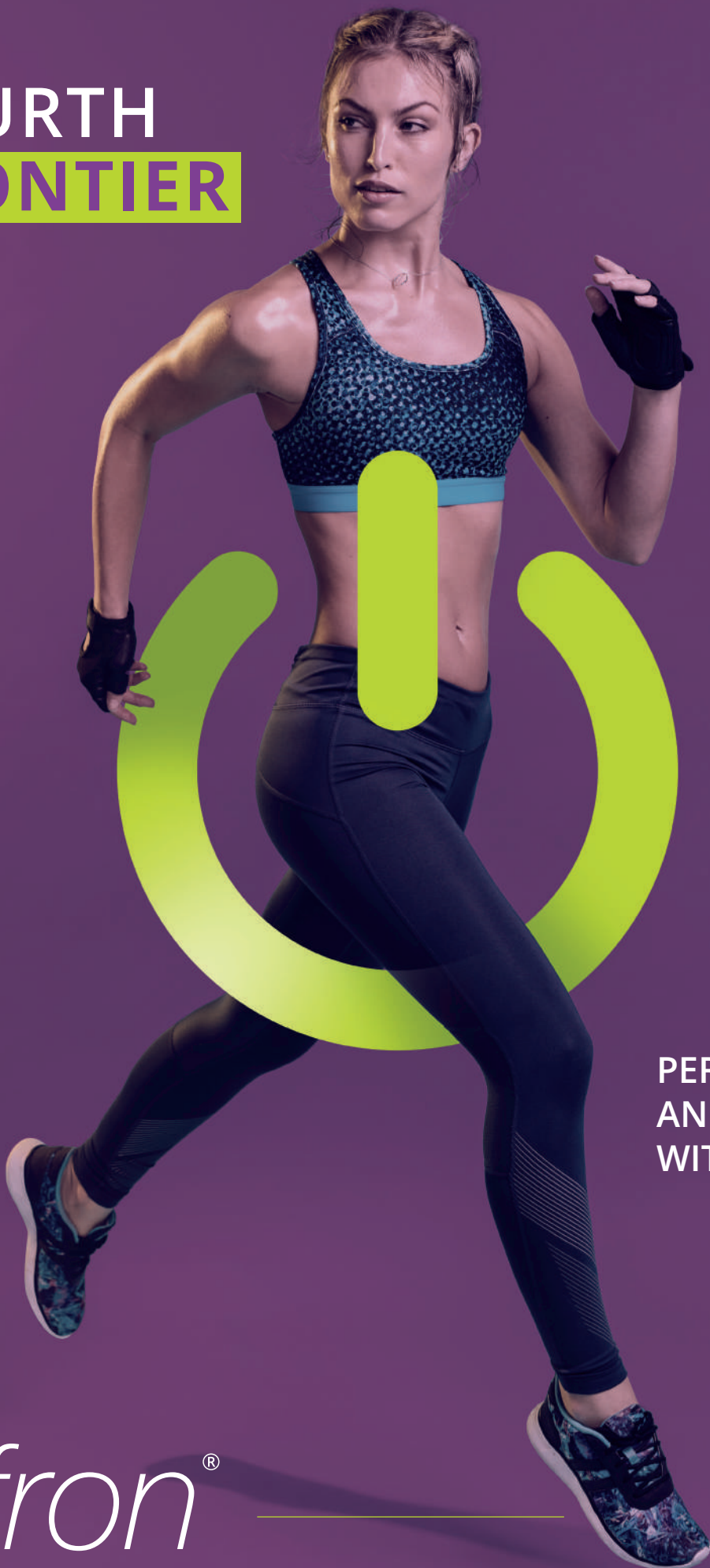


THE  
FOURTH  
FRONTIER



PERFORMANCE  
AND SLEEP  
WITH AFFRON®

*affron*®

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## PERFORMANCE, RECOVERY, AND SLEEP

Athletes of all standards continue to seek any advantage or edge that may improve performance. One of the most important areas is recovery, specifically the rate (or speed) of recovery and its quality.

