

Immunosurveillance associated with upper respiratory symptoms in elite swimmers: 8-month period leading into Commonwealth Games

Introduction

- Most research suggests that a greater degree of immune suppression and subsequent increased illness risk occurs during winter and the heaviest training periods.
- Monitoring an individual's change in salivary Immunoglobulin A (sIgA) throughout a training programme, could help identify athletes at risk of illness; promoting the use of individual athlete monitoring.
- Epstein Barr Virus (EBV) has been identified as one of the most likely causes of illness symptoms (Reid et al., 2004).
- An association has been found between short sleep duration (< 7 hours) and increased number of illnesses, including cold and flu (Orzech et al., 2014). These findings are empirical because athletes do not obtain enough sleep, regularly sleeping less than the NR of 7-9 hours of sleep per night.

Objective

- To monitor individual mucosal immunity and identify risk factors of upper respiratory symptoms (URS), such as training load (TL), mucosal immunity, EBV status, and sleep; providing coaches with guidance to enable modification of training and/or other illness preventative strategies for elite swimmers.

Methods

- Fourteen elite national and international swimmers (age \pm SD: 20 \pm 1 years) were observed for 8-months leading into the Commonwealth Games 2018 and Swim Cup Eindhoven.
- The periodised plan of TL for each week was classified by coaches as low, moderate, and high. When this was compared against swimmer's perceived weekly TL intensity, it was significantly correlated ($r(34)=.484, p=0.003$) and thus used for analysis.
- An adapted weekly illness questionnaire enabled swimmers to record self-reported TL, illness symptoms, and sleep quantity/ quality on a weekly basis.

Baseline Measurements (Week 1)

Mass (kg) & Stature	Blood Sampling (EBV)	Saliva Sampling (sIgA)	Weekly Illness Questionnaire	Asthma/Allergy/ Medical information
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Weekly Measurements (Weeks 4-31)

Saliva Sampling (sIgA)	Weekly Illness Questionnaire
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Weeks 7-9 & 11-14

Sleep Data (wrist-worn Actigraphy); measuring latency, efficiency, total time in bed (TTIB), total sleep time (TST), wakes after sleep onset (WASO), number of awakenings, average time awake.

Results

- Seventy URS episodes were recorded, leading to 34 days of missed training.
- Incidence of URS was significantly more during TL, compared than low high ($p < .001$) and moderate ($p=.011$). Duration of URS was significantly longer during moderate ($p=.021$) and high ($p < .001$) TL, compared to low. Symptom severity was significantly higher during high ($p=.001$) TL, when compared to low.
- When sIgA values were normalised to each individual's mean, relative sIgA concentration was 12% lower during URS than when no symptoms were present (Figure 2). Overall, swimmers spent 58% of the season below their individual 'healthy' sIgA average.
- Average sleep duration was 6.5 hours, latency was 14 minutes, sleep efficiency was 75%.
- Both TST ($p=.001$) and TTIB ($p=.001$) were significantly lower during moderate and high training loads, compared to low. Number of awakenings were significantly lower ($p=.025$) during moderate training loads, compared to low (Table 1).
- Eight swimmers (61%) had evidence of past infection with EBV. However, EBV seropositivity had no relationship with incidence, severity, or duration of URS.

