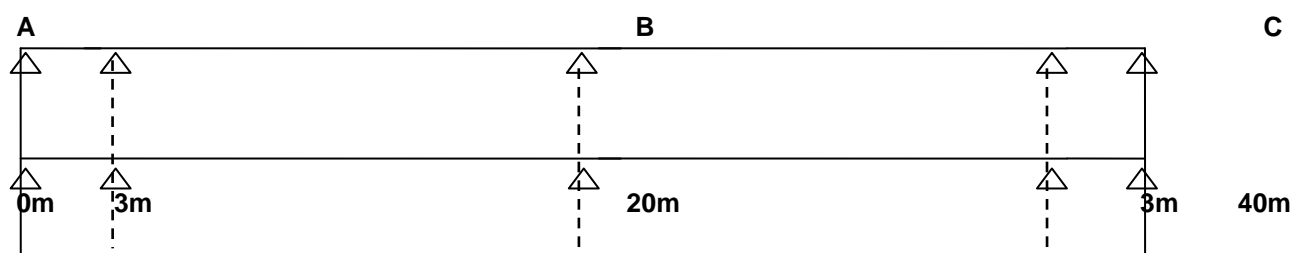


Figure 1 – 30-15 IFT Set Up

Using the results of the test, a training intervention was implemented over an eight week period (Table 2). Players completed two sets of repeat efforts with a four minute passive recovery period in between sets. Players had to complete their required distance in fifteen seconds, followed by a fifteen second passive recovery at the end of their distance. Distances were determined by individual results on the 30-15 IFT by using the spreadsheet created by French researcher Dr. Martin Buchheit PhD. Players with lower termination levels on the test ran less distance than players with higher results. A straight line protocol was used to eliminate the change in velocity a change in direction produces, and to reduce the risk of chronic groin, adductor or knee injuries that may result from a shuttle

type repeat bout. Durations of each session are located within Table 2. The program ran over 8 weeks and was performed on Thursday afternoons on a grass oval. Players were promoted or demoted to further or less distances at the discretion of the conditioning coach, depending on whether or not they looked to be cruising or struggling at their initial distance. Practically the session was easy to set up and only needed a field in length of approximately 100m, 10-15 markers and a trundle wheel to measure distance. A countdown timer with intervals was the preferred method of monitoring time during the session. After the eight week intervention the players were re-tested on the 30-15 IFT test to see if improvements had been made.

Table 2 – Weekly Training Program

| Date | Week | Sets x Reps | Intensity (%VIFT) | Work:Rest | Distance | Total Time (min) |
|----------|--------|-------------|-------------------|-----------|----------|------------------|
| 19 - Feb | Week 1 | 2 x 12 | 95% | 1:1 | As below | 16 |
| 26 - Feb | Week 2 | 2 x 13 | 100% | 1:1 | As below | 17 |
| 5 - Mar | Week 3 | 2 x 14 | 100% | 1:1 | As below | 18 |
| 12 - Mar | Week 4 | 2 x 15 | 100% | 1:1 | As below | 19 |
| 19 - Mar | Week 5 | 2 x 14 | 95% | 1:1 | As below | 18 |
| 26 - Mar | Week 6 | 2 x 16 | 100% | 1:1 | As below | 21 |
| 2 - Apr | Week 7 | 2 x 16 | 105% | 1:1 | As below | 21 |
| 9 - Apr | Week 8 | 2 x 16 | 105% | 1:1 | As below | 21 |

Distance to Travel at % VIFT (final velocity of intermittent fitness test)

| Final Result (km/h) | Distance (m) | | Distance (m) | |
|---------------------|--------------|---------|--------------|---------|
| | At 95% | At 100% | At 100% | At 105% |
| 18 | 71 | 75 | 75 | 79 |
| 18.5 | 73 | 77 | 77 | 81 |
| 19 | 75 | 79 | 79 | 83 |
| 19.5 | 77 | 81 | 81 | 85 |
| 20 | 79 | 83 | 83 | 88 |
| 20.5 | 81 | 85 | 85 | 90 |
| 21 | 83 | 88 | 88 | 92 |
| 21.5 | 85 | 90 | 90 | 94 |
| 22 | 87 | 92 | 92 | 96 |
| 22.5 | 89 | 94 | 94 | 98 |

RESULTS

After performing the intervention over an eight week period, results indicated an improvement in performance on the 30-15 IFT. The change in mean times (n=13) recorded on the test saw an improvement of 3.5%. Without performing a statistical analysis this change in performance would seem to be fairly small.

