# Relationship between heart rate variability and repeated sprint exercise in young soccer players

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**Aim:** The sport of soccer is characterized by neuromuscular performance resulting in short bursts interspersed by brief recovery periods over an extended period of time. Several studies suggest that the cardiac autonomic nervous system (ANS) assessed by heart rate variability (HRV) may provide useful information regarding the functional adaptations to training stimulus. Although HRV has often been associated with aerobic power and cardiovascular fitness, the influence of sympathovagal balance on neuromuscular performance in young athletes is not well assessed.

The aim of this study was to assess the influence of the autonomic system on the performance of repeated sprints, involving predominantly muscular power and anaerobic metabolism, in young soccer players.

**Method:** Twelve young soccer players, selected for the Sicilian Regional Representative of the Italian Football Federation, mean age 15 years, were recruited. Resting HRV was measured and indices of power spectral analysis (ratio LF/HF) were calculated to evaluate the sympathovagal balance. To assess the state of physical fitness of subjects, $VO_2max$ was determined by maximal graded treadmill test. Finally, the athletes performed 10 maximal all-out 6-sec cycling sprints (RS), interspersed with 30-sec of passive recovery, to measure the peak power (PP) represented by the highest value recorded during a single sprint, and the average of the values of maximum power (AP) recorded during all sprints.

**Results:** On the basis of their $VO_2max$ (56.22 ± 3.93 ml·$Kg^{-1}$·$min^{-1}$), all subjects showed good levels of physical fitness. HRV index (LF/HF = 1.31 ± 0.74) showed an inverse correlation with PP (14.05 ± 0.89 W·$Kg^{-1}$; r = -0.709, P = 0.01), and with AP (12.82 ± 0.88 W·$Kg^{-1}$; r = -0.606, P = 0.04).

**Conclusion:** Our study shows that a low ratio LF/HF, which reflects a parasympathetic predominance in the ANS balance, is associated with a better anaerobic contribution to performance resulting in higher values of PP and AP during brief repeated maximal cycling sprints. The assessment of resting HRV before exercise may be useful for performance monitoring of young soccer players.

