THE RELATIONSHIP BETWEEN SLEEPING HABITS AND BODY FAT COMPOSITION

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Introduction

The quantity and quality of college student sleep have changed dramatically over the past several decades, with dissatisfaction of sleep rising from 24% to 71% between 1978 and 2001, and mean hours of sleep reported dropping from 7.75 hours per night to 6.65 hours (Becker, Felts, & Vail-Smith, 2009). 73% of college students also reported some form of sleep disturbances, with women reporting more problems than men (Becker, Felts, and Vail-Smith, 2009). Sleep restriction elevates the sympathetic nervous system and increases evening cortisol production, which can lead to increased caloric intake and abdominal fat (Magee, 2010). Sleep debt is also associated with lower levels of leptin secretion, which leads the hypothalamus to interpret that the fat cells need more food and directs the body to eat more. As leptin levels decrease, the hypothalamus interprets the message that the fat cells need more food and directs the body to eat more (Magee, 2010). Additionally, sleep restriction also leads to an increase in ghrelin, a hunger hormone produced and secreted from the stomach. Higher circulating ghrelin levels stimulate hunger and food intake (Magee, 2010). Results showed an >30% increase in desire for calorie-dense foods, such as cake and potatoes. 70% of the change in hunger reported could be explained by the ghrelin-to-leptin ratios, suggesting a strong neuroendocrine control of food intake (Marshall, Rogers, & Trenell, 2007). Consequently, sleep debt is related to glucose intolerance. Glucose tolerance was 40% lower after sleep restriction than after sleep extension and reached a range that is typical of aging people who have impaired glucose intolerance (Cauter, Leproult, Spiegal, & Tasali, 2009). Poor sleep quality also produced similar results in glucose tolerance levels. After 3 nights of suppression of slow-wave sleep in healthy young adults, insulin sensitivity had decreased by around 25% and reached the level reported in again individuals and in populations at high risk of diabetes mellitus (Cauter, Leproult, Spiegal, & Tasali, 2009). Chronic partial sleep loss may increase the risk of obesity and diabetes by adversely affecting the parameters of glucose regulation, dysregulation of the neuroendocrine control of appetite (Cauter & Knutson, 2008). The dysregulation of appetite resulted in an average increase of 350-500 kcal/day caloric excess and thus, increasing weight gain, which will further influence glucose control and the development of obesity (Marshall, Rogers, & Trenell, 2007).

Purpose

The purpose of this research was to compare the relationship between sleeping habits and body fat composition.

Methods

Eight undergraduate students (3 male – ages 23 ± 1.00 yrs, 5 female – ages 24.8 ± 3.56 yrs) were administered the Pittsburgh Sleep Quality Index (PSQI) survey, a self-rated questionnaire which assesses sleep quality during the previous month. After the PSQI was completed, each participant was weighed using a clinical scale in kilograms and height measured to the hundredth of a centimeter. Data gathered (age, height, weight, gender) were input into the hydrostatic weighing computer program and water temperature was recorded in the nearest degree. The hydrostatic chair was then weighed and calibrated before each participant was weighed. Each participant was asked to wear a swimsuit and wash off any oils or lotions that they might be wearing. Upon entering the tank, each participant removed all bubbles from the skin and swim suit then slowly moved to where the chair is suspended from a load cell so as not to disturb the water. Each participant sat on the chair, took several deep breaths, and then exhaled as much air as possible underwater. A tap on the chair was an indicator for the participant to come up for air and end that trial. A total of 4 trials for each participant were given and the mean Siri method for calculating body fat percentage was used.

Results

In males, the mean weight equaled 76.42 ± 4.95 Kg. In females, the mean weight equaled 61.85 ± 7.79 Kg. The PSQI global score has a possible range of 0-21 points. Actual scores ranged from 4-13 in males with a mean PSQI score of 9.00 ± 4.58, and 5-15 in females with a mean PSQI score that equaled 9.60 ± 4.56 (See Table 1). For individual components, each with a possible range of 0-3, the observed ranges were 0-3. Self-reported mean hours slept per night equaled 6.33 ± 2.078 hours in males and 5.60 ± 0.65 hours in females. The correlation coefficient between PSQI scores and body fat percentage equaled r=0.79 in males and r=0.22 in females. The correlation coefficient between PSQI scores and weight (Kg) equaled r=-0.99 in males and r=-0.32 in females. The correlation coefficient between hours slept per night and body fat percentage equaled r=-0.96 in males and r=-0.28 in females.

