# Correlates of Qualtiy Sleep and Academic Performance

*Craig M. Becker, Troy Adams, Caroline Orr, and Lyndsay Quilter*

**Abstract**

Sleep problems have become epidemic and traditional research has discovered many causes of poor sleep. The purpose of this study was to complement existing research by using a salutogenic or health origins framework to investigate the correlates of good sleep. The analysis for this study used the National College Health Assessment data that included 54,111 participants at 71 institutions. Participants were randomly selected or were in randomly selected classrooms. Results of these analyses indicated that males and females who reported "good sleep" were more likely to have engaged regularly in physical activity, felt less exhausted, were more likely to have a healthy Body Mass Index (BMI), and also performed better academically. In addition, good male sleepers experienced less anxiety and had less back pain. Good female sleepers also had fewer abusive relationships and fewer broken bones, were more likely to have been non-smokers and were not binge drinkers. Despite the limitations of this exploratory study, these results are compelling, however they suggest the need for future research to clarify the identified relationships.

**Background**

Sleep problems in the United States have become epidemic (Krishnan & Collop, 2006). Nearly two-thirds of American adults experience trouble sleeping one or more nights per week and 10-15% of Americans have been diagnosed with chronic insomnia (National Sleep Foundation, n.d.; Turkoski, 2006). A recent poll by the National Sleep Foundation (National Sleep Foundation, n.d.) found that over half of the people in the United States (52%) describe their sleep habits as not good or poor, raising the question "what is keeping Americans awake?" Factors that inhibit or prevent sleep are generally the focus of traditional research.

* Craig M. Becker, PhD; Assistant Professor, Health Education and Promotion; East Carolina University, School of Health and Human Performance, 110 Christenbury, Greenville, NC 27858; Telephone: 252-328-5312; Fax: 252-328-1285; E-mail: beckerc@ecu.edu; Chapter: At-Large

Troy Adams, PhD; Department of Health Promotion and Wellness; Rocky Mountain University of Health Professions, 1622 West 820 North, Provo, UT 84601

Caroline Orr, BS; Department of Health Education and Promotion; East Carolina University, 110 Christenbury, Greenville, NC 27858

Lyndsay Quilter, BS; Exercise and Wellness; Arizona State University, 7350 E. Unity Drive, Mesa, AZ 85212

* Corresponding Author

Traditional research has identified many common causes of inadequate sleep quantity such as family and work demands and/or poor physical health, (Motivala, Levin, Oxman, & Irwin, 2006; National Sleep Foundation, n.d.) with obesity and overweight being among the leading causes of poor sleep (Kohatsu et al., 2006; National Sleep Foundation; O'Brien, Sitha, Baur, & Waters, 2006). For example, approximately 18 million Americans have chronic sleep apnea, a condition related to obesity (Hiestand, Britz, Goldman, & Phillips, 2006; National Sleep Foundation). Poor sleep quality also has been associated with higher levels of stress and depression, both of which have a reciprocal negative impact on sleep (Fortunato & Harsh, 2006; Fuligni & Hardway, 2006; Taras & Potts-Datema, 2005). Previous research has focused on variables related to sleep *quantity* such as bed/wake time, sleep latency, and nap length/frequency (Buboltz, Jr., Soper, Brown, & Jenkins, 2002; Fortunato & Harsh; Kohatsu et al., 2006; Turkoski, 2006).

Findings about factors related to sleep quality indicated that these factors vary by age. For example, adolescents report more severe sleep-deprivation during the week and indicate more trouble falling asleep (Fortunato & Harsh, 2006). Factors related to poor sleep with this age group included caffeine consumption, stress from schoolwork, depression, and biological factors (Fortunato & Harsh; Fuligni & Hardway, 2006; Taras & Potts-Datema, 2005).

Unlike younger adults, older adults report frequent waking, early rising (Mauk, 2005), and nearly a twofold greater rate of chronic insomnia as primary sleep problems (Mauk, 2005; Rybarczyk et al., 2005; Sivertsen et al., 2006). Research indicates that some poor sleep quality among older adults may be related to illness-related factors such as medications and conditions such as restless leg syndrome (Mauk; Rybarczyk et al.; Sivertsen et al.).

