

## Sleep Quality and Anxiety in Different Sports Categories

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### ABSTRACT

Sleep is a needed and repairing physiological state, usually recurring and reversible, characterized by a depression in the senses, the conscience, and the spontaneous motricity, in which a person can awaken due to sensory stimulus. In the case of athletes, sleep has been considered a key factor for competition and its efficiency, being the most common alterations among athletes partial sleep privation and fragmented sleep. athletes increase their anxiety level when the competition is approaching. This increase in anxiety produces a negative effect in the sleep quality, motivating a sleep disruption before a competition. We selected volunteers of 4 kinds of sports: athletics, boxing, basketball and crossfit and a control group was added that didn't practice any sports with regularity. All the participating filled the State-Trait Anxiety Inventory (STAI) and the Pittsburgh Sleep Quality (PSQI) tests. This sleep is affected by the stress athletes are subjected to before a competition. Anxiety shows higher levels in women than in men, so women are worse sleepers than men.

**Keywords:** Anxiety, Athletics, Sleep, Sport

### Introduction

Humans have the physiological necessity of sleeping throughout their lives to recover the energy they have lost in their daily lives activities, and therefore, keeping healthy (Fernández *et al.*, 2003; Caia *et al.*, 2017). When we are sleeping, our vital functions remain, although more slowly, and our energy requirement is lower. Therefore sleep is a needed and repairing physiological state, usually recurring and reversible, characterized by a depression in the senses, the conscience, and the spontaneous motricity (Houssay, 2000), in which a person can awaken due to sensory stimulus (Guyton and Hall, 2001). The recommendation is to sleep between 7-9 hours during the night (Hirshkowitz *et al.*, 2015) but in athletic people it should be between 9-10 hours of sleep during the night (Bird, 2013). However a lot of disturbances can affect sleep, among the more frequent are: somnolence, tiredness, sleeplessness and the disruption of sleep-awake rhythms (Walsleben, 1982). This disorder appears in the 12- 25% of the general population (Walsleben, 1982), and frequently is connected to stress in any situation, like illness, ageing and pharmacology treatment.

Sleep quality is, therefore, a great important clinical aspect and it's shown in the statistics that confirms that 30-40% of the population has insomnia, and 60% of shift workers reported disruptions in the wake-sleep cycles (American Psychiatric Association, 1994). In this way, the subjective measuring, psychological screening like clinic interviews, scales and sleep questionnaires, and shelf-records, try to measure different parameters involved in the sleep act and in the consequences of the lack of sleep. Therefore, evaluations of sleep scales through shelf-records were developed. This kind of evaluation is basically subjective and includes quantitative aspects like sleep duration, number of wake ups, sleep latency, and qualitative aspects like sleep feeling, mood or the sleep contents (Buysse *et al.*, 1989).

In the case of athletes, sleep has been considered a key factor for competition and its efficiency (García-Mas *et al.*, 2003), being the most common alterations among athletes partial sleep privation and fragmented sleep. Many researches suggests sporty usually sleep worse during competition periods, especially the night before an important competition (Kubitz *et al.*, 1996; Fu Y, 1999) and that the reduction of sleep hours has a negative effect in their performance (Cheikh *et al.*, 2018). Furthermore, athletics increase their anxiety level when the competition is approaching. This increase in anxiety produces a negative effect in the sleep quality, motivating a sleep disruption before a competition (Monti and Monti, 2000). An inadequate sleep will have a negative impact in the training recovery, with a decrease in performance. Hence, sleep is one of the most important recovery strategies for athletes, and those with bad sleep habits could have a higher risk of physical and mental overloading (Malhotra, 2017).

Anxiety is another important factor in sports performance. Athletes have an increase in anxiety before a competition (But *et al.*, 2003). This anxiety is related with the time and the location where the event is developed (Cerin, 2003).

In this way, taking into account all these statements, we want to analyze the relation between sleep quality and anxiety before competition in different sport categories and different genders.

## Material and Methods

### Design of Investigation

An experimental study was conducted to determine if a relation between the practices of different sports activities, sleep quality and anxiety levels exists. We selected volunteers of 4 kinds of sports: athletics, boxing, basketball and crossfit and a control group was added that didn't practice any sports with regularity. These sports were widely practiced in our city during the recollection of data for this study.

