

## Journal Scan

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1. *J Sports Sci.* 2015;33(20):2106-15.

### Perceptions of well-being and physical performance in English elite youth footballers across a season.

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The 2011 English Elite Player Performance Plan (EPPP) stipulates training volumes that could put elite youth players at high risk of non-functional overreaching.

The aim of the study was to assess player perceptions of well-being and physical performance to these high training loads. Fourteen academy football players (mean  $\pm$  SD: age  $17 \pm 1$  years; stature  $179 \pm 6$  cm; body mass  $70.8 \pm 8.6$  kg, at pre-season) completed a perception of well-being questionnaire 1-4 times per week throughout each training block (pre-season, in-season 1, 2, 3). Physical performance tests were carried out at the end of each training block. Increases in training exposure ( $P < 0.05$ ; [Formula: see text] = 0.52) and moderate to large deteriorations in perceptions of well-being (motivation, sleep quality, recovery, appetite, fatigue, stress, muscle soreness  $P < 0.05$ ; [Formula: see text] = 0.30-0.53) were evident as the season progressed. A moderate decrease in 30 m sprint performance ( $P < 0.05$ ; [Formula: see text] = 0.48), a large improvement in Yo-Yo intermittent recovery test performance ( $P < 0.05$ ; [Formula: see text] = 0.93) and small decreases in countermovement jump ( $P > 0.05$ ; [Formula: see text] = 0.18) and arrowhead agility ( $P < 0.05$ ; [Formula: see text] = 0.24) performance were evident as the season progressed. The present findings show an imbalance between stress and recovery

in English elite youth players even when players experience lower training exposure than stipulated by the EPPP.

2. *Sports Med.* 2015 Nov;45(11):1547-59. doi: 10.1007/s40279-015-0377-9.

### Sleep Hygiene and Recovery Strategies in Elite Soccer Players.

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In elite soccer, players are frequently exposed to various situations and conditions that can interfere with sleep (e.g., playing night matches interspersed with 3 days; performing activities demanding high levels of concentration close to bedtime; use of products containing caffeine or alcohol in the period preceding bedtime; regular daytime napping throughout the week; variable wake-up times or bedtime), potentially leading to sleep deprivation. We outline simple, practical, and pharmaceutical-free sleep strategies that are coordinated to the constraints of elite soccer in order to promote sleep. Sleep deprivation is best alleviated by sleep extension; however, sleep hygiene strategies (i.e.,

consistent sleep pattern, appropriate napping, and active daytime behaviors) can be utilized to promote restorative sleep. Light has a profound impact on sleep, and sleep hygiene strategies that support the natural environmental light-dark cycle (i.e., red-light treatment prior to sleep, dawn-simulation therapy prior to waking) and prevent cycle disruption (i.e., filtering short wavelengths prior to sleep) may be beneficial to elite soccer players. Under conditions of inordinate stress, techniques such as brainwave entrainment and meditation are promising sleep-promoting strategies, but future studies are required to ascertain the applicability of these techniques to elite soccer players. Consuming high-electrolyte fluids such as milk, high-glycemic index carbohydrates, some forms of protein immediately prior to sleep, as well as tart cherry juice concentrate and tryptophan may promote rehydration, substrate stores replenishment, muscle-damage repair and / or restorative sleep. The influence of cold water immersion performed close to bedtime on subsequent sleep is still debated. Conversely, the potential detrimental effects of sleeping medication must be recognized. Sleep initiation is influenced by numerous factors, reinforcing the need for future research to identify such factors. Efficient and individualized sleep hygiene strategies may consequently be proposed.

3. *Sports Med.* 2015 Oct;45(10):1387-400.

### **Stress, Sleep and Recovery in Elite Soccer: A Critical Review of the Literature.**

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In elite soccer, players are frequently exposed to various situations and conditions that can interfere with

sleep, potentially leading to sleep deprivation. This article provides a comprehensive and critical review of the current available literature regarding the potential acute and chronic stressors (i.e., psychological, sociological and physiological stressors) placed on elite soccer players that may result in compromised sleep quantity and/or quality.