Research has identified college students as a unique group because of their cultural sleep-related challenges (Buboltz, Jr. et al., 2002; Jensen, 2003). Not surprisingly, college students seem to function better when well rested (Buboltz, Jr. et al., 2002; Carney, Edinger, & Meyer, B., et al, 2006; Tsai L, Li S., 2004) because sleep is an enabling capacity (Trockel, Barnes, & Egget, 2000).

Approximately three-quarters of undergraduates report occasional sleep problems and over half report feeling tired in the morning (Buboltz, Jr. et al., 2002; Carney et al., 2006). In one study, freshmen reported earlier wake times, which was cited as the primary determinant of reduced sleep *quantity,* relative to upperclassmen (Tsai L, Li S., 2004). Another study correlating academic performance of first-year college students found that wake-up times accounted for the largest amount of variance in grade point average (Trockel et al., 2000). Similar relationships between sleep quality and academic performance have been noted in other research

(Campos-Morales, Valencia-Flores, Castaño-Meneses, Castañeda-Figueiras, & Martínez-Guerrero, 2005). Poor sleep quality in college students also has been linked to stress, depression, and anxiety (Carney et al.; Jensen, 2003; Tsai L, Li S.). Research suggests that non-clinical approaches, such as development of consistent sleep patterns have been successful at improving the sleep habits among college students (Buboltz, Jr. et al., 2002). These results suggest that the university setting may provide an opportunity to intervene with this group (Buboltz, Jr. et al., 2002; Jensen, 2003). Overall, our review indicated that while there has been research, only a limited amount has focused on the correlates and associated consequences of *good* sleep among college students in the United States.

## Purpose

In contrast to traditional research, this study followed recent recommendations to assess positive health correlates (Becker, Glascoff, Mitchell, Durham, & Arnold, 2007; Benyamini, Idler, Leventhal, & Leventhal, 2000). This research study was guided by salutogenesis, a model devoted to learning about the origins of health (Antonovsky, 1985). The aim of this study, therefore, was to investigate factors related to restful or good sleep. To accomplish this aim, the two fold purposes of this exploratory study were to identify behavioral and demographic characteristics associated with good sleep quality, and to determine how sleep quality was related to academic performance.

## Methods

### *Design and Sample*

A retrospective design was employed with analysis of cross-sectional data from the American College Health Association (ACHA), National College Health Assessment (NCHA) collected during the Spring 2005. Students at 78 United States institutions (N = 56,637) completed this NCHA; however, only students who were randomly selected or in randomly selected classrooms were included (N = 54,111 students at 71 institutions) (American College Health Association, 2007).

Each institution provided permission for ACHA to release data in aggregate form to interested researchers. Permission to use these data were requested and received, and approval was received for all study procedures from a University Institutional Review Board (IRB).

Institutional characteristics indicated a relative balance of public to private institutions (38 vs. 33) and enrollment size (16 with < 2,500 students, 7 with 2,500-4,999, 16 with 5,000-9,999, 15 with 10,000-19,999 and 17 with 20,000+ students). Most institutions (n=67) were 4-year, and were geographically dispersed with 18 in the northeast, 14 in the Midwest, 17 in the south and 22 in the west. Thus, the data were from a large random sample that was drawn from several different types of institutions.

Validity screens developed for research with NCHA data were employed (Adams & Rust, 2006; Adams & Collner, In press; Adams & Moore, In press). First, an omission criterion (mean plus four standard deviations) was applied to three continuous variables: "Hours of alcohol consumed at last party" (> 14 hours), "Number of drinks consumed at last party" (> 22), and "Number of sexual partners in past 12 months" (> 13). Students with values beyond four standard deviations on any of these variables were omitted (n = 2,324). Also, consistent with NIH weight guidelines, students with BMI values below 15 or over 45 were omitted (n = 2,325). The final sample consisted of 49,462 United States college students. Additional demographic data about the sample are provided in Table 1.

### *Measures*

The NCHA was developed by a team of college health professionals and assessed for external validity against national surveys with representative databases (Adams & Collner, In press; American College Health Association, 2007; Centers for Disease Control and Prevention, 1997). The NCHA includes approximately 300 hundred items that assess behavioral, medical, normative and demographic characteristics.

