

Effectiveness of Treadmill versus Ground-Based Over-Speed Training on Speed, Power, and High Intensity Running Ability in Elite Youth Female Soccer Players: A Pilot Study

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Soccer Fitness Inc.

- A soccer-specific strength and conditioning facility located in Toronto, Ontario, Canada.

Our Principles of Training:

1. Athlete
Assessment and
Monitoring of
Training

2. Functional, Sport-
Specific Training

3. Science-Based
Training

4. Customization
and Periodization of
Training

5. Athlete/Coach
Education and
Professional
Development

6. Athlete
Enjoyment



Introduction

- Speed is a critical characteristic of performance in female soccer
 - Speed is the ability to achieve maximum velocity, typically determined with the following equation: stride length x stride frequency
 - Speed in soccer: maximum velocity, maximum acceleration (change in speed), repeated sprint sequences, intermittent high intensity running activity
- Acceleration is a key characteristic of speed in female soccer:
 - “Top class” – national team – female players perform more high intensity running and sprinting than “high level” – non-national team professional players (Mohr *et. al.*, 2008)
 - Average number of sprints per game in elite female soccer: 26 (Krustrup *et. al.*, 2005)
 - Average sprint distance in female soccer: 15.8m (Vescovi *et. al.*, 2012)



Introduction

- To improve acceleration:
 - Improve stride length - increase leg strength and leg power
 - Linear Sprints
 - Resisted Sprints (Spinks *et al.*, 2002)
 - Plyometrics (Chelly *et al.*, 2014)
 - Resistance training (80% 1RM (Reilly, 2006)
 - Incline Running
 - Incline Treadmill Running (Myer *et al.*, 2007)
 - Improve stride frequency- requires increasing speed of leg muscle contraction (also termed “over-speed training”)
 - Downhill running (Chen *et al.*, 2006)
 - Assisted sprint training with elastic loading device (Upton, 2011)
 - Improvements in acceleration in female soccer players have been seen with the use of elastic loading devices (“Ground Based Training”) (Upton, 2011)



Introduction

- Upton (2011):
 - AST (Assisted Sprint Training) Group: 4 weeks, 3 training sessions per week (12 training sessions in total)
 - Protocol: 10 x (3-second/15 metre assisted sprint) using the Power Cords, with 3 minutes rest between repetitions
 - Results: AST Group:
 - Significant improvement in maximum velocity (40-yard sprint)
 - Significant improvement in acceleration (0-5 yards, 5-15 yards); 15 yards = 13.7 metres

Introduction

- At Soccer Fitness Inc., we are interested in maximizing the efficiency of training for elite athletes; one of the ways in which we do this is through the use of a high speed running treadmill
- High Speed Treadmill Training:
 - Is an alternative method of over-speed training
 - May be effective in improving stride frequency by increasing the speed of leg muscle contraction when running
 - May be advantageous to elastic loading devices because workload can be customized to each individual athletes, and also because workload can be more easily controlled, allowing coaches to focus on quality of movement
 - Has been shown to increase activation of specific muscles involved in sprinting, i.e. hamstrings and hip flexors (Higashihara, 2010)

To date, no studies have examined the effects of high speed treadmill training on acceleration in youth female soccer players

Aim of the Study:

to compare the effects of high speed treadmill over-speed training with ground-based over-speed training on speed, power, and high-intensity running ability in elite youth female soccer players