Sleep is an essential part of the recovery process as it provides a number of important psychological and physiological functions. The effects of sleep disturbance on post-soccer match fatigue mechanisms and recovery time course are also described. Physiological and cognitive changes that occur when competing at night are often not conducive to sleep induction. Although the influence of high-intensity exercise performed during the night on subsequent sleep is still debated, environmental conditions (e.g., bright light in the stadium, light emanated from the screens) and behaviours related to evening soccer matches (e.g., napping, caffeine consumption, alcohol consumption) as well as engagement and arousal induced by the match may all potentially affect subsequent sleep. Apart from night soccer matches, soccer players are subjected to inconsistency in match schedules, unique team schedules and travel fatigue that may also contribute to the sleep debt. Sleep deprivation may be detrimental to the outcome of the recovery process after a match, resulting in impaired muscle glycogen repletion, impaired muscle damage repair, alterations in cognitive function and an increase in mental fatigue. The role of sleep in recovery is a complex issue, reinforcing the need for future research to estimate the quantitative and qualitative importance of sleep and to identify influencing factors. Efficient and individualised solutions are likely needed.

4. *PLoS One*. 2015 Jul 9;10(7):e0130544.

### **The Effect of Chinese Traditional Exercise-Baduanjin on Physical and Psychological Well-Being of College Students: A Randomized Controlled Trial.**

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**BACKGROUND:** The physical and mental health of college students tends to continuously decline around the world, therefore, it is important to improve their health during college period. Baduanjin, a traditional Chinese exercise which combines movements with breath and mind, may be one of the selectable effective exercises. However, the effect of Baduanjin exercise on college students has not been established. In this study, we systematically assessed the effectiveness and safety of Baduanjin exercise on physical and mental health of college students by a rigorous randomized, parallel-controlled design.

**METHODS:** A total of 222 college students from Fujian University of Traditional Chinese Medicine were recruited and randomly allocated at an equal ratio into control or Baduanjin training. Participants in control group were informed to maintain their original activity habit, and those in Baduanjin exercise group received a 12-week Baduanjin exercise training with a frequency of 1 hour per day and 5 days per week on the basis of their original activity habit. The physical and psychological outcomes, including lumbar muscle strength, lower limb proprioception function, physical fitness, as well as self-reported symptom intensity, stress, self-esteem, mood, quality of life, quality of sleep, and adverse events, were evaluated at baseline, 13 weeks (at the end of 12-week intervention), and 25 weeks (after the 12-week follow-up period). Intention-to-treat analysis was performed for the above outcomes.

**RESULTS:** Compared with controls, significant improvements in Baduanjin exercise group at the end of 12-week intervention period were found on lower limb proprioception function (the rate of average trace error on right lower limb (%): control 23.50±5.50, Baduanjin 21.92±6.54, P=0.004; the rate of average trace error on left lower limb (%): control 22.32±6.62, Baduanjin 20.63±4.62, P=0.046), cardiorespiratory endurance (step test index: control 47.66±5.94, Baduanjin 50.07±9.30, P=0.025), flexibility (control 14.35±7.26cm, Baduanjin 15.39±6.43cm, P=0.009) and explosive force of lower limb (standing long jump test (m): control 1.77±0.24, Baduanjin 1.79±0.22, P=0.005 for adjustment baseline) in physical outcomes, and attention (Schulte Grid test (second): control 210.4±51.15, Baduanjin 192.4±47.14, P=0.034) in mental outcome. Lumbar muscle strength in Baduanjin group had been moderately enhanced but no significant difference compared to controls. No significant changes in other physical and mental outcomes, including vital capacity, blood pressure, heart rate, hand grip force, self-symptom intensity, stress, self-efficacy, quality of life, and quality of sleep, were found between groups. No adverse event was reported during the study period.

**CONCLUSION:** Regular Baduanjin exercise had an advantage for college students on improvement of lower limb proprioception, enhance of cardiorespiratory endurance, flexibility, explosive force of lower limb and attention, compared with usual exercise.

5. *Res Sports Med*. 2015;23(3):330-6.