Results Continued

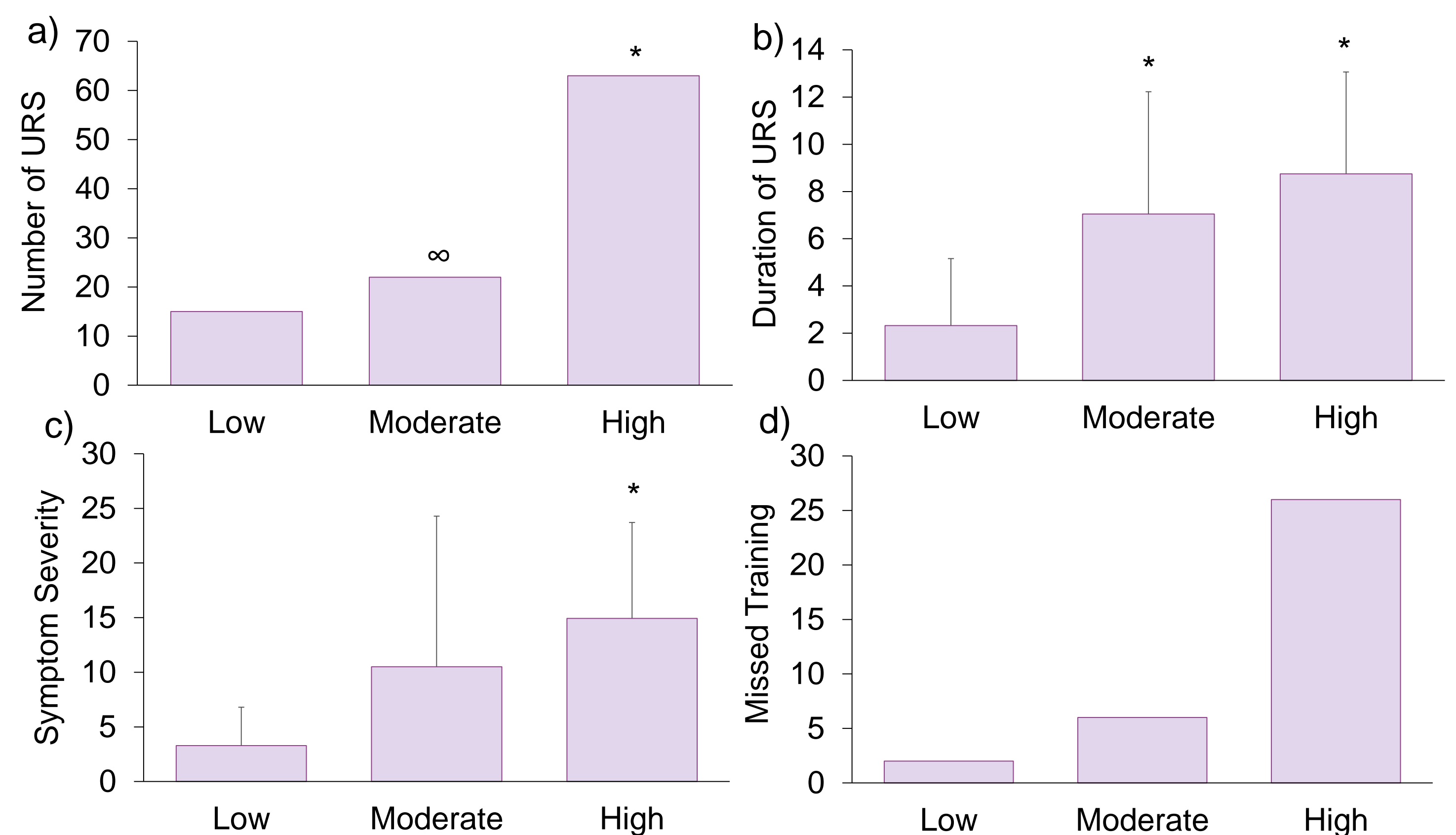


Figure 1. Number of self-reported URS episodes (a), duration of URS (b), symptom severity (c) and missed training days (d) for all swimmers over 8-months, presented across three different TLs. *Denotes a significant difference between TL for the variables marked, when compared to low intensity training. ∞Denotes a significant difference between moderate and high TL.