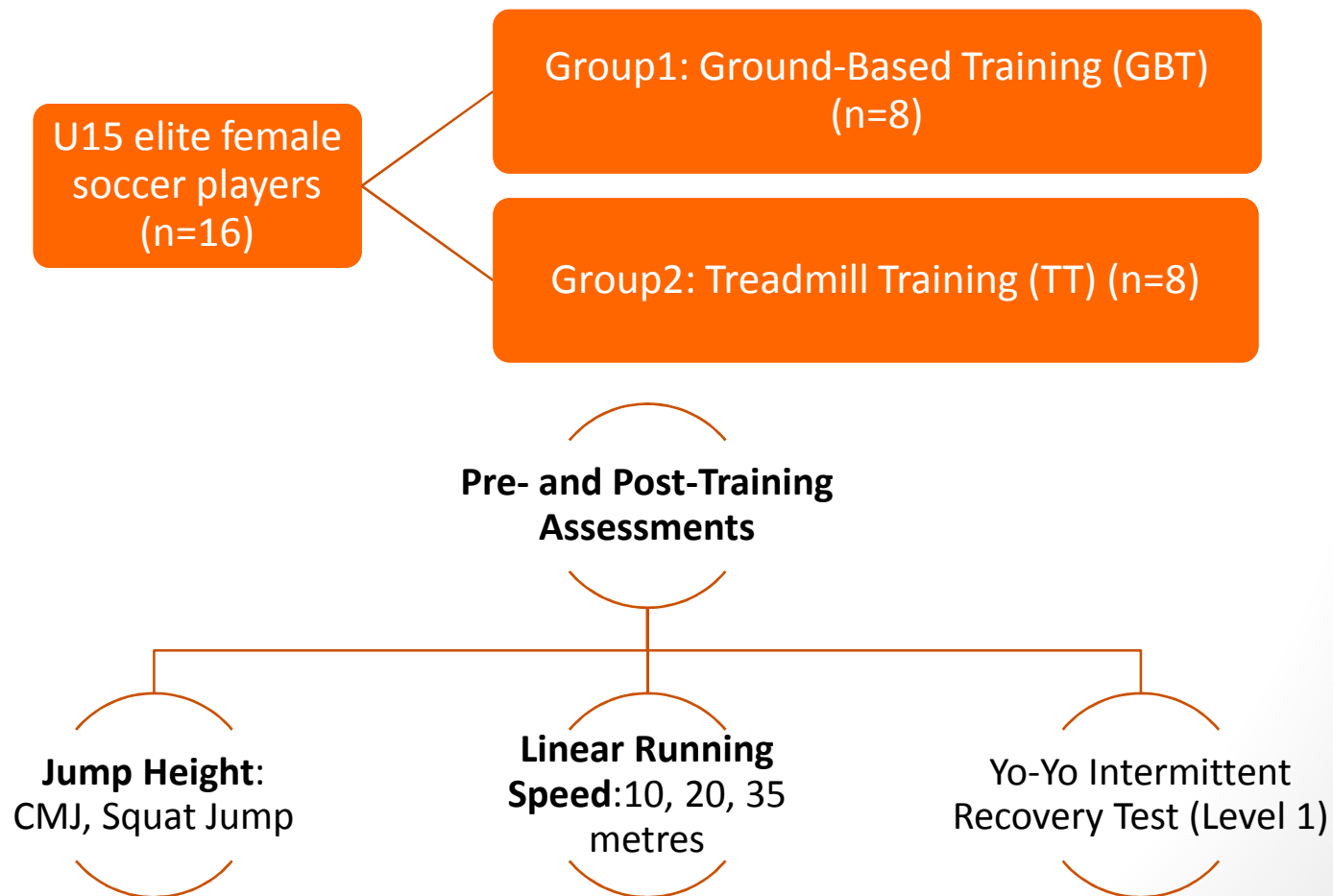
Methods

- Tuff Tread HS Elite High Speed Running Treadmill:
 - Maximum speed: 30 MPH / 42.8 KMPH
 - Maximum incline: 40%
 - Uses un-weighting harness (for safety, and to allow athletes to reach speeds higher than they can normally reach on the ground)