### **Sleep Management Strategy and Performance in an Extreme Mountain Ultra-marathon.**

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We intended to assess the relationship between sleep strategies and performance during the North-Face Ultra-Trail du Mont-Blanc 2013, to test the hypothesis that

sleep management can influence athletic performance. Almost all runners specifically adopted sleep management strategies before the race. Among the finishers 72% didn't sleep at all during the race and 28% took a least one break for sleep. Non-sleepers completed the race faster than the sleepers ( $P = 0.0008$ ). Race time was positively correlated with drowsiness ( $P < 0.0001$ ) and negatively correlated with the number participations in this race ( $P = 0.0039$ ). Runners who adopted a sleep management strategy based on increased sleep time before the race completed the race faster ( $P = 0.0258$ ). Most finishers seemed to be aware of the importance of developing sleep management strategies and increasing sleep time some nights before the race appeared to be the most relevant strategy to improve performance.

6. *Int J Sports Physiol Perform.* 2015 Nov;10(8):950-7.

### **Sleep and Recovery in Team Sport: Current Sleep-Related Issues Facing Professional Team-Sport Athletes.**

**Fullagar HH(1), Duffield R, Skorski S, Coutts AJ, Julian R, Meyer T.**

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While the effects of sleep loss on performance have previously been reviewed, the effects of disturbed sleep on recovery after exercise are less reported. Specifically, the interaction between sleep and physiological and psychological recovery in team-sport athletes is not well understood. Accordingly, the aim of the current review was to examine the current evidence on the potential role sleep may play in postexercise recovery, with a tailored focus on professional team-sport athletes. Recent studies show that team-sport athletes are at high risk of poor sleep during and after competition. Although limited published data are available, these athletes also appear particularly susceptible to reductions in both sleep quality and sleep duration after night competition and periods of heavy training. However, studies examining the relationship between sleep and recovery in such situations are lacking. Indeed, further observational sleep studies in team-sport athletes are required to confirm these concerns. Naps, sleep extension, and sleep-hygiene practices appear advantageous to performance; however, future proof-of-concept studies are now required to

determine the efficacy of these interventions on postexercise recovery. Moreover, more research is required to understand how sleep interacts with numerous recovery responses in team-sport environments. This is pertinent given the regularity with which these teams encounter challenging scenarios during the course of a season. Therefore, this review examines the factors that compromise sleep during a season and after competition and discusses strategies that may help improve sleep in team-sport athletes.

7. *PLoS One.* 2015 Jan 23;10(1):e0115329.

### **Sleep restriction during simulated wildfire suppression: effect on physical task performance.**

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**OBJECTIVES:** To examine the effects of sleep restriction on firefighters' physical task performance during simulated wildfire suppression.

**METHODS:** Thirty-five firefighters were matched and randomly allocated to either a control condition (8-hour sleep opportunity,  $n = 18$ ) or a sleep restricted condition (4-hour sleep opportunity,  $n = 17$ ). Performance on physical work tasks was evaluated across three days. In addition, heart rate, core temperature, and worker activity were measured continuously. Rate of perceived and exertion and effort sensation were evaluated during the physical work periods.

**RESULTS:** There were no differences between the sleep-restricted and control groups in firefighters' task performance, heart rate, core temperature, or perceptual responses during self-paced simulated firefighting work tasks. However, the sleep-restricted group were less active during periods of non-physical work compared to the control group.

**CONCLUSIONS:** Under self-paced work conditions, 4 h of sleep restriction did not adversely affect firefighters' performance on physical work tasks. However, the sleep-restricted group were less physically active throughout the simulation. This may indicate that sleep-restricted participants adapted their behaviour to conserve effort during rest periods, to subsequently ensure they were able to maintain performance during the firefighter work tasks. This work contributes new knowledge to inform fire agencies of firefighters' operational capabilities when their sleep is restricted during multi-day wildfire events. The work also highlights the need for further research to explore how sleep restriction affects physical performance during tasks of varying duration, intensity, and complexity.

8. *J Dev Behav Pediatr.* 2015 Apr;36(3):158-65.

### **Bedtime and sleep timing but not sleep duration are associated with eating habits in primary school children.**

Thivel D(1), Isacco L, Aucouturier J, Pereira B, Lazaar N, Ratel S, Doré E, Duché P.