### *Analysis*

For the first analysis, the dependent variable focused on how much good sleep the student was getting. The data were derived from the question, "On how many of the past 7 days did you get enough sleep so that you felt rested when you woke up in the morning?" Response options ranged from 0 to 7 days. For the first analysis only, sleep quality was dichotomized into either good sleep (6-7 days) or poor sleep (0-1 days). Participants who reported 2-5 days of good sleep were not included in first analysis. Good sleep, the dependent variable, was therefore operationally defined as the participants who self-reported that they had 6-7 days of restful sleep.

For a second analysis, the dependent variable was self-reported Grade Point Average (GPA) (A, B, C/D/F) with a grade of C/D/F as the referent group. GPA was the only variable used to track academic success. For statistical purposes, because there were relatively few students who reported a GPA of D/F, those that did were combined with the "C" students.

Frequency analysis was first performed on both dependent variables. The first research question was assessed using a forward conditional, stepwise, binary logistic regression. The independent variables were entered together in the first step followed by the demographic variables in the second step to identify important predictors of sleep quality. The analyses used the Wald test to determine if important relationships existed. The relationship was considered statistically significant if the Confidence Interval (C.I.) for the Wald test did not include 1, or unity (Harrell, 2001).

Table 1

*Demographic Characteristics*

| Predictor | N | % |
|---|---|---|
| Gender | | |
| Female | 30,451 | 64.4 |
| Male | 16,830 | 35.6 |
| Age (Mean = 21.1 ± 2.3 ) | | |
| 18 | 5,371 | 11.3 |
| 19 | 9,639 | 20.2 |
| 20 | 8,425 | 17.7 |
| 21 | 7,475 | 15.7 |
| 22 | 4,789 | 10.0 |
| 23 | 2,233 | 4.7 |
| 24 | 1,594 | 3.3 |
| 25 and over | 8,196 | 17.2 |
| Race | | |
| Caucasian | 31,644 | 72.9 |
| African American | 2,402 | 5.5 |
| Hispanic | 1,835 | 4.2 |
| Asian | 4,481 | 10.3 |
| American Indian | 148 | .3 |
| Multi-Racial | 2,898 | 6.7 |
| Current relationship status | | |
| Single | 23,487 | 54.0 |
| Married | 3,746 | 8.6 |
| Committed | 15,728 | 36.2 |
| Sep./ Div./ Wid. | 497 | 1.1 |
| Current living arrangement | | |
| Residence Hall | 15,661 | 36.0 |
| Frat/ Sorority House | 725 | 1.7 |
| Other University Housing | 2,184 | 5.0 |
| Off Campus | 16,642 | 38.3 |
| With Parents | 5,992 | 13.8 |
| Other | 2,270 | 5.2 |
| Weekly number of hours worked | | |
| 0 Hours | 16,333 | 37.7 |
| 1-9 Hours | 7,209 | 16.6 |
| 10-19 Hours | 8,810 | 20.3 |
| 20-29 Hours | 5,844 | 13.5 |
| 30-39 Hours | 2,246 | 5.2 |
| 40 Hours | 1,554 | 3.6 |
| Over 40 Hours | 1,376 | 3.2 |
| Weekly number of hours volunteered | | |
| 0 Hours | 27,590 | 63.8 |
| 1-9 Hours | 13,800 | 31.9 |
| 10-19 Hours or more | 1,857 | 4.3 |

To address the second research question, a multinominal logistic regression was used. The demographic variables sleep quality (0 through 7 days of good sleep) and the important predictors from the first analysis were all entered in one block. Analyses were conducted separately for men and women.

For both analyses Odds Ratios (O.R.) were used, odds ratios were used to indicate the likelihood or "odds" that the studied behaviors occurred. Odds ratios were used to measure effect size. An odds ratio greater than 1 indicated that the behavior studied was more likely to occur and if odds ratio less than 1, it indicated that the behavior was less likely to have occurred (Tabachnick, 2000).