Discussion Point

The TIS boys' football team completed an eight week periodised high intensity interval training cycle, with an intermittent fitness test pre and post cycle. Their results on this test indicated that from test to re-test, the mean termination velocity in the 30-15 IFT improved. This may be attributed to the one per week high intensity interval training session that was conducted on Thursday afternoons. The results seem to suggest that this type of cycle - one conditioning session per week for an eight week period - can elicit an improvement in the aerobic system in soccer players in the 14-16 year age bracket. From a practical application viewpoint the use of variable distance high intensity interval training within a team environment, gives players the chance to improve their physiological parameters without having to adhere to a team based session, in which all players complete similar distances no matter what their aerobic level. In traditional conditioning sessions, all players - regardless of position, anthropometric build or aerobic conditioning level - complete the same distance in more or less the same time. This type of training would leave players at opposite ends of the aerobic capacity scale either completely taxed, or not challenged at all. Improvements in players' physiological variables at the lower or higher end of the team distribution may not be as efficient as they could be. Training using the direct prescription variables from 30-15 IFT, results in a simple, time efficient method the strength and conditioning coach can use to improve players maximal aerobic speed, peak oxygen uptake and ventilatory threshold.

REFERENCES

1. Bangsbo, J, Norregaard, L. and Thorso, F. Activity profile of competition soccer. *Canadian Journal of Sport Science*. 16: 110-116. 1991.
2. Bloomfield, J, Ploman, R. and P. O'Donoghue. Physical demands of different positions in FA Premier League soccer. *Journal of Sports Science and Medicine*. 6: 63-70. 2007.
3. Buchheit, M. The 30-15 Intermittent Fitness Test: Accuracy for individualising interval training for young intermittent sport players. *Journal of Strength and Conditioning Research*. 22: 365-374. 2008.
4. Buchheit, M, Al Haddad, H, Millet, G.P. et al. Cardio respiratory and cardiac autonomic responses to 30-15 Intermittent Fitness Test in team sport players. *Journal of Strength and Conditioning Research*. 32: 93-100. 2009.

Practical Application

Strength and conditioning coaches can have many athletes and teams under their guidance, be in charge of clubs with grade level teams combining players of varying skill and attitude, or be in direct affiliation with one club or team at the professional level. These varied levels of association with teams and athletes pose different challenges for strength and conditioning coaches to overcome. For coaches in an institute system for example, with limited time spread over varying sports, this method of conditioning can be used in a time efficient manner within varying sports. For coaches in charge of a football club for example, this method of training can be implemented across all grades no matter what skill level players are at. All players can be incorporated into one or separate sessions with aerobic capacity the only determinant of how far each player runs. For the coach in charge of a professional team, this session can be incorporated into periodised conditioning cycles in the pre season or in season, and doesn't take up extensive blocks of time. Players at all levels of competition react favourably to conditioning sessions that are time efficient, and that they feel they have worked hard in. High intensity interval sessions such as those prescribed from 30-15 IFT results achieve these goals.

CONCLUSION

An eight week high intensity interval training intervention was shown to improve mean results from test to re-test in the 30-15 IFT in male soccer players aged 14-16. 1 session per week was shown to be effective in improving physiological variables in players. 30-15 IFT based conditioning sessions are practical and time efficient methods that the strength and conditioning coach can implement in training cycles, in order to gain improvements in players physiological parameters.

Acknowledgements

The author would like to thank Dr. Michael Newton from Edith Cowan University for his assistance and support in preparing training cycles, and the players and head coach Dean May of the TIS boys' football program whose continued efforts during training assisted the completion of this paper.

5. Buchheit, M, Laursen, PB, Kuhnle, J et al. Game based training in young elite handball players. *International Journal of Sports Medicine*. 30: 251-258. 2009.
6. Dupont, G, Akakapo, K and Berthoin, S. The effect of in season high intensity interval training in soccer players. *Journal of Strength and Conditioning Research*. 18: 584-589. 2004.
7. Duthie, G, Pyne, D and Hooper, S. Applied physiology and game analysis of rugby union. *Sports Medicine*. 13: 973-991. 2003.
8. Helgerud, J, Engen, LC, Wisloff, U and Hoff, J. Aerobic endurance training improves soccer performance. *Medicine and Science in Sport and Exercise*. 33: 1925-1931. 2001.
9. Hoff, J and Helgerud, J. Endurance and strength training for soccer players: physiological considerations. *Sports Medicine*. 3: 165-180. 2004
10. Reilly, T. Physiological aspects of soccer. *Biology and Sport*. 11: 3-20. 1994.