Practical tips to manage travel fatigue and jet lag in athletes

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Word count:

Abstract: not applicable

Main text: (excluding title page, references and figure): 796

Conflict of Interest:

The authors report no conflict of interest pertaining to this manuscript.

Funding:

No funding received

Author contributorship:

Dina C (Christa) Janse Van Rensburg (DCJvR): manuscript (first draft), manuscript editing, infographic finalisation

Peter M Fowler (PF): manuscript editing, infographic development, infographic finalisation Sebastien Racinais (SR): manuscript editing, infographic finalisation

Data sharing statement:

Not applicable

Ethical approval information:

Not applicable

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Travel forms an integral part of modern-day athletes lives. The interrelated effects of travel fatigue, jet lag and increased risk of illness, are likely to affect performance unless managed appropriately. Travel fatigue follows any long journey and resolve following a good night's sleep, but can accumulate with frequent travel. Jet lag ensues misalignment between the internal circadian rhythms and new destination time after rapid travel across more than 3 time-zones, Jet resulting in sleep disruption, daytime fatigue and gastrointestinal disturbances. Sleep loss appears to be central to the detrimental impact of long-haul travel on performance. Additionally, circadian rhythms of numerous psychological and physiological variables with a typical early-morning nadir and late afternoon peak, will be misaligned to the new destination time, which, depending on time of competition, could affect performance directly.

Recovery from jet lag requires resynchronisation of the human circadian systems to the new light-dark cycle.² Various peripheral rhythms resynchronise at different rates but internal desynchronisation progressively disappear as all rhythms synchronise to local time, ⁵ probably explaining why athletes often feel worse on day 2-4 compared to day 1 of arrival. The circadian system needs to either advance (east travel) or delay (west travel) depending on travel direction.² Eastward travel is generally tougher as endogenous circadian rhythms have an ~25h period making it harder to advance than delay your circadian system.³ Resynchronisation takes approximately 1 and 0.5 days respectively per east and west time-zone crossed.³ Athletes require a comprehensive travel management plan to minimise impact on performance.⁴

Most evidence on travel fatigue and jet lag management is from non-athletic populations in laboratory settings.³ Interventions commonly promoted include: light exposure/avoidance, sleep, exercise, nutrition, melatonin, stimulants and sedatives.³ Their application and timing depends on number of time-zones crossed, travel direction, length of stay and individual chronotype.² Illness prevention may seem unrelated to travel fatigue and jet lag management, but if an athlete contracts illness both conditions may be aggravated.⁴ Based on currently available evidence, practical tips include (Figure 1 explains detail):

1. Pre-travel

- Protect sleep minimise accumulation of sleep debt and/or bank sleep.^{1,5-6}
- Determine core body temperature minimum (CBTmin) as the majority of jet lag interventions are based around this.² Assessing CBTmin requires continuous CBT measurement (e.g. ingestible temperature pill), but are invasive, time-consuming, and costly. In the field, an estimated value

