

Sprint conditioning of elite soccer players: Worth the effort or lets just buy faster players?

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Expert Opinion | Sprint | Training | Soccer

Headline

Straight sprinting is the most frequent physical action prior to goals for the scoring and assisting player (1). Sprinting capacity separates soccer players of varying standards of play (2, 3). Total sprint distance and number of sprints undertaken during games have increased by 35% and 85% in English Premier League players from the 2006-07 to the 2012-13 season (4). Additionally, professional players have become faster over time (2, 3). Clearly, sprinting skills are becoming more and more important in modern soccer.

Aim. The aim of this commentary is to shed some light on the challenges associated with sprint conditioning of elite soccer players and to question its value.

Discussion

Expected sprint training effects. In research literature, the majority of soccer related training interventions have provided positive effects on sprinting capabilities (5, 6). At the extreme, improvements up to 6-7% over short sprint distances (5-20 m) have been observed in soccer players following sprint training twice a week over 6-8 weeks (5). However, the overall positive findings may be explained by a publication bias in favor of substantial improvements, and that the majority of studies have been performed on young and/or untrained players. Indeed, sprint performance becomes more resistant to training enhancement with increasing performance level, age and training status (2, 3, 7-10). Studies based on track-and-field statistics show that athletes could spend years training to improve only a few hundredths of a second over short distances (7-9), and mean peak performance in world-class sprinters is achieved at 25-26 years of age (8). In soccer players, sprint performance peaks several years earlier. Cross-sectional analyses of varying age categories in males (Fig. 1) reveal practically no further development in sprint velocity after the age of 20-22 y (2). Female players struggle even more to improve their sprinting velocity from junior to senior age, as peak performance in speed is achieved already in the mid-teens before it stabilizes through adulthood (10). Thus, if physical skills relevant for soccer are not well developed at late junior or early senior age, it becomes more challenging to develop these capabilities to the required level.

Trainability of varying sprinting skills. Sprint performance is generally more resistant to training enhancement compared to other physical capabilities (7-8). Previously published intervention studies in well-trained soccer players show that acceleration capacity (e.g., 0-20 m) is more resistant to training than peak velocity and repeated sprint performance (11-13). Thus, players are more disposed to adaptations over somewhat longer but less soccer-specific sprint distances. Players perform a high number of brief accelerations during training/games (4) and rarely reach their true peak velocity (14). Thus, most players have largely maximized their accelerated

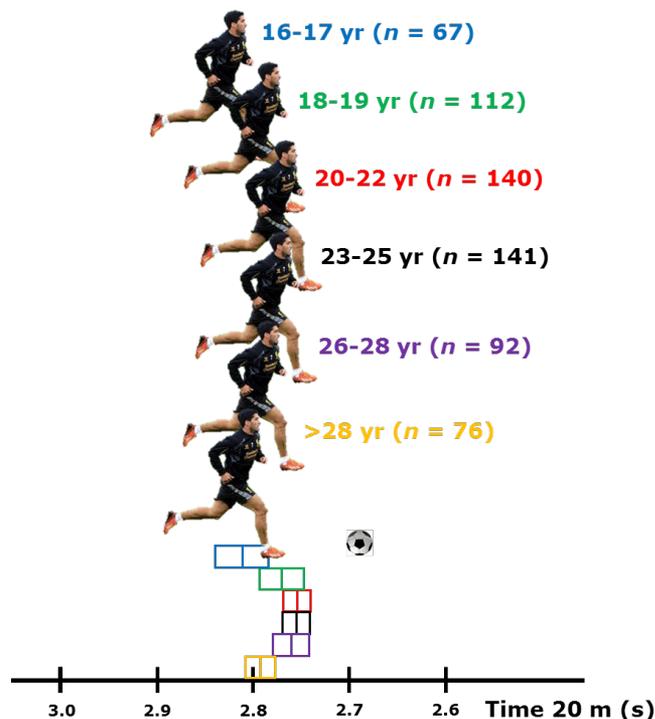


Fig. 1. 20-m sprint performance according to age categories in Norwegian 1st and 2nd division soccer players (2). 95% CIs are located at the timeline beneath the athletes. Timing was initiated by a floor pod (placed on the start line) at the point of front foot lift-off. Practically no further development in sprint velocity is observed beyond 20-22 years of age.

