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## Mental Health in Student Athletes: Associations With Sleep Duration, Sleep Quality, Insomnia, Fatigue, and Sleep Apnea Symptoms

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### Abstract

**Purpose:** To quantify the relationship between sleep difficulties and poor mental health among student athletes using validated measures.

**Methods:** Data were collected from 190 National Collegiate Athletic Association Division I student athletes. Sleep assessments included measures of sleep duration, sleep quality, insomnia, fatigue, and sleep apnea symptoms. Mental well-being was assessed as depression, anxiety, mental health days, stress, and social support from family, friends, significant other, and teammates.

**Results:** Shorter sleep duration, poor sleep quality, insomnia, and fatigue were consistently and independently associated with stress, depression, anxiety, mental health days, and social support. Sleep apnea symptoms were associated with stress, depression, and social support.

**Conclusions:** Short sleep duration, poor sleep quality, and daytime fatigue in student athletes are all associated with depression, anxiety, stress, poor mental health days, and decreased social support. These associations are not accounted for solely by stress.

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Sleep is an emerging area of interest in the context of athletics.<sup>1–4</sup> Sleep loss impairs cognitive performance<sup>5–7</sup> and physical performance,<sup>8–10</sup> which can lead to reduced athletic performance. Notably, sleep deprivation and/or insufficient sleep are associated with reduced athletic performance among elite athletes and improvements in sleep have been associated with corresponding improvements in athletic performance.<sup>9,11</sup> The topic of sleep health in collegiate athletes was recently reviewed<sup>12</sup> in the context of position statements from

the National Collegiate Athletic Association (NCAA)<sup>13</sup> and the International Olympic Committee.<sup>14,15</sup>

In addition to cognitive functioning and physical performance, sleep plays a particularly important role in mental health. Sleep disturbance is a prominent feature in nearly all psychiatric conditions, including depression, bipolar disorder, post-traumatic stress disorder, other anxiety disorders, attention deficit disorders, and many others. Insomnia is a well-recognized risk factor for the development of depression<sup>16–18</sup> and the recurrence of depressive episodes among remitted depressed individuals.<sup>19</sup> Insomnia is also a known risk factor for suicide<sup>20</sup> and may interact with short sleep duration.<sup>21</sup> Regarding general stress and mental well-being, several studies have shown that poor sleep quality is strongly associated with higher levels of stress and overall poorer mental health.<sup>22–24</sup> Although the causal direction of sleep and mental health issues is not firmly established, it is clear that these two factors are inextricably linked.

Mental health remains an important factor for student athletes. Student athletes are at a high risk of depression and anxiety and often operate under conditions of high physical and/or emotional stress.<sup>25–27</sup> Social support could possibly serve as a protective factor, mitigating some of the impact of stressful situations on mental health. However, few studies have examined the relationship between sleep and mental health among athletes, particularly using validated sleep screening measures.

Accordingly, the current study investigated the relationship between several relevant sleep variables (sleep duration, sleep quality, insomnia, fatigue, and sleep apnea symptoms) on a wide range of mental health variables (stress, depression, anxiety, mental well-being, and social support) among college athletes, using established, validated measures where possible. It was hypothesized that (1) poor sleep would be associated with poor mental health among student athletes and (2) some, but not all, of these relationships would be mediated by stress.

## METHODS

### Sample

Data were collected from surveys administered to 190 NCAA Division I athletes over the summer and during the first 2 weeks of the Fall 2016 semester. To be eligible for the survey, students had to be at least 18 years of age. Selection favored returning students. Students were recruited through flyers, in-person solicitations at training facilities, and word of mouth among students and athletics staff. All surveys were administered online, using the student's phone, tablet, or computer or a study-provided tablet. Participants were paid for completing surveys. This study was approved by the Institutional Review Board of the University of Arizona.

### Measures

Mental health–depression was assessed with the Center for Epidemiological Studies Depression Scale (CESD),<sup>28</sup> a well-validated screening tool for depression. Scores range from 0 to 60, with values greater than 16 considered high risk for a depressive disorder. The

CESD was originally developed to assess depression symptoms as they are experienced in the general population, and it has been used in young adult populations.<sup>29,30</sup> It is generally accepted as a reliable and valid depression screener.<sup>28,31</sup>

Anxiety was assessed using the Generalized Anxiety Disorder (GAD) questionnaire,<sup>32</sup> a standard screening tool for anxiety disorders. Scores range from 0 to 21. It was originally developed to assess generalized anxiety disorder symptoms, but has since become a standard screening tool for anxiety disorder in general.<sup>33</sup>

Stress was measured with the Perceived Stress Scale (PSS),<sup>34</sup> a standard and well-validated measure of global perceived levels of stress. This questionnaire has since become a standard measure in stress research.<sup>35,36</sup> Higher scores reflect greater experiences of life stresses.