## Volunteers

A total of 83 athletes (42 men and 41 women), who volunteered after an informative talk. Exclusion criteria were based in volunteers without previous physical or psychological pathologies volunteered to participate in the study. All of them belong to a federate sports team from Extremadura. The data of the individuals were 17-33 ( $=23,37 \pm 3,85$ ) years old. The volunteers under 18 had to fill a document signed by their parents or tutor. In Table 1 it is shown the description of our sample (Table 1).

**Table 1:** General Sample Description

Speciality	Athletes	%	Woman	Men
Athletism	19	18,09	9	10
Boxing	21	20	9	12
Crossfit	24	22,85	11	13
Basketball	19	18,09	12	7
Control group	22	20,95	11	11
Total	105		52 (49,5%)	53 (50.5%)

## Questionnaire

Self-made questionnaires were filled from March 2019 to May 2019. In this time, the professional athletes were under the same condition of stress because they were at the end of the tournaments season. All the participating filled the State-Trait Anxiety Inventory (STAI) (Spielberger *et al.*, 2008) and the Pittsburgh Sleep Quality (PSQI) (Buysse *et al.*, 1989) tests.

The anxiety level was analyzed by STAI questionnaire which has different self-evaluated scales measuring 2 independent concepts: Anxiety-State (AE) and Anxiety-Range (AR) (Spielberger *et al.*, 2008). The second scale of this study was the only one that was taken into consideration because this shows us the anxiety propension, which is stable and it is the ability of a person to notice threatening situations. In athletes in a high Anxiety-Range state, they would be in a threat or alert state during competition.

With the Pittsburgh Sleep Quality Index (PSQI) (Buysse *et al.*, 1989), we measured the subjective sleep quality. This questionnaire has 19 items that determine the sleep parameters, sleep duration, sleep disturbance, sleep quality, daytime dysfunction, sleep latency and the Indicator of Sleep Quality (IPCS) (Buysse *et al.*, 1989). We discard the parameter of medication use because our participants don't take any. All the questions of the test are from the last month of the volunteer's life. The score of these seven parameters are between 0 (it doesn't exist difficulty), to 3 (serious difficulty). The global score has a rank between 0 (no difficulty) to 21 (difficulty in all components that can be measured in this test).

The volunteers were asked to complete the questionnaire carefully and to spend the necessary time to fill it.

### Statistical Analysis

A descriptive study was conducted, measuring qualitative variables of the medium and standard deviation ( $X \pm DS$ ).

The descriptive and inferential study was conducted with the GraphPadPrism6 software for the statistical resolution. It was verified with the Kolmogorov-Smirnov test, if the population were in a normal distribution. The results were analyzed with ANOVA variance tests between the comparison of multiple and well-balanced groups. The significance was 0,05 ( $p < 0,05$ ).

### Results

#### The Pittsburgh Sleep Quality Index

The data obtained in the Pittsburgh Sleep Quality Index it's shown in [Table 2](#). To ease the comprehension of the results, you can only see the items of the test with significant differences.

**Table 2:** Medium Value obtained in each kind of sport after filling the Pittsburgh Sleep Quality Index. M=Men, W=Woman. a) p-value<0,05 respect to the control; b) p-value<0,05 respect to the opposite gender in the same kind of sport

