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The Relationship Between Sleep Quality and Quantity with Muscle Readiness, Stress, and Overall Health in College Athletes

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Introduction

- Sleep is essential for the physical and mental recovery of athletes, and college athletes typically have poor sleep quality and poor sleep quantity.³
- Individuals who sleep for an average of less than seven hours a day are more likely to feel stressed, additionally in college-aged students, duration of sleep has a significant inverse effect on stress levels.^{1,2}
- Poor sleep quality is linked to physical and mental health complaints, and sleep quality may be a better indicator for health and wellbeing compared to sleep quantity, as the former better reflects sleep efficiency.³
- Good sleep is linked to improved performance capacity,⁶ as well as reduced risk of injury and illness, and improved participation in training in athletes.⁷

Purpose

- To examine the relationships between sleep quantity, sleep quality, perceived muscle readiness, stress, and overall health in Division III female college athletes.
- Hypothesis: There is a positive relationship between both sleep quantity and quality with muscle readiness, and overall health and a negative relationship with stress. Furthermore, sleep quality will have a stronger relationship with stress, muscle readiness, and overall health, compared to sleep quantity.

Methods

- An online daily health and wellness survey was given to female basketball (n=23), soccer (n=25), and swimming (n=24) teams over the course of their season at a small Division III college in Minnesota.
- Sleep quantity (hours) was reported by each athlete daily, while the remaining variables were measured on a one to five Likert scale (Figure 1).
- The product of sleep quantity (hours) and quality was also calculated to create a composite sleep score for each athlete on each day of their respective season.
- Bivariate correlations were calculated to determine the strength of the relationships between all variables, including the sleep composite scores.

	1	2	3	4	5
Sleep Quality	Insomnia	Restless	Difficulty Falling Asleep	Good	Very Restful
Muscle Readiness	Severe Soreness	Major Soreness	Moderate Soreness	Mild Soreness	Fully Recovered
Stress	Feeling Overwhelmed	Feeling Very Stressed	Feeling Moderately Stressed	Minor/Healthy /Productive Stress	No/Healthy Stress
Health	Feeling Terrible	Feeling Well	Just OK	Feeling Above Par	Feeling Good

Table 1. Description of Likert scale for survey questions

Results

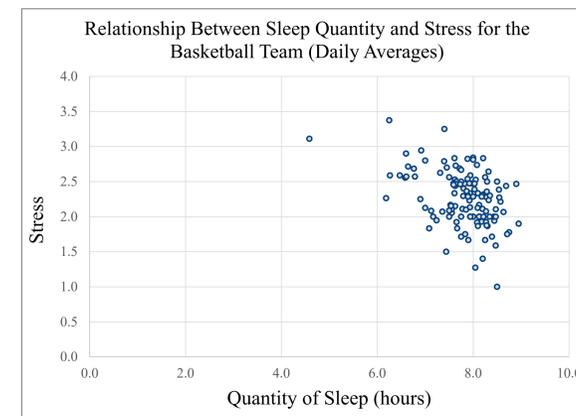


Figure 1. The relationship between sleep quantity and stress (daily averages) was highest for the basketball team ($R = .271, n = 1934, p < .05$).

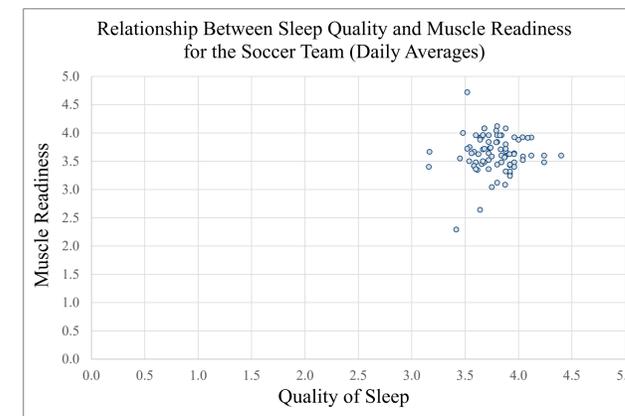


Figure 2. The relationship between sleep quality and muscle readiness was highest for the soccer team ($R = .134, n = 2028, p < .05$).