Mental well-being was assessed by asking, “Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?” Responses were 0 to 30. This item is based on the Measuring Healthy Days survey items developed by the Centers for Disease Control and Prevention.<sup>37</sup>

Social support was assessed with the Multidimensional Scale of Perceived Social Support (MSPSS),<sup>38</sup> a well-validated measure that includes subscales for family, friends, and significant other. A fourth scale for teammates was created by taking the items from the “friends” scale and substituting the word “teammates” for “friends.” This scale has demonstrated strong psychometric properties across a wide range of populations.<sup>39–42</sup>

Overall sleep quality was assessed with the Pittsburgh Sleep Quality Index (PSQI), a well-validated global measure of poor sleep.<sup>43</sup> Scores range from 0 to 21, with a cutoff value of 5 indicating poor sleep. One item in the PSQI asks, “How many hours of actual sleep did you get at night? (This may be different than the number of hours you spend in bed.)” This item was used to estimate habitual sleep duration.

Insomnia severity was assessed with the Insomnia Severity Index (ISI), a well-validated and standard tool for the assessment of insomnia symptoms.<sup>44</sup> Scores range from 0 to 28, with 0 to 7 usually indicating no insomnia, 8 to 14 usually indicating mild insomnia, 15 to 21 indicating moderate insomnia, and 22 to 28 indicating severe insomnia. The ISI has demonstrated strong psychometric properties and is considered a gold standard assessment of the experience of insomnia.<sup>45–47</sup>

Fatigue was assessed with the Fatigue Severity Scale (FSS), a well-validated, standard measure of general fatigue.<sup>48</sup> This scale has scores ranging from 0 to 63, with 36 representing a cutoff for pathological fatigue. Sleep apnea symptoms that were assessed included loud snoring and snorting/gasping during sleep. These were assessed from the validated Multivariable Apnea Prediction (MAP) index,<sup>49</sup> which asks, “During the past month, on how many nights or days per week have you had or been told you had the following.” Those who indicated “loud snoring” at least 1 night per week were coded as “Yes” and those who indicated any “snorting/gasping” were coded as “Yes.” The MAP has been used as a valid sleep apnea screener in multiple contexts.<sup>49–53</sup>

## Statistical Analyses

All variables were examined for outliers and physiologically implausible values. Continuous variables were reported as mean and standard deviation, and categorical variables were reported as percentages. Linear regression analyses, with mental health variable as outcome and sleep variable as predictor, were adjusted for age, sex, and year in school. Unstandardized regression coefficients (B) and 95% CIs were calculated. To determine whether these relationships are accounted for by stress, PSS score was entered as an additional covariate in all models for which stress was not the outcome assessed. All analyses were performed using STATA software version 14.0 (STATA Corp).

## RESULTS

### Sample Characteristics

Characteristics of the sample are reported in Table 1. The mean age of the sample was 19 years, and the sample was 46% female. The plurality of participants were second, third, and fourth year college students. The sports represented were football (24%), track and field (16%), swimming (15%), softball (8%), baseball (7%), soccer (6%), golf (5%), gymnastics (5%), volleyball (4%), basketball (4%), tennis (4%), cheer (2%), and diving (1%). The mean self-reported sleep duration of the sample was 7 hours, with a mean sleep quality rating of 8, which is in the “poor sleep” range. Mean ISI score was 8, which is in the range of “mild” insomnia. Mean fatigue score was 29, which is moderately high. Loud snoring was prevalent in 17% of the sample and snoring/gasping was prevalent in 18%. Mean CESD depression score was 11 and mean GAD score was 5. Mean number of poor mental health days in the past month was 5. Social support scores were moderately high in all categories except teammates, where scores were lower.

### Sleep and Stress in Student Athletes

Table 2 displays results of regression analyses examining relationships between sleep-related variables and stress, operationalized as PSS score, adjusted for age, sex, and year in school. Each additional hour of sleep duration was associated with a 1-point reduction on the PSS. Each 1-point worsening of the PSQI or ISI score was associated with approximately 1 additional point on the PSS. Each 1-point increase on the FSS was associated with a 0.25-point increase on the PSS. Although snoring was not associated with the PSS score, the presence of snoring/gasping was associated with 3.6 additional points on the PSS.