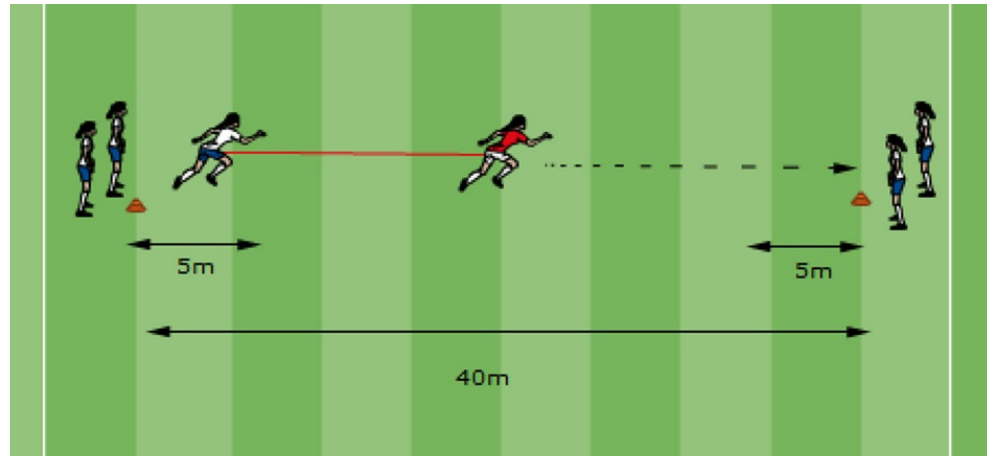
Methods

- 6-week (2 sessions per-week) training-based study; training protocols based on Upton (2011)



Methods

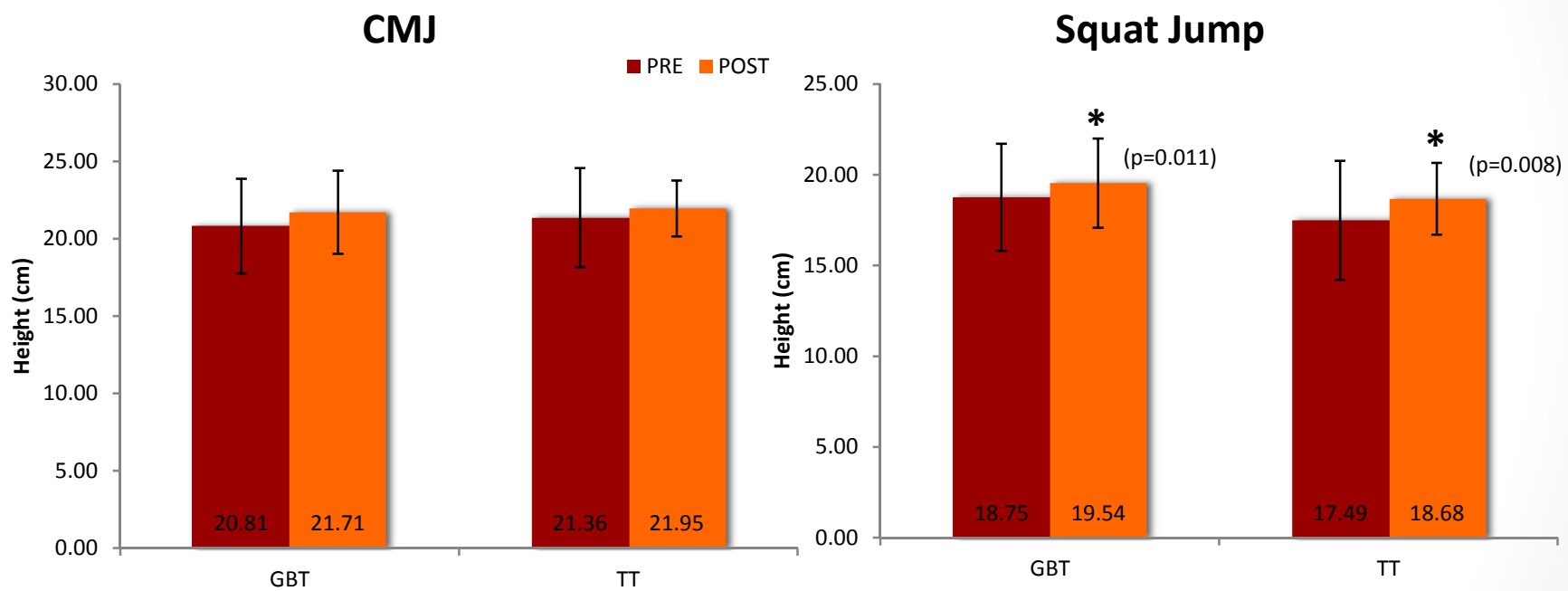
- GBT Group
 - Standardized 10-minute warm-up
 - 10 x maximal effort (3-4s) assisted sprints (Power Cords) of 25m, with 5m of acceleration and 5-10m deceleration, and 180s rest between repetitions



