

Time-motion analysis of elite young French soccer players

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Introduction

Understanding the contribution of the energy systems in soccer has involved the use of time-motion studies. A number of tools have been used (e.g., pen and paper methods, video, electronic tracking devices). Recently, global positioning technology (GPS) has been shown to be as accurate as computer-based tracking system². Whereas there is extensive literature in adults⁴, data on young elite players are scarce. Since young athletes are known to experience less fatigue than adults during intermittent exercises⁵, we expected, in contrary to that observed in adults⁴, total running distance in young soccer players to be equivalent during both halves. The aim of the present study was thus, using GPS, to investigate time-motion profiles of soccer in elite young French players.

Methods

2 x 11 highly-trained male adolescents (14.2 ± 0.5 y, $VO_{2peak} = 56.5 \pm 0.9$ ml. $^{-1}min.kg^{-1}$, Figure 1) performed an official 2 x 40-min soccer game on grass. Movements and heart rate (HR) of 9 players (except goal keeper and substitutes) were recorded with a portable GPS (FRWD B100, FRWD Technologies, Oulu, Finland). Sampling frequency was 1 Hz for GPS. HR was averaged on a 5-s basis. The distance and time spent in seven speed zones were selected for analysis: 0-0.5, 0.5-5.9, 6-8.9, 9-11.9, 12-14.9, 15-16.9 and >17 km/h². Time spent in the following five HR zones was also computed: <70, from 71 to 85, from 86 to 95 and >95% of maximal HR (HR_{max}). HR_{max} was determined the week before the experimental game using an intermittent incremental aerobic test (i.e., 30-15 Intermittent Fitness¹). Results are presented as mean \pm SE.

Results

Total distance covered was 5372 ± 125 m. Distance covered was significantly higher during the first than during the second half (2805 ± 398 vs. 2567 ± 278 m, $p = 0.04$). Percentage of total time spent in each velocity zones is presented in Figure 2. Time <5.9 km/h was significantly higher during the second half, whereas time 6-8.9km/h was significantly lower. Time spent in each HR zones is illustrated in Figure 3. Time spent below 70% HR_{max} was significantly higher in second half, whereas time >86% HR_{max} was lower ($p < 0.001$).



Fig. 1 : SC Amiens young elite soccer team (<14 y)

Conclusions

In young elite soccer players, total distance covered during a 80-min competitive game tended to be lower than that previously reported in professional adults (even extrapolated to a 90-min game: ~ 6.5 km vs. ~ 10 km⁴ in adolescents vs. adults, respectively), which can be related to technical/tactical factors, but also to lower cardiorespiratory fitness values⁴. We also observed that distance covered during the 2^d half was significantly reduced compared to the first one. This was associated with a longer time devoted to low-intensity efforts (i.e., walking) and less to high-intensity runs (Fig. 2). The significantly lower time spent in high-intensity HR zones during the 2^d half (Fig. 3) confirms the development of fatigue (i.e., cardiac drift but also possible decreased running economy) observed via GPS recordings. Present findings confirm that, as adults⁴, young soccer players are likely to experience temporary fatigue during a game and especially towards the end of a game.

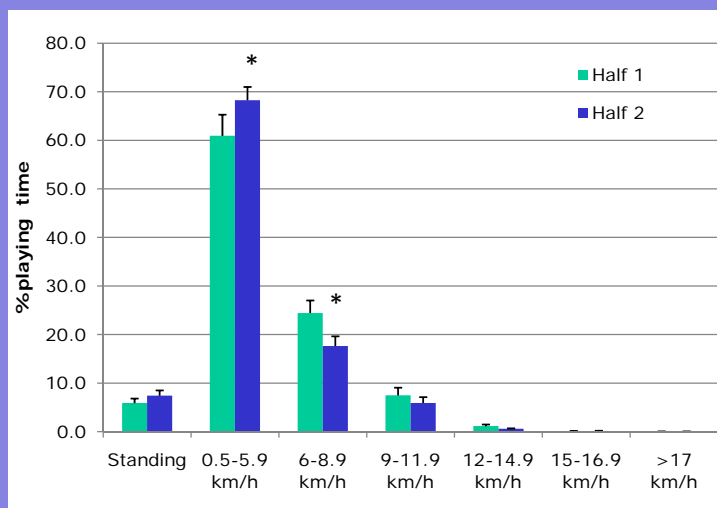


Fig. 2 : Percentage of total time spent in each velocity zones for first and second half. *: $p < 0.050$

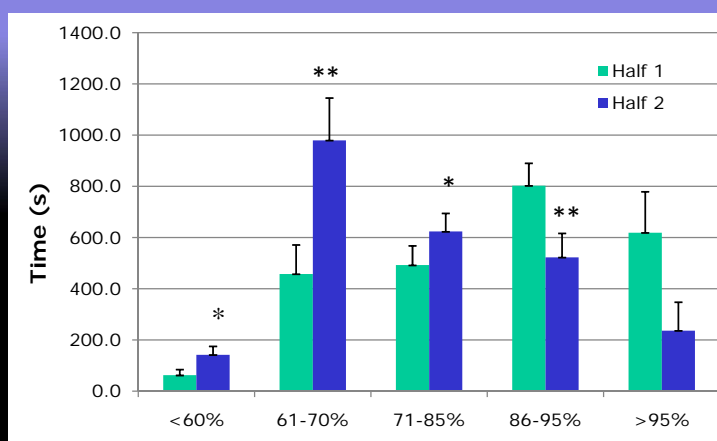


Fig. 3 : Time spent in each heart rate (HR)-intensity zones for first and second half. *: $p < 0.05$, **: $p < 0.001$

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