### Sleep and Depression, Anxiety, and Mental Well-being

Table 3 displays results of regression analyses examining relationships between sleep-related variables and depression (CESD score), anxiety (GAD score), and mental well-being (poor mental health days per month), adjusted for age, sex, and year in school. Additionally, stress (PSS score) was added to these models to determine whether the associations are mediated by stress. Each additional hour of sleep duration was associated with a lower CESD score and a lower GAD score, but no significant association with mental health days. The relationship with CESD score remained when stress was added to the model. Each additional point on the PSQI or the ISI was associated with a higher CESD score, a higher

GAD score, and more poor mental health days. All of these relationships were maintained when stress was added to the model for both sleep variables. Similarly, each point on the FSS was associated model, but the relationship with poor mental health days with higher depression and anxiety scores and more poor mental health days. The relationships with depression and anxiety were maintained when stress was added to the was not. Both snoring and snorting/gasping were associated with a higher depression score, but this was not significant after stress was added to the model.

### **Sleep and Social Support From Family, Friends, Significant Other, and Teammates**

Table 4 displays results of regression analyses examining relationships between sleep-related variables and social support from family, friends, significant other (MSPSS scores), and teammates, adjusted for age, sex, and year in school. Additionally, stress (PSS score) was added to these models to determine whether the associations are mediated by stress. Each additional hour of sleep duration was associated with more social support from family, and this was maintained when stress was added to the model. Higher PSQI scores were associated with decreased social support from friends, significant other, and teammates, although these relationships were not significant when stress was added to the model. Higher ISI scores were associated with decreased social support from family, friends, significant other, and teammates, although only the relationship with support from family and teammates was still significant after including stress in the model. Higher FSS scores were associated with decreased support from teammates, although this was no longer significant after including stress in the model. Snoring was not associated with social support. However, snorting/gasping was related to decreased support from family, friends, significant other, and teammates, and the relationship with support from friends remained significant after including stress in the model.

## **DISCUSSION**

Overall, as expected, most sleep variables were related to most mental health variables, and although stress mediated many relationships, most were independent of the effects of stress.

The students demonstrated overall poor sleep quality and sleep hygiene. This is likely due to late night social activity, socialization, examination preparation, studying, early morning responsibilities, travel for competition, and other factors. It is not clear whether student athletes' sleep is worse than that of their non-athlete counterparts; future research could examine whether these patterns are different for athletes and non-athletes. It is possible that increased time demands would lead to worse sleep among athletes; it is also possible that increased access to support services and other qualities often found in athletes (eg, resilience) may lead to better sleep overall. It should be noted that college students in general experience poor sleep hygiene, with a multitude of causes.<sup>54-58</sup> It is possible that this contributes to mental health on college campuses in general, irrespective of athlete status.

Several findings from this study deserve further comment. First, shorter sleep duration was associated with higher levels of stress, depression, and anxiety, more poor mental health days, and decreased social support from family. Several previous studies have shown that

population levels of short sleep duration are associated with poor mental health. Similarly, laboratory studies have demonstrated that experimentally induced sleep deprivation in healthy young individuals is associated with increased symptoms of depression, anxiety, somatic complaints, and feelings of persecution,<sup>59</sup> and leads to poorer emotional coping<sup>60</sup> and degraded ability to deal effectively with frustration.<sup>61</sup> In addition, the combination of short sleep duration and insomnia may be particularly detrimental.<sup>62</sup> Short sleep duration has also been associated with decreased social support in the general population,<sup>63</sup> supporting the findings of this study. Several recent position statements suggest that healthy adults need at least 7 hours of sleep,<sup>64–68</sup> although young adults and/or athletes may require more, up to 9 hours.<sup>66,69</sup>

Similar to the findings regarding sleep duration, poor sleep quality and insomnia severity were also associated with higher levels of stress, depression, and anxiety, more poor mental health days, and decreased social support from family, friends, significant other, and teammates. Many previous studies have shown that poor sleep quality and insomnia in the general population are associated with depression, anxiety, stress, and poor mental health days.<sup>16–18,70–72</sup> Some evidence also suggests decreased social support.<sup>73</sup> Insomnia is prevalent in the general population, and was prevalent in the current sample. Although some basic techniques may be helpful for the amelioration of minor sleep problems when student athletes report significant difficulties falling asleep or maintaining sleep, the diagnosis of Insomnia Disorder should be considered and referrals for appropriate treatment should be made. According to recent position statements by the American Academy of Sleep Medicine<sup>74</sup> and American College of Physicians,<sup>75</sup> pharmacologic therapy for insomnia is not recommended as a first-line treatment. Rather, cognitive behavioral therapy for insomnia is recommended in that it has equal or better efficacy, better long-term outcomes, and fewer adverse effects. As an additional benefit for athletes, most hypnotic medications produce psychomotor slowing and increase risk for accidents and injuries, which further supports the use of cognitive behavioral therapy for insomnia, which avoids these adverse side effects.