sprint performance potential (at least when compared to peak velocity sprinting) during regular soccer conditioning. Moreover, longitudinal training studies reveal that soccer players are considerably more disposed to change-of-direction capacity adaptations than accelerated and maximal velocity sprinting (15, 16). Exercises with higher underlying components of maximal strength are generally more adaptive than speed-related exercises (8).

Challenges associated with concurrent sprint and soccer conditioning.

Although sprinting actions are essential within crucial situations, sprint performance varies constantly in response to games (acute fatigue) and microcycles/seasonal loading patterns (chronic variations). Indeed, fatigue leads to decreased sprint performance following 90 minutes of play (17-18), and the magnitude of this impairment may be positively correlated with the very-high-speed ($>25.0 \text{ km}\cdot\text{h}^{-1}$) running distance covered during the match (18). A recent review concluded that at least 72 hours are needed for most players to be fully recovered after match (19). Higher accumulated and acute workloads are also associated with greater injury risk (20). Hence, the busier the soccer schedule, the less room for

developing physical capabilities. Superior sprint performance has been observed off-season compared to in-season and pre-season in professional players (21). Weekly changes in group-mean values up to 0.05 s over 20-m sprint (nearly 2%) have been observed in the early pre-season conditioning period of male juniors (12). These weekly or seasonal variations are considerably higher than the typical variability of sprint performance over 10-20-m distances (~1%) (22).

Training strategies. Even though the principle of specificity is clearly present (5), several questions remain regarding the optimal sprint training methods within the larger context of the team sport setting (6). Due to constraints with overall soccer conditioning, it is most likely more effective to structure the players weekly soccer training rather than introducing an additional physical conditioning regime. This is particularly important for professional athletes in the very best leagues, playing 1-2 games per week over a 9-10 months season. In such settings, the main focus is simply to recover and get ready for the next match. There is simply no room to train speed. For substitutes and reserve team players, however, the situation is sometimes different. Because sprinting skills to a large degree depend on specific technical components (determined by the laws of motion), and repetition is the mother of learning, proper movement patterns should be learned as early as possible (e.g., youth academies). Off course, this provides that the conditioning experts possess the adequate knowledge. Unfortunately, most coaches for kids and youths are volunteers and less experienced than those working with professional players, and this is a major limitation of the current system. Overall, it is essential that the small amount of time available for physical training of players is used effectively. Conditioning experts have to balance their training methods and exercises in order to optimize the development/maintenance of different skills in relation to their contribution to overall soccer performance. A theoretically perfect conditioning program for certain capabilities may limit the development of other important qualities and vice versa. Based on the varying physiological and technical profiles among athletes (23), it is essential to diagnose each individual and develop training programs that target their key physiological and technical weaknesses. Based on this approach, the conditioning staff at the Norwegian Olympic Federation have experienced that it is possible to improve 0-20-m sprint time in national team players by up to 0.2 s within 6-8 weeks (60-80 min. weekly, individualized speed training) during off-season and early pre-season. This provides that i) the players are motivated, ii) not too old (<24-25 y), and iii) the overall soccer conditioning can be adjusted to the speed training. Worth the effort? Well, thats up to the head coach to decide.

Practical applications

- The older and better-trained the players, and the busier the soccer schedule, the lower the odds for developing sprinting speed.
- In soccer players, acceleration is more resistant to training than maximal velocity, repeated sprint performance and COD capacity, respectively.
- Developing faster players is mainly a matter of choice when it comes to i) deciding how much soccer-specific training that can be sacrificed, ii) the specific coaching skills and iii) players motivation.

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