Results (cont'd)

Subject	Mean (Males)	SD (Males)	Mean (Females)	SD (Females)
Age	23	1.00	24.80	3.56
Weight	76.42 Kg	4.95 Kg	61.85 Kg	7.79 Kg
Body Fat %	12.61%	5.08%	20.35%	5.88%
Hours Slept	6.33 Hrs.	2.078 Hrs.	5.60 Hrs.	0.65 Hrs.
PSQI Score	9.00	4.58	9.60	4.56

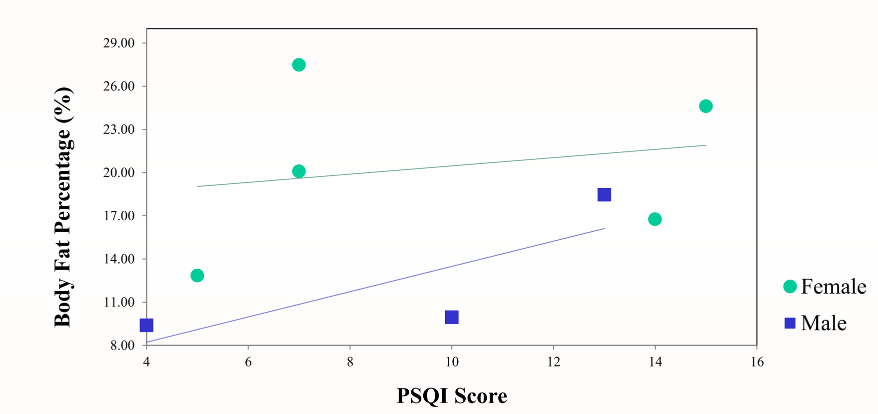

Figure 1: Relationship Between PSQI Scores And Body Fat Percentage In Men And Women

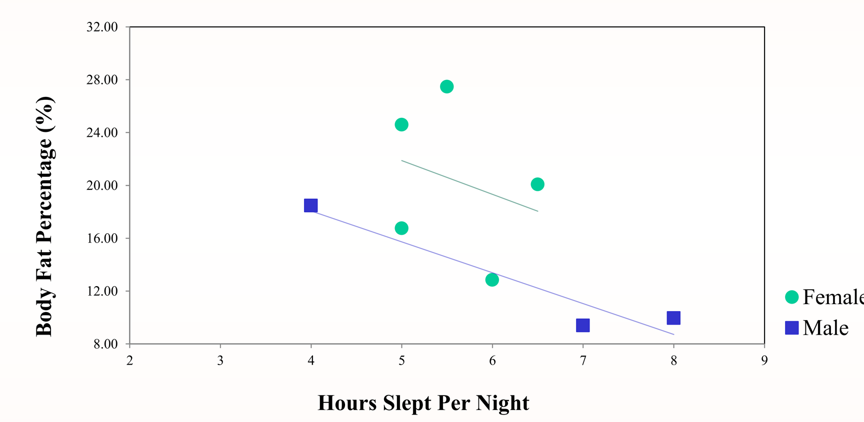

Figure 2: Relationship Between Hours Slept Per Night And Body Fat Percentage In Men And Women

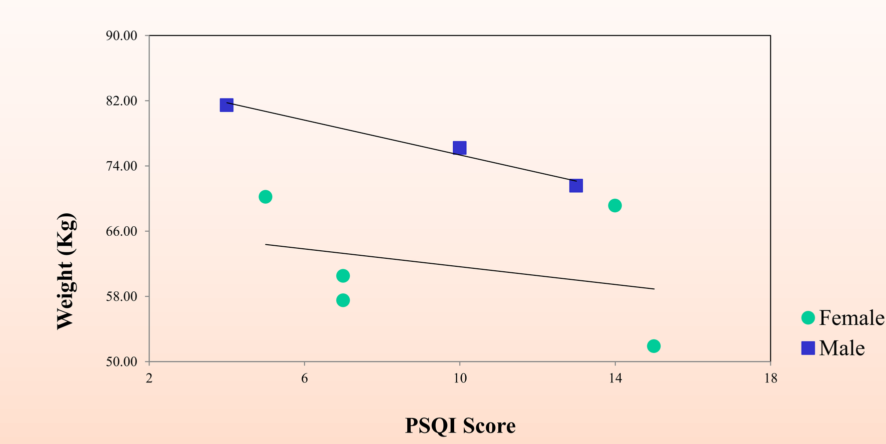

Figure 3: Relationship Between PSQI Score And Weight In Men And Women

Conclusions

PSQI scores and body fat percentage share a positive linear relationship in both men and women. Hours slept per night and body fat percentage share inverse linear relationship in both men and women. These relationships indicate that the individuals who either had less quantity or less quality of sleep had higher body fat percentages and/or weight.