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# Comparison of sleep between youth elite amateur athletes and professional athletes

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## Abstract

Recent studies suggest that professional athletes seem to experience significant sleeping problems. However, little is still known about the occurrence of sleeping challenges at different stages of an athletic career. This descriptive study aimed to compare the sleep of professional athletes with younger elite amateur athletes. A total of 401 sportsmen, 173 youth elite amateur athletes and 228 professional athletes fulfilled a validated questionnaire. The self-estimated quality of sleep (on a linear scale 0–10) was significantly better in youth, being 7.9 compared to 7.4 ( $p < 0.001$ ). The professional athletes had a significantly higher risk for sleeping problems, especially during the competitive season (OR = 7.3, 95% confidence interval 4.1–12.9) and they also used significantly more sleep medications (OR = 8.3, 95% confidence interval 1.7–4.1). Interestingly, majority of youth athletes (85.4%) had received adequate sleep counselling compared with professional athletes (58.1%), ( $p < 0.001$ ). Furthermore, 75.8% of professional athletes considered that additional sleep counselling would improve their performance compared with only 45.6% of youth athletes ( $p < 0.001$ ). Our study demonstrates that compared with the younger counterparts, professional athletes experience impaired sleep quality and significantly more sleeping problems. There may be various underlying factors to induce the problems. The early intervention with sleep counselling may play an important role in preventing these problems and, therefore, it is recommended to be integrated in athletes' overall training process.

**Keywords** Youth elite athlete · Counselling · Sleep · Professional athlete

## Introduction

Our well-being is based on a healthy lifestyle; regular exercise, healthy nutrition and refreshing sleep. All these elements influence each other through complex interactions. If one neglects one component, there exists a major risk

that it will impact the other parts, thus risking the individual's health [1]. Sleep disorders have become increasingly prevalent, it has been estimated that at least one in every five adults suffers from chronic sleep problems [2, 3]. Sleep disturbances have not only become frequent in the general population, but recent studies indicate that elite athletes are faced by multiple sleep problems [1, 4–8]. They are known to get less sleep than non-athletes, and furthermore they have longer sleep latency and lower sleep efficiency for example because of recurrent awakenings at nighttime. Also, insomnia and sensitivity of sleep are common among professional athletes [5, 9, 10].

To be a successful athlete, one must have talent, will to train hard and ability to recover well. Therefore, the recovery provided by restorative sleep can be viewed as a cornerstone of successful training and performance for athletes. For elite amateur athletes, the frequent exposure to high-intensity training and competition programmes increases their need for recovery, and therefore may increase their overall requirement for sleep [1]. On the other hand, problems in sleeping may affect the balance of training and recovery, also

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predisposing them to overtraining [11]. Sleep deprivation has been found to be associated with athletic injuries [12] and encouraging young athletes to get optimal amounts of sleep seems to help protect them against injuries [13]. Athletes are exposed not only to major physical efforts but also to intense psychological stress. However, it seems that they are not provided with appropriate techniques to overcome their sleep problems [4, 14].

Sleep is not only about quantity i.e. hours spend in bed but also quality. Although some studies have investigated how long athletes sleep, a search of the literature reveals that there is limited information about the quality of their sleep and sleeping problems. Furthermore, little is known about sleep and possible challenges in sleeping at different stages of athletic career [12, 15, 16]. Several studies have demonstrated that professional athletes are facing increased risk of poor sleep and even sleep disorders are not uncommon among them [1, 4–8]. On the other hand, previous studies have also demonstrated that systematic sleep counselling can enhance the quality of athletes' sleep [1, 10, 17]. In which point the problems start to progress or do younger amateur athletes also already confront major challenges in sleeping and quality of sleep? A recent study indicated that many collegiate student athletes are not obtaining enough sleep. However, the investigators stated that more data on student-athlete sleep risk factors, sleep quality measurement, and the prevalence of sleep disorders is needed [16]. There is a definite need for studies examining athletes at different stages of their career to better understand the nature of possible challenges in sleeping. Furthermore, we need more evidence of impact of interventions, such as, sleep counselling, on athletes' sleep. This cross-sectional study aimed to compare the quality of sleep, the prevalence of sleep problems, the use of sleep medication and received sleep counselling between youth elite amateur athletes and professional athletes. We hypothesized that professional athletes encounter more difficulties in sleeping than their younger, amateur colleagues. Based on our previous studies, we also hypothesized that sleep counselling may be of importance [1].