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**OBJECTIVE:** In the context of childhood obesity progression, sleep patterns have been associated with unhealthy eating habits and energy intake. The association between several eating habits and sleep patterns in children has been recently studied. The aim of this study was to explore the association between sleep patterns, eating habits, and physical fitness in primary school children.

**METHODS:** A total of 236 children of 6 to 10 years old were recruited. Anthropometric characteristics and body composition were measured, and cardiorespiratory (20-m shuttle run test) and musculoskeletal (squat jump and cycling peak power) fitness tests were performed. Parents were asked to fill out an eating habits questionnaire, and children were classified into 4 categories as a function of the number of eating risk factors they presented. Parents completed a questionnaire about their child's bedtime and waking hours during weekdays and weekends.

**RESULTS:** Weight ( $p < .01$ ), waist circumference, and fat mass ( $p < .05$ ) were significantly higher in late sleepers ( $27.6 \pm 6.3$  kg;  $60.1 \pm 7.6$  cm;  $19.52 \pm 7.44$ ) compared with normal sleepers ( $25.4 \pm 3.7$  kg;  $58.2 \pm 4.9$  cm;  $17.44\% \pm 6.23\%$ ). None of the physical fitness parameters were associated with sleep duration, bedtime, wake-up time, nor were they significantly different between late and normal sleepers. Bedtime was significantly earlier in children consuming breakfast everyday (08:30 vs. 09:00 PM,  $p < .01$ ); later in children snacking (09:15 vs. 09:30 PM,  $p < .05$ ) or watching TV at lunch (10:00 vs 09:30 PM,  $p < .05$ ). There is an association between the proportion of normal and late sleepers and the accumulation of healthy eating habits ( $p < .001$ ).

**CONCLUSION:** Bedtime and sleep timings (normal or late sleepers) are associated with eating habits in primary school children. It seems necessary to consider the number of unhealthy eating habits adopted by children when studying these associations.

9. *Brain Inj.* 2015;29(2):221-7.

### **Sleep disturbances in athletic concussion.**

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**BACKGROUND:** Sleep disturbances are a common symptom following concussions to include athletic concussion.

**REVIEW:** This review applies literature on sleep following traumatic brain injury and concussion to sport concussions and places these considerations in the context



of sleep and athletic performance. It also includes a description of sleep abnormalities in sleep duration, quality and timing as well as recommended treatment approaches. Finally, it includes a brief discussion of emerging paradigms of sleep and concussion recovery.

10. *J Sports Sci.* 2015;33(7):670-4.

### **Combined effects of sleep deprivation and strenuous exercise on cognitive performances during The North Face® Ultra Trail du Mont Blanc® (UTMB®).**

**Hurdiel R(1), Pez  T, Daugherty J, Girard J, Pousset M, Poletti L, Basset P, Theunynck D.**

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This study investigated the effects of combined sleep deprivation and strenuous exercise on cognitive and neurobehavioral performance among long-distance runners completing one of the most difficult ultramarathons in the world. Seventeen runners participated. Each had a wrist-worn actigraph throughout the race to record their sleep time. In addition, each individual's performance in 10-min response-time tests before and after the race was recorded and a questionnaire enabled participants to report any difficulties they experienced during the competition. During race completion times of 27 to 44 h, combined acute lack of sleep ( $12 \pm 17$  min of rest during the race) and strenuous exercise (168.0 km) had marked adverse effects on cognitive performances ranging from mere lengthening of response time to serious symptoms such as visual hallucinations. This study suggests that regardless of rest duration and time in race, cognitive performances of ultramarathoners are adversely affected.

11. *J Sports Med Phys Fitness.* 2015 Oct;55(10):1234-41.

### **Relationships between sleep quality, physical fitness and body mass index in college freshmen.**

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**AIM:** The aim of this study was to analyze the association between poor sleep quality with BMI and health-related physical fitness among college freshmen.

**METHODS:** The participants were college freshmen enrolled in 2011. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). A global PSQI score of 5 and total sleep time (TST) of 7 hours were used to differentiate between poor and good sleepers. Various Body Mass Index (BMI) ranges were used to categorize groups of underweight, normal weight and overweight. Health-related fitness was measured by Sit-And-Reach, Curl-Up, and Run/Walk Tests.