Consistent with our expectations, sleep apnea symptoms (particularly snoring/gasping) were also associated with increased stress and depression, and decreased social support from family, friends, significant other, and teammates. Sleep apnea is a condition that is often undiagnosed, especially in young adults in good health. Anatomical features can predispose to risk of sleep apnea, even in lean athletes. Risk is even higher among football players, especially linemen.<sup>76,77</sup> There are several available screening instruments for sleep apnea (eg, the STOP-BANG questionnaire<sup>78</sup>) and screening measures for daytime sleepiness,<sup>79</sup> which is a common daytime symptom of sleep apnea. These are also published in the NCAA Mental Health Best Practices document.<sup>80</sup> Undiagnosed sleep apnea can lead to increased fatigue and many other health problems caused by excessive sleep fragmentation, increased oxidative stress, and intermittent hypoxia during the night.<sup>81</sup>

From the current findings, it is clear that sleep plays an important role in mental health among student athletes and should be considered as a potentially modifiable factor for poor mental health for this population. The NCAA recently published Mental Health Best Practices guidelines<sup>80</sup> that include sleep screening as part of a mental health program. In

addition, resources such as the accompanying handbook<sup>82</sup> and guide<sup>83</sup> may be helpful in addressing sleep problems among student athletes.

### Limitations

There were several limitations to our methods. First, no objective measures of sleep were available, so all responses were obtained from self-report instruments. However, most of the instruments included in the study were well-validated measures that have been used extensively in sleep research. Second, because this was a cross-sectional study, no inferences of causality could be made. It is likely that sleep and mental health exist in a bidirectional relationship. Although it is not possible to disentangle the causal association from these data, prior controlled laboratory research has demonstrated that sleep deprivation and restriction lead to worsening of mental health symptoms such as depression and anxiety (Kahn-Green et al. 2007). Third, the sample consisted of individuals from a single university and may not completely generalize to all institutions. Although replication of these findings will be necessary to establish their applicability to the broader population, the results of this research are consistent with the extant literature on the role of sleep in mental health, attesting to the likely veracity and applicability of these findings more broadly. Another important limitation of this study was that there was no non-athlete comparison group. The scope of this study was exclusively athletes, which precluded the ability to examine whether mental health or sleep variables systematically differed between athletes and non-athletes, and/or whether the relationship between these was different. It is plausible that all three of these (sleep, mental health, and the relationship) may be different among athletes for multiple reasons.

### IMPLICATIONS FOR CLINICAL PRACTICE

The current study investigated the relationship between sleep and mental health in a sample of Division I student athletes. Overall, sleep duration, sleep quality, insomnia severity, fatigue, and sleep apnea symptoms were generally associated with increased stress, depression, and (in most cases) anxiety. They were also associated with a higher number of poor mental health days and decreased perception of social support. Athletics programs should consider sleep screening among student athletes to identify those at risk, promote healthy sleep practices (as much as is possible given scheduling demands), and develop relationships with sleep physicians and behavioral sleep medicine specialists for the purpose of referral and treatment. The current study was unable to explore the mechanisms of these relationships; future studies could better identify the causal pathways at play, which would be useful for refining interventions. Future studies should also explore the degree to which modification of sleep improves mental health among student athletes, and whether these changes can result in more distal changes in athletic performance and better quality of life.