## Materials and methods

### Participants

All athletes participated in sleep counselling of the study group and the sleep questionnaire used in study was essential part of the counselling and all athletes fulfilled it. No exclusion criteria were used. The sleep questionnaire was fulfilled prior to sleep counselling as a screening tool. A total of 401 athletes (368 male, 33 female) including 173 youth amateur elite amateur athletes and 228 professional athletes participated. The youth athletes were draftees of

the Finnish Defence Forces Sports School ( $n = 173$ ) representing same sport as professional athletes. The professional athletes represented national Olympic athletes, representing both summer and winter disciplines ( $n = 65$ ), ice hockey players ( $n = 137$ ), and soccer players ( $n = 26$ ); both the ice hockey and football teams represented the highest national level (Table 1). The major difference between these two groups was that for the professional athletes their regular income came from their sport compared with the youth elite amateur athletes. The study was conducted in two private sleep clinics (same physician) in collaboration with the local university. The participants were given both oral and written information about the trial and they provided signed informed consent. Approval from the Research Ethics Committee of the local University Hospital District was obtained for the study.

### Study design

This descriptive study was conducted between September 2013 and September 2015. A standard clinical protocol for evaluating the sleep of athletes was used: the sleeping habits, the prevalence of sleep disturbances and problems, the use of sleep medication and previously received sleep counselling of all participants were evaluated via a questionnaire.

### Sleep questionnaire

The questions in the sleep questionnaire were based on previous validated questionnaires (Basic Nordic sleep questionnaire) that have been used to screen for sleep disturbances and sleep problems with some amendments related to athletic performance [1, 18–21]. In the questionnaire, the athletes were asked to self-estimate their regular sleep duration i.e. the sum of average nocturnal sleep time from sleep onset

**Table 1** Baseline demographics of the study population

	Youth elite amateur athletes ( $n = 173$ )	Professional athletes ( $n = 228$ )
Sex		
Male	171	197
Female	2	31
Age	19 (0.751) (18–22)	25.9 (6.073) (16–51)
Sport		
Ice hockey		137
Soccer		26
Olympic disciplines		65

Data are mean values (standard deviation) or number of cases

to wake-up (6 h or less, 7 h, or 8 h or more), sleep onset time, number of nocturnal awakenings, whether they have had regular problems in sleeping during the off-season or in the competitive season (if they have experienced problems, had they taken sleep medication and if so, what medication), and if their bedfellows have noticed breathing pauses during their sleep. The following questions were recorded; (a) How often do you feel excessively sleepy during the daytime? (b) How often do you take a nap? (c) How often do you snore? (d) How often do you take sleep medication? The participants were also asked whether they have unpleasant feelings in their legs or extremities at rest and/or when lying in bed in the evening and if moving their limbs or walking can help ease these unpleasant sensations. Furthermore, the participants were asked to self-estimate the average quality of their nocturnal sleep (a linear scale of 0 to 10; 0 = worst possible and 10 = best possible). Finally, the participants were asked to assess whether they consider good sleep as being important for their athletic performance. They were also asked whether they had received previously sleep counselling and, if they considered that an additional sleep counselling would further improve their performance. The questionnaire can be found in Appendix (Supplementary Material).