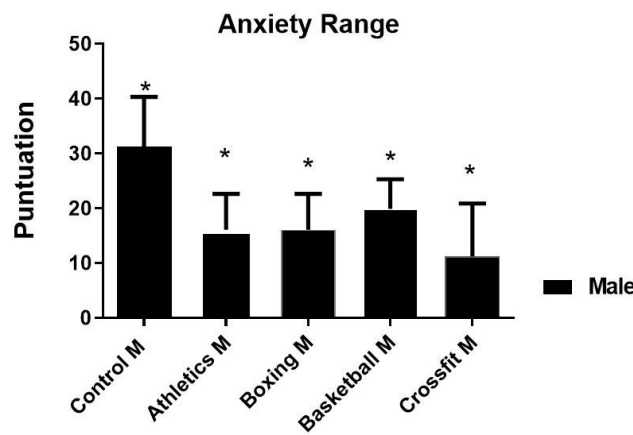
	Endurance Sports						Intermittent Sports			
	Control		Athletism		Crossfit		Basketball		Boxing	
	M	W	M	W	M	W	M	W	M	W
Sleep duration	0 ± 0	0,27 ± 0,46b	0 ± 0	0,88 ± 0,78b	1,16 ± 0,42b	0,63 ± 0,50	0,71 ± 0,48	0,5 ± 0,52	0,66 ± 0,46a	1 ± 0 b
Sleepdisturbance	0,36 ± 0,67	0,90 ± 0,83	1 ± 0,63	0,66 ± 0,86	1,46 ± 0,87a	2 ± 1 a,b	1,14 ± 0,69	1,75 ± 1,05b	0,16 ± 0,38	0,33 ± 0,5
Sleepquality	0 ± 0	1,09 ± 0,30a	0,4 ± 0,51a	1,11 ± 0,60b	0,84 ± 0,68a	1,45 ± 0,68ab	0,85 ± 0,37	1,25 ± 0,62ab	0,75 ± 0,75a	0,66 ± 0,5a
Daytimedysfunction	0,45 ± 0,52	0,81 ± 0,98	1,4 ± 0,51	1,33 ± 0,5	1,07 ± 0,95 f	1,25 ± 0,96	0,71 ± 0,75	0,58 ± 0,79	0,25 ± 0,45 cd	0 ± 0 cd
Sleeplatency	0,45 ± 0,68	2,18 ± 0,40	1,6 ± 0,69a	1,33 ± 0,70	1,92 ± 0,64	1,90 ± 0,83	2,12 ± 0,99	1 ± 0,60	2,58 ± 0,51ab	1 ± 0,86
PSQI	3,18 ± 1,94	7,09 ± 2,77	4,9 ± 2,02	5,44 ± 1,74	6,38 ± 2,66a	7,45 ± 4,32a	6 ± 2,17a	6,28 ± 1,70a	4 ± 0,86	4,16 ± 2,62a

To summarize, we dichotomized the groups in good sleepers (PSQI<5) and poor sleepers (PSQI>5) (Agargun *et al.*, 1996). The data appears in [Table 3](#).

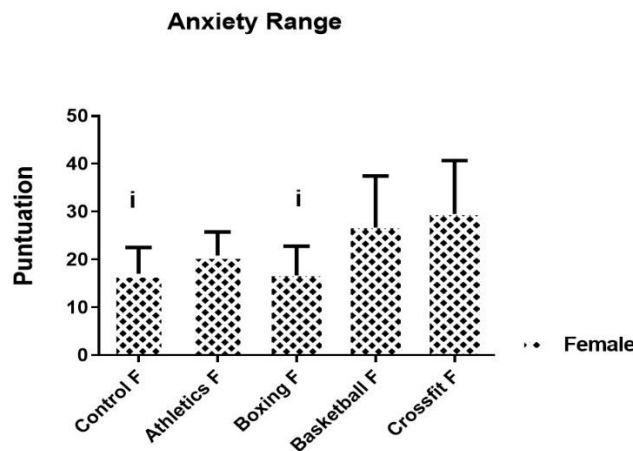
**Table 3:** Dicotomitation of good sleepers and poor sleepers according to score in the PSQI

Good Sleepers		Poor Sleepers	
Control F	7,09 ± 2,77	Control M	3,18 ± 1,94
Athletics F	5,44 ± 1,74	Athletics M	4,9 ± 2,02
Crossfit M	6,38 ± 2,66	Boxing M	4 ± 0,86
Crossfit F	7,45 ± 4,32	Boxing F	4,16 ± 2,62
Basketball M	6 ± 2,17		
Basketball F	6,28 ± 1,70		

The results in the Anxiety Range test (AR) are represented according to gender. In this way, in Fig. 1, we see the values of the masculine group, discovering that between the control group and the other male groups there is a significant difference, a higher Anxiety Range in the control group than in the rest of groups. It wasn't found any significant difference among the different sports. The lowest Anxiety Range level was found in the Crossfit Male group.



