



## Original research

# Sleep practices implemented by team sport coaches and sports science support staff: A potential avenue to improve athlete sleep?

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## ABSTRACT

**Objectives:** The primary aims of the present study were to assess the sleep hygiene knowledge of high performance team sport coaches and sports science support staff; the sleep practices these individuals implement with athletes; and the barriers to the more frequent use of these practices.

**Design:** Cross-sectional observational study.

**Methods:** A sample of 86 Australian coaches and sports science support staff working within high performance team sport volunteered to complete a four-part questionnaire, including the Sleep Beliefs Survey used to assess sleep hygiene knowledge.

**Results:** Overall sleep hygiene knowledge was adequate ( $15.3 \pm 2.9$ , score range 0–20; mean  $\pm$  SD), however knowledge of sleep–wake cycle behaviours (score  $4.9 \pm 1.6$  out of 7) and thoughts and attitudes about sleep ( $3.6 \pm 1.0$  out of 5) were inadequate. Over half (56%) of coaches and support staff had monitored athlete sleep, while 43% had promoted sleep hygiene. Lack of resources (response range 44–60%) and knowledge (16–41%) were the two main barriers to the implementation of sleep monitoring and sleep hygiene practices.

**Conclusions:** Team sport coaches and sports science support staff have adequate overall sleep hygiene knowledge, yet some specific areas (e.g. sleep–wake cycle behaviours) warrant improvement. There appear to be limited sleep practices implemented with athletes, particularly regarding the promotion of sleep hygiene. The development of educational sleep resources for coaches and support staff to implement with athletes may help address the identified barriers and improve sleep knowledge.

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## Practical implications

- Coaches and support staff should increase their focus on routine sleep assessment, utilising recently validated sleep resources designed to identify athletes with sleep concerns.
- The development of coach and support staff focused educational sleep resources could be used to deliver effective sleep monitoring and sleep hygiene practices to athletes and promote peer knowledge transfer.
- It may be beneficial for coaches and support staff who work with female athletes to focus more on athlete engagement to ensure the sleep recommendations they provide are effective.

## 1. Introduction

Sleep is essential for optimal health,<sup>1</sup> performance<sup>2</sup> and recovery.<sup>3</sup> While most athletes, coaches and support staff recognise the importance of sleep,<sup>4,5</sup> evidence suggests high performance athletes can experience habitual impairments to sleep quality and quantity.<sup>6</sup> Athlete sleep can also be particularly susceptible to the situational stressors of training,<sup>7</sup> competition<sup>8</sup> and travel.<sup>9</sup> To ameliorate these sleep concerns, behavioural sleep education and sleep hygiene strategies have been shown to be beneficial.<sup>10–12</sup> Despite the need for, and benefits of, athlete sleep education, information regarding the sleep interventions and recommendations provided by coaches and support staff, who have a crucial role in providing behavioural and performance-related advice to athletes,<sup>13</sup> is lacking. For example, although there is a call for greater sleep monitoring of athletes,<sup>7,14,15</sup> there is no empirical evidence detailing how often it is conducted and by what method. Whether coaches

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and support staff experience barriers when trying to implement sleep interventions and recommendations to athletes, and what precisely these barriers may be is also unknown.

Understanding the sleep knowledge and currently implemented sleep monitoring and sleep hygiene practices from the perspective of the coaches and support staff who deliver them may offer an avenue to improve the sleep of team sport athletes (e.g. optimising the sleep recommendations imparted from coach to the athlete). Therefore, within high performance team sport coaches and sports science support staff, the primary aims of the present study were to assess sleep hygiene knowledge, the sleep monitoring and sleep hygiene practices these individuals implement with athletes, and the barriers to the more frequent use of these practices. The secondary aim of this study was to explore what situations coaches and sports science support staff believe affect athlete sleep during a competition season. We also sought to determine whether sleep knowledge, sleep practices and barriers to implementation differed between job roles, as well as the gender of athletes worked with and employment status.

