THE RELATIONS BETWEEN SLEEP, DEPRESSION, AND ANXIETY IN A

COLLEGE POPULATION

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Sleep occupies a large bulk of our time throughout our life. It is necessary to live a healthy and productive life. However, many people suffer from sleeping difficulties and disorders. College students, in particular, appear likely to practice poor sleep habits and suffer from sleep disorders (Brown, Soper, & Buboltz, 2001). Through various changes of their daily schedules, college student sleep habits likely fall subject to a wide variety of changes which can often inhibit the student. But, relatively few studies have specifically examined the sleep-health relations with college student samples, leaving unanswered questions regarding the types of sleep disorders impacting students and the effects on their mental health.

The Diagnostic and Statistical Manual of Mental Disorders 4th Ed. (DSM-IV-TR), indicates that sleep problems often co-occur with many mental health disorders. In particular, depression and anxiety are frequently seen in combination with a sleeping disorder. However, the relations among sleep, depression, and anxiety are far from fully understood, and surprisingly little research has specifically examined college students. Thus, the present study was designed to explore the relations among sleep disorders, depression, and anxiety in a sample of college students. Prior to describing the specific details of the present study, a brief literature review is presented detailing previous research that has investigated links among sleep, depression, and anxiety.

Biological Aspects of Sleep and Depression

There are several biological components that are involved in both sleep and depression. These common components provide some explanation for the often-found

comorbidity of mood and sleep disorders. For example, the suprachiasmatic nucleus (SCN), the hypothalamus-pituitary-adrenal axis, cortisol levels, and circadian rhythm processes are known to be related to both depression and sleep. The SCN is located in the hypothalamus and often identified as the pacemaker that regulates circadian processes (i.e., approximately 2-4 hour daily cycles). The changes in activity in the SCN parallel the sleep/wake cycle: electrical activity is higher during the day when a person is generally alert and exposed to light, and is lower in the night when a person is generally less active and has less exposure to natural light. There is also increased neuronal activity in the SCN during rapid eye movement (REM) sleep and waking, as evidenced by a correlation between SCN activity and slow-wave activity during non-rapid eye movement (NREM) sleep (Deboer et al., 2003). In regard to depression, a recent study by Zhou et al. (2009) found disturbances in the SCN, specifically poor transport of arginine vasopressin among those with depression. This finding may explain why people with depression have difficulty keeping normal circadian rhythms (also see Bao et al., 2008 for additional evidence).

The hypothalamus-pituitary-adrenal (HPA) axis is another biological system that is likely involved in sleep and depression. Notably, different alterations in the HPA axis suggest biological differences in the subtypes of depression, specifically melancholic and atypical depression. In a review article Antonijevic (2008) discussed previous work involving the HPA axis and sleep and depression, which looked at HPA axis activity and sleep–electroencephalogram (EEG) changes in different groups of people with depression in an attempt to determine the difference in subgroups of depression. People with depression do not all have the same biological findings, which lead to the belief that there

are the specific subtypes. The alterations in the HPA axis activity can either be overdrive which is usually associated with the melancholic depression subtype, or reduced activity which is more commonly associated with the atypical depression subtype. Bao et al. (2008) suggested that the differences in the HPA system may lead to the depressive episode and could have a causal role. These findings provide some support for biological differences being able to help determine the different subtypes of depression.

Research also indicates that cortisol levels relate to both sleep and depression. Stetler and Miller (2005) compared cortisol levels in depressed and non-depressed women, specifically morning cortisol levels. Usually in depressed people the cortisol levels are higher than that of normal functioning individuals (Pruessner, Hellhammer, Pruessner, & Lupien, 2003). However, Stetler and Miller (2005) found that morning cortisol levels of depressed women to be blunted compared to non-depressed women. This was an outpatient sample and that could be part of the reason for the different results, because an outpatient sample is less severely depressed than an inpatient sample. However, this study could also support the idea that atypical depression has a reduction in the activity of the HPA system, which is different from the melancholic depression subtype. Therefore, it is possible that the Stetler and Miller results are due to a sample of individuals predominantly with atypical depression.

As noted above, circadian rhythms are widely believed to result from SCN activity. This "internal clock" is endogenously entrained (synchronizes with) environmental signs, especially light, on an approximately 24-hour cycle. Major cycles associated with the pacemaker include the sleep-wake cycle, body temperature, and melatonin secretion. Interestingly, circadian rhythm disturbances commonly co-occur

with depression. Furthermore, different circadian disturbances may help distinguish the different subtypes of depression. One circadian abnormality that is commonly found with depression is that of elevated nocturnal core body temperature. According to Monteleone and Maj (2008), "the most consistent finding has been a lower blood concentration of melatonin and a phase advance or a trend toward a phase advance of melatonin circadian rhythm in individuals suffering from major depression" (p.703). Melatonin lowers the core body temperature, which helps to reduce arousal and facilitate sleep (Zisapel, 2001). There is evidence that in depression there are changes in the secretion of melatonin.