Recovery aims to restore physiological and psychological processes, so that the athlete can compete or train again at their best (optimum) level. There are several methods used to enhance recovery including interventions like massage and compression.

However, two of the most popular interventions are nutrition and sleep - including the nutrition to support sleep. In fact, **sleep is the fourth stage of performance. To prepare, perform, recover, and sleep.**

**Perform, recover, sleep, go again... with affron®.**

## THE NEED FOR SLEEP

**Sleep is essential for the brain and the body and is dependent on the quality of the sleep cycle.**

The duration and composition of sleep changes across the life cycle, albeit almost all humans (including athletes) need at least 7-10 hours of sleep a night to function optimally<sup>1,2</sup>.

Poor quality sleep over a long period of time is known to reduce athletic performance. However, it can also impact athlete 'health' and general well-being. **For example, a lack of sleep (deprivation) or quality of sleep (time to get to sleep, disturbed sleep) can negatively affect mood, learning, memory, cognition, pain perception, immunity, and inflammation<sup>3</sup>.**



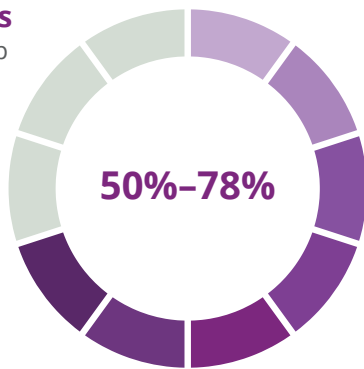
## SLEEP AND THE ATHLETE

A growing volume of peer-reviewed publications speaks to the recent and rapid growth in scope and understanding of sleep for athlete health and performance. More than 80% of all peer-reviewed publications on this topic have been published in the last 10 years (>1 000 papers)<sup>3</sup>.

It is well reported that elite athletes are particularly susceptible to inadequate or disturbed sleep. **In fact, 50%–78% of elite athletes experience sleep disturbance whilst 22%–26% suffer highly disturbed sleep**<sup>4,5,6</sup>.

