CAN SHORT BOUTS OF TECHNIQUE TRAINING IMPROVE SPRINT TECHNIQUE AND PERFORMANCE IN YOUTH SOCCER PLAYERS?

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This study aimed to investigate whether a technique-oriented intervention would result in improvements in sprint running technique and sprint performance in youth soccer players. Fourteen youth soccer players with pelvis and trunk control issues were divided into intervention and control groups. The intervention group did three weekly 15 minute running technique-oriented training sessions over seven weeks while their counterparts continued with their usual training programme. Sprint performance and technique were assessed before and after the intervention with a Laveg device and two video cameras, respectively, during a 40-m maximal sprint test. The players of the intervention group showed improved control of the trunk and pelvis ($p \leq 0.01$) while no change was observed in the control group. Both groups showed a trend for improvement in sprint performance.

KEYWORDS: qualitative analysis, intervention, football

INTRODUCTION: Reaching high maximal speed and high-intensity runs in soccer are crucial for match outcomes (Mallo et al., 2015). Although these high-intensity sprints account for just about 10% of the total distance covered during a match (Faude, Koch, & Meyer, 2012), sprinting is the single most frequent locomotive action in goal situations performed by either the scoring player or the one assisting. A recent study showed that greater distances covered at sprint speeds can be used to identify young players with the potential to succeed in the short and long term (Alcântara et al., 2022).

Most research on sprint training in soccer players highlights the use of isolated free sprint training, weight/strength training, resisted sprint training, and plyometric training to improve sprint performance (Hammami et al., 2019; Morin et al., 2017; Lockie et al., 2012). These papers reported a reduction in flight time and increase in step length, horizontal force and power with accompanied improvements in sprint performance. Nevertheless, these intervention studies did not directly address the running technique.

Although not conclusive, several studies have reported that poor sprinting technique is a risk factor for sprint-related injuries (Kalema et al., 2022). More specifically, excessive anterior pelvic tilt and trunk side-bending whilst sprinting are suggested to increase the risk of sustaining hamstring injuries in soccer players (Schuermans et al., 2017). Such injuries cause layoffs, which indirectly affects performance negatively. It could therefore be hypothesized that running technique interventions could be a useful method to improve the sprint technique and performance of soccer players.

There is, nevertheless, a scarcity of literature on sprinting technique interventions in soccer players. Lupo et al. (2019) showed that running technique intervention is an effective method of improving sprint performance in prepubescent soccer players. However, the researchers did not report on the specific modifications the intervention elicited in the technique of the players. In amateur athletes, Mendiguchia et al. (2021) showed that improvements in sprinting technique (including pelvis and trunk control) resulted in better sprint performance. The aim of the current study was to assess the impact of a technique-oriented intervention on sprint technique and performance in youth soccer players.

METHODS: Elite youth (U16 male academy team) soccer players (n=29, age 14.7±0.4 years, height 173.4±4.7 cm, weight 61.2±6.5 kg) performed two maximal effort 40-m sprints to assess their technique and performance at the beginning (START) and end (END) of the intervention period. Written informed consent was obtained from the legal guardians of the players. Based on

qualitative video analysis, 14 of these players were identified with sprinting technique issues relating to trunk and pelvis control and were assigned either to a control (CNTRL, n=7) or intervention (INT, n=7) group.

The INT group participated in three weekly 15-minute running technique sessions (Table 1) delivered by a Sports Biomechanist, over seven weeks while the CNTRL group continued their usual training. The exercises of the intervention programme were designed together with the strength and conditioning coaches. Video feedback on the individual objectives regarding trunk and pelvis control were provided to the INT group during the training sessions. The assessment was repeated at the END.

Table 1. Intervention programme received by the INT group.

Type of training	Day of the week	Exercises with video feedback
Coordination and postural control drills	Sunday (AM)	Forward, backward, and lateral hops with arm swing Running postural stances with/without weights
Coordination and sprinting technique drills	Monday (AM)	Hops and bounds with and without arm swing and upright trunk posture A and B-skips with variations Sub-maximal sprinting strides
Maximal speed running with feedback	Wednesday (PM)	Maximal speed running with feedback on individual objectives

The fastest sprint trial at the START and the END assessments for the players were used for PRE and POST analysis. The maximum speed ($m \cdot s^{-1}$), and average speed ($m \cdot s^{-1}$) at every meter were assessed during the 40-m sprints with a Laveg device (LDM 300 C, Jen Optik, Gmbh, Germany). For technique analysis, sprints were filmed with two video cameras (sagittal and frontal views at 100 frames per second). Key images on trunk posture (anterior lean and lateral flexion at mid-stance), control of the pelvis (hip drop at mid-stance), and knee drive at toe-off of the opposite leg were extracted from the video at maximum speed phase (at around 30-35 m). A panel of ten experts (Biomechanists and Strength and Conditioning coaches) rated the pre-selected images of key positions for possible improvements in technique between PRE and POST assessments on a scale from 1 (no improvements) to 5 (definite improvement) for both the INT and CNTRL groups. The independent raters were not aware of the specific players that took part in the intervention. The ratings of technique improvement were compared using a paired sample t-test and Aiken's V (Penfield & Giacobbi, 2004) was calculated to determine inter-rater validity. A 1-dimensional statistical parametric mapping (1D-SPM) was applied to the Laveg data to assess improvements over the 40m sprint through a 2x2 (INT/CNTRL x PRE/POST) ANOVA.