## 2. Methods

A convenience sample of 86 coaches and sports science support staff (35 coaches and 51 support staff) volunteered to participate in the present study. Coaches and support staff were recruited from the Australian Institute of Sport, National Sporting Organisations and official sporting bodies through personal email contact with researchers or indirectly through administrative staff. A total of 14 sporting bodies were contacted through email, and 12 participated. As some emails were forwarded on by administrative staff, it is not possible to know how many potential participants received information about the study compared to those who responded. Participating coaches and support staff were from a variety of Australian team sports, including Australian rules football; basketball; cricket; football; hockey; netball; rugby sevens; softball; volleyball; water polo; wheelchair basketball; and wheelchair rugby. At the time of study participation, all coaches and support staff had a role (44 employed full-time and 42 part-time) within a high-performance team sport at an international level or within professional teams, including: assistant coach; dietitian; head coach; manager (e.g. high performance); physiotherapist; psychologist; sport scientist; and strength and conditioning coach. Of these coaches and support staff, 47 were working with female team sports at the time of participation, and 39 with male team sports. The study was approved by the University of Canberra Human Research Ethics Committee (registration 17–114).

In a three-month period from June to August 2017, participating coaches and support staff were asked to complete an online questionnaire (Qualtrics, Utah) to assess their sleep hygiene knowledge, and record the sleep monitoring and sleep hygiene practices they implement in their current role within high performance team sport (see Supplementary File A). The first section of the questionnaire obtained demographic information about survey respondents, including occupation, employment status and the sport and gender of athletes they worked with in their current role.

The second section of the questionnaire assessed the sleep hygiene knowledge of respondents using the Sleep Beliefs Scale (SBS).<sup>16</sup> The SBS is a 20-item scale used to assess knowledge and beliefs about sleep hygiene practices and their effect on sleep in general, not only the behaviour of the respondent. A correct answer was scored with 1, while an incorrect answer was scored with 0, and total scores can range between 0 and 20.<sup>16</sup> In addition to the total score, there were three factor scores (see Supplementary File B) which represent specific areas of sleep knowledge: sleep-incompatible behaviours (score range 0–8); sleep-wake cycle

behaviours (score range 0–7); and thoughts and attitudes to sleep (score range 0–5).<sup>16</sup> Higher total and factor scores correspond to greater sleep hygiene knowledge.<sup>16</sup> SBS total and factor scores  $\geq 75\%$  were defined as adequate,<sup>17</sup> while scores  $<75\%$  were considered inadequate. The SBS also underwent minor modification, and the wordings of questions 2, 4, 6 and 20 were adjusted to reduce the ambiguity of the potential responses. The adjustments aligned with comparable items in the Sleep Hygiene Index.<sup>18</sup> For example, question 4 was changed from ‘taking a long nap during the day’ to ‘taking a long nap (>2 h) during the day’.

The third section of the questionnaire obtained information on the sleep monitoring and sleep hygiene practices implemented by respondents. For example, if the respondent answered ‘yes’ to monitoring the sleep of their athletes, they were required to complete a closed response question. The multiple-choice question addressed how respondents monitored the sleep of their athletes, with the options of: ‘self-reported sleep diaries’; ‘activity wrist monitors (actigraphy)’; ‘sleep questionnaires’; ‘testing for “morning larks” or “night owls” (i.e. chronotype)’; and/or ‘other’. If respondents selected ‘other’, they were required to describe the alternative method used to monitor athlete sleep. The fourth section of questions obtained information regarding the barriers to implementation of sleep monitoring and sleep hygiene practices, and identification of situations encountered within high performance team sport that respondents believe affect athlete sleep.

