



Sleep and its importance in sport: a concise systematic review

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Abstract

The present work addressed the nuances of sleep and its importance in the athlete's life. Another point of great value that will also be addressed in this research is the functions of sleep in the human body and how its deprivation can cause various harms. Although there are numerous reasons for developing direct sleep deprivation, sleep is of fundamental importance for the functioning of the human body and its phases will be studied and detailed in this article. Despite the passing of time and modernity that has made human life more hectic and some of the healthy habits forgotten, this study demonstrated how sleep has broader functions than just rest. The problem of the research was the direct connection between sleep and the performance of athletes. The methodologies used were explanatory and qualitative research.

Keywords: Sleep. Sport. Health. Hormones. Phases.

Introduction

Sleep is a state characterized by the suppression of wakefulness, a slowdown in metabolism, muscle relaxation, and a decrease in sensory activity. A state where every human being must maintain himself at least once a day, however, sleep does not only presume the rest of the mind and body [1]. The need to sleep has been known since the dawn of man on planet Earth and is a reset tool for the body [2,3]. This study brought up the different states that sleep has and why it is so important to respect the limits of the body and rest.

The direct importance of sleep as a tool for athletes to renew themselves and keep their bodies as healthy as possible and how the body reacts in the state of rest provided by the state of rest was presented for the reader's knowledge. Furthermore, the study of sleep was presented as neuroscience, its phases, and processes.

Still, the present study is of enormous importance in society, since all individuals should know the advantages of properly used sleep, as well as the disadvantages of keeping your body alert for longer than indicated. Remembering that each individual has different needs and sleep times, and there is no general rule.

In this regard, the main objective of the present work was to provide a greater understanding of how sleep has the power to improve several aspects of the individual's health and how it becomes an indispensable tool in the life of an athlete. This study does not exhaust the subject but serves as a starting point for further research that deepens and expands on such a complex topic, as well as highlighting the need for further discussions on the present topic.

Methods

Study Design

The present study followed a concise systematic review model, following the systematic review rules - PRISMA (Transparent reporting of systematic review and meta-analysis: <http://www.prisma-statement.org/>).

Search Strategy and Search Sources

The literary search process was carried out from September to November 2022 and was developed based on Scopus, PubMed, Science Direct, Scielo, and Google Scholar, addressing scientific articles from various eras to the present day. The descriptors (MeSH Terms) were used: *Sleep. Sport. Health. Hormones. Phases*, and using the Boolean "and" between MeSH terms and "or" between historical discoveries.

Study Quality and Risk of Bias

Quality was rated as high, moderate, low, or very low for risk of bias, clarity of comparisons, accuracy, and consistency of analyses. The most evident emphasis was

on systematic review articles or meta-analysis of randomized clinical trials, followed by randomized clinical trials. The low quality of evidence was attributed to case reports, editorials, and brief communications, according to the GRADE instrument. The risk of bias was analyzed according to the Cochrane instrument through the analysis of the Funnel Plot graph (Sample size versus Effect size), using Cohen's test (d).

Results and Discussion

Summary of Findings

As a corollary of the literary search system, a total of 138 articles were found that were submitted to the eligibility analysis and, then, 17 of the 47 final studies were selected to compose the results of this systematic review. The listed studies showed medium to high quality (Figure 1), considering in the first instance the level of scientific evidence of studies in types of study such as meta-analysis, consensus, randomized clinical trial, prospective and observational. The biases did not compromise the scientific basis of the studies. According to the GRADE instrument, most studies showed homogeneity in their results, with $I^2=96.7\%>50\%$. Considering the Cochrane tool for risk of bias, the overall assessment resulted in 20 studies with a high risk of bias and 27 studies that did not meet GRADE.

Figure 1. Flowchart showing the article selection process.

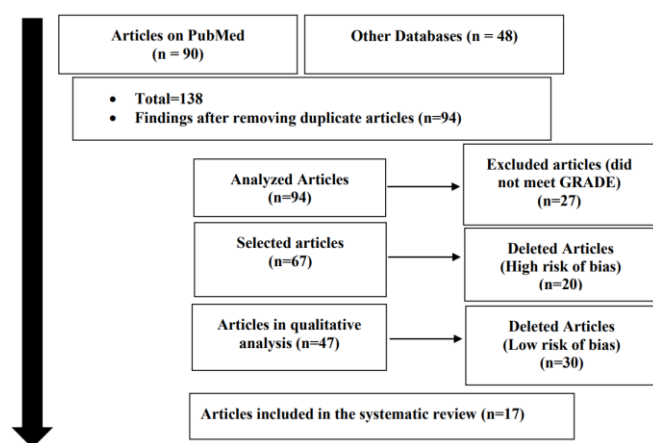
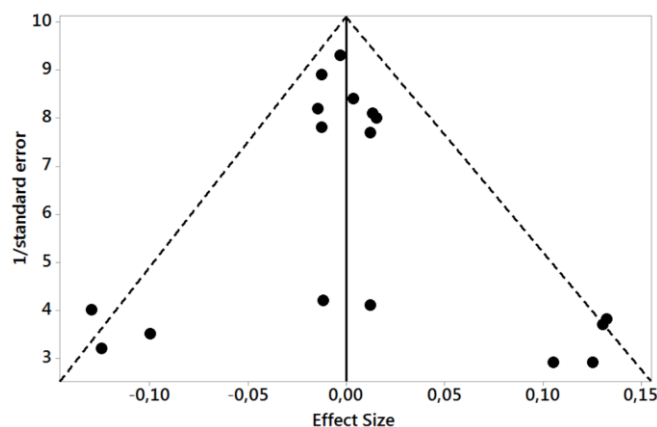