Independent variables were selected based on past research indicating a relationship with sleep quality. These variables included: Relationships in the past 12 months that were abusive emotionally, physically, or sexually (yes or no) (Fuligni & Hardway, 2006); 30 day usage of cigarettes, marijuana, cocaine, or amphetamines (never, not in past 30 days, at least once) (Buboltz, Jr. et al., 2002; Carney et al., 2006; Jensen, 2003); binge drinking during the preceding two weeks (0 to 9 or more times) (Carney et al.; Jensen); weekly frequency of participation in vigorous exercise, or muscle toning exercise (0-7 days) (O'Brien et al., 2006; Turkoski, 2006; Kohatsu et al., 2006); feelings in the past 12 months of hopelessness, being overwhelmed, exhaustion, sadness, or depression (never to 11 or more times) (Motivala et al., 2006; Fortunato et al., 2006); and experiencing in the past 12 months anxiety, asthma, back pain, broken bones, ear infection, or strep throat (yes or no) (Fortunato et al.; Jensen). Demographic variables included: age, year in school (freshman through graduate student), hours worked per week (0 to 40 or more), hours volunteered per week (0 to 10 or more), BMI group (underweight to morbidly obese), member of a fraternity or sorority (yes or no), relationship status (single, married/engaged, separated/divorced, widowed), and living arrangement (residence hall, university housing, fraternity/sorority, off-campus, with parents).

## Results

More students reported having poor sleep (n = 10,346) than those who reported having good sleep (n = 6,333). GPA was distributed as follows: A = 41.2%, B = 47.8, and C/D/F = 11.0%.

The adjusted results of the first analysis indicated that 29% and 31% of the variance respectively was accounted for. For classifications, it correctly classified the respondents into good or poor sleep quality group with 72% and 74% accuracy respectively.

After statistically controlling for all variables in the model, the odds of reporting good sleep quality were higher in males who participated regularly in vigorous/moderate physical activity (O.R. 1.21) and strength training (O.R. 1.15), felt less exhausted (O.R. for never exhausted 5.65), been free of back pain (O.R. 1.36), not been employed (O.R. 1.97 for 0 hours of work), and had not experienced anxiety (O.R. 0.72). (Table 2)

The odds of reporting good sleep quality were higher in females who participated more regularly in vigorous/ moderate physical activity (O.R. 1.26) and strength training (O.R. 1.12), felt less exhausted (O.R. for never exhausted 11.55), had not been in an emotionally (O.R. 1.25) or sexually (O.R. 1.82) abusive relationship, had not been a smoker (O.R. 1.33), was not a binge drinker (O.R. 3.94 for never binging), had not broken a bone (O.R. 1.42), had not been employed

Table 2

*Prediction Model for Good Sleep in Males*

| Predictor | Males | | |
|---|---|---|---|
| | Wald | O.R. | 95% C.I. |
| Vigorous/moderate physical activity | 78.01 | 1.21 | 1.16 to 1.26 |
| Strength training | 38.57 | 1.15 | 1.10 to 1.12 |
| Anxiety | 6.10 | 0.72 | 0.57 to 0.92 |
| Felt exhausted | 11 or more times was the referent | | |
| 0 times | 215.45 | 5.96 | 4.69 to 7.56 |
| 1-2 times | 173.60 | 4.32 | 3.47 to 5.37 |
| 3-4 times | 153.54 | 4.21 | 3.37 to 5.23 |
| 5-6 times | 69.03 | 2.85 | 2.22 to 3.64 |
| 7-8 times | 28.62 | 2.15 | 1.63 to 2.85 |
| 9-10 times | 11.33 | 1.67 | 1.24 to 2.24 |
| No back pain | 20.58 | 1.36 | 1.19 to 1.55 |
| Hours of employment | 30+ hours was the referent | | |
| 0 hours | 13.33 | 1.97 | 1.37 to 2.83 |
| 1 – 9 hours | 10.87 | 1.92 | 1.30 to 2.83 |
| 10 – 19 hours | 7.12 | 1.69 | 1.15 to 2.49 |
| 20 – 29 hours | 2.14 | 1.35 | 0.90 to 2.01 |
| Year in school | Graduate school was the referent | | |
| 1st year | 37.58 | 0.47 | 0.37 to 0.60 |
| 2nd year | 32.14 | 0.51 | 0.41 to 0.65 |
| 3rd year | 28.65 | 0.55 | 0.44 to 0.68 |
| 4th year | 2.93 | 0.82 | 0.65 to 1.03 |
| 5th year | 9.30 | 0.62 | 0.45 to 0.84 |

(O.R. 2.32 for 0 hours of work), had not volunteered (O.R. 1.84 for 0 volunteer hours), had not used marijuana (O.R. 0.69), and did not feel *more* sad (O.R. for never sad .50). (Table 3)

