

Effectiveness of treadmill vs ground-based repeated sprint training on sprint time and high-intensity running ability in youth female soccer players.

Richard Bucciarelli¹, Justin Cresser², Matija Vugrinicek³

Soccer Fitness Inc., Canada¹, SC Toronto Soccer Club, Canada², Soccer Fitness Inc., Canada³

Introduction and Purpose

In Canadian youth soccer, the pre-season period prior to the outdoor season typically comprises 6-8 weeks, beginning in mid-to-late March and ending in mid-to-late May. Repeated sprint training, consisting of 10 or more repetitions of high to maximal intensity sprints, is a commonly used training method during the soccer pre-season. This type of training is especially useful during pre-season because it has been shown to improve both speed as well as high-intensity running ability. Studies done on soccer players, as well as athletes in other sports, have demonstrated the effectiveness of a “ground-based” (running sprints on the ground) repeated sprint training protocol on improving speed and high-intensity running ability. High speed/high incline treadmill training (using specialized high speed running treadmills) is an alternative method of performing repeated sprint training. To date, there have not been any studies comparing a ground-based to a treadmill-based protocol for repeated sprint training in youth soccer players. The aim of this study was to examine the differences in speed and high-intensity running ability following a 6-week, 2 days per week, repeated sprint protocol using either a ground-based (GBT) or treadmill-based (TT) repeated sprint training protocol.

Methods

Female soccer players (N=17), recruited from a local youth soccer club, first completed a fitness assessment with a series of tests, which were as follows:

10, 20, and 35 Metre Linear Sprint (10SPRINT, 20SPRINT, 35SPRINT) – Infrared timing gates were set at the start and finish lines, as well as at the 10- and 20-metre marks. Athletes began from a stationary position with one foot on the start line and sprinted maximally through the finishing gates. Two trials were performed with the fastest time recorded.

Yo-Yo Intermittent Recovery Test-Level 1 (YO-YO) – The 20 metre course and 5 metre recovery zone were marked with cones. Athletes traveled out and back on the course keeping pace with audible beeps from the Yo-Yo CD and had 10 seconds recovery between each shuttle (40 metres). A warning was given after the first unsuccessful shuttle and the test was terminated after the second. The final stage completed was recorded.

Following testing, players were randomly assigned to either TT or GBT using a simple computer-generated randomization. 9 players participated in the Treadmill Training Group, and 8 players participated in the On-Field Training group. Both groups performed a 6-week, 2 sessions per week, repeated sprint training protocol, comprising of 15 repetitions of a 6-second maximal effort, separated by 60 seconds of passive recovery. A standardized 15-minute warm-up protocol was performed pre-training, and a body-weight strength circuit was performed post-training with both groups. Training was conducted as follows:

Treadmill Training (TT): This training was performed on the Woodway Pro-Elite high speed running treadmill. All players performed 15 repetitions of 6-second sprints, with exactly 60 seconds of recovery, and the treadmill set at a 25% grade. Running speeds were individualized for each participant at 75% of maximal running speed, as determined from the time taken to complete the “split” between the individuals’ 20 and 35 metre sprint test.

Ground Based Training (GBT): This training was performed at the Terra Sport facility field turf fields. All players performed 15 repetitions of 6-second maximal sprints on the ground, with exactly 60 seconds of recovery between each sprint.

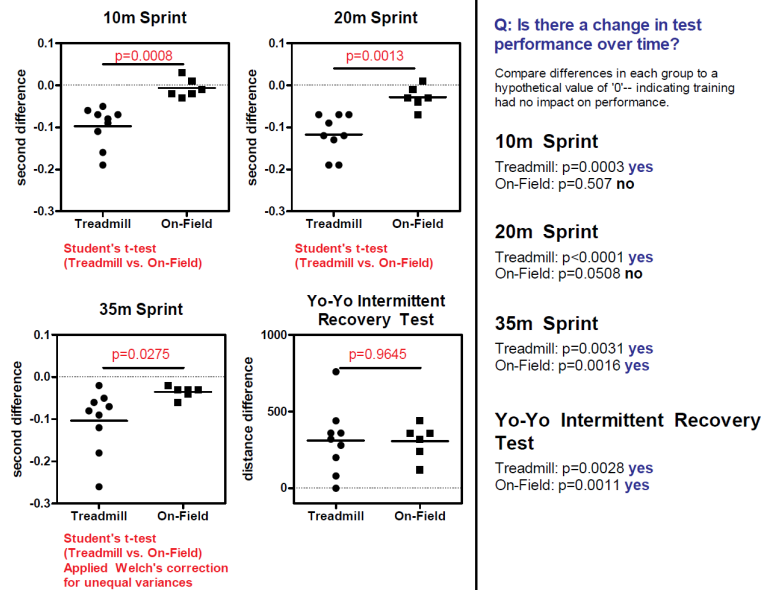
Results

At baseline, there was no difference in 10m, 20m and 35m sprint times between the TT and GBT groups. Improvement in sprint performance was assessed following 6 weeks of training by comparing the difference in sprint times pre- and post- training. Following 6 weeks of training, girls randomly assigned to TT had significant improvements in 10m, 20m and 35m sprint performance.

There was no difference in distance covered pre- and post-test between TT and GBT in the Yo-Yo Intermittent Recovery Test. When evaluating program effectiveness, there was a significant improvement in player performance in the TT group for all tests post-training (10m, 20m, 35m sprint and Yo-Yo Intermittent Recovery Test). The GBT group showed improved performance in 35m sprints and the Yo-Yo Intermittent Recovery Test, but not in the shorter sprint distances (Figure 1).

Results

Figure 1. Difference in 10m, 20m and 35m sprint times as well as Yo-Yo Intermittent Recovery Test scores between TT and GBT groups.



Discussion and Conclusions

Results of the study indicate that Treadmill Training produced a significantly greater increase in running speed with a small – but also greater – increase in high intensity running ability, than On-Field Training. The exact mechanisms responsible for the improvements in performance as a result of repeated sprint training are not clear. RSA itself was not assessed in our study, but RSA is a complex physical ability that requires both a strong neuromuscular/anaerobic component (speed, power) as well as a strong metabolic component (oxidative capacity, creatine phosphate replenishment, H⁺ buffering).

Thus, repeated sprint training will place a great demand on athletes’ anaerobic and aerobic energy systems, not surprisingly leading to improvements in both speed and high intensity running ability, as were demonstrated in our study. Because TT was shown to elicit a greater improvement in sprint times over shorter distances (10 and 20 metres) it is possible that TT is more effective at training and improving the neurological component of RSA. Since speed and repeated sprint ability is a critical component of performance in soccer, the results of this study warrant further research into using high speed / high incline treadmills as a means of improving these physical abilities in soccer players.

Perhaps, more research using a TT repeated sprint training protocol with additional assessments including measurements of running economy such as stride length, stride frequency, and pelvic displacement, as was done in the study by Myer et. Al. (2007), could determine whether or not the improvements seen in 10/20 metre sprint times from TT were due to improved ability in these markers of running economy.

Acknowledgements

Thanks is extended to the following teams and coaches for participating in this study:

- Frank Iaizzo and Peppe Raso, Technical Directors, International FC
- Matija Vugrinicek, Senior Strength and Conditioning Coach, Soccer Fitness
- Francesco Vescio, Joe Vecchione, Strength and Conditioning Coaches, Soccer Fitness
- Julia Burgess, Head Coach, SC Toronto 1998 Girls
- Mario Consiglio, Head Coach, SC Toronto 1995 Girls
- All players from the SC Toronto 1998 and 1995 Girls