### Elite athletes

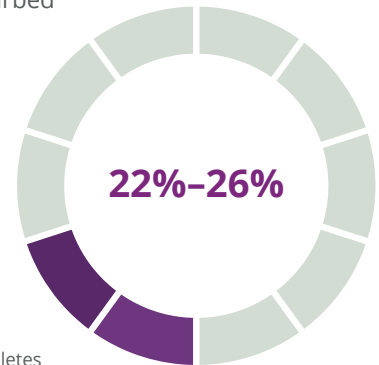
Experience sleep disturbance



**Figure 1.** Percentage of elite athletes experiencing sleep disturbances.<sup>4,6</sup>

### Elite athletes

suffer highly disturbed sleep

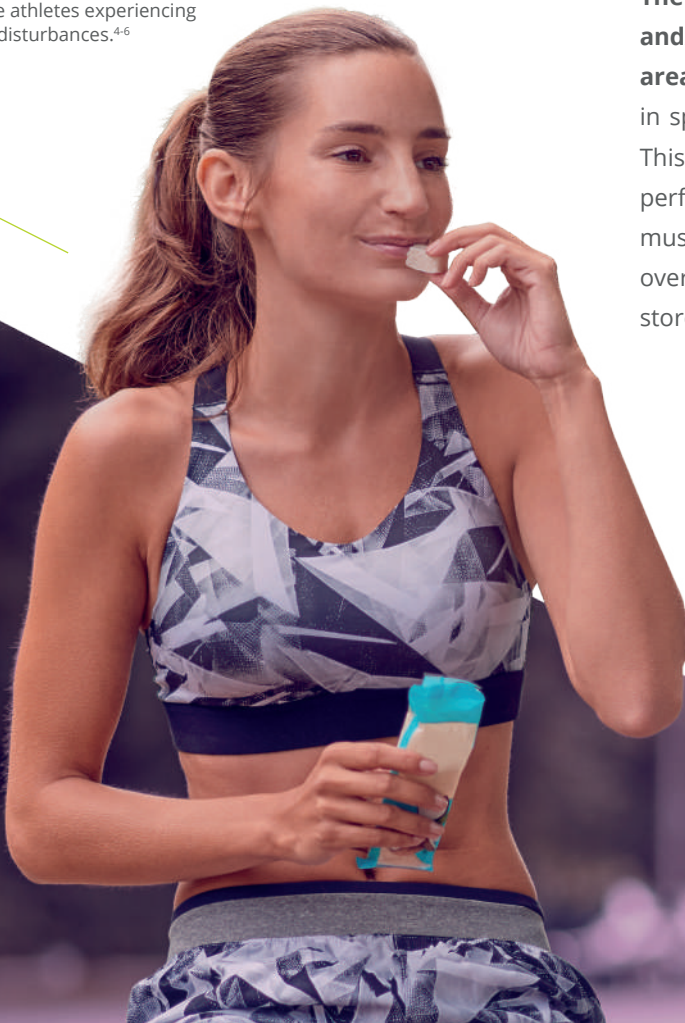


**Figure 2.** Percentage of elite athletes suffering highly disturbed sleep.<sup>4,6</sup>

Evidence also indicates that **clinical sleep problems are prevalent in high level athletes**. For example, a recent review highlighted the prevalence of insomnia symptoms (e.g., longer sleep latency, greater sleep fragmentation, non-restorative sleep, and excessive day-time fatigue).

## THE ROLE OF NUTRITION

**The role of nutrition to enhance the quality and/or quantity of sleep has become of huge area of scientific and practical interest** not only in sport, but in other areas of health and disease. This is not just because of the direct link to performance, but also the indirect impact on muscle recovery and repair, hormonal status, overnight protein synthesis or muscle glycogen stores.



Principally, nutrition strategies have focused on the avoidance (or management) of caffeine intake throughout the day and before bed. However, this relates more to the avoidance of an ingredient rather than the benefits of consuming an ingredient. Currently, there is a wide range of products on the market that are positioned towards sleep, however, there is limited evidence to support their benefits.

**Three in ten global consumer say that they currently find it difficult or very difficult to get to sleep at night.<sup>3-10</sup>**



Figure 3. Sleep and stress management infographic, by FMCG Gurus.

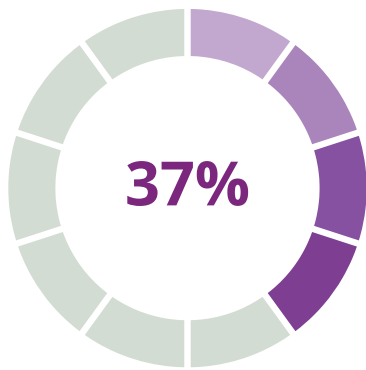
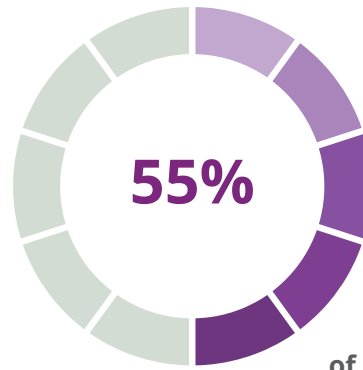


Figure 4. Sleep and stress management infographic, by FMCG Gurus.

**37% of global consumer say they suffer from stress.**



**55% of consumers are interested in products that help improve sleeping patterns.**

Figure 5. Sleep and stress management infographic, by FMCG Gurus.