Results of the second analysis indicated that after controlling for the demographic variables and predictors from the first analysis, sleep quality was associated with GPA in both genders. Odds ratios for getting enough sleep for males were 1.07 for A students and 1.03 for B students. For females, odd ratios for getting enough sleep were 1.09 for A students and 1.05 for B students. Relative to males in the C/D/F group, those in the A and B groups were respectively 7% and 3% more likely to get good sleep. Likewise, females in the A and B groups were respectively 9% and 5% more likely to get good sleep. However, sleep was not the strongest predictor of academic performance. The strongest predictor of GPA among both males and females was Body Mass Index (BMI). Statistical significance using the Wald test for BMI was indicated because the associated confidence interval did not include 1 (unity). (C.I. for A males=0.56-0.63, B males=0.73-0.82; C.I. for A Females=0.58-0.64, B Females=0.75-0.83). In addition the large Wald statistic in comparison to other variables designated its importance. The BMI Wald statistic was the largest of the nondemographic variables. The results indicated that students with a normal BMI were more likely to earn an A or B, while those classified as overweight or obese were more likely to have earned a C, D, or F. (Tables 4 & 5)

## Discussion

The findings from this exploratory study, using a salutogenic or health causing framework, provided a method to discover variables related to good sleep for both men and

Table 3

*Prediction Model for Good Sleep in Females*

| | Females | | |
|---|---|---|---|
| Predictor | Wald | O.R. | 95% C.I. |
| Vigorous/moderate physical activity | 206.000 | 1.258 | 1.22 to 1.30 |
| Strength training | 10.046 | 1.116 | 1.08 to 1.15 |
| Cigarettes | At least once was the referent | | |
| Never used | 14.878 | 1.328 | 1.15 to 1.53 |
| Not in past 30 days | 7.990 | 1.260 | 1.07 to 1.48 |
| Marijuana | At least once was the referent | | |
| Never used | 18.500 | 0.694 | 0.59 to 0.82 |
| Not in past 30 days | 7.609 | 0.786 | 0.66 to 0.93 |
| Binge drinking | 6 times or more was the referent | | |
| None | 8.247 | 3.939 | 1.55 to 10.04 |
| 1 time | 4.162 | 2.663 | 1.04 to 6.82 |
| 2 times | 4.115 | 2.661 | 1.03 to 6.85 |
| Felt exhausted | 11 or more times was the referent | | |
| 0 times | 387.065 | 11.553 | 9.05 to 14.74 |
| 1-2 times | 509.212 | 7.763 | 6.50 to 9.28 |
| 3-4 times | 327.926 | 4.829 | 4.07 to 5.73 |
| 5-6 times | 184.691 | 3.225 | 2.72 to 3.82 |
| 7-8 times | 126.325 | 2.787 | 2.33 to 3.33 |
| 9-10 times | 49.455 | 1.966 | 1.63 to 2.37 |
| Felt sad | 11 or more times was the referent | | |
| 0 times | 30.249 | 0.496 | 0.39 to 0.64 |
| 1-2 times | 20.068 | 0.610 | 0.49 to 0.76 |
| 3-4 times | 14.805 | 0.647 | 0.52 to 0.81 |
| 5-6 times | 5.605 | 0.761 | 0.61 to 0.95 |
| 7-8 times | 7.653 | 0.709 | 0.56 to 0.91 |
| 9-10 times | 4.668 | 0.752 | 0.58 to 0.97 |
| No emotionally abusive relat | 9.489 | 1.252 | 1.09 to 1.45 |
| No sexually abusive relat | 7.829 | 1.822 | 1.12 to 2.78 |
| No back pain | 33.134 | 1.324 | 1.20 to 1.46 |
| No broken bones | 6.950 | 1.418 | 1.09 to 1.84 |
| Hours of employment | | | |
| 0 hours | 26.542 | 2.232 | 1.65 to 3.03 |
| 1-9 hours | 20.095 | 2.063 | 1.50 to 2.83 |
| 10-19 hours | 14.444 | 1.838 | 1.34 to 2.52 |
| 20-29 hours | 4.041 | 1.394 | 1.01 to 1.93 |
| Volunteer hours | | | |
| 0 hours | 23.798 | 1.840 | 1.44 to 2.35 |
| 1-9 hours | 19.992 | 1.772 | 1.38 to 2.23 |
| Year in school | | | |
| 1st year | 98.097 | 0.398 | 0.33 to 0.48 |
| 2nd year | 53.976 | 0.523 | 0.44 to 0.62 |
| 3rd year | 23.855 | 0.666 | 0.57 to 0.78 |
| 4th year | 8.771 | 0.777 | 0.66 to 0.92 |
| 5th year | 4.304 | 0.765 | 0.59 to 0.99 |

