

# 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 system<sup>2</sup>. Whereas there is extensive literature in adults<sup>4</sup>, data on young elite players are scarce. Since young athletes are known to experience less fatigue than adults during intermittent exercises<sup>5</sup>, we expected, in contrary to that observed in adults<sup>4</sup>, 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 ( $14.2 \pm 0.5$  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/h<sup>2</sup>. 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 Fitness<sup>1</sup>). Results are presented as mean  $\pm$  SE.

## Results

Total distance covered was  $5372 \pm 125$  m. Distance covered was significantly higher during the first than during the second half ( $2805 \pm 398$  vs.  $2567 \pm 278$  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:  $\sim 6.5$  km vs.  $\sim 10$  km<sup>4</sup> in adolescents vs. adults, respectively), which can be related to technical/tactical factors, but also to lower cardiorespiratory fitness values<sup>4</sup>. We also observed that distance covered during the 2<sup>d</sup> 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<sup>d</sup> 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 adults<sup>4</sup>, young soccer players are likely to experience temporary fatigue during a game and especially towards the end of a game.

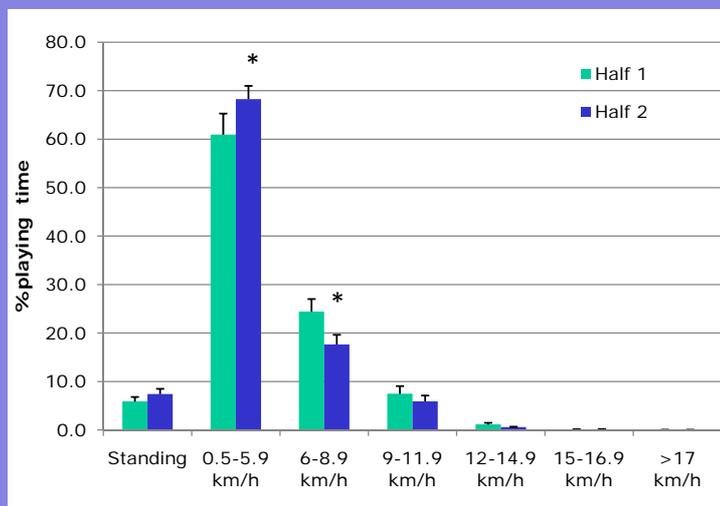


Fig. 2 : Percentage of total time spent in each velocity zones for first and second half. \*:  $p < 0.050$

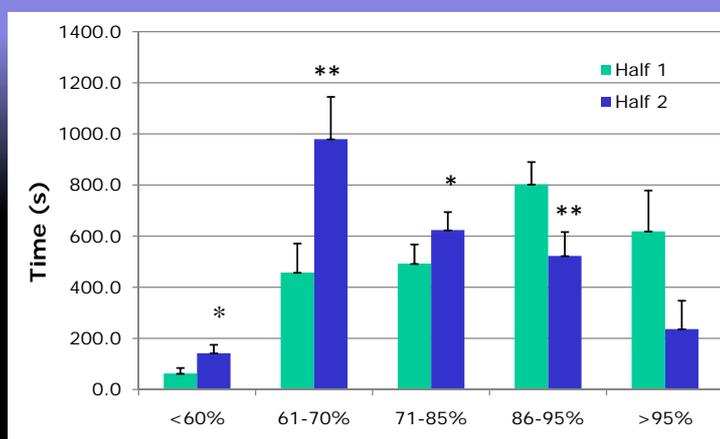


Fig. 3 : Time spent in each heart rate (HR)-intensity zones for first and second half. \*:  $p < 0.05$ , \*\*:  $p < 0.001$

## References

- Buchheit M. (2008) *Journal of Strength & Conditioning Research*; 22(2):365-374.
- Edgecomb S.J. and Norton K.I. (2006) *Journal of Science and Medicine in Sport*; 9(1-2):25-32.
- Hill-Haas S., Coutts A., et al. (2007) *Journal of Science and Medicine in Sport*; Sep 5 [Epub ahead of print]
- Mohr M., Krustup P., et al. (2003) *Journal of Sports Sciences*; 21(7):519-28.
- Ratel S., Williams W.C., et al. (2004) *Eur J Appl Physiol*, 92: 204-210.