In addition to core body temperature effects, sleep-wake cycle disturbances are very common among depressives. It is also known that relapse risk is increased if sleep disturbances are persistent. According to Monteleone and Maj (2008), "it seems likely that alteration in the sleep-wake cycle may desynchronize many endogenous rhythms, which then, in turn, may lead to a depressed state" (p.705). It appears there may be a circular pattern that arises with one circadian rhythm, the sleep-wake cycle, change that leads to other rhythm changes which ultimately may induce depression.

Separate from depression diagnoses, circadian rhythm disorders are also described in the DSM-IV-TR. Circadian rhythm disorders occur when an individual's sleep and wake pattern is out of sync with environmental patterns and can be persistent, periodic, or transient (Zisapel, 2001). Examples include non-24 hour sleep-wake syndrome, jet lag, shift work disorder, advanced phase syndrome, and delayed sleep phase syndrome (DSPS). Of these, DSPS appears to be especially relevant for understanding both college student sleep problems and depression. DSPS is when there is a persistent inability to fall asleep and wake at regular times. Typically, sleep onset is delayed until late at night

resulting in late morning or afternoon waking. Although commonly casually dismissed as simply a lifestyle choice (e.g. a "night owl"), attempts to change this pattern usually fail despite the want to change. The opposite of DSPS is advanced sleep phase syndrome (ASPS), which consists of early sleep onset and early morning waking and is a persistent disorder. There are usually no sleep maintenance problems and there is usually failure at any attempts to delay sleep onset.

Brown, Soper, and Buboltz (2001) studied the prevalence of DSPS in a college student population. College students tend to have to wake early for classes or work commitments during the week and sleep later and for longer periods of time on the weekends. Brown et al. (2001) stated that, "such instable sleep patterns exacerbate and in some instances may cause symptoms associated with DSPS" (p.472). The study included 191 undergraduate students and they administered a survey packet for participants to fill out. Brown et al. estimated an 11.5% prevalence of DSPS in the sample. Females reported higher rates than males for some symptoms. There was not a significant difference between men and women in overall incidence of DSPS. These results suggest that the college lifestyle might be a strong influencing factor on DSPS.

Insomnia and Hypersomnia

There are many sleep disorders that range in duration and symptoms among other criteria (DSM-IV-TR; American Psychiatric Association, 2000). Sleep disorders vary in symptoms, onset, and duration and there are many different kinds. They range from not sleeping to oversleeping to sudden awakenings during sleep. There are also nightmares, dyssomnia, and sleep disorders related to medical conditions, substance use, and mental disorders.

One of the most prevalent and documented sleeping disorders, and relevant for its' relations to other mental disorders, is insomnia. However, there is no specific and agreed upon definition for insomnia. In general, having difficulty falling asleep and maintaining sleep, and short sleep duration even when there is sufficient time for sleep are considered defining features of insomnia (Colten & Altevogt Eds., 2006). Daytime impairments such as fatigue, irritability, and difficulty concentrating are often considered factors of insomnia. According to the DSM-IV-TR (2000) the specific criteria to diagnose primary insomnia are:

> "A. The predominant complaint is difficulty initiating or maintaining sleep, or nonrestorative sleep, for at least 1 month.
> B. The sleep disturbance (or associated daytime fatigue) causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.
> C. The sleep disturbance does not occur exclusively during the course of Narcolepsy, Breathing-Related Sleep Disorder, Circadian Rhythm Sleep Disorder, or a Parasomnia.
> D. The disturbance does not occur exclusively during the course of another mental disorder.
> E. The disturbance is not due to the direct physiological effects of a substance or a general medical condition" (p.604).

At least ten percent of adults in the United States are affected by the symptoms of insomnia. Insomnia can be seen as a state of hyperarousal and stress may be an activator of the HPA axis that can lead to insomnia (Colten & Altevogt Eds., 2006). The problem can then be carried on by cognitive factors that may include fear of sleeplessness and worry. Also, abnormal or overactive brain activity contributes to the arousal and insomnia. Insomnia is a risk factor/symptom for or comorbid with some psychological disorders, especially depression.