women. Factors related to good sleep included participation in physical activity, having good relationships, and the absence of emotional, physical, or other problems. While these relationships are clearly not causal, findings suggest that institutions that are *already* providing programs to help students develop physical fitness habits, effective relationship skills, and emotional coping skills *may* also be positively impacting sleep quality and academic performance.

Findings from this study also indicate that sleep quality should be included with indicators of academic performance in multivariate models. A relationship was found between those who indicated experiencing more restful sleep and those who had better academic performance. Interestingly, the strongest predictor of academic performance was BMI such that those with a healthy BMI performed better academically.

These findings provide health educators with good sleep as an additional positive reason to promote engagement in health behaviors (Kohatsu et al., 2006; National Sleep Foundation, n.d.; O'Brien et al., 2006). Practical applications

Table 4

*Prediction Model for Male Academic Performance*

| | Males | | | | | |
|---|---|---|---|---|---|---|
| | A Students* | | | B Students* | | |
| Predictor | Wald | O.R. | 95% C.I. | Wald | O.R. | 95% C.I. |
| Get enough sleep | 19.97 | 1.07 | 1.04 to 1.10 | 4.79 | 1.03 | 1.00 to 1.06 |
| Vigorous/moderate physical activity | 9.43 | 1.06 | 1.02 to 1.10 | 2.22 | 1.03 | 0.99 to 1.06 |
| Strengthening exercises | 4.45 | 0.96 | 0.93 to 1.00 | 0.04 | 1.00 | 0.97 to 1.04 |
| Anxiety | 6.74 | 0.78 | 0.65 to 0.94 | 1.52 | 0.90 | 0.75 to 1.07 |
| Back pain | 17.22 | 0.80 | 0.72 to 0.89 | 2.53 | 0.92 | 0.83 to 1.02 |
| Age | 46.89 | 1.06 | 1.04 to 1.07 | 8.07 | 1.02 | 1.01 to 1.04 |
| Year in school | 317.12 | 1.48 | 1.42 to 1.54 | 93.84 | 1.23 | 1.18 to 1.23 |
| Relationship status | 8.83 | 1.09 | 1.03 to 1.15 | 0.45 | 1.02 | 0.97 to 1.07 |
| Living situation | 170.33 | 0.78 | 0.75 to 0.81 | 31.36 | 0.91 | 0.88 to 0.94 |
| Fraternity or sorority | 26.85 | 1.59 | 1.34 to 1.90 | 0.42 | 1.05 | 0.90 to 1.24 |
| Weekly work hours | 5.69 | 0.96 | 0.92 to 0.99 | 12.79 | 0.94 | 0.91 to 0.97 |
| BMI | 253.29 | 0.59 | 0.56 to 0.63 | 77.96 | 0.77 | 0.73 to 0.82 |
| Weekly volunteer hours | 73.95 | 1.57 | 1.42 to 1.74 | 19.86 | 1.25 | 1.13 to 1.38 |

* Relative to C/D/F

of these findings for health educators on university campuses are possible. For example, health professionals could continue with the implementation of programs related to healthy behaviors and add associated sleep and academic performance benefits to document the importance and value of these programs. These results should be important to educators, administrators, parents, and students. These associated benefits provide another connection of health behaviors to a positive college experience and better academic performance.

Possible limitations of the study include the cross-sectional design, which does not allow for causality to be inferred. For example, it would not be possible to determine whether better sleep led to less anxiety or if lack of anxiety led to better sleep. Either way, these findings have important implications because they suggest that personal behaviors that can be controlled by the individual may have a relationship to sleep quality. Additionally, the study was limited to college students and GPA was the only variable used to track academic success. There are also possible limitations resulting from the combined group of C/D/F students for statistical reasons. The collapsed C/D/F group may have great variability and it is recommended that future research investigate these populations. Another limitation results because almost 65% of this population was female, and results, including these, document gender differences. In reviewing these findings, because college students are a unique population and tend to have unique health challenges, these findings may not generalize to other adults. Further, even though the data were from a large, nationally dispersed sample of college students, the data may not have been representative of all college students.