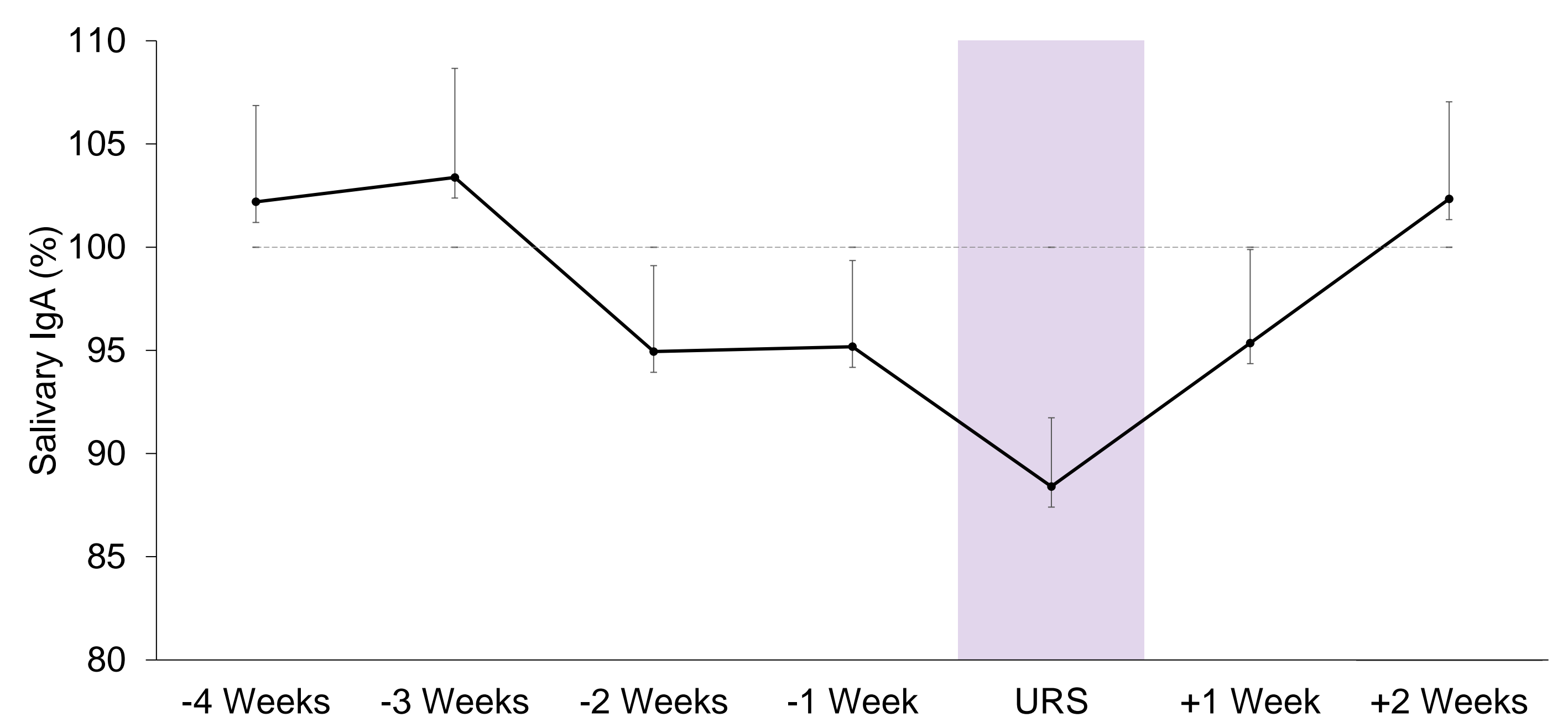


Figure 2. Seven weeks of average relative sIgA (%), 4 weeks preceding and 2 weeks post URS episode (n = 59).

Training Load	Latency (min)	Efficiency (%)	TTIB (min)	TST (min)	WASO (min)	Number of Awakenings	Average Time Awake (min)
Low	17	71	553	445	90	30	3
Mod	12	82	451 *	366 *	72	22 *	3
High	12	72	449 *	363 *	74	25	3

Table 1. Night-time data for the whole group of swimmers (n = 13), during low, moderate, and high training loads. *Denotes a significant difference between training loads for the variables marked, when compared to low intensity training.

Discussion/Conclusion

- The importance of individual athlete monitoring for coaches and physiologists, to identify those at increased illness risk was highlighted.
- Identification of risk factors associated with URS, such as high training loads, lowered sIgA and inadequate sleep, may allow for modifications in training or other illness preventative strategies.
- Overall, elite swimmers showed inadequate sleep, therefore promoting the use of sleep hygiene strategies and napping would be recommended.
- There was high prevalence of EBV seropositivity for the elite swimmers; however, it was not a predictor of URS. Low participant numbers could be considered for the lack of significant findings with EBV serostatus; there is ongoing debate that individual data and trends may be more useful in elite athletic research, compared to group statistical analysis.