The mean and standard deviation was calculated for SBS total and factor scores.<sup>16</sup> Normality was assessed using Q–Q plots in conjunction with the Shapiro–Wilk test. To calculate the differences in scores based upon categorical variables for the job role (coach versus support staff), gender worked with (female versus male) and employment status (full-time versus part-time), independent samples t-tests (two-tailed) were performed. If the data was not normally distributed a Mann–Whitney U test was conducted. Frequency tables were calculated for sleep monitoring and sleep hygiene practices, barriers to implementing these practices, and situations believed to affect athlete sleep. The percentage of respondents who reported ‘yes’ to monitoring athlete sleep was also calculated. For these respondents, differences between categorical variables for job role, the gender worked with, and employment status was determined for each sleep monitoring response using a Pearson’s chi-squared test ( $\chi^2$ ) (or Fisher exact when value  $<5$ ). This method was repeated for sleep hygiene practices, barriers to implementation of these practices, and situations believed to affect athlete sleep. All statistical analysis was conducted using R Studio version 3.4.0 “You Stupid Darkness”<sup>19</sup> with significance set to  $p \leq 0.05$ .

## 3. Results

There was a significant difference between coaches and support staff ( $4.3 \pm 1.7$  v  $5.3 \pm 1.5$ ,  $p = 0.009$ ) for the SBS factor sleep-wake cycle behaviours (see Table 1). Overall sleep hygiene knowledge was adequate, as was the SBS factor sleep-incompatible behaviours. However, knowledge of sleep-wake cycle behaviours and thoughts and attitudes about sleep were considered inadequate. Particular components of these factor scores which scored poorly were: trying to fall asleep without having a sleep sensation (38%); getting up when it is difficult to fall asleep (38%); staying in bed longer than one should 2–3 times a week (49%); going to bed 2 h earlier than the habitual hour (51%); and taking a long nap (>2 h) during the day (62%).

Coaches monitored the sleep of the athletes they work with less than support staff (43% v 65%,  $p = 0.045$ ; Table 2), and those working part-time monitored the sleep of the athletes less than those working full-time (40% v 70%,  $p = 0.005$ ). When exploring

**Table 1**  
Sleep Beliefs Scale (SBS) total and factor scores by job role, gender worked with and employment status (mean ± SD).

| Overall                                  | Job role   |               | Gender worked with |            | Employment status |            |
|--|------------|---------------|--------------------|------------|-------------------|------------|
|  | Coach      | Support staff | Male               | Female     | Full-time         | Part-time  |
| Total score (0–20)                       |            |               |                    |            |                   |            |
| 15.3 ± 2.9                               | 14.9 ± 3.1 | 15.5 ± 2.7    | 15.8 ± 2.9         | 14.8 ± 2.8 | 15.0 ± 2.7        | 15.5 ± 3.1 |
| Sleep-incompatible behaviours (0–8)      |            |               |                    |            |                   |            |
| 6.7 ± 1.2                                | 6.9 ± 1.3  | 6.3 ± 1.2     | 6.8 ± 1.3          | 6.7 ± 1.2  | 6.6 ± 1.4         | 6.9 ± 1.1  |
| Sleep–wake cycle behaviours (0–7)        |            |               |                    |            |                   |            |
| 4.9 ± 1.6                                | 4.3 ± 1.7  | 5.3 ± 1.5*    | 5.3 ± 1.5          | 4.6 ± 1.7  | 4.9 ± 1.6         | 4.9 ± 1.7  |
| Thoughts and attitudes about sleep (0–5) |            |               |                    |            |                   |            |
| 3.6 ± 1.0                                | 3.7 ± 1.0  | 3.6 ± 0.9     | 3.8 ± 0.8          | 3.5 ± 1.0  | 3.5 ± 0.7         | 3.7 ± 1.1  |

\* Difference ( $p < 0.05$ ) between two groups within a category.**Table 2**  
Absolute and relative number of responses for those who state “Yes” they monitor athlete sleep.