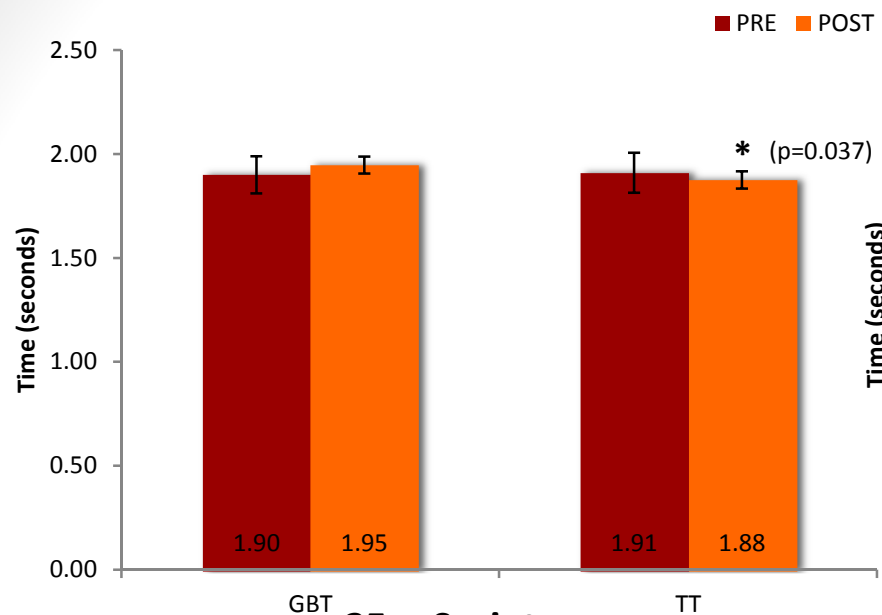
Methods

- TT Group
 - Standardized 10-minute warm-up
 - 10 x maximal effort (3-4s) high speed treadmill sprints (Tuff Tread HS Elite) at 120% maximal running speed, and with 180s rest between repetitions