HOW TO MANAGE TRAVEL FATIGUE AND JET LAG IN ATHLETES PRE TRAVEL (1-2 weeks prior) **DURING TRAVEL** SLEEP · Educate athletes on how travel is · Minimise sleep debt / ILLNESS PREVENTION SLEEP likely to impact them and the tools · Bank sleep: Increase time in bed by 30-60 min/night • Sleep timing: Maximise rest and · Aim for 7-9h quality sleep/night sleep during a 'sleep window' that corresponds to when it is night at the Sneeze into elbow, not hands **CALCULATE CBTmin** · Practice good sleep hygiene · Use hand sanitizer/wash hands frequently place of departure, and it is easier to · Interventions to accelerate adjustment **ILLNESS PREVENTION** initiate sleep **OTHER** of body clock are based an individual's · Consider probiotic supplementation · Sleep hygiene: Minimise blue light · Nutrition: Use high glycaemic index Melatonin onset occurs approx. 2h 2 weeks prior foods and tryptophan rich proteins to pre-sleep onset and CBTmin occurs neck pillow, wear comfortable, loose help promote sleep approx. 7h post melatonin onset. TRAVEL TIMING fitting clothing . Hydration: Drink to thirst and avoid So, for an athlete whose average · Hypnotics: If well tolerated, and Aim for a flight schedule that; alcohol and caffeine adhering to WADA regulations, in > Minimises the time between the average wake time is 07:00, their . Seating: Book exit row or aisle seat to consultation with team physician last nighttime sleep at the place of departure and first nighttime sleep . Mobility: Ensure frequent movement to maximise rest and sleep during at the destination around plane following sleep Has the fewest stopovers, particularly 'sleep window during the middle of the night at the place of departure time POST TRAVEL LIGHT EXPOSURE/AVOIDANCE + SLEEP HYGIENE NUTRITION **MELATONIN + EXERCISE** . Ald sleep onset: minimise light exposure and implement · Align mealtimes with new local time a wind-down routine 30-60 min prior to bedtime. . Fat little and often to reduce the risk of stomach EAST (phase advance) upset due to the effects of jet-lag . Ensure the sleep environment is cool (18-20°C), dark · AVOID light in the 3-4 h BEFORE CBTmin · High glycaemic index foods & tryptophan rich and quiet . MAXIMISE light in the 3-4 h AFTER CBTmin proteins can help promote sleep combine with exercise/training **FATIGUE MANAGEMENT** · 3 mg melatonin 11.5 h before CBTmin WEST (phase delay) · Utilise caffeine little but often, MAXIMISE light in the 3-4 h BEFORE CBTmin but avoid -6h prior to bed time combine with exercise/training · AVOID light in the 3-4 h AFTER CBTmin **ILLNESS PREVENTION** 3 mg melatonin 4 h after CBTmin · Avoid touching mouth, nose and eyes · Sneeze into elbow not hands SLEEP SCHEDULE · Use a hand sanitizer with >70% alcohol activity, but if · Adjust sleep schedule by 30-60 min per day as not available wash hands frequently body clock adjusts to new time-zone · Do not share drinking bottles, cups, cutlery, towels, etc. . In general start with EARLIER bed and wake times with other people and move LATER following travel WEST and start · Avoid raw vegetables and undercooked meat, wash with LATER bed and wake times and move EARLIER and peel fruit before eating, choose beverages from following travel EAST sealed bottles

Figure 1: How to manage travel fatigue and jet lag in athletes

can be calculated based on habitual timing of sleep and wake.² If travelling with a team, individualised timing of interventions is not feasible. Currently the best practice-led option is to calculate the teams` average CBTmin and apply interventions accordingly.²

 In individual cases with known gastrointestinal disturbances, the team doctor may consider to use probiotics.⁴

2. During travel

- Protect sleep maximise rest and sleep during a 'sleep window' corresponding to night-time at
 place of departure and when it is easier to initiate sleep.^{1,5} Sedative usage should be
 individualised and only by doctor's order.
- Implement illness prevention strategies.⁴ Avoid touching areas known to carry micro-organisms, and frequently wipe those areas clean e.g. tray table.
- Drink to thirst, avoid alcohol and caffeine, and ensure frequent movement around the plane.⁴

3. Post-Travel

- Plan light exposure and/or avoidance around CBTmin, depending on timing for east vs. west.²
- If feasible, coincide training sessions with light exposure. Although sunlight is the best option, indoor training with the aid of artificial light may be an alternative when dark outside. Keep training intensity low for the first few days building up to higher intensity and skill-specific training.²
- Melatonin has both chronobiotic (circadian phase-shifting) and hypnotic (sleep-inducing) properties. Product availability, dosages and purity differ between countries. Team doctors should be cautious and preferably use known products.⁷ The efficacy of melatonin for the treatment of jet lag has recently been questioned.
- Protect sleep follow a sleep schedule and adjust sleep timings as the body clock adjusts to the
 new time-zone. Utilise sleep hygiene interventions and supplement night-time sleep with a
 daytime nap (this can correspond with light avoidance).¹ Sedatives, specifically short-acting (e.g.
 Zolpidem 10mg), may be an option in athletes previously tolerating the drug with no adverse
 events.⁴ Athletes should adhere to the most recent World Anti-Doping Agency regulations for
 all pharmacological interventions.
- Implement illness prevention strategies.⁴
- Caffeine may be used to increase alertness and manage daytime fatigue.

Meal-timing and meal-composition may help to reduce jet lag symptoms. Schedule meals
according to destination time. Consume protein-rich meals to help with alertness and
carbohydrate-rich meals to induce drowsiness.⁸

We recommend that practitioners focus first on the easier to implement interventions that help treat the symptoms of jet lag (i.e. protecting sleep) and prevent illness, before employing more difficult interventions such as accelerating the adjustment of the circadian system to the new time-zone. Considering cost of travel research, multi-centre studies should be conducted utilising standardised, simple measures in athletes who travel frequently.

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