**RESULTS:** A substantial proportion of college students were affected by poor sleep quality. Significantly more females were poor sleepers and had a TST shorter than 7 hrs. No difference in the proportions of participants categorized based on BMI between male and female students. Males generally scored better on health-related physical fitness tests than females. All results of physical fitness tests were significantly correlated with BMI, sleep quality (global PSQI), and TST in both males and females. Poor sleepers were associated with a higher BMI and lower performance of physical fitness. TST was negatively associated with BMI and time length to complete 1600-m or 800-m Run/Walk Test, and positively correlated with the performance of Sit-And-Reach and Curl-Up Tests in both genders.

**CONCLUSION:** Poorer sleep quality and decreased TST were associated with lower performance in health-related physical fitness assessment among college students. Health promotion and educational programs for young adults should emphasize the importance of sleep quality and TST.

12. *Sports Med.* 2015 Feb;45(2):161-86.

### **Sleep and athletic performance: the effects of sleep loss on exercise performance, and physiological and cognitive responses to exercise.**

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Although its true function remains unclear, sleep is considered critical to human physiological and cognitive function. Equally, since sleep loss is a common occurrence prior to competition in athletes, this could significantly impact upon their athletic performance. Much of the previous research has reported that exercise performance is negatively affected following sleep loss; however, conflicting findings mean that the extent, influence, and mechanisms of sleep loss affecting exercise performance remain uncertain. For instance, research indicates some maximal physical efforts and gross motor performances can be maintained. In comparison, the few published studies investigating the effect of sleep loss on performance in athletes report a reduction in sport-specific performance. The effects of sleep loss on physiological responses to exercise also remain equivocal; however, it appears a reduction in sleep quality and quantity could result in an autonomic nervous system imbalance, simulating symptoms of the overtraining syndrome. Additionally, increases in pro-inflammatory cytokines following sleep loss could promote immune system dysfunction. Of further concern, numerous studies investigating the effects of sleep loss on cognitive function report slower and less accurate cognitive performance. Based on this context, this review aims to evaluate the importance and prevalence of sleep in athletes and summarises the effects of sleep loss (restriction and deprivation) on exercise performance, and physiological and cognitive responses to exercise. Given the equivocal understanding of sleep and athletic performance outcomes, further research and consideration is required to obtain a greater knowledge of the interaction between sleep and performance.

13. *J Sports Med Phys Fitness.* 2015 Dec;55(12):1555-64.

### **The impact of a simulated grand tour on sleep, mood, and well-being of competitive cyclists.**

**Lastella M(1), Roach GD, Halson SL, Martin DT, West NP, Sargent C.**

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**AIM:** Professional cycling is considered one of the most demanding of all endurance sports. The three major professional cycling stages races (i.e. Tour de France, Giro d'Italia and Vuelta a España) require cyclists to compete daily covering between ~150-200 km for three consecutive weeks. Anecdotal evidence indicates that such an event has a significant effect on the sleep, mood, and general well-being of cyclists, particularly during the latter stages of the event. The primary aim of this study was to simulate a grand tour and determine the impact a grand tour has on the sleep, mood, and general well-being of competitive cyclists.

**METHODS:** Twenty-one male cyclists (M±SD, age 22.2±2.7 years) were examined for 39 days across three phases (i.e. baseline, simulated grand tour, and recovery). Sleep was assessed using sleep diaries and wrist activity monitors. Mood and general well-being were assessed using the Brunel Mood Scale (BRUMS) and Visual Analogue Scales (VAS).

**RESULTS:** The amount and quality of sleep as assessed by the wrist activity monitors declined during the simulated grand tour. In contrast, self-reported sleep quality improved throughout the study. Cyclists' mood and general well-being as indicated by vigour, motivation, physical and mental state declined during the simulated tour.

**CONCLUSION:** Future investigations should examine sleep, mood and well-being during an actual grand tour. Such data could prove instrumental toward understanding the sleep and psychological changes that occur during a grand tour.

14. *Med Sci Sports Exerc.* 2015 May;47(5):960-6.

### **Decline in cardiorespiratory fitness and odds of incident sleep complaints.**

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**PURPOSE:** To examine longitudinal change in cardiorespiratory fitness and odds of incident sleep problems.