RESULTS: The INT group showed significant ($p \leq 0.01$) improvements in running technique compared to the CNTRL group (Table 2)**,** with a significant agreement between the experts (Aikens $V \geq 0.75$, 95% CI). Specifically, the INT group reduced lateral flexion and forward lean of the trunk, as well as pelvic drop (Figure 1).

Table 2. Average rating of improvements for the INT and CNTRL

	Intervention group	Control group
Trunk control	3.14 ± 0.86	1.54 ± 0.44
Pelvic drop	3.04 ± 1.03	1.74 ± 0.37
Knee drive	2.54 ± 1.01	1.46 ± 0.62

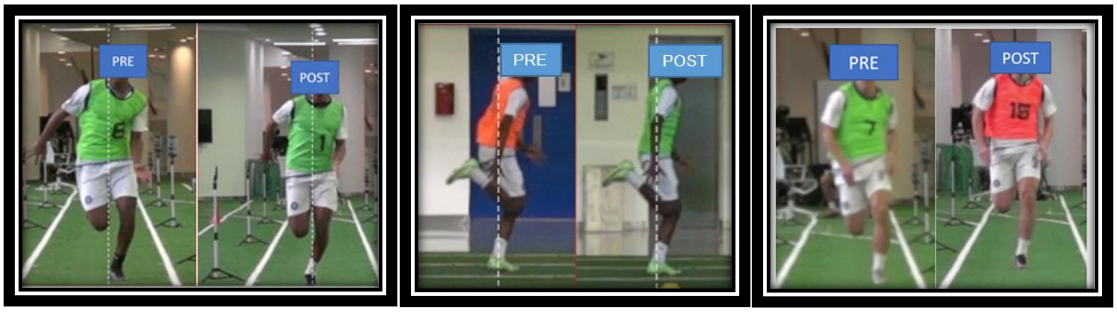

Figure 1: Examples of improvements in trunk control and hip drop in the intervention group

Although the 1D-SPM showed no statistically significant differences, a trend for improvement in sprint performance (max speed: 8.57±0.52 $m \cdot s^{-1}$ to 8.82±0.30 vs. 8.53±0.21 to 8.69±0.18 $m \cdot s^{-1}$, INT and CNTRL, respectively) was seen post-intervention (Figure 2).

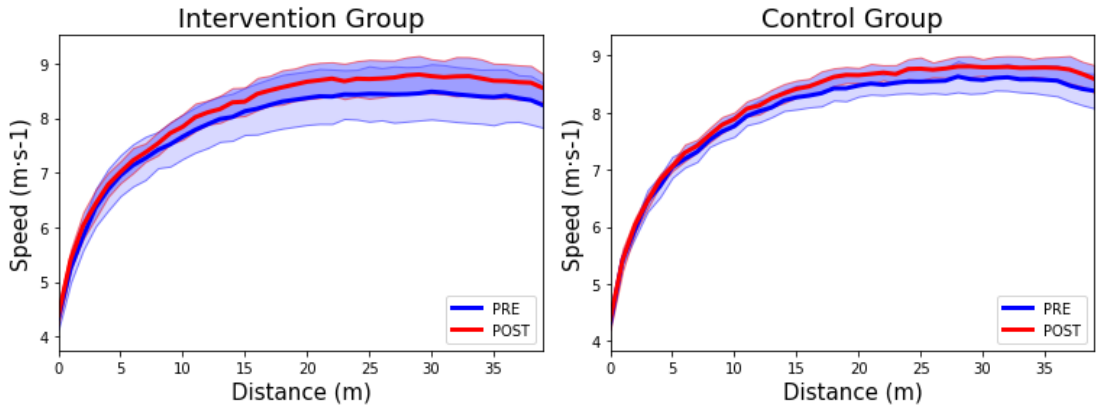

Figure 2: Speed-distance graphs at pre and post-intervention test INT and CNTRL groups.

DISCUSSION: The results of this study indicates that exposing youth soccer players to short bouts of technique training may result in improvements in their sprinting technique, namely better control of the trunk and pelvis during the stance phase at maximal speed sprinting. This finding is similar to the previous intervention study of Mendiguchia et al. (2021), who did three weekly sessions over six weeks with amateur athletes. Previous studies (Mendiguchia et al., 2021; Schuermans et al., 2017) have suggested that good trunk and pelvis control may reduce the risk of hamstring injuries, common in soccer players.

Another positive finding was that the sprint performance of the INT group was not compromised by the technique intervention despite the somewhat lower training volume/intensity compared to the CNTRL group. In fact, there was a similar trend of improvement in performance in the INT and CNTRL groups. This finding is concurrent with the two similar intervention studies of running technique training on sprint performance (Mendiguchia et al., 2021; Lupo et al., 2019, with prepubescent soccer players). Compared to the previous studies using relatively long intervention sessions (30-60 mins), the short intervention sessions used in the present study (15 mins) may be sufficient to achieve similar technique and performance outcomes thus minimizing the time taken off from soccer and other physical training.

The findings of the study should be interpreted with caution due to limitations with sample size, and relying only on the interrater agreement for determining the improvements in sprinting technique.

CONCLUSION: The current study indicates that short and specific technique-oriented training bouts over seven weeks can improve sprint technique in youth soccer players without any adverse effects on sprint performance. Such short interventions would be easier to integrate as part of the training session without compromising football training volume.

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