

## Post-match recovery in elite soccer referees

Matthew Weston, Alan M Batterham

Teesside University, Middlesbrough, UK

The measurement of recovery following competition is required to facilitate the effective planning and timing of subsequent training sessions. Soccer refereeing at the elite-level represents a significant physical challenge. The effect of match intensity on post-match recovery, however, has yet to be investigated. **PURPOSE:** To examine the effect of match intensity on recovery in elite soccer referees. **METHODS:** Data were collected from 14 elite soccer referees for 194 English Premier and Football League matches (range: 5 to 21 matches). Internal match loads were RPE (CR-10 scale) and heart rate (HR) load, computed by multiplying the accumulated duration in each of five different HR zones by a multiplier for each zone and summing the results. Each match was analysed using a semi-automated match-analysis system. External match loads were the referees' total distance covered (m) and the total high-speed running distance (m; running speed  $>19.8 \text{ km}\cdot\text{h}^{-1}$ ). The referees' recovery was recorded 30-min after waking on the day following their match, with a score of 0 representing poor recovery and 10 representing full recovery. A within-referee design was used to determine if high internal and external match loads were associated with low post-match recovery scores. Within-subject correlations between the referees' measures of external and internal match load and post-match recovery ( $n=194$ ) were examined, with 90% confidence intervals (CI) and effect sizes (Cohen's  $d$ ) also presented. **RESULTS:** Match internal loads were  $6.7 \pm 1.5$  and  $304 \pm 47$  au for RPE and HR load, respectively. Match external loads were  $11648 \pm 609$  and  $1025 \pm 338$  m for total distance and high-speed running, respectively. Post-match recovery was  $6.7 \pm 1.2$  au. There was a small correlation between post-match recovery and match RPE ( $r = -0.24$ : 90% CI  $-0.36$  to  $-0.12$ ,  $d = 0.49$ ) and trivial correlations between recovery and total distance ( $r = 0.10$ :  $-0.02$  to  $0.22$ ,  $d = 0.20$ ), high-speed running ( $r = -0.03$ :  $-0.15$  to  $0.09$ ,  $d = 0.06$ ) and HR load ( $r = 0.06$ :  $-0.07$  to  $0.18$ ,  $d = 0.11$ ). **CONCLUSION:** Elite soccer referees' post-match psychophysiological recovery was influenced by the perceived exertion of their matches but not by their match running distances or match heart rates. Future research should investigate the effect of fitness levels and age on the post-match recovery process.