### Statistical analysis

Patient characteristics and variables were analysed with the Statistical Package for Social Sciences (SPSS software version 22 for Windows, SPSS Inc., Chicago, USA). Descriptive statistics were expressed as frequencies with percentages for categorical variables and with mean  $\pm$  the standard deviation (SD) for continuous variables. Differences between the groups in categorical variables were assessed using Pearson's Chi-squared test and in continuous variables with an

independent samples *t* test. The distributions of continuous variables were normally distributed. Adjusted *p* values by age and by age and sex were calculated by a binary logistic regression model and linear regression model. The differences were regarded statistically significant if a two-sided *p* value was less than 0.05.

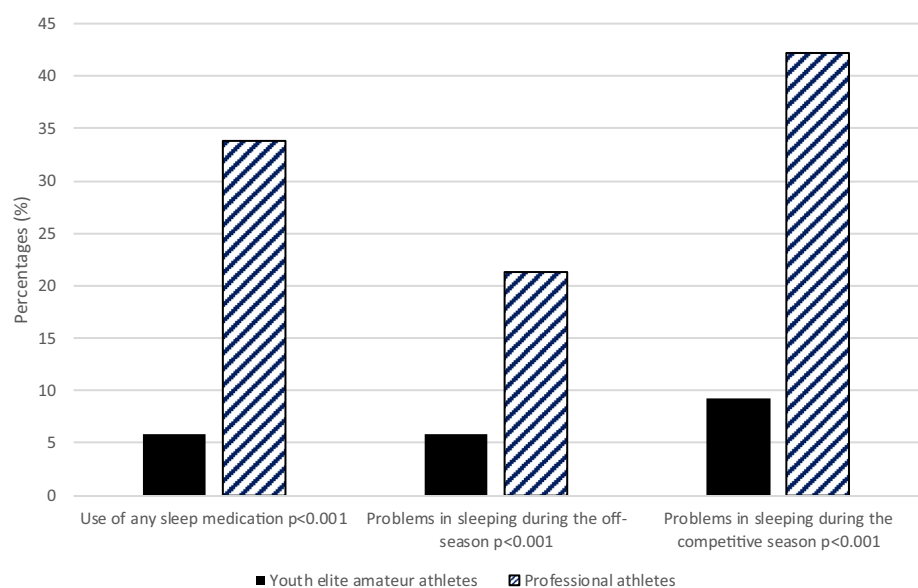
### Results

A total of 401 sportsmen, 173 youth elite amateur athletes and 228 professional athletes, were included in the study. At the time of the survey, the mean age of the youth athletes was 19.5 (SD 0.751) and of the professional athletes 25.9 (SD 6.073) (Table 1).

Almost all the participants (98.3%) considered that good sleeping is important for their performance (92.2% of youth and of 99.1% of professional athletes,  $p = 0.435$ ). The self-estimated quality of sleep (on a linear scale 0 to 10) was significantly better among the youth athletes, being 7.9 compared to 7.4 of professional athletes ( $p < 0.001$ ). Professional athletes had a significantly higher risk for problems in sleeping (OR = 4.4, 95% confidence interval 2.1–9.2), especially during the competitive season (OR = 7.3, 95% confidence interval 4.1–12.9) when almost half of professional athletes (42.2%) had notable problems in sleeping (Fig. 1). Professional athletes also used significantly more sleep medications (OR = 8.3, 95% confidence interval 1.7–4.1 (Fig. 1). Breathing pauses during sleep were more evident among professional athletes (OR = 14.8, 95% confidence interval 1.1–112.1). All the main differences between the groups, also adjusted by age, are also shown in Table 2.

Most youth athletes (85.4%) had received adequate sleep counselling compared with professional athletes (58.1%),

**Fig. 1** Comparison of sleep of youth elite amateur and professional athletes. Data are percentages. Differences between the groups were assessed using Pearson's Chi-squared test