|   | Overall  |               | Job role  |                   | Gender worked with |            | Employment status |               |
|---|----------|---------------|-----------|-------------------|--------------------|------------|-------------------|---------------|
|   | Absolute | Frequency (%) | Coach (%) | Support staff (%) | Male (%)           | Female (%) | Full-time (%)     | Part-time (%) |
| Do you monitor the sleep of the athletes you support? | 48       | 56            | 43        | 65*               | 67                 | 47         | 70*               | 40            |
| Self-reported sleep diaries                           | 36       | 75            | 34        | 47                | 49                 | 36         | 50                | 33            |
| Activity wrist monitors (actigraphy)                  | 10       | 21            | 9         | 14                | 13                 | 11         | 20                | 2             |
| Sleep questionnaires                                  | 11       | 23            | 9         | 16                | 15                 | 11         | 18                | 7             |
| Testing for ‘morning larks’ or ‘night owls’           | 2        | 4             | 3         | 2                 | 0                  | 4          | 0                 | 5             |
| Other   | 10       | 21            | 8         | 14                | 21                 | 4          | 11                | 12            |

\* Difference ( $p < 0.05$ ) between two groups within a category.

the specific sleep monitoring practices implemented, using an Athlete Management System and various forms of verbal methods, for example, “personal daily questioning” and “daily rating tool”, were the most common ‘other’ responses. Lack of resources (60%) was the main barrier to more frequent sleep monitoring of athletes, followed by being too busy (23%), lack of knowledge (16%), players not liking it (16%) and ‘other’ (12%). Limited staff compliance and interest in sleep monitoring and a low priority at a higher organisational level were the frequent ‘other’ barriers reported. Some (21%) reported that they do not experience any barriers to monitoring athlete sleep and a minority (10%) reported they do not believe it is important to monitor sleep and therefore do not choose to do so.

Less than half of the coaches and support staff surveyed promote or administer sleep hygiene strategies with athletes (see Table 3). Lack of resources (44%) and knowledge (41%) were the major barriers to the more frequent implementation of sleep hygiene strategies, followed by being too busy (23%), players not liking it (11%), and ‘other’ (16%). Lack of player buy-in and adherence, as well as issues with staff compliance and perceptions of sleep being a low priority at a higher organisational level, were the frequent ‘other’ barriers reported. A minority (8%) did not think it was important, and therefore do not implement sleep hygiene strategies. Coaches and support staff working with female athletes were more likely to identify ‘players not liking it’ as a barrier to implementing sleep hygiene practices compared to the coaches and support staff who work with male athletes (19% v 3%,  $p = 0.019$ ).

The majority of coaches and support staff (86%) believe that night competition negatively influenced athlete sleep, closely followed by domestic travel (64%) and congested competition schedules (56%). Less than half of coaches and support staff believe morning (42%) and night training (45%) affected athlete sleep. The common ‘other’ (15%) situations thought to affect athlete sleep included international travel and long-haul flights, as well as life stressors and study or work commitments. Some respondents also indicated poor travel conditions for female athletes, for example, “international travel in economy seats”, “odd domestic flight times” and “extreme travel routines”, can make away games difficult. In addition, coaches and support staff working with female athletes did not believe night competition or domestic travel influence sleep

as much as those who work with males (night competition, 79% v 95%,  $p = 0.03$ ; domestic travel, 53% v 77%,  $p = 0.025$ ).

#### 4. Discussion

The primary aims of the present study were to assess the sleep hygiene knowledge and implementation of athlete sleep strategies by coaches and sports science support staff, together with identifying barriers to the use of these practices. The present study also explored what situations coaches and support staff believe affect athlete sleep during a competition season. This study demonstrates that team sport coaches and support staff have adequate overall sleep hygiene knowledge, yet most do not implement sleep monitoring or sleep hygiene practices with athletes. Lack of resources and knowledge are the major barriers to the more frequent implementation of sleep monitoring and sleep hygiene practices. A novel finding of this study was that coaches and support staff working with female athletes do not believe night competition and domestic travel affects sleep as much as those who work with male athletes.

The sleep hygiene knowledge of coaches and support staff is generally acceptable and consistent across occupations. In comparison, those working in other support-based professions (e.g. medical physicians) have varied, though generally poor, sleep knowledge.<sup>20,21</sup> It is promising that coaches and support staff appear well educated about the behavioural sleep concepts important for team sport athletes compared to other support-based professionals.<sup>22</sup> However, some specific areas (i.e. sleep–wake cycle behaviours and thoughts and attitudes about sleep) warrant improvement, particularly concerning coaches inadequate sleep–wake cycle behaviours. For example, both short (i.e. 5–30 min) or longer (>30 min) duration naps can be beneficial, but coaches and support staff must be aware of the resulting sleep inertia following a long nap<sup>23</sup> when providing advice to athletes. Addressing the identified areas of poorer comprehension through coach and support staff directed education may assist with their end delivery of sleep hygiene recommendations to athletes.

