Sprint Training in Preadolescent Soccer Players

Massimo Venturelli, David Bishop, and Lorenzo Pettene

Young soccer players are usually trained with adult-training methods, even though the physiological adaptations are likely to be very different compared with adults. In contrast, some have suggested training preadolescents only with coordination training. The purpose of this study was to investigate whether coordination or repeated-sprint training better improved speed over 20 m, with and without the ball. Sixteen soccer players (mean age 11 ± 0.5 y) were randomly assigned to a sprint-training group (STG = 7) or a coordination-training group (CTG = 9). The STG trained twice a week for 12 wk and performed 20 repetitions of 20- and 10-m sprints; the CTG performed coordination training (eg, speed ladder running) for the same training duration. Maximal jump height, anthropometric measures, and 20-m sprint time, with and without ball, were evaluated before and after the training period. Statistical significance was determined using two-way ANOVA with repeated measure and Pearson test for correlation. Both groups improved speed without the ball: STG = 3.75 ± 0.10 s to 3.66 ± 0.09 s (P < .05); CTG = 3.64 ± 0.13 s to 3.56 ± 0.13 s (P < .05), with no difference between groups. Sprint time with the ball pre- and posttraining was 4.06 ± 0.11 s and 4.05 ± 0.19 s (P > .05) for STG and 4.04 ± 0.12 s and 3.82 ± 0.15 s (P < .05) for CTG, with a significant difference between groups posttraining (P < .05). There were significant correlations between sprint time without ball, CMJ, and SJ. These data suggest that coordination training increases the speed with the ball more than typical repeated-sprint training. It can be hypothesized that running speed with ball improved more in CTG because this particular action requires improvements in coordination.

Keywords: adolescent, coaching, exercise performance

Preadolescence is a stage of development characterized by great physiological changes in the musculoskeletal and neuromuscular systems. Physiological adaptations in preadolescents after physical training may therefore be expected to be different compared with adults.1 Despite this, previous studies have shown that young athletes trained with adult-training methods are able to improve sprint performance.2

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Rather than use adult-training methods, some authors have suggested to train children (9 to 13) using only coordination training, as in this age range the neuromuscular adaptations are easy to improve.\textsuperscript{3} Despite this suggestion, it is not known whether coordination training is superior to other types of training for improving technical skills (such as sprinting with ball) and physical performance (such as sprint without ball and jump height), which have been suggested to be important for talent identification in preadolescent soccer players.\textsuperscript{4} The purpose of this preliminary study therefore was to investigate, in preadolescent soccer players, the effects of coordination or repeated-sprint training on speed, with and without a ball, and jump height.

**Methods**

During (September–November) 18 preadolescent male soccer players at the 1st stage of maturation\textsuperscript{5} (mean ± SD: age 11.0 ± 0.5 y, mass 40.5 ± 5.0 kg, height 149.0 ± 6.0 cm) were selected from juniors development squad of the professional Italian soccer team ChievoVerona. Subjects trained and played in the same team that was involved in the national championships. All subjects and their parents were informed about the purpose of the study; relatives of the children gave their informed consent to participate.

Before and after a training period and following a 5-min warm-up (jogging without stretching), subjects were evaluated for best 20-m sprint time, with (SWB) and without the ball (SNB); maximal squat jump (SJ) height; and countermovement jump (CMJ) height. The tests were performed in this order, with 5-min passive rest between tests, and the best of 3 trials for each test was recorded before a baseline familiarization. During SWB, test players were required to achieve the fastest possible time while maintaining the ball near the feet and performing a minimum of 5 touches. Sprint tests were evaluated using photoelectric cells, whereas vertical jump tests were performed using Optojump (both from Microgate Bolzano, Italy).

Subjects were then randomly assigned to a sprint-training group (STG = 9) or a coordination-training group (CTG = 9); two goalkeepers did not attend training with the minimum frequency (2 times a week) and were excluded from the analysis (ie, final n for STG = 7).

