

Letter to the Editor

Re: Emotions, immunity and sport: Winner and loser athlete's profile of fighting sport

Brain, Behavior, and Immunity 47, 2015, p.238

Lawrence D. Hayes, Nicholas Sculthorpe, Fergal M. Grace

To the Editor,

We read with interest the recent work of Pesce et al. (2015) who investigated levels of salivary testosterone (sal-T), cortisol (sal-C) and their ratios (T/C) alongside anger (RS Score) and anxiety states (AS score) during the approach to seasonal competition in kick-boxers. The authors make the general assumption that there are associations between sal-T and sal-C with RS and AS scores and the proinflammatory salivary cytokine IL-1 β .

Whilst we found the rationale and study design to be of interest to the behavioural and immunological community, we highlight new limitations with the authors' chosen instrument (saliva hormone measurement) which requires a cautionary approach to the interpretation of their findings. The authors state that sal-T is a reliable indicator of serum or plasma concentrations, however, recent investigations have demonstrated this is not always the case. Furthermore, the reported changes in sal-T, sal-C and sal-T:C are all within the critical difference for measurement, that would confirm that a biologically meaningful change had occurred. In this respect, we draw the authors' attention to the original work of Fraser and Fogarty (1989). Indeed, we have shown the critical difference for sal-T, sal-C and T:C measurement to be 148%, 90% and 207%, respectively. Further to this, our other recent work has indicated that the timing of salivary sampling appears to be at least as important as the type of exercise, such that the true baseline measures should be obtained 24 h or more prior to exercise (Hayes et al., 2015).

Moreover, while the authors correctly refer to the lack of reliability between saliva and plasma cytokines, they fail to repeat the same for sal-T and sal-C. We further note that contrary to their concluding statement, their cited manuscript in support of measuring IL-1 β , in fact, concludes that saliva levels are not directly associated with plasma levels and only becomes significantly associated when adjusted for smoking, age and adiponectin levels in adolescent girls.

Additionally, the authors' supposition that increases in T levels are evident following resistance exercise and that these increases in anabolic hormones are 'essential for muscular adaptation' overlooks some recent compelling evidence to the contrary (Mitchell et al., 2013). In conclusion, we argue the high variability of sal-T and sal-C in controlled laboratory conditions (Hayes et al., 2014)

will be greater in an applied setting, such as the present study and recommend that conclusions based on these measures should be made both with caution and with reference to the critical difference in order to contextualize any observations made.

References

C.G. Fraser, Y. Fogarty, Interpreting laboratory results, *BMJ*, 298 (6689) (1989), pp. 1659–1660

L.D. Hayes, F.M. Grace, J.S. Baker, N. Sculthorpe, Exercise induced responses in salivary testosterone, cortisol, and their ratios in men: a meta-analysis, *Sports Med.* (2015)

L.D. Hayes, N. Sculthorpe, J.D. Young, J.S. Baker, F.M. Grace, Critical difference applied to exercise-induced salivary testosterone and cortisol using enzyme-linked immunosorbent assay: distinguishing biological from statistical change, *J. Physiol. Biochem.*, 70 (4) (2014), pp. 991–996

C.J. Mitchell, T.A. Churchward-Venne, L. Bellamy, G. Parise, S.K. Baker, S.M. Phillips, Muscular and systemic correlates of resistance training-induced muscle hypertrophy, *PLoS One*, 8 (10) (2013), p. e78636

M. Pesce, I. Fratta, V. Ialenti, A. Patruno, A. Ferrone, S. Francheschelli, A. Rizzuto, R. Tatangelo, G. Campagna, L. Speranza, M. Felaco, A. Grilli, Emotions, immunity and sport: winner and loser athlete's profile of fighting sport, *Brain Behav. Immun.* (2015)