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**TABLE 1**

## Characteristics of the Sample

Characteristic	Category/Units	Values
Age	Years	19.353 ± 4.949
Sex	Men	54.21%
	Women	45.79%
Year in school	First	5.26%
	Second	33.16%
	Third	31.05%
	Fourth	23.68%
	Fifth	5.26%
	Part-Time	1.58%
Stress	PSS score	23.342 ± 7.116
Depression	CESD score	10.763 ± 7.470
Anxiety	GAD score	5.137 ± 4.459
Mental well-being	Good mental health days	5.365 ± 7.764
Social support	MSPSS Family score	23.453 ± 5.309
	MSPSS Friends score	22.221 ± 5.290
	MSPSS Significant Other score	22.237 ± 5.931
	Team score	15.537 ± 4.829
Sleep duration	Hours	6.963 ± 1.171
Sleep quality	PSQI score	8.147 ± 3.051
Insomnia	ISI score	7.684 ± 5.150
Fatigue	FSS score	29.468 ± 10.981
Loud snoring	Yes	17.37%
Snorting/gasping	Yes	17.90%

PSS = Perceived Stress Scale; CESD = Center for Epidemiological Studies Depression Scale; GAD = Generalized Anxiety Disorder questionnaire; MSPSS = Multidimensional Scale of Perceived Social Support; PSQI = Pittsburgh Sleep Quality Index; ISI = Insomnia Severity Index; FSS = Fatigue Severity Scale

Relationships Between Sleep Variables and PSS Stress Score, Adjusted for Age, Sex, and Year in School

**TABLE 2**

Sleep Variable	B	95% CI	P
PSQI Sleep Duration	-1.001	(-1.901 to -0.101)	.0295
PSQI Sleep Quality	1.036	(0.725 to 1.347)	< .0001
ISI Insomnia	0.779	(0.607 to 0.952)	< .0001
FSS Fatigue	0.246	(0.156 to 0.337)	< .0001
MAP Snoring	2.26	(-0.621 to 5.141)	.1233
MAP Snorting/Gasping	3.601	(0.829 to 6.373)	.0111

PSQI = Pittsburgh Sleep Quality Index; ISI = Insomnia Severity Index; FSS = Fatigue Severity Scale; MAP = Multivariable Apnea Prediction index

**TABLE 3**

Relationships Between Sleep Variables and Depression (CESD Score), Anxiety (GAD Score), and Mental Well-being (Healthy Days), Adjusted for Age, Sex, and Year in School

Sleep Variable	Mental Health Outcome	Adjusted			Adjusted + Stress		
		B	95% CI	P	B	95% CI	P
PSQI Sleep Duration	CESD Depression Score	-1.854	(-2.750 to -0.957)	<.0001	-1.186	(-1.862 to -0.509)	.0006
	GAD Score	-0.775	(-1.322 to -0.228)	.0057	-0.382	(-0.806 to 0.042)	.0772
PSQI Sleep Quality	Healthy Mental Health Days	-0.824	(-1.797 to 0.150)	.0966	-0.282	(-1.139 to 0.575)	.5166
	CESD Depression Score	1.143	(0.830 to 1.457)	<.0001	0.52	(0.239 to 0.801)	.0003
ISI Insomnia	GAD Anxiety Score	0.788	(0.610 to 0.966)	<.0001	0.459	(0.294 to 0.624)	<.0001
	Healthy Mental Health Days	1.028	(0.688 to 1.368)	<.0001	0.572	(0.224 to 0.919)	.0013
FSS Fatigue	CESD Depression Score	0.851	(0.679 to 1.023)	<.0001	0.442	(0.266 to 0.618)	<.0001
	GAD Anxiety Score	0.501	(0.398 to 0.604)	<.0001	0.27	(0.162 to 0.377)	<.0001
MAP Snoring	Healthy Mental Health Days	0.598	(0.393 to 0.802)	<.0001	0.248	(0.020 to 0.475)	.0329
	CESD Depression Score	0.311	(0.222 to 0.400)	<.0001	0.162	(0.086 to 0.237)	<.0001
MAP Snoring/ Gasping	GAD Anxiety Score	0.171	(0.116 to 0.225)	<.0001	0.083	(0.036 to 0.130)	.0006
	Healthy Mental Health Days	0.192	(0.091 to 0.293)	.0002	0.067	(-0.030 to 0.163)	.1765
MAP Snoring/ Gasping	CESD Depression Score	3.102	(0.158 to 6.046)	.039	1.544	(-0.650 to 3.739)	.1666
	GAD Anxiety Score	1.069	(-0.701 to 2.838)	.2348	0.161	(-1.190 to 1.512)	.8145
MAP Snoring/ Gasping	Healthy Mental Health Days	-0.576	(-3.730 to 2.577)	.7187	-1.771	(-4.497 to 0.955)	.2013
	CESD Depression Score	3.284	(0.426 to 6.143)	.0245	0.799	(-1.369 to 2.967)	.4681
MAP Snoring/ Gasping	GAD Anxiety Score	1.34	(-0.377 to 3.058)	.1253	-0.114	(-1.444 to 1.216)	.8656
	Healthy Mental Health Days	1.484	(-1.544 to 4.511)	.3348	-0.524	(-3.190 to 2.143)	.6988

