

The Effects of Jet Lag and Travel Fatigue on the Athletic Population

Schedule: 1.0 hr (1 CEU unit)

Format: CEU

Equipment Needed: Digital Viewing Device

Fee: None

Learning Objectives:

- 1) Participants will be able to increase an understanding of symptoms and causes of jet lag.
- 2) Participants will be able to distinguish between jet lag and travel fatigue.
- 3) Participants will be able to have a working knowledge of preventative measures of jet lag.
- 4) Participants will be able to understand the physiological causes of trans-meridian travel.

Course Overview:

This course provides an in-depth overview of the observations relating to jet lag travel fatigue on an athlete's body. It will provide management strategies for athletes to lessen the effects of jet lag when traveling across time zones.

Research and Techniques:

Many research articles have been written in the past 10 years discussing the effects jet lag has on athletes and how to lessen those effects. The Clinical Journal of Sports Medicine published an article in 2012 that discussed the difference between jet lag and travel fatigue. Jet lag is a physiological response the body has after traveling to a new time zone, caused by circadian de-synchronization. Travel fatigue, on the other hand, consists of a combination of physiologic, psychological, and environmental factors that accumulate over a season. This combination may affect the athlete's performance when he/she is unable to recover appropriately. Travel fatigue accumulates over the course of a season versus jet lag, which will happen with each crossing of a time zone.¹

Athletes suffering from jet lag can experience gastrointestinal upset, sleep disturbance, intermittent fatigue, and impaired concentration.¹ Symptoms of jet lag are worse as the number of time zones crossed increases, and when one travels east to west.¹⁻³ Traveling eastward increases jet lag symptoms because the length of day is shortened, which then causes the circadian system to shorten as well.⁴ Travel fatigue presents itself with persistent fatigue, re-current illness, changes in behavior, and loss of motivation.¹

An estimate of how long jet lag will last was charted in an article written by Waterhouse et.al. He suggested that after traveling up to three time zones, a person may not need any days to adjust. However, when traveling eastward, a person needs about 1 day per time zone crossed, and when traveling westward, a half day per time zone crossed is needed to adjust. One may also want to try and have as short of time possible in between your last proper sleep in the country being left and the first proper sleep in the destination country to lessen effects of jet lag.²

Sleep deprivation is considered to be the leading cause of intensifying the magnitude and duration of jet lag symptoms. The best management strategy has been found to be adapting to the destination time zone before departure. This is an approach that can be implemented the week leading up to travel. Teams should modify training routines and start practicing on the destination time zone a few days before departure. They should also try and take an

evening flight when traveling east so that the athletes can get enough sleep on the flight to avoid sleep debt.¹ Even modification of a schedule 1-2 hours for 1-2 nights before departure would be beneficial.⁷

To try and lessen the effects of jet lag on the flight, adjust your watch to the destination time when you board. Also, start to eat your meals and sleep on the destination country's time as well. Make sure you pack things to make you comfortable and able to sleep such as pillows, earplugs, and an eye mask. Proper hydration, including avoiding alcohol and caffeine, is also important due to dry cabin air. Use of sleep aids may be beneficial in some cases, although research is ambiguous. Sleep aids do not guarantee prolonged sleep and have not been tested enough to indicate residual effects on mental or physical performance.² Hypnotic aids will help you sleep if you are having insomnia following travel, but may impair performance the following day.^{4, 8} Non-pharmacological methods that can be utilized include nutritional, environmental and behavioral measures. These have been found to strengthen the zeitgebers in the new timezone.² Zeitgebers are time-givers, which are rhythms resulting both directly and indirectly from the environment. The two best known zeitgebers are light and melatonin.⁶ Light inhibits the release of melatonin, which is connected to the body's chronobiologic system.⁷ While any light is a zeitgeber, natural light has a much stronger effect.