Training for STG was based on maximal sprints of 10 and 20 m on a natural grass field, for a total of 20 repetitions, with 60 to 90 s of passive recovery between repetitions. Training for CTG was based on multilateral coordination exercises executed on the same field: 10 repetitions of speed ladder runs, 10 repetitions of high-knee skipping, 10 repetitions of lateral skips, 10 repetitions of changing rhythm during slow running, and 10 repetitions of different arm movements while skipping. The coordination drills were performed at 2 to 2.5 m s\textsuperscript{-1} for a distance of 10 m. The number of repetitions for both groups did not change throughout the training period.

Both groups trained twice a week (30 min) for a total of 12 weeks; the residual training and match time was not different between groups as the coach maintained the same group partition for the tactical technical training; the mean match time for each group was also equivalent (330 min vs 320 min; \(P > .05\)). Repeated-
measures two-way ANOVA, with post hoc analysis (Bonferroni), were used to determine significant training or group effects. Pearson correlation coefficients were used to analyze the baseline data; significance for all tests was set at $P < .05$.

**Results**

All data at baseline were significantly equivalent for both groups; there was no significant change in SJ height for STG (21.9 vs 23.1 cm) or CTG (24.9 vs 25.4 cm). Similarly, there was no significant change in CMJ height for STG (23.5 vs 23.4 cm) or CTG (25.9 vs 26.1 cm). Both groups had a significant improvement in 20-m sprint time without the ball following training (Figure 1), with no significant difference between groups. In contrast, only CTG had a significant improvement in 20-m sprint time with the ball (Figure 2). No significant correlations were observed between baseline anthropometrical measures and sprint or explosive power outcomes; however, there were significant correlations between SJ and SNB ($r = .64; P = .008$) and between CMJ and SNB ($r = .67; P = .004$).

**Discussion**

The main finding of this study was that despite no significant difference between groups for explosive power or 20-m sprint time (without the ball), coordination training resulted in significantly greater improvements in 20-m sprint time with the ball than repeated-sprint training. No significant correlations were observed between anthropometrical parameters and speed, SJ or CMJ results; however, there were significant correlations between explosive power, as measured by jump height, and sprint time without the ball.

There was a significant increase in sprint speed without the ball for both groups, with no difference between groups. Kotzamanidis$^2$ has previously reported slightly greater improvements in 20-m sprint time (3.7% vs 2.4% in the current study) in adolescents following 10 weeks of sprint training only. This greater improvement can probably be attributed to the recruitment of nonathletic boys vs elite junior soccer players in the current study.$^6$

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<th>STG</th>
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<th>CTG</th>
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<td>Pre</td>
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<td>20 m without ball</td>
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<td>Time (s)</td>
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<td>20 m with the ball</td>
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<td>Time (s)</td>
<td>4.06 ± 0.11</td>
<td>4.05 ± 0.19</td>
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<td>Explosive power</td>
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<td>SJ height (cm)</td>
<td>21.9 ± 3.4</td>
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<td>24.9 ± 5.5</td>
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<td>CMJ height (cm)</td>
<td>23.5 ± 2.1</td>
<td>23.4 ± 2.9</td>
<td>25.9 ± 4.9</td>
<td>26.1 ± 3.8</td>
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*Figure 1— Speed and explosive results for both groups before and after training.
In contrast to the similar speed improvements without the ball, data from this study suggest that coordination training improved speed with the ball more than the typical repeated-sprint training. Coordination training as performed in this study may therefore provide a greater neural stimulus, resulting in better intra-muscular and intermuscular coordination. We propose that running speed with the ball is faster for CTG because this particular action requires good coordination. To our knowledge, this is the first study to compare the effects of different training methods on sprint speed with the ball.

Maximal vertical jump height, evaluated by SJ and CMJ, was unchanged during the training period with no significant differences between groups. These data are in contrast to a previous study that reported significant improvement in SJ height after 10 weeks of sprint training.² It is not clear why these differences occurred as both studies involved the training of preadolescents for 10 to 12 weeks. However, once again, greater improvements may have been seen in the previous study because the preadolescents were less well trained compared with those in the current study.

Conclusions

These data suggest that coordination training increases a specific soccer skill (sprinting with ball) more than typical repeated-sprint training. It can be hypothesized that running speed with ball improved more in CTG because this particular action requires improvements in coordination ability, and the incomplete development of motor skills in preadolescent children could be influenced by this training.
References