## THE ROLE OF AFFRON®

**Affron®** is a saffron® extract (*Crocus sativus* L.) standardized to  $\geq 3.5\%$  **Lepticosalides®**, a complex set of biomolecules responsible for the beneficial and organoleptic properties of **affron®**. They have been shown to improve mood in healthy consumers with occasional stress, low mood and sleeplessness<sup>7-13</sup>.

More recently, 14mg of **affron®** taken twice daily over 4 weeks showed sleep enhancing effects in adults with self-reported unsatisfactory sleep<sup>12</sup>. This included:

- » A reduction in the parameters related to insomnia (Reduced ISI score), improving sleep sensation<sup>12</sup>.
- » Decreased sleep latency, accelerating falling asleep<sup>12</sup>.
- » Decreased number of awakenings after sleep onset, favouring continuous sleep<sup>12</sup>.
- » Increased state of alertness on awakening, making easier to get up and start the day<sup>12</sup>.

It is proposed that this was a result of following mechanisms of action:

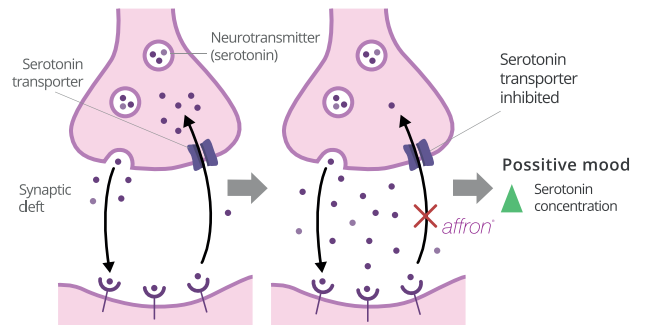


Figure 6. Saffron mechanism of action.

### Insomnia Severity Index Score (ISI)

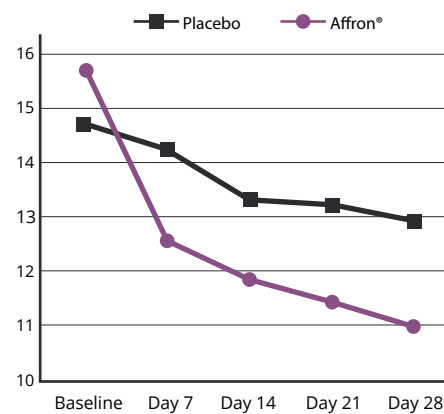


Figure 7. Change in Insomnia Severity Index Scores.

### Restorative Sleep Questionnaire Score (RSQ)

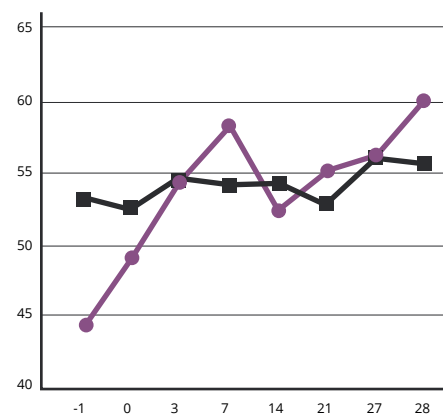


Figure 8. Change in Restorative Sleep Questionnaire scores.



A new clinical study published in 2021, described that an affron single night dose (14 mg) before bedtime over 4 weeks, showed restorative sleep effect in adults with self-reported unsatisfactory sleep<sup>13</sup>. The study result reported:

- A significant **improvement of 24,6% of sleep quality**, compared to the placebo.
- A **reduction of 6%, 22%, and 26%** in the number of **insomnia** classifications from baseline to week 4 in the placebo, **affron®** 14 mg and 28 mg groups, respectively.
- The very first time, a single dose of **affron®** 1 hour before going to sleep revealed an **increase in melatonin concentration** from baseline to week 4, compared to the placebo.

In summary, the results of this study provide further **confirmation of the sleep-enhancing effects of 28 days of affron® supplementation** at 14 mg, 1 hour before bedtime, facilitating a consumer's adherence.