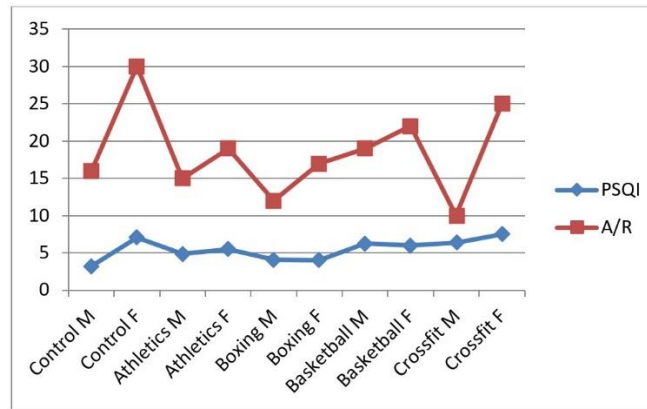
**Figure 1:** Represents the Anxiety/Range levels (AR) in men (M) in the different sport groups. (± SD). (\*) P-valor<0,05 respect to Control M



**Figure 2:** Represents the Anxiety/Range levels (AR) in women (W) in control and the different sport groups. (± SD). (i) P-valor<0,05 respect to Crossfit F

## Ratio PSQI-A/R

In Fig. 3 we can see the relation between the PSQI values and the Anxiety Range (AR) medium values. In all the analyzed groups, there were higher values in the indicator of total quality sleep (PSQI), more in the femenin gender than in the masculine groups, so women had worse sleep quality than men. In addition, these PSQI high values are associated with high values in AR. And vice versa, low values in PSQI indicates better sleep quality are associated with lower values of Anxiety Range.



**Figure 3:** Represents medium values obtained in the PSQI global indicator of sleep and medium values obtained in AR

## Discussion

Analyzing the duration of sleep, we can see that boxing and athletics are lower than control group. Sleep disorders are greater in crossfit volunteers regarding control group. The lack of sleep affects important aspects in the practice of different sports disciplines, like speed, stamina, attention, executive function and learning (Simpson *et al.*, 2017). Besides, stamina sports are more affected by the lack of sleep than strength sports. Sleep helps restore the immune system and muscular and cartilage recovery after an intense training (Kirschen *et al.*, 2018).

The second aim of this study was to investigate the temporal relationship between state anxiety and changes in precompetitive sleep quality. Athletes worrying about the competition appear to start worrying about their sleep as well. Furthermore, it is these changes in cognitive anxiety that are negatively related to changes in perceptions of the restorative value of sleep. As we have seen in other articles, this anxiety is related to with the hour of the day and the place where the event is developed (Cerin, 2003).

In the table of the dichotomic separation we can see that the majority of the bad sleepers are women, because they have more basal anxiety, so we can think that these results are expected according to the bibliography where Krane V and Williams JM, (1987) determined that when there is a sport

competition, the man has lower levels of anxiety. In spite of this, according to other authors (Jones and Swain, 1992), we have to evaluate the psychosomatic cognitive interpretation that each athlete has because some of them are comfortable with high levels of anxiety, and improving their competition results.

These bad sleeper results were also found by Swinbourne R, Gill N, in 2016. They developed a studio with 175 men and women athletes and they observed that 50% of athletes are well sleepers. Moreover, they found that they have 28% somnolence, which is clinically meaningful. One of the factors of this worse quality is related to the higher sleep latency in athletes (Leeder *et al.*, 2012).

Also, in our study differences in sleep latency and efficiency appeared which are the same results as Lastella, *et al.* (2015) who analyzed sleep in 124 elite athletes, in individual and group sports where it was observed a 86% of sleep efficiency, lower in individual sports than in group sports. So, with our study we can conclude that athletes in individual sports have more anxiety than group sports. It can be caused by responsibility falling only in one individual. Because of this, there are some authors (Saez, 2017) who incise in the importance of psychological work and self-confidence as a fundamental skill in competitive athletes, so self-esteem can improve sport efficiency, influencing their anxiety and their night sleep. The limitations of the study are that they were conducted in a period of time with a specific photoperiod conditions and these conditions varies throughout the year and this can affect the sleep quality.

## Conclusion

Respect to the Pittsburgh Sleep Quality Index, we can say that men and women that practice crossfit and basketball, and the women that practice boxing, have a worse sleep quality in comparison to people that don't practice sports professionally.

Following the dichotomic criteria of good and bad sleepers, the poor sleepers groups are mostly women.

After analyzing the anxiety, the most interesting conclusion is in the crossfit results. Men that practice crossfit are the ones with less anxiety. However, women that practice crossfit presents higher levels of anxiety.

Sleep is important for the sport development and efficiency. This sleep is affected by the stress athletes are subjected to before a competition. Anxiety shows higher levels in women than in men, so women are worse sleepers than men.

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