**METHODS:** A cohort of 7368 men and 1155 women, age 20-85 yr, was recruited from the Aerobics Center Longitudinal Study. The cohort did not complain of sleep problems, depression, or anxiety at their first clinic visit. Cardiorespiratory fitness assessed at four clinic visits between 1971 and 2006, each separated by an average of 2-3 yr, was used as a proxy measure of cumulative physical activity exposure. Sleep complaints were made to a physician during follow-up.

**RESULTS:** Across visits, there were 784 incident cases of sleep complaints in men and 207 cases in women. After adjusting for age, time between visits, body mass index, smoking, alcohol use, chronic medical conditions, complaints of depression or anxiety at each visit, and fitness at visit 1, each minute of decline in treadmill endurance (i.e., a decline in cardiorespiratory fitness of approximately 0.5 MET) between the ages of 51 and 56 yr increased the odds of incident sleep complaints by 1.7% (range = 1.0%-2.4%) in men and by 1.3% (range = 0.0%-2.8%) in women. Odds were <8% higher per minute decline in people with sleep complaints at visits 2 and 3.

**CONCLUSIONS:** The results indicate that maintenance of cardiorespiratory fitness during middle age, when decline in fitness typically accelerates and risk of sleep problems is elevated, helps protect against the onset of sleep complaints made to a physician.

15. *Appl Physiol Nutr Metab.* 2014 Nov;39(11):1230-6.

### **Impact of 5-h phase advance on sleep architecture and physical performance in athletes.**

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Travel across time zones causes jet lag and is accompanied by deleterious effects on sleep and performance in athletes. These poor performances have been evaluated in field studies but not in laboratory conditions. The purpose of this study was to evaluate, in athletes, the impact of 5-h phase advance on the architecture of sleep and physical performances (Wingate test). In a sleep laboratory, 16 male athletes (age:  $22.2 \pm 1.7$  years, height:  $178.3 \pm 5.6$  cm, body mass:  $73.6 \pm 7.9$  kg) spent 1 night in baseline condition and 2 nights, 1 week apart, in phase shift condition recorded by electroencephalography to calculate sleep architecture variables. For these last 2 nights, the clock was advanced by 5 h.

Core body temperature rhythm was assessed continuously. The first night with phase advance decreased total sleep time, sleep efficiency, sleep onset latency, stage 2 of nonrapid eye movement (N2), and rapid eye movement (REM) sleep compared with baseline condition, whereas the second night decreased N2 and increased slow-wave sleep and REM, thus improving the quality of sleep. After phase advance, mean power improved, which resulted in higher lactatemia.

Acrophase and bathyphase of temperature occurred earlier and amplitude decreased in phase advance but the period was not modified. These results suggest that a simulated phase shift contributed to the changes in sleep architecture, but did not significantly impair physical performances in relation with early phase adjustment of temperature to the new local time.



16. *J Sports Sci.* 2015;33(3):293-9.

### **Sleep/wake behaviour of endurance cyclists before and during competition.**

**Lastella M(1), Roach GD, Halson SL, Martin DT, West NP, Sargent C.**

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Good sleep is critical for optimising recovery and athletic performance. Yet, few studies have investigated how athletes sleep before and during competition. The aim of this study was to determine whether such sleep is poorer than that before a usual training day. Twenty-one male endurance cyclists' (age:  $19.9 \pm 1.7$  years) sleep/

wake behaviour was assessed using wrist activity monitors for 11 nights, including a six-night baseline training phase, three nights before competition and two nights during competition. Cyclists had less sleep on the night before competition ( $6.5 \pm 0.9$  h) and during the first night of competition ( $6.8 \pm 0.8$  h) than at baseline ( $7.4 \pm 0.6$  h). Cyclists also went to bed and woke up earlier during competition than at baseline. Competition schedules and competition itself can disrupt the sleep/wake behaviour of athletes during competition. Future investigations should examine sleep during three stages of competition (i.e. before, during and after competition). This will help coaches develop a greater understanding of how sleep changes during different phases of competition and enable them to plan post-competition training programmes to ensure appropriate rest and recovery is obtained.