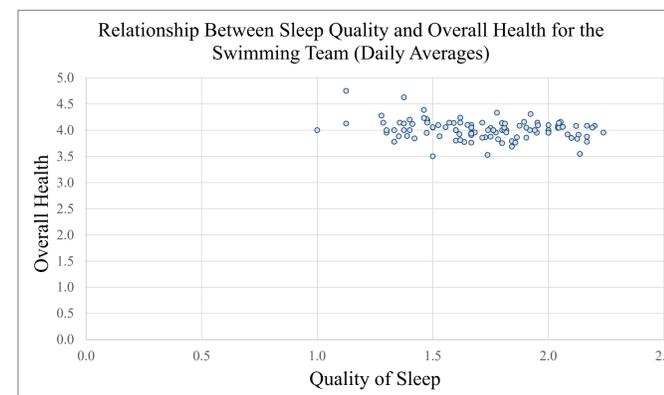


Figure 3. The relationship between sleep quality and overall health was highest for the swimming team ($R = .262, n = 1981, p < .05$).

	Stress	Muscle Readiness	Overall Health
Quantity of Sleep	$R = -0.245$ $n = 5944$ $p < .05$	$R = .032$ $n = 5944$ $p < .05$	$R = .158$ $n = 5944$ $p < .05$
Quality of Sleep	$R = -0.160$ $n = 5944$ $p < .05$	$R = .080$ $n = 5944$ $p < .05$	$R = .227$ $n = 5944$ $p < .05$

Figure 5. The Bivariate correlations between quantity and quality of sleep with stress, muscle readiness, and overall health for all athletes.

- Overall health was weakly correlated with composite sleep score for the basketball team ($R = .291, n = 1934, p < .05$) and swimming team ($R = .238, n = 1981, p < .05$). Stress was weakly correlated with the composite sleep score for the soccer team ($R = .287, n = 2028, p < .05$).

- The correlation between sleep quality and sleep quantity was moderate ($R = .321, n = 5944, p < .05$).

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Discussion

- Overall, sleep quantity was weakly and inversely related to stress, weakly and directly related to overall health, but not related to muscle readiness.
- Additionally, sleep quality was weakly and inversely related to stress, weakly and directly related to overall health, but not related to muscle readiness.
- Perceived muscle readiness may be more of an indicator of previous workout intensity and less of an indicator of sleep condition.
- Neither sleep quantity or quality alone produced strong correlations with stress, muscle readiness, and overall health.
- Furthermore, no one team had the highest correlation for sleep and stress, muscle readiness, or overall health.

- Each sports team displayed a different strongest relationship: sleep quantity and stress was highest for the basketball team, sleep quality and muscle readiness was highest for the soccer team, and sleep quality and overall health was highest for the swimming team.

- Stress, muscle readiness, and overall health are broad parameters and may be influenced by confounding variables not accounted for in this study.

- When comparing sleep and stress, our results were similar but not as strong as previous research.^{1,2} Likewise, when comparing sleep and overall health, our results were similar but not as strong as previous research that looked at self-reported-overall health,⁸ as well as physical and mental health complaints.³

- A possible explanation for this may be that we studied athletes, while previous research we compared our results to did not.^{1,2}

- One limitation of this study is the difficulty of measuring our variables with a Likert scale. Health is a complex topic and this scale may not be precise enough to accurately measure differences brought about by mental and physiological processes.

- Future research may break down stress, sleep, muscle readiness, and overall health into more specific variables. Along with subjective measures of these variables, more objective measurements could provide more precise and accurate results.

- For example, sleep could be analyzed and measured, as well as broken down into deep and light sleep categories. Deep sleep is important for physical recovery, and light sleep is important for mental recovery.^{4,6} Sleep deprivation leads to significantly higher stress hormone levels,⁵ and sleep disturbances have a deteriorating effect on health and performance capacity.⁶

Conclusions

Data from this study suggests there are weak correlations between sleep quantity and quality with perceived stress and overall health in female college athletes. Muscle readiness does not appear to be related to sleep quality and/or sleep quantity. Despite the weak correlations, it is still important to monitor and understand athletes' sleep quality and quantity and overall wellness when developing and administering training plans.