Considering team sport athletes can experience habitual<sup>6</sup> and situational<sup>7–9</sup> sleep disruption, it is crucial their sleep be regularly monitored to ensure they obtain adequate sleep. However,

**Table 3**

Absolute and relative number of responses for those who state “Yes” they promote or administer sleep hygiene strategies with athletes.

|   | Overall  |               | Job role  |                   | Gender worked with |            | Employment status |               |
|---|----------|---------------|-----------|-------------------|--------------------|------------|-------------------|---------------|
|   | Absolute | Frequency (%) | Coach (%) | Support staff (%) | Male (%)           | Female (%) | Full-time (%)     | Part-time (%) |
| Do you promote or administer sleep hygiene strategies with your athletes? | 37       | 43            | 31        | 51                | 46                 | 40         | 50                | 36            |
| Establishing a regular sleep/wake routine                                 | 30       | 81            | 20        | 45                | 41                 | 30         | 45                | 24            |
| Short naps (<30 min) not long naps (>2 h)                                 | 27       | 73            | 14        | 43*               | 38                 | 26         | 36                | 26            |
| No hard exercise within 1 h before bedtime                                | 10       | 27            | 9         | 14                | 15                 | 9          | 14                | 10            |
| No alcohol or caffeinated beverages within 4 h of bedtime                 | 27       | 73            | 26        | 35                | 33                 | 30         | 30                | 33            |
| Not using the bed for things other than sleeping or sex                   | 18       | 49            | 11        | 27                | 21                 | 21         | 18                | 24            |
| Not doing mentally stimulating or important activities before bedtime     | 24       | 65            | 11        | 39*               | 33                 | 23         | 34                | 17            |
| Not going to bed feeling angry or upset                                   | 10       | 27            | 9         | 14                | 13                 | 11         | 9                 | 14            |
| Sleeping in a comfortable bed   | 23       | 62            | 20        | 31                | 28                 | 26         | 34                | 19            |
| Creating a cool, dark and quiet bedroom                                   | 35       | 95            | 29        | 49                | 44                 | 38         | 45                | 36            |
| Reducing thinking or planning   | 23       | 62            | 17        | 33                | 31                 | 23         | 34                | 19            |

\* Difference ( $p < 0.05$ ) between two groups within a category.

the present study identified that most coaches and support staff do not monitor the sleep of their athletes. In addition, the majority of the sleep monitoring conducted is through self-reported sleep diaries, with minimal use of validated questionnaires or objective assessments. Limited objective sleep monitoring is not unsurprising, as there can be difficulties accessing required equipment, users need specific skills to ensure effective use, and it can be impractical when trying to implement with large groups of athletes. Although self-reported measures are simpler to implement within high performance sport,<sup>24</sup> coaches and support staff should be cognisant of the tendency of some athletes to overestimate sleep durations,<sup>14</sup> and poor sleep quality may be indicative of a range of sleep issues (e.g. difficulty falling asleep or impaired daytime functioning). As part of an increased focus on routine sleep assessments and screening, it may be beneficial for coaches and support staff to integrate sleep questionnaires designed to identify athletes with maladaptive sleep behaviours (i.e. Athlete Sleep Behaviour Questionnaire)<sup>25</sup> and sleep disturbances (i.e. Athlete Sleep Screening Questionnaire).<sup>26</sup> Such sleep questionnaires are cost-effective and time-efficient to implement compared to other sleep assessment tools (e.g. actigraphy). Therefore, these questionnaires may be useful considering the central reported barriers to sleep monitoring with athletes are lack of resources and time.