**Affron®** supplementation was **well-tolerated, with no reported significant adverse effects**, offering natural support that avoids the undesirable effects that other botanicals or melatonin could cause in some persons.

By the very first time, a single dose of **affron®** 1 hour before sleep revealed **new possible mechanism of action** influencing sleep hormones.



### Sleep Quality improvements after 4 weeks (PSD)

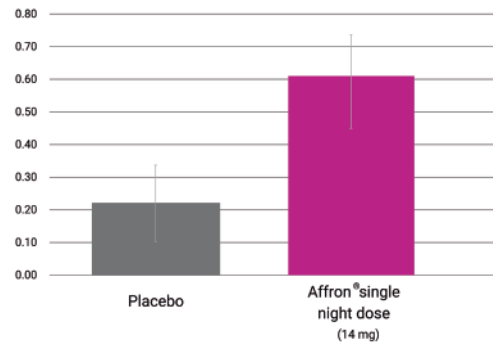


Figure 09. Changes in sleep quality ratings from baseline to week 4.

### Percentage reduction in insomnia classification (ISQ)

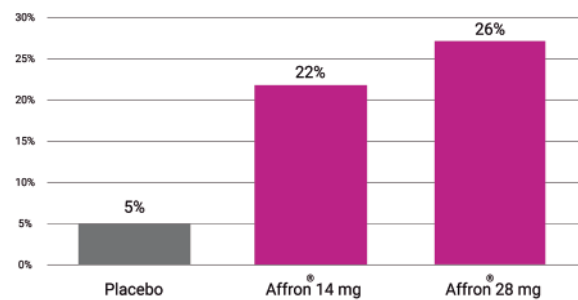


Figure 10. Changes in Insomnia Symptom Questionnaire (ISQ) from baseline to week 4.

### Change in evening Melatonin (pg/ml)

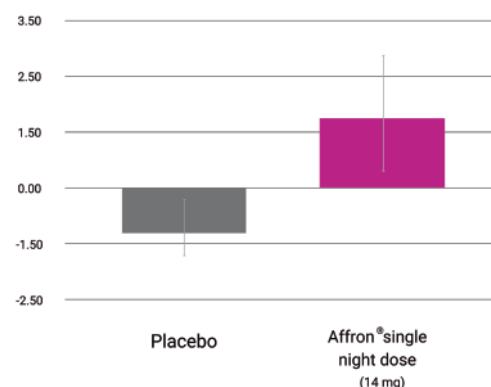


Figure 11. Changes in salivary hormone (melatonin) concentrations from baseline to week 4.

The results demonstrate that **affron®** is efficacious at improving sleep in individuals with sleep disturbance<sup>12,13</sup>. On the basis that sport, and exercise, increases the risk of sleep disturbance, there is good rationale to use **affron®** in sports nutrition.

COUNTRY	WORDING
EUROPE <i>[EFSA on hold claims]</i>	<ul style="list-style-type: none"> <li>Helps maintain a state of relaxation and mental physical well-being / helps to maintain good mood</li> </ul>
CANADA <i>[Approved claims]</i>	<ul style="list-style-type: none"> <li>Helps to support mood balance</li> <li><b>affron®</b> helps to relieve restlessness and/or nervousness (calmative)</li> <li>Supports positive effects on symptoms of perceived stress such as fatigue, weariness and irritability</li> <li>Helps to reduce the symptoms of perceived stress such as fatigue, weariness and irritability</li> <li>RDD: 14 mg x 2/day</li> </ul>
JAPAN <i>[FFC approved claims]</i>	<ul style="list-style-type: none"> <li>This product contains saffron- derived crocin, saffron- derived Safranal, and has the ability to reduce sleepiness during activities and maintain the motivation necessary to accomplish things for those who feel that the quality of sleep is low</li> <li>RDD: 14 mg x 2/day</li> </ul>

Table 1. Available claims to make on **affron®**

## THE OPPORTUNITY

In 2020, the global sports nutrition market was worth \$21.8bn, and is projected to grow at 8% YoY to 2025 (Euromonitor International). **The growth of sports nutrition is driven by the increase in active consumers who are interested in the importance of exercise and nutrition to improve health as much as performance.**

As a result, there is greater interest in the role of nutrition beyond the immediate periods before, during and after sport, with particular focus on how to improve the quality of the diet, support immunity and improve sleep (amongst others).