### References

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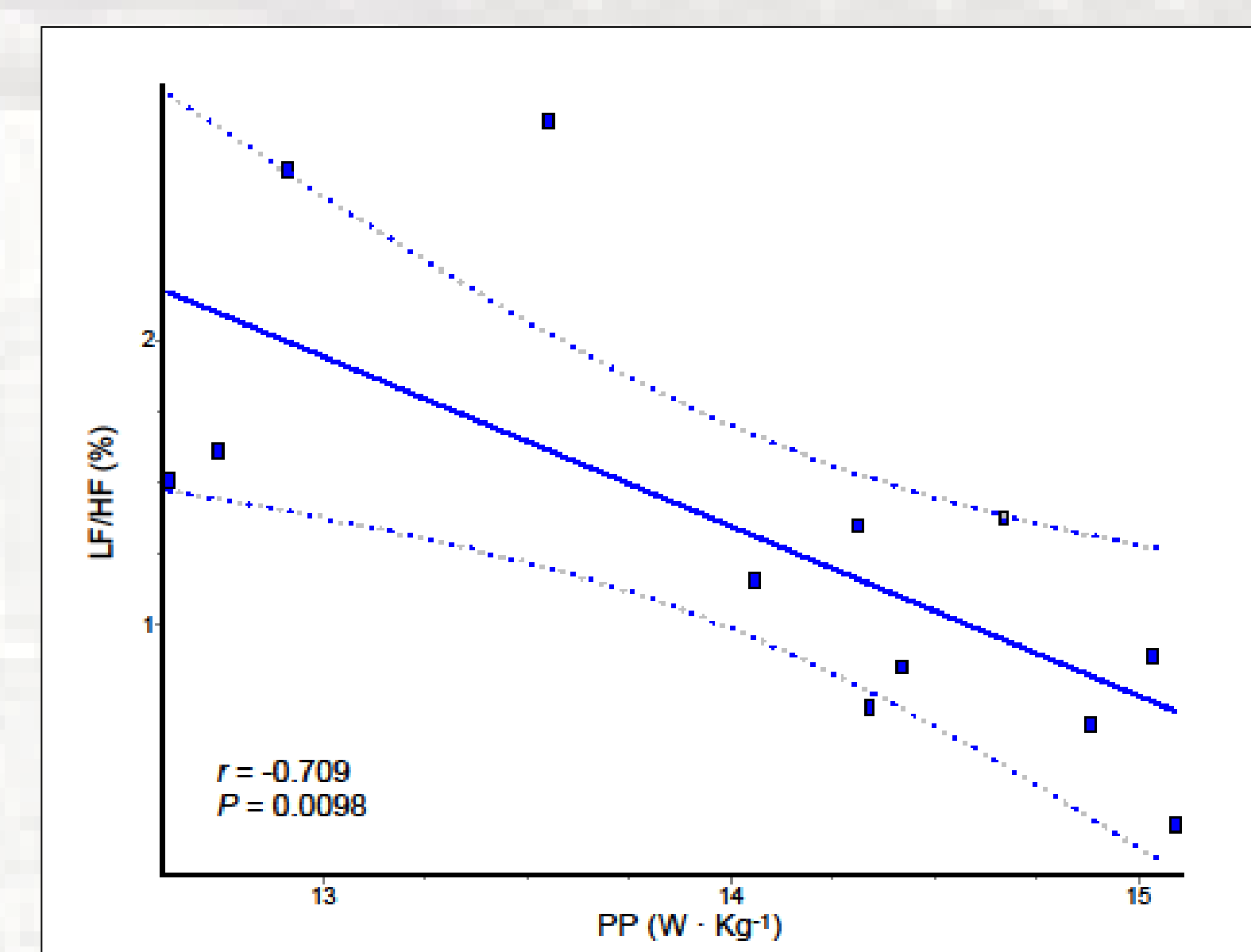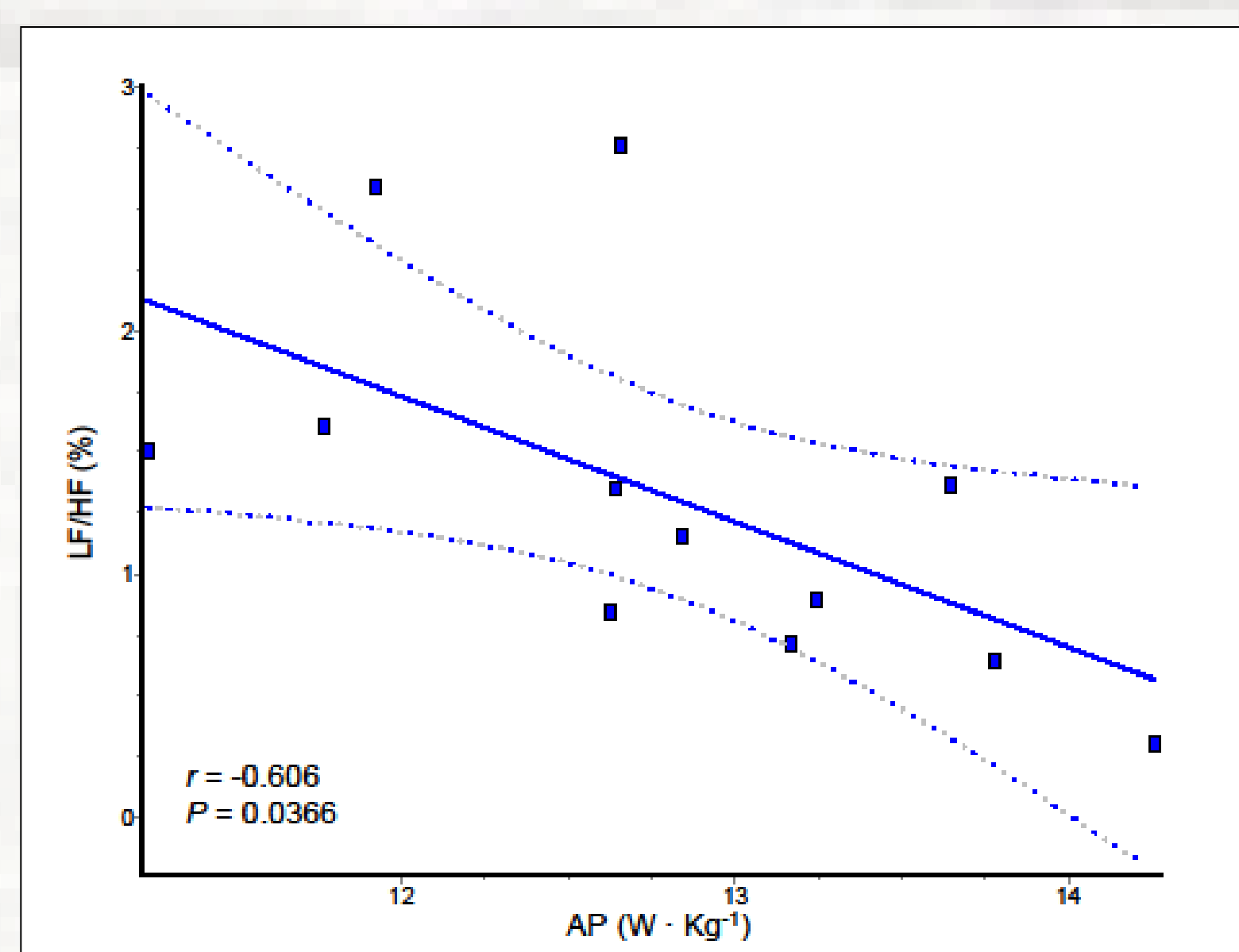| | (n = 12) |
|---|---|
| Age (y) | 14.8 ± 1.03 |
| Body height (cm) | 171 ± 5.76 |
| Body weight (Kg) | 64 ± 6.35 |
| BMI (Kg · $m^{-2}$) | 22.0 ± 1.40 |
| Fat mass (%) | 14.8 ± 5.71 |
| Fat free mass (Kg) | 53.6 ± 6.06 |
| $VO_{2max}$ (ml · $Kg^{-1}$ · $min^{-1}$) | 56.22 ± 3.93 |
| $HR_{max}$ (bpm) | 190 ± 8.35 |
| LF/HF | 1.31 ± 0.74 |
| PP (W · $Kg^{-1}$) | 14.05 ± 0.89 |
| AP (W · $Kg^{-1}$) | 12.82 ± 0.88 |

Table I: Characteristics of subjects (means ± s).



Fig. 1: Relationship between LF/HF and AP



Fig. 2: Relationship between LF/HF and PP

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