In addition to the lack of sleep monitoring currently conducted, less than half of the coaches and support staff surveyed promote or administer sleep hygiene strategies to athletes. Sleep hygiene strategies have recently been shown to improve athlete sleep,<sup>10–12</sup> for example, increased time in bed (+25 min) and sleep duration (+20 min) following two education sessions.<sup>12</sup> However, a month after these sessions, sleep changes had returned to those observed before delivery.<sup>11</sup> The return of these sleep outcomes to pre-intervention levels highlights the importance of providing consistent sleep hygiene promotion and reinforcement. Individuals who have frequent contact with athletes, such as coaches and support staff, may, therefore, be the most effective promoters of sleep hygiene strategies. Further research assessing whether greater sleep knowledge leads to more frequent, and effective, imparting of this knowledge is warranted.

Coaches and support staff reported a lack of resources and knowledge as the main obstacles when implementing sleep monitoring and sleep hygiene practices. To address these barriers, it may be beneficial for educational sleep resources to be developed (e.g. resources like sleep hygiene strategies, infographics or video tutorials). Doing so would directly address the current lack of resources, improve the overall sleep knowledge of coaches and support staff, as well as confidence in knowledge application. Accessible sleep resources may also encourage coaches and support staff to promote sleep monitoring and sleep hygiene practices

to other staff members and peers (a common knowledge transfer practice within sport),<sup>27</sup> thereby increasing broader sleep engagement. Educational sleep resources and peer promotion of the importance of sleep may also help emphasise sleep as being a priority to higher-level staff within sporting organisations. Although it was not a barrier reported by all, the present study also identified an increased resistance to the implementation of sleep hygiene strategies by coaches and support staff who work with female athletes. The reasons for this resistance are currently unclear; however, it may be beneficial for those who work with female athletes to focus on athlete engagement to ensure the recommendations they provide are effective.

In general, coaches and support staff believe situational challenges can affect sleep. These beliefs are in-line with the evidence highlighting the negative impact of training and competition schedules<sup>7,8</sup> and travel demands<sup>9</sup> on athlete sleep. However, compared to those working with male athletes, fewer coaches and support staff supporting females believe night competition and domestic travel stressors impair sleep. This finding is particularly surprising, as it is plausible that workplace inequality and inferior working conditions could make the situations female athletes face particularly challenging and thus lead to greater sleep concerns. Coaches and support staff need to be made aware of the specific concerns females may face to ensure they receive appropriate sleep support.

When considering the results of the present study, it must be recognised that the SBS<sup>16</sup> used to assess sleep hygiene knowledge has not been validated for use with this population.<sup>16</sup> The threshold used to define adequate and inadequate knowledge is also not based upon the SBS, rather a different questionnaire<sup>17</sup> with a comparable scale. In addition, the SBS represents just one example of sleep hygiene recommendations in existence, and various other slightly different iterations of ‘sleep hygiene’ exist.<sup>28</sup> As such, caution should be shown when generalising the sleep hygiene knowledge results beyond those described in the present study. Finally, coaches and support staff who participated in this study were recruited through a convenience sample of high performance team sports and as such, the results may not be generalisable to all coaches and support staff involved at all levels and sports.

## 5. Conclusion

The results from the present study indicate team sport coaches and support staff have adequate overall sleep hygiene knowledge, yet some specific areas warrant improvement, particularly sleep-wake cycle behaviours and thoughts and attitudes about sleep. The implementation of sleep monitoring and sleep hygiene practices with athletes also appears to be infrequent, with a lack of

resources and knowledge the central barriers reported. To address these barriers and improve sleep knowledge, the development of educational sleep resources specifically for coaches and support staff to use with their athletes would be highly beneficial. Not only would this provide tools to use when implementing sleep practices, but it may also supplement their sleep knowledge, improve confidence when applying this knowledge and encourage peer learning with other sports professionals. As coaches and support staff are crucial for monitoring and modifying an athlete's behaviours, improving their sleep knowledge and the barriers to implementation of sleep practices may lead to improved sleep habits of team sport athletes.

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### Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.jsams.2019.01.008>.

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