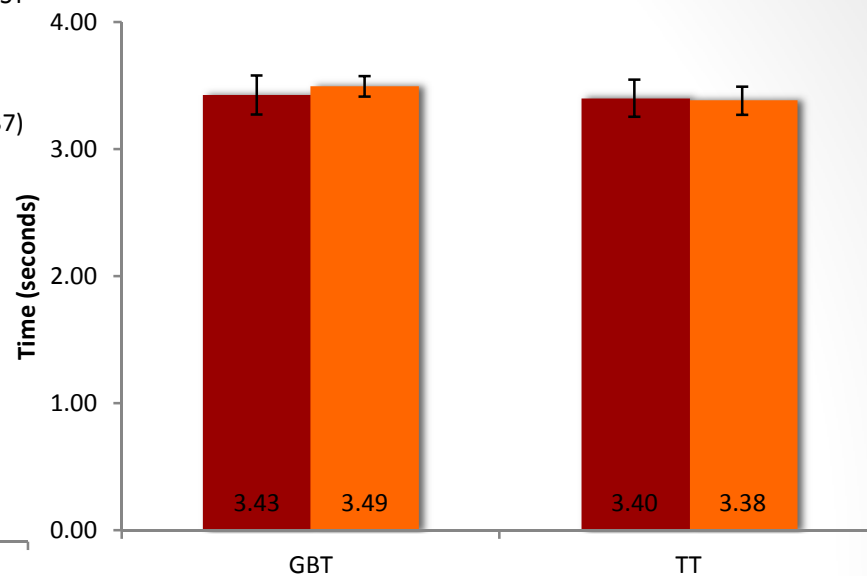




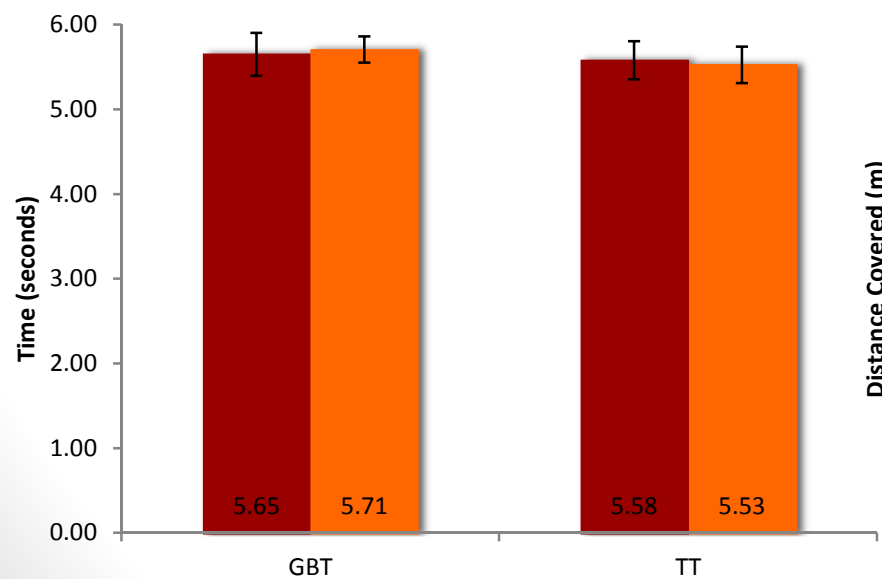
10m Sprint



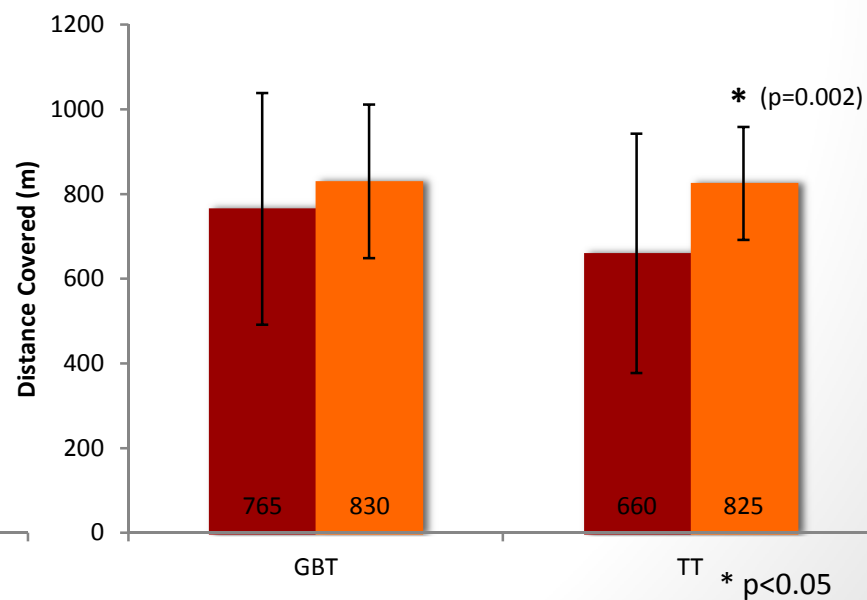
20m Sprint



35m Sprint



YYIRT-L1



Discussion/Conclusions

- TT was shown to be effective in improving acceleration (10m sprint) and high intensity running ability (YYIRT)
- TT and GBT were both shown to be effective at improving leg power (squat jump)
- It is possible that the improvements resulting from increased acceleration ability led to better neuromuscular recruitment, which had an effect not only on acceleration ability, but also on jump ability and high intensity running ability

Future Directions

- Larger sample sizes
- Different assessments of acceleration (5 metre/15 metre, 0-5/5-10/10-15/5-15 metre sprint split times)
- Different training protocols (4 weeks / 3 training sessions per week, etc.)
- Different high speed treadmill training protocols (workload >120% of maximal running speed)
- Quantify workload with elastic loading device
- Compare high speed treadmill training with other methods of over-speed training (e.g. downhill running)

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