**Table 2** Comparison of sleep of youth elite amateur and professional athletes

	Youth elite amateur athletes	Professional athletes	<i>p</i> value	Adjusted <i>p</i> value*
Self-estimated quality of sleep (0–10)	7.9 ± 1.0	7.4 ± 1.5	<0.001	0.022/0.027
Use of any sleep medication	10 (5.8%)	76 (33.9%)	<0.001	<0.001/<0.001
Problems in sleeping during the off-season	10 (5.8%)	34 (21.3%)	<0.001	0.005/0.005
Problems in sleeping during the competitive season	16 (9.2%)	96 (42.2%)	<0.001	<0.001/<0.001
Breathing pauses during sleep	1 (0.6%)	18 (7.9%)	0.001	0.021/0.016
Good sleep is important for performance	168 (98.2%)	226 (99.1%)	0.435	0.666/0.759
Enough counseling regarding rest and sleep	146 (85.4%)	132 (58.1%)	<0.001	<0.001/<0.001
Better sleep counseling would improve their performance	78 (45.6%)	172 (75.8%)	<0.001	<0.001/<0.001
Hope for an examination and treatment of sleep problem	21 (12.3%)	117 (52.2%)	<0.001	<0.001/<0.001

Data are mean values, number of cases (percentages), and standard deviation. Differences between the groups in categorical variables were assessed using Pearson's Chi-squared test and in continuous variables with an independent samples *t* test

\*Adjusted by age/age and sex

( $p < 0.001$ ). Majority of professional athletes (75.8%) considered that additional sleep counselling would improve their performance compared with only 45.6% of youth athletes, ( $p < 0.001$ ). Furthermore, only 12.3% of youth athletes experienced a need for more extensive sleep examination and treatment compared with 52.2% of the professional athletes, ( $p < 0.001$ ).

There were no differences between the study groups in sleep duration (most slept 7–8 h/night), in falling asleep (in both groups more than half fell asleep generally in 10–30 min), in the number of nocturnal awakenings (most woke 0–1 times/night) or in daytime tiredness (only about 4% of all participants had tiredness for 5 to 7 days a week). In napping frequencies or durations, there were no differences between the groups, about half of all participants took naps 2 to 4 days a week and for more than half of the athletes the nap lasted 30–60 min. Snoring was also at least as common in both groups; more than 80% reported snoring in 0–2 nights per week. 95.3% of youth and 76.8% of professional athletes reported not having unpleasant feelings in their legs and there was no statistically significant difference between the groups.

## Discussion

Our study demonstrates that the sleep of youth athletes is superior compared to professional athletes. The main findings were that the self-estimated quality of sleep was significantly higher in youth athletes, they had a significantly lower risk for major sleeping problems, especially during the competitive season and used less sleep medications compared with professional athletes.

Sleep has far-reaching impacts on our health and overall well-being. In athletes, a poor night's sleep may impair

performance including reaction time, accuracy, strength and endurance [10, 22]. Sleep deprivation can also harm cognitive functions like such as judgement and decision-making; increase the risk of exercise-related injuries; allow for the development of recurrent upper airway infections and cause chronic pain; even lead to the creation of a vicious cycle related to sleep loss, impaired recovery; increased feelings of pain that themselves predispose athletes to sleep disturbances and delay recovery from a sports-related injury e.g. a concussion [10, 13, 23–26]. The present study supports the earlier findings that sleeping-related problems are indisputably common among professional athletes [1, 6].

We easily forget that it is only last few years that the importance of sleep on athletic performance has received the attention it deserves. Athletes are nowadays getting more and already at younger age evidence-based information about proper sleep hygiene aiming at it becoming part of everyday athletic training routines [17]. This is also supported by our finding that significantly more, nearly 90%, of youth athletes reported having received adequate counselling regarding sleep compared with 60% of professional athletes. To even highlight the difference between the groups, three out of every four professional athletes experienced that an additional, better sleep counselling would improve their athletic performance compared with less than half of the youth athletes. Every second professional athlete evaluated needing more extensive medical sleep examination and treatment compared to only one out of every ten youth athlete.