Figure 2 presents the results of the risk of bias of the studies through the Funnel Plot, showing the calculation of the Effect Size (Magnitude of the difference) using the Cohen Test (d). Precision (sample size) was indirectly determined by the inverse of the standard error (1/Standard Error). This chart had a symmetrical behavior, not suggesting a significant risk of bias, both between studies with small sample sizes (lower precision) that are shown at the bottom of the chart and in studies with large sample sizes that are

shown at the top.

Figure 2. The symmetrical funnel plot does not suggest a risk of bias among the small sample size studies that are shown at the bottom of the plot. High confidence and high recommendation studies are shown above the graph (n=17 studies).



Source: Own authorship.

Athlete's Sleep and Performance

To begin the aforementioned study on sleep and its direct connection with the sport, it is necessary to understand its importance within this world. Sleep is part of the tripod on which the evolution of the sport is based: rest, proper nutrition, and programmed training. If one of these situations is not respected, the income will decrease. Athletes, especially high-performance ones, have a very regimented life, with a highly planned routine from eating to sleeping hours, all these factors are directly linked to their biological clock or circadian cycle [1,2].

For ideal performance, the athlete must increase his sleep time, especially for those athletes who perform periodized, interval, and longer training. With increased sleep time the body will recover to new training levels. One of the greatest examples of the vital importance of sleep for athletes occurs with long-distance triathletes, who need nine to ten hours of sleep per night, and for those who have such availability, one or two hours of sleep in the morning after training [3]. Below are some of the main benefits of sleep for athletes:

- Muscle recovery;
- Accelerated production of hormones such as GH, known as growth hormone;
- Immune system support.

When the athlete sleeps properly, his muscle recovery occurs satisfactorily so that the body is "ready" for his next workout or test. In cases where such recovery does not occur, the intensity of the next training session may be impaired, and when this action

becomes recurrent, the result is known as overtraining (excessive training/lack of rest) [3].

Sleep helps in the production of hormones, such as the already mentioned growth hormone (GH - Growth Hormone), as this is released at night, helping muscle recovery. Another hormone that can be mentioned is cortisol, which has an anti-inflammatory action and is released when we wake up, which demonstrates some fundamental actions of sleep [4].

Leptin can also be mentioned as one of the hormones secreted during sleep and its main function encompasses the control of the feeling of satiety. Thus, athletes who remain awake longer than recommended will feel the need to ingest greater amounts of carbohydrates [5]. The immune system also enters the list of advantages of sleep, because, with such a system properly maintained, there will be less risk of infections and will keep the hormones responsible for hunger and satiety under control [1,7].

Sleep Phases

For a better understanding of how sleep works in athletes' bodies, it is necessary to understand its phases. Sleep has five stages, where the first three will be focused on relaxation, while the rest will be deep sleep where recovery will occur [3]. Below is a demo developed by Dr. Regeane Trabulsi Cronfli, where the phases of sleep and the hormones involved are exemplified:

- ✓ Phase 1 Melatonin is released, inducing sleep (drowsiness);
- ✓ Phase 2 The cardiac and respiratory rhythms decrease, (light sleep) the muscles relax and the body temperature drops;
- ✓ Phases 3 and 4 Peak GH and leptin release; cortisol begins (deep sleep) to be released until it reaches its peak in the early morning;

REM sleep Acronym for rapid eye movement is the peak of brain activity when dreams occur. Muscle relaxation reaches a maximum, and heart and respiratory rates increase again. Such definitions reflect the difference between quantity and quality of sleep, where even if athletes sleep the appropriate hours, they cannot reach deep sleep, that is, it will not be the appropriate rest with the expected results [8].

Many athletes find it difficult to maintain adequate sleep, especially in times that precede competitions. Some problems such as anxiety, travel, time zone changes, stress, and such diagnoses should be made by the team that accompanies the athletes so that the best solution is found. It is worth remembering that sleeping pills cannot be considered, as some of them may appear in anti-doping tests [9].