Melatonin is a hormone synthesized primarily in the pineal gland. In normal circadian rhythm, melatonin is secreted in its highest during the hours of darkness or sleep.³ Short term use of melatonin has been found safe, although athletes should speak with their team physician before taking any medications.⁴

Post-flight, teams will need 2 to 4 days to adjust. They should not practice from 2 to 4 p.m. or 2 to 4 a.m. of the departure zone. During these times, it is best to take a nap to reduce cumulative sleep debt. Research suggests that ingesting 50-200mg of caffeine in combination with a 15 to 30 minute nap will improve cognitive function in sleep deprived states.¹ Caffeine may also be useful to help with alertness if taken in the morning, but should be avoided in late-afternoon/evening.^{1,3}

Another way to improve alertness is circadian phase shifting. Exposure to light is the most effective way to achieve this.¹ When traveling west, athletes should remain active during the day and avoid long naps, although they may go to bed 1 to 2 hours earlier than normal local time. For flights east, athletes should use shades or dark glasses enroute to accommodations to minimize light exposure, and then sleep until late morning. Light exposure in the afternoon is beneficial. Exercising outdoors is another way to help arouse athletes. However, after an eastward flight, morning exercise should be avoided the first few days. When determining practice times, teams should aim to practice at the time they will play as soon as possible after arrival.^{3,7}

The 'feeding hypothesis' (Leathwood, 1989) proposes that eating a high protein breakfast activates the arousal system by raising plasma tyrosine concentrations. It also suggests that eating a high carbohydrate evening meal raises plasma tryptophan, and releases serotonin, a precursor to melatonin, thereby helping sleep regulation. While evidence favoring this hypothesis is weak, a military study found small improvements in sleep and performance at mental tasks (Graeber, 1982).^{2,7}

Characteristics that can alter the rate of adjustment to a time-zone transition include age, chronotype, flexibility of sleeping habits, and fitness. Younger individuals are more flexible and will have less difficulty than the elderly. "Morning People" will adjust better to eastward travel; and their counterparts, "Night Owls," will adjust better to westward travel. People who are better at adjusting their times of sleeping, and

are less influenced by the conditions in which they sleep, will have an advantage over those with a rigid schedule. Lastly, the more fit an individual is, the less difficulty he or she will have adjusting.²

Evidence for athletes' physical performance with jet lag is inconsistent. Since physiologic measures such as heart rate, ventilation, and blood lactate are associated with circadian rhythms, it is difficult to measure the influence of performance. Physical measures such as peak muscle force, anaerobic power, and vertical jump are also affected, and thus no one has been able to show a clear impact that jet lag has on athletes' performance.^{4,7} However, when looking at the National Football League, data shows that West Coast teams consistently beat East Coast teams in evening games when they are both home or away. The assumption is that playing closer to an athletes' normal practice time, gives them an advantage with circadian rhythms.⁵

There are many ways to help deal with jet lag, but trips should be planned with focus on an itinerary that minimizes travel fatigue. If staying in a new time zone 3 days or less, teams do not necessarily need to adjust with the new time if their competition coincides with daytime on home time. Also, breaking up a team's journey with a layover could reduce the severity of jet lag, although not always practical.⁷

Preventing Jet Lag

- Start adjusting to the new time zone a few days before departure, including decreasing intensity of training
- Proper Hydration during your flight
- Avoid alcohol and caffeine during your flight and for the first few days of arrival
- Choose meals that you are familiar with on the plane, and eat at the destination time
- Sleep on the flight if it is night at your destination....choose evening flights eastward
- Arrive a number of days before competition, if possible
- Utilize naps in short duration
- Speak with your team physician about use of any prescription, over-the-counter, or homeopathic medication
- Educate athletes and personnel on these matters in advance of travel

Faculty Credentials:

Erin Finnegan, MS, ATC

Sponsors – n/a

References

1. Samuels, C: Jet Lag and Travel Fatigue: A Comprehensive Management Plan for Sport Medicine Physicians and High-Performance Support Teams. Clin J Sport Med. May 2012; 22(3): 268-273.
2. Waterhouse J, Reilly T, Edwards B: The Stress of Travel. Journal of Sports Sciences. 2004; 22: 946-966.
3. Reilly et al: A: Coping with Jet-Lag: A Position Statement for the European College of Sport Science. European Journal of Sport Science. March 2007; 7 (1): 1-7.
4. Lee A, Galvez JC: Jet Lag in Athletes. Sports Health. June 2012; 4(3): 211-216.