An important part of the prevention of sleeping problems in athletes is to improve their overall knowledge and provide evidence-based information of the significance of restoring sleep on their performance and, on the other hand, potential consequences of insufficient sleep on health, behaviour, attention, learning and athletic performance [10, 27, 28]. Previous studies have demonstrated that systematic

examination, counselling, and individual treatment planning can enhance the quality of athletes' sleep [1, 10, 17]. Furthermore, this information should not be limited only for athletes but also for the coaching and medical professionals to gain a precision approach.

The counselling should be focused on regular and healthy lifestyle, general sleep matters, and aims to reduce alertness and sympathetic activity in the evening [1, 10, 14, 29–31]. Typical sleep hygiene strategies include for example waking up at the same time each day, constant evening routines, and avoiding stimulants and distractions [10]. Napping and banking sleep can not only serve as an effective recovery tool between training sessions which occur on the same day but can also be used as a practical solution to reduce daytime sleepiness, particularly for athletes involved in sports which require early morning training [5, 32, 33]. Even though the short-term use of sleep medication is demonstrated to be beneficial in promoting sleep, these drugs are also associated with several harmful effects, such as misuse, increased risk for amnesia and daytime drowsiness, long-term usage, the development of tolerance, and possible impacts on the next days' performance [12, 14, 34]. Therefore, it is always recommended that sleep-promoting medication must be used with caution, and this is especially true for athletes.

Sleep is a complex physiological and psychological phenomenon, and many factors may disturb it. In addition to the role of counselling in improving the sleep, there may be some other reasons behind the differences between youth and professional athletes. Although their training and competition schedules further exacerbate the deficiency of the sleep of both youth and professional athletes [5, 27, 30, 35], professional athletes may be more often exposed to extreme travel circumstances and late-night performance [36]. One important difference may be that when the sport becomes work, the mental stress and physical demands tend to increase. Furthermore, athletes often seem to forget their daily life load as many have obligations outside their sports. The amount of rest and recovery should meet these elevated needs [14]. Sleep does change over the years, becoming more superficial and disturbed, but only in elderly age. In our study, there was 6-year difference (19.5 vs 25.9) in age between the groups (Table 1). Both groups may be considered to represent young, healthy adult population. Therefore, the age difference itself cannot explain the difference between the groups.

Some limitations of the present study need to be acknowledged. Although this descriptive study has one of the largest sample sizes regarding the sleep of athletes, the number of the participants is still relatively small. In addition, in our study, sleep was evaluated by a questionnaire without any objective assessment. Due to the cross-sectional study design, one has to interpret with caution the causality of sleep and sleep counselling. We did not collect data from

use of caffeine or energy drink and BMI. However, since all the participants were top athletes, there were no overweight or obese individuals among them. Although, the study groups were homogeneous, females are underrepresented in both groups. Both sexes should be included in future studies. There are well-known gender differences in sleeping in general population; therefore, these findings may not be applicable for female athletes. Although the participants represent wide variety and common sports, these results may not apply to all disciplines. In the future studies, the marital status and the amount of children of the participants should be examined. Evaluating different methods to improve the sleep of athletes and the impact of improved sleep on athletic performance should be targeted in future studies. Sleeping problems have become prevalent in general population but also among athletes and larger well-conducted studies with longer follow-up are needed.

## Conclusions

Based on current knowledge, restorative sleep may be considered the cornerstone of athletes' successful recovery. Previous studies have shown that sleeping problems have become common in professional athletes. This descriptive study compared the sleep between youth elite amateur athletes and professional athletes. Our results demonstrate that younger athletes have received more sleep counselling and experience less sleeping problems. Although there may be various factors affecting the sleep, our findings indicate that early sleep counselling may play an important role in prevention of sleep problems in athletes. Therefore, sleep counselling should be recommended to be part of athletes' overall training process aiming at success.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s11332-021-00780-5>.

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## Declarations

**Conflict of interest** No potential conflict of interest was reported by the authors.

**Ethical approval** Approval from the Research Ethics Committee of the local University Hospital District was obtained for the study.

**Informed consent** The participants were given both oral and written information about the trial and they provided signed informed consent.

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