In this context, Luiz Felipe Prota [8] comments on the National Sleep Foundation, which indicates that a satisfactory night's sleep revolves around seven to nine hours a day for a young person or adult, with fluctuations in variables according to age. Sleep is essential for the functioning of the body's physiological and psychological functions. While we sleep, the body produces hormones and substances that play vital roles, therefore, eliminating this rest from our routine completely compromises the balance of the body.

The Effects of Lack of Sleep

Sleepless nights bring countless negative effects to the lives of athletes, such as an imbalance in the autonomic nervous system, that is, the athlete's body may show symptoms of overtraining even without the aforementioned overtraining. The main complaint of athletes is linked to the increase in the perception of effort resulting in a drop in performance, there is no physical change but the brain responds and interprets situations differently as if the effort performed was much greater than the real [8].

Luiz Felipe Prota [8] connects the football players with the football players when they haven't slept well:

"Cognitive performance can be affected and some player skills are directly impacted, such as losing the ability to calculate spaces and references within the field. tactical scheme or the right timing of a header in a high tackle or an attack on a goal. Speed and accuracy can be impacted which can increase the chances of error on the field."

However, the problems linked to lack of sleep are more extensive and dangerous. As sleep hours are reduced, a serious health problem can develop: diabetes. The production of insulin (a hormone responsible for removing sugars from the body) is inhibited by lack of sleep [10].

The Neuroscience of Sleep

Sleeping well is one of the main requirements for a healthy life and this is a remarkable fact for society, but few know the reasons and scientific explanations for this fact. To start this part of the study, it is necessary to introduce the study of sleep and understand how it works scientifically and conceptually. The word sleep derives from the Latin Somnus, which designates a state of rest (normal and periodic) where there is a temporary suspension of motor (voluntary) and sensory-perceptual activity [2,3].

The definition of sleep is made by some authors such as Valle L et al. 2008 [10]:

"The deliberate triggering of an alteration or reduction of conscious state, lasting a very long time, an average of 8 hours (...) starting at

about the same time in every 24 hours, and (...) physically, mentally and intellectually restored".

Roper Dorland also conceptualizes sleep as "a period of rest for body and mind, during which volition and consciousness are in partial or complete inactivity." Sleep has a cycle with its already mentioned phases, which according to Lavie (1998, 45) will depend on the sleep time of each individual, emphasizing that as age advances, sleep cycles decrease [7].

The two stages of sleep are known as Non-Rapid Eye Movement (NREM) and Rapid Eye Movement (REM). There are no unanimous opinions in the scientific community about the role of sleep in the human body, but some functions are exhaustive [11]:

- Recovery of metabolites;
- Cleansing the brain of toxins;
- Regulation of hormones;
- Consolidation of memories.

Memory processing is also one of the advantages and mysteries of sleep, where it is proven that sleep supports the formation of memories, increasing learning [12]. Sleep has been studied since 1924, using memorization and teaching a new language to some individuals, demonstrating that there is an exponential decrease in how much such people store new information in their brains. However, when there are a few hours of post-learning sleep, the decrease is more subtle [13].

The scientific explanation for this phenomenon is the action of the hippocampus while we sleep, as it reactivates itself to produce some activities similar to those when we are awake. The hippocampus directly sends data to the cortex, which response and results in the "delta wave" and then the "dream axis" [14].

Ancient scientific literature held these "delta waves" to be responsible for generalized periods of silence, however, contemporary studies demonstrate another reality. They are responsible for isolating sets of neurons, which form long-term memories [12-14].

During sleep, human beings go through four to five phases that result in the two types mentioned NREM and REM sleep. The first type is the beginning of sleep, where there are no dreams, while the second type is named after the movement performed by our eyes, known as the period when dreams occur. It is noteworthy that the interruption of these cycles is an unhealthy but very common practice, such as when the alarm clock rings [15].

In this sense, there are countless advantages of a good night's sleep for the human body and one of them is directly linked to the excretion of metabolites that are no longer needed by the brain [12-15]. Other organs normally use the lymphatic system for such action, but

the brain does not have this functionality and needs another way for its self-cleaning [16]. Covers the brain, because in this period there is a slight decrease in brain cells. In short, it is during sleep that the brain will carry out its daily cleaning [17].

Conclusion

After all the previous exposition, there are more concrete facts than just simple suspicions of the real need for sleep for a healthier life and the best performance of athletes. As demonstrated, sleep is responsible for several functions in the organism, and its deprivation will bring harm and diseases. The situation of human beings in the 21st century is very clear, where technology, entertainment, and work deprive the necessary hours of sleep, but it is necessary to develop the habit of maintaining the necessary moments of sleep so that all body functions are regenerated and maintained sufficiently. The research presented demonstrated all the important points related to sleep and its connection with athletes and neuroscience, as well as the opinion of several authors on the subject. With this article, it is hoped that the subject in question has been clarified and reminds anyone who reads it about the importance of maintaining sleep.

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Informed consent

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Conflict of interest

The authors declare no conflict of interest.

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