

Effectiveness of treadmill versus ground-based speed training on speed, power and high-intensity running ability in elite Canadian youth female soccer players.

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Introduction and Purpose

Speed training is a commonly used method of developing fitness in soccer, and it has been shown to elicit improvements in soccer players' acceleration and running speed. The use of a high speed running treadmill may be advantageous versus over-ground running, due to the fact that running speed can be more closely controlled, and also that coaching and correcting running technique is easier to accomplish. To date, there has been little research comparing the effectiveness of speed training using a high speed running treadmill versus ground-based speed training, on markers of physical fitness in soccer players. The aim of this study was to measure improvements in speed – as measured over short, medium and longer distances specific to the sport of soccer – from training done using a high speed treadmill training protocol, versus a ground-based training protocol, in elite youth female soccer players.

Methods

Female soccer players (N=19), recruited from a local youth soccer club, first completed a fitness assessment with a series of linear running speed tests, at 10, 20, and 35 metres.

Infrared timing gates were set at the start and finish lines, as well as at the 10- and 20metre 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.

Following testing, players were randomly assigned to either Control (CT), Ground-Based Training (GBT), or Treadmill Training (TT) groups, using a simple computer-generated randomization. 6 players participated in each of the CT and GBT groups, and 7 players participated in the TT group. Each training protocol comprised 10 weeks of training, with 1 training sessions completed each week (training protocol was similar to that used by Tonessen et al., 2011). A standardized 15-minute warm-up protocol was performed pre-training with both training groups. Training was conducted as follows:

Treadmill Training (TT): This training was performed on the Tuff Tread HS Elite high speed running treadmill at the Soccer Fitness Training Centre. All players performed 2-5 sets of 4-5 repetitions of 5-second sprints, with 90 seconds of recovery between repetitions, and 10 minutes recovery between sets, matched in volume and intensity to the protocol used previously by Tonessen et al. (2011); (See Table 1). Running speeds were individualized for each participant at 100% 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 on an indoor, synthetic turf soccer field. All players performed a similar speed training protocol as the TT group (See Table 1). Training volume and intensity, including number of sprints and sprint speeds, were kept consistent between the TT and GBT groups.

A mixed design, repeated measures analysis of variance (ANOVA) was used to analyze and compare the differences in scores between the TT, GBT, and CT groups pre- and post-training intervention, for all outcome measures used (10, 20 and 35m Sprint).

Table 1. Speed Training protocol (Tonessen et al., 2011)

Week#	#Sets	#Reps	Distance (m)	Recovery Time (min)	Set Recoervy Time (min)	Intensity
1	3	4	40m	1.5min	10min	95-100%
2	4	4	40m	1.5min	10min	95-100%
3	5	4	40m	1.5min	10min	95-100%
4	2	5	40m	1.5min	10min	95-100%
5	3	5	40m	1.5min	10min	95-100%
6	4	5	40m	1.5min	10min	98-100%
7	2	5	40m	1.5min	10min	98-100%
8	3	5	40m	1.5min	10min	98-100%
9	4	5	40m	1.5min	10min	98-100%
10	2	4	40m	1.5min	10min	98-100%

Results

In speed testing, TT elicited a significant improvement (p < 0.05) in both the 10-, 20- and 35-metre speed tests (mean pre- and post-training sprint times in TT were 1.94s-1.84s, 3.38s-3.23s, and 5.45s-5.20s, respectively), whereas GBT did not (see Figures 1, 2, and 3).

Figures 1, 2, and 3. Mean sprint time changes (s) in 10, 20, and 35m sprint tests







Discussion and Conclusions

Results of this study indicate that speed training using TT may be more effective than speed training using GBT in improving speed and acceleration in elite youth female soccer players. The specific mechanisms responsible for the greater improvements seen in acceleration and running speed from TT were not investigated in this study, but may include greater training intensity, including a higher and more controlled running speed. Further research is warranted, including research using different protocols of TT and GBT, as well as research examining the mechanisms responsible for improvements in acceleration and running speed

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