## Recommendations

Findings indicated that sleep quality is associated with grade point average, a primary measure of academic productivity among college students. While these questions are provocative, they suggest the need for future research because answers to these questions require investigations that are beyond the scope of this study. The gender differences observed in this study indicate that future research and program design may need to be tailored by gender. The BMI relationship also raises a host of questions regarding the mechanism by which the BMI/Academic performance might be mediated, all of which need further study. Future studies could investigate if students with lower BMI's perform better? Also, because sleep is associated with BMI in this study, future research could investigate if students with lower BMI's perform better academically simply because they are more rested? Other studies could investigate if lower BMI facilitates better sleep? This study opens the door to many additional and valuable questions about what factors could positively impact academic performance.

Table 5

*Prediction Model for Female Academic Performance*

| | Females | | | | | |
|---|---|---|---|---|---|---|
| | A* | | | B* | | |
| Predictor | Wald | O.R. | 95% C.I. | Wald | O.R. | 95% C.I. |
| Get enough sleep | 52.32 | 1.09 | 1.07 to 1.12 | 17.64 | 1.05 | 1.03 to 1.08 |
| Vigorous/moderate physical activity | 62.34 | 1.14 | 1.10 to 1.17 | 15.14 | 1.06 | 1.03 to 1.10 |
| Strengthening exercises | 6.53 | 0.96 | 0.93 to 0.99 | 0.00 | 1.00 | 0.97 to 1.03 |
| Age | 40.86 | 1.04 | 1.03 to 1.06 | 4.60 | 1.01 | 1.00 to 1.03 |
| Year in school | 346.09 | 1.42 | 1.37 to 1.47 | 92.12 | 1.20 | 1.15 to 1.24 |
| Living situation | 167.89 | 0.82 | 0.79 to 0.84 | 55.99 | 0.89 | 0.87 to 0.92 |
| Fraternity or sorority | 6.16 | 1.24 | 1.05 to 1.46 | 2.84 | 0.87 | 0.75 to 1.02 |
| Weekly work hours | 20.51 | 0.93 | 0.90 to 0.96 | 28.15 | 0.92 | 0.90 to 0.95 |
| BMI | 361.98 | 0.61 | 0.58 to 0.64 | 99.05 | 0.79 | 0.75 to 0.83 |
| Weekly volunteer hours | 85.77 | 1.49 | 1.37 to 1.62 | 17.35 | 1.19 | 1.10 to 1.08 |
| Emotionally abusive relationship | 3.51 | 0.62 | 0.55 to 0.70 | 18.03 | 0.78 | 0.70 to 0.88 |
| Smoked cigarettes | 31.22 | 0.84 | 0.79 to 0.89 | 5.78 | 0.93 | 0.88 to 0.99 |
| Smoked marijuana | 8.58 | 1.11 | 1.04 to 1.19 | 8.45 | 1.10 | 1.03 to 1.12 |
| 5+ Drinks at a time | 56.14 | 0.89 | 0.86 to 0.92 | 6.71 | 0.96 | 0.94 to 0.99 |
| Felt very sad | 38.97 | 0.92 | 0.89 to 0.94 | 25.91 | 0.94 | 0.91 to 0.96 |
| Broken bones | 4.56 | 0.79 | 0.64 to 0.98 | 2.30 | 0.85 | 0.70 to 1.05 |

* Relative to C/D/F. ** C.I. = Confidence Interval

It is recommended that future research investigate the relationship of academic success with other variables such as persistence and retention. Also, because sleep problems affect so many people, future research could apply these study methods that identify correlates of good sleep to other populations. Future studies could investigate working populations using a measure of work productivity as the outcome variable. In summary, the value and importance of quality sleep has been related to multiple positive health and performance consequences (Fuligni & Hardway, 2006; Mauk, 2005; Taras & Potts-Datema, 2005). Consistent with theorists (Antonovsky, 1996) who propose focusing on causes of good health (salutogenesis), future research should also focus on discovering additional correlates of *good* sleep.

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