5. Smith RS, Guilleminault C, Efron B. Circadian Rhythms and Enhanced Athletic Performance in the National Football League. *Sleep*. 1997; 20: 362-365.
6. Waterhouse J, Reilly T, Atkinson G: Jet-lag. *Lancet*. 1997; 29: 1611-1616.
7. Reilly T, Waterhouse J, Edwards B: Jet Lag and Air Travel: Implications for Performance. *Clin Sports Med*. 2005; 24: 367-380.
8. Coste O, Lagarde D: Clinical Management of Jet Lag: What Can Be Proposed When Performance is Critical?. *Travel Medicine and Infectious Disease*. 2009; 7: 82-87.

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Record answers below. CLEARLY CIRCLE ONE ANSWER.

- | | | |
|------------|-------------|-------------|
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| 2. A B C D | 7. A B C D | 12. A B C D |
| 3. A B C D | 8. A B C D | 13. A B C D |
| 4. A B C D | 9. A B C D | 14. A B C D |
| 5. A B C D | 10. A B C D | |

Mark Answers Above.

1. Melatonin secretion is highest:
 - a) During hours of light
 - b) During hours of darkness
 - c) When circadian rhythms are disrupted
 - d) When circadian rhythms are normal

2. The following Zeitgebers most effect circadian rhythms:
 - a) Natural light
 - b) Artificial light
 - c) Melatonin
 - d) A & C

3. According to most theories, jet lag is worse when:
 - a) Traveling east to west
 - b) Traveling west to east
 - c) Traveling north to south
 - d) Traveling south to north

4. Which passenger will most likely have the mildest symptoms of jet lag?
 - a) Elderly male
 - b) Middle age female
 - c) Collegiate athlete
 - d) Middle age male drinking coffee

5. When traveling east, which flight should be taken?
 - a) Departing when the destination time is evening
 - b) Departing when the destination time is morning
 - c) Flight having multiple layovers
 - d) Direct flight

6. You should try to nap at this time of the departure zone
 - a) 2-4am/2-4pm
 - b) 11-1am/11-1pm
 - c) 8-10am/8-10pm
 - d) 6-8am/6-8pm

7. Which is not a symptom of jet lag?
 - a) Gastrointestinal upset
 - b) Recurrent illness
 - c) Sleep disturbance
 - d) Intermittent fatigue

8. Travel fatigue differs from jet lag by
- a) Travel over more than 3 time zones
 - b) Travel over more than 5 time zones
 - c) Travel over more than 10 time zones
 - d) Gradual accumulation of travel over time
9. What should be avoided after an eastward flight?
- a) napping
 - b) Training
 - c) Morning exercise
 - d) Large meals
10. What should you do after a flight west?
- e) Go to bed 1-2 hours later than local time
 - f) Retire to bed until late morning
 - g) Remain active during the day
 - h) Take a long nap
11. Which is not a cause of travel fatigue?
- a) Disruption of normal routine
 - b) Stresses associated with travel
 - c) Long travel season
 - d) GI distress
12. Which is the leading cause of jet lag?
- a) Dehydration
 - b) Sleep deprivation
 - c) Gastrointestinal Upset
 - d) Sleep Aids
13. According to the 'feeding hypothesis' what macronutrient should be high at breakfast?
- a) Protein
 - b) Carbohydrate
 - c) Fat
 - d) Water
14. Which of the following action on a plane will not positively affect jet lag symptoms?
- a) Being comfortable (pillow, eye mask, etc.)
 - b) Drinking alcohol
 - c) Avoiding caffeine
 - d) Sleeping