Sleep is therefore not just about elite performance, but those engaged in regular exercise as part of healthy lifestyle. It is also an important component of the consumer aspiration for a 'healthy body, healthy mind' where consumers want to connect the benefits of exercise with everyday health and wellness, **including the importance of sleep and mood.**

## Factors that contribute to sleep disturbance

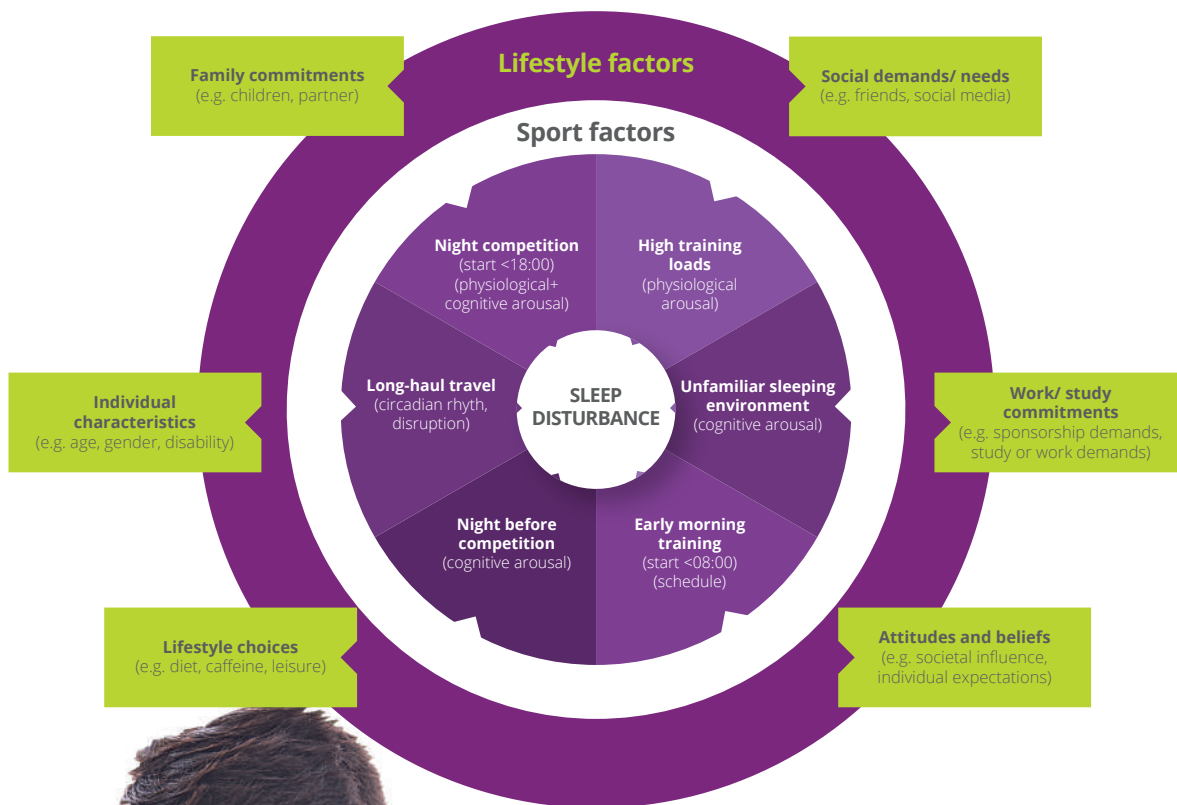


Figure 12. Factors that contribute to sleep disturbance (sport specific; white and lifestyle specific). Adapted from Walsh et al, 2020 [3]



Currently, sleep related products are focused on protein and/or ingredients like melatonin. As such, there is an exciting opportunity to promote recovery, performance and health with well researched ingredients that enhance the quantity and quality of sleep.