CESD = Center for Epidemiological Studies Depression Scale; GAD = Generalized Anxiety Disorder questionnaire; PSQI = Pittsburgh Sleep Quality Index; ISI = Insomnia Severity Index; FSS = Fatigue Severity Scale; MAP = Multivariable Apnea Prediction index

**TABLE 4**  
Relationships Between Sleep Variables and Social Support, Adjusted for Age, Sex, and Year in School

Sleep Variable	Social Support	Adjusted			Adjusted + Stress		
		B	95% CI	P	B	95% CI	P
PSQI Sleep Duration	MSPSS Family	0.939	(0.291 to 1.586)	.0047	0.776	(0.135 to 1.417)	.0179
	MSPSS Friends	0.301	(-0.368 to 0.970)	.3759	0.034	(-0.601 to 0.669)	.9156
	MSPSS Significant Other	0.513	(-0.228 to 1.254)	.1735	0.382	(-0.361 to 1.125)	.3119
PSQI Sleep Quality	Support from Teammates	0.593	(-0.016 to 1.201)	.0563	0.333	(-0.238 to 0.904)	.2514
	MSPSS Family	-0.31	(-0.557 to -0.063)	.0141	-0.15	(-0.420 to 0.121)	.2765
	MSPSS Friends	-0.373	(-0.622 to -0.124)	.0034	-0.118	(-0.382 to 0.146)	.3773
ISI Insomnia	MSPSS Significant Other	-0.325	(-0.604 to -0.046)	.0224	-0.222	(-0.531 to 0.087)	.1587
	Support from Teammates	-0.39	(-0.616 to -0.164)	.0008	-0.139	(-0.377 to 0.099)	.2509
	MSPSS Family	-0.304	(-0.447 to -0.161)	< .0001	-0.233	(-0.404 to -0.061)	.008
FSS Fatigue	MSPSS Friends	-0.279	(-0.425 to -0.132)	.0002	-0.101	(-0.271 to 0.069)	.2414
	MSPSS Significant Other	-0.234	(-0.400 to -0.069)	.0057	-0.179	(-0.378 to 0.019)	.0764
	Support from Teammates	-0.334	(-0.465 to -0.204)	< .0001	-0.18	(-0.332 to -0.029)	.02
MAP Snoring	MSPSS Family	-0.084	(-0.154 to -0.014)	.0182	-0.045	(-0.119 to 0.028)	.2266
	MSPSS Friends	-0.06	(-0.131 to 0.011)	.0962	0.007	(-0.065 to 0.079)	.857
	MSPSS Significant Other	0.021	(-0.058 to 0.101)	.6013	0.065	(-0.019 to 0.149)	.1306
MAP Snoring/ Gasping	Support from Teammates	-0.097	(-0.161 to -0.033)	.0033	-0.036	(-0.100 to 0.029)	.2806
	MSPSS Family	-0.056	(-0.216 to 2.050)	.9583	0.362	(-1.694 to 2.418)	.7285
	MSPSS Friends	-1.012	(-3.139 to 1.115)	.3491	-0.412	(-2.416 to 1.591)	.6851
MAP Snoring/ Gasping	MSPSS Significant Other	1.501	(-0.857 to 3.859)	.2108	1.843	(-0.496 to 4.182)	.1216
	Support from Teammates	-0.858	(-2.808 to 1.093)	.3869	-0.255	(-2.065 to 1.555)	.7813
	MSPSS Family	-2.157	(-4.181 to -0.133)	.0368	-1.553	(-3.564 to 0.458)	.1292
MAP Snoring/ Gasping	MSPSS Friends	-3.889	(-5.883 to -1.894)	.0001	-3.031	(-4.953 to -1.109)	.0021
	MSPSS Significant Other	-2.654	(-4.925 to -0.382)	.0222	-2.224	(-4.518 to 0.070)	.0573
	Support from Teammates	-2.257	(-4.130 to -0.383)	.0185	-1.338	(-3.109 to 0.433)	.1377

PSQI = Pittsburgh Sleep Quality Index; MSPSS = Multidimensional Scale of Perceived Social Support; ISI = Insomnia Severity Index; FSS = Fatigue Severity Scale; MAP = Multivariable Apnea Prediction index