

Circadian rhythmicity

Having read a few articles on the subject I have gained a particular interest in circadian rhythmicity. I first heard of the subject in the wake of the Beijing Olympic Games whereby it was suggested that certain time periods of the day are more likely to produce higher feats of physical performance than others. It was suggested that circadian rhythm was one of the major factors behind the higher numbers of record breaking performances in the early evening as opposed to other times in the day.

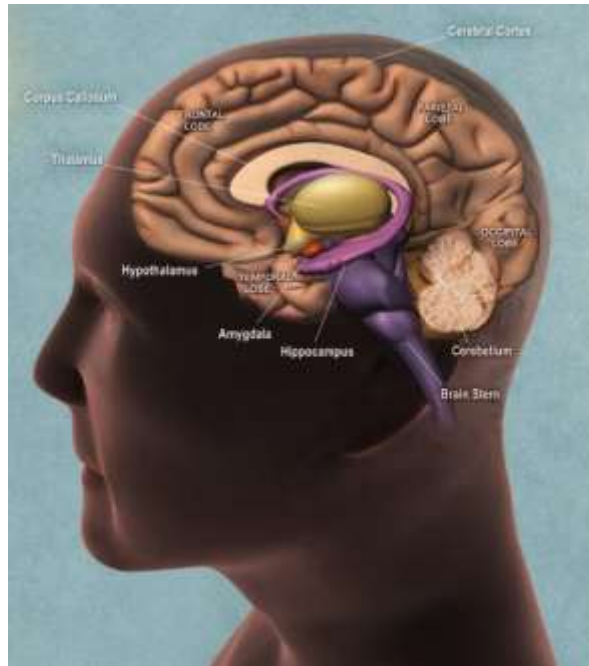
Let's first have a look and find out more about circadian rhythms.

What is Circadian Rhythmicity?

Circadian rhythms are physical, mental and behavioral changes that follow a roughly 24-hour cycle, responding primarily to light and darkness in an organism's environment (National Institute of General Medical sciences, 2013). They are found in most living things, including animals, plants and many tiny microbes. They are not the same as biological clocks but are related, as biological clocks drive circadian rhythms.

Biological clocks that control circadian rhythms are groupings of interacting molecules in cells throughout the body. A "master clock" in the brain coordinates all the body clocks so that they are in synch.

The 'master clock' controlling circadian rhythms is the suprachiasmatic nucleus, or SCN. Located in the hypothalamas, the SCN contains about 20,000 nerve cells.



(news-medical.net)

What influences circadian rhythms?

Natural factors within the body influence circadian rhythms, as well as external factors or signals from the environment. Light is the main influence on circadian rhythms, turning on or turning off genes that control an organism's internal clocks.

Circadian rhythms may influence sleep-wake cycles, hormone release, body temperature and other important bodily functions. Some research has found a link between such rhythms and various sleep disorders, such as insomnia, as well as an association with obesity, diabetes, depression, bipolar disorder and seasonal affective disorder.



(promotehealth.info)

With regards to sleep cycles, the SCN controls the production of melatonin, a hormone that changes your perception of tiredness and drowsiness. As the SCN is closely positioned to the optic nerves in the eye, it receives information about incoming light. If there is less light, the SCN tells the brain to make more melatonin so you will feel more tired.

Other related problems

Travelling across time zones can disrupt circadian rhythms, as when flying/travelling abroad. When passing across time zones, the body's clock or rhythm will be different to the time you perceive i.e. the time on your watch. Time is needed for your body to adjust to the new time zone, but depending on the length and number of time zones passed, this can take up to a few days.



London, UK



Paris, France



Shanghai, China

(activeden.net)

How to measure?

There are several markers used for measuring the timing of a mammal's circadian rhythm which include:

- melatonin secretion
- core body temperature
- cortisol levels

Measurement of core temperature is one of the markers used to measure circadian rhythms. Results have found the average human adult's temperature reaches its minimum at about 5 a.m., about two hours before habitual wake time.

On the other hand, maximum temperatures are gained in the early evening period between the hours of 5 pm and 9 pm. This correlates strongly with the suggested peak zone for physical activity, whereby with a higher body temperature, the body may be more suited to physical activity. This is the main reasoning behind the success in athletes in physical events during the 5 pm to 9pm window.

So how can we use circadian rhythms?

It would appear that the late afternoon/evening period of the day is most likely to produce optimal training gains for higher intensity exercise. It is suggested that such

training is better conducted at this point in the day where possible as the body is in the best physical state to train, largely due to the body's higher temperature level. It appears physical training as close to the training window, 5pm to 9pm, may produce better physical performance and thus, training where possible should be scheduled near this time.

Although during the early afternoon body temperature will be on the rise, beware of training too close to lunch, as following eating hormonal release can induce feelings of lethargy which will not be conducive to physical activity.

On the flip side it has been argued that cognitive tasks would be better scheduled in the mornings. With regards to sporting teams this may suggest that activities such as team meetings should be planned in the am rather than the pm.

During travel, trying to time orientate as quickly as possible would reduce any potential effects of overseas travel. Trying to adapt to the destination time zones as quickly as possible is key. Adapting to the destination time could be aided by altering sleep cycles before and during travel and using medications such as melatonin.

Conclusion

Hope you have enjoyed reading this article. Definitely an interesting subject which needs more research so we can further understand the processes and influences circadian rhythms have on the human body and their relationship to exercise.

Thanks for reading

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