## DEVELOPING THE BEST PRODUCTS

**Affron®** is a natural plant extract that is water soluble and versatile to use in multiple applications, including powder, food, and drinks.

It is recommended to consume 28mg of **affron®** per day, whether taken as a single dose, or split twice per day. It helps to 'aid restful sleep' and can be combined with protein or any other sleep formulation or promoted as a standalone product. There are a range of exciting product options possible. Two options are suggested below to help bring to life how affron can help improve sleep in products that could be added to any sports nutrition range.

## PREMIUM OVERNIGHT PROTEIN

Developed by sleep experts, our overnight protein combines the nourishing power of plant protein with 28mg **affron®** to **promote sleep by helping you to relax and feel good**. With soothing flavours, overnight regeneration has never tasted so good.

- » 15-20g plant-based protein | high in protein
- » **Affron®** | aids restful sleep
- » Creamy and soothing flavours
- » 100% natural and plant based

### Suggested EFSA Claims

BOTANICAL INGREDIENT	WORDING	RECOMMENDED DOSAGE
Saffron	Helps maintain a state of relaxation and mental physical well-being.	30 mg
Plant-based protein	Protein contributes to the maintenance of muscle mass.	15 mg



## PREMIUM SLEEP CAPSULES

**Life can be stressful.** Exercise can take it out of you. These nootropic capsules contain research backed ingredients that help **to reduce stress, promote relaxation, and help you get a good night's sleep. Relax, reset, and regenerate.**

- » 28 mg affron®
- » Valerian root
- » 100% natural and plant based
- » Galenic formulation. HPMC Capsules

### Suggested EFSA Claims

BOTANICAL INGREDIENT	WORDING	RECOMMENDED DOSAGE
Saffron	Helps maintain a state of relaxation and mental physical well-being.	30 mg
Valerian	To help sleep onset, Clinically/Scientifically proven to help normalise. /Promote sleep (onset), Valerian helps to maintain a natural sleep. To support calmness and in case of irritability. Helps you to cope calmly with the stress of a busy lifestyle. Support of mental well-being in cases of tension and stress. Contributes to optimal relaxation. Helps to support the relaxation.	120 - 360 mg



## CONCLUSION

Athletes of all standards are susceptible to poor sleep, characterised by short sleep duration (<7hours each night) and poor sleep quality (e.g., fragmented sleep). This has been shown to reduce performance and impact on general health and wellbeing. As a result, **sleep has never been more relevant to sports nutrition and the growth active nutrition. Affron® offers a proven, natural and plant-based solution that is versatile to use multiple formats and formulations.**

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A leading voice on the sports and active nutrition category, and in particular how it is evolving and the role of innovation. Nick has previously worked with elite athletes as an Exercise Physiologist, and managed applied nutrition research programmes at GSK.



## ABOUT PHARMACTIVE BIOTECH PRODUCTS S.L.U.

**Pharmactive Biotech Products S.L.U.** is a privately owned company that develops and manufactures differentiated natural ingredients supported by scientific evidence. We offer the Pharmaceutical and Nutraceutical industry a natural, science-based therapeutic alternative that can be safely used either in combination with existing medications as add-on ingredients for improved efficacy or presented as a single standing remedy; with patented products, proven benefits and claims for our natural ingredients in the areas of for example mood improvement, anxiety and stress reduction, eye-health, cardiovascular health advancement and enhancement of the body's immune system against cold and flu.





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