Another sleep disorder that is diagnosed is hypersomnia. Again, there is no consensus on the definition of hypersomnia. The defining feature of hypersomnia is excessive daytime sleepiness that is clinically significant (Colten & Altevogt Eds., 2006). The Multiple Sleep Latency Test (MSLT), a daytime sleep lab procedure, objectively measures daytime sleepiness which helps in determining the diagnosis of insomnia. Hypersomnia usually begins around adolescence. According to the DSM-IV-TR (2000) the specific criteria to diagnose primary hypersomnia are:

> "A. The predominant complaint is excessive sleepiness for at least 1 month (or less if recurrent) as evidenced by either prolonged sleep episodes or daytime sleep episodes that occur almost daily.
> B. The excessive sleepiness causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.
> C. The excessive sleepiness is not better accounted for by insomnia and does not occur exclusively during the course of another sleep disorder and cannot be accounted for by an inadequate amount of sleep.
> D. The disturbance does not occur exclusively during the course of another mental disorder.
> E. The disturbance is not due to the direct physiological effects of a substance or a general medical condition" (p.609).

According to Weitzman (1981) having a difficult time achieving total alertness, unavoidable napping, and an increase in total sleep time are other characteristics of hypersomnia. Hypersomnia is seen with some psychological disorders, most notably atypical depression.

Koffel and Watson (2009) found two major factors of sleep complaints among both college students and older adults. All participants completed a battery of measures and the sleep variables were factor analyzed resulting in two major factors of insomnia and lassitude. Specifically, high loadings for the insomnia factor included measures of insomnia, long sleep latency, poor sleep quality, and minutes awake at night; whereas

high loadings for the lassitude factor included measures of hypersomnia, fatigue, and sleepiness. Of these two factors, Koffel and Watson found that the college students had higher scores on the lassitude scale and the older adults had higher scores on the insomnia scale.

The second part of Koffel and Watson (2009) study was very similar to the first, but it used psychiatric outpatients as their participants instead and conducted a confirmatory factor analysis. They again found that two main factors were present, insomnia and lassitude. These two factors were then correlated to depression and anxiety to see the relations between them. In the first part of the study the lassitude factor had stronger correlations with both depression and anxiety when compared to the insomnia factor. Thus, there may be a relationship between lassitude or hypersomnia and anxiety and depression.

Sleep and Depression

As the previous sections suggest, sleep disorders and disruptions appear to either be symptoms of psychological disorders, comorbid with them, or may play a causal role. Depression and anxiety are among the psychological disorders that have been connected to sleep. For example, Buysse et al. (2008) studied depression and insomnia and stated that one of the most reliable risk factors for insomnia is depressive symptoms or depression and that the reverse is the same, insomnia is a risk factor for depression. In their study Buysse et al. found that there was an association between both insomnia alone and insomnia comorbid with depression and future episodes of any kind. Among their findings were also that insomnia was a predictor of a major depressive episode, typically a major depressive episode predicted future insomnia, and that depression alone was the

weakest correlation with any form of future episode. Also, they found that insomnia alone and depression alone were not correlated. Buysse et al. support the view that insomnia is more than just a symptom of depression, but a comorbidity of it.

Manber et al. (2008) also are in favor of the concept that insomnia and depression are comorbid rather than insomnia being a symptom. According to Manber et al. (2008), "insomnia is often more than merely a correlate or symptom of the depressive illness; it also affects the course of the illness, response to treatment, and when unresolved, it is a risk factor for relapse" (p.489). Antidepressants do not treat the sleep disturbances that occur in conjunction with depression many of the times. In Manber et al.'s study, participants received escitalopram, an antidepressant medication, and either cognitive behavioral therapy for insomnia (CBTI) or a control therapy. They found that those who received CBTI with the antidepressant medication fared much better than those who received the control therapy with the antidepressants. The rate of remission of depression for those who received the control and antidepressant was 33%; whereas the rate of remission for those who received the CBTI along with the antidepressant was 62%. The rate of remission of insomnia was 8% for those who received the control and antidepressant and 50% for those who received CBTI and the antidepressant according to the insomnia severity index. These rates show that the CBTI does have a positive outcome in this trial for the participants. The CBTI group had both higher remission for insomnia and depression. It could be inferred that when the sleep disturbance was corrected that other symptoms of depression were improved too, thus the depression going into remission. Treating the sleep disturbance directly may help the overall depression.

Although not as deeply researched as the association with insomnia, depression has also been linked with hypersomnia. In a study of 17 to 25 year olds, Hawkins, Taub, and Van de Castle (1985) found that their young depressed participants tended to oversleep, but that their sleep continuity was not that different from the norm. Participants of this study spent five nights in the experimenters' sleep laboratory where they were monitored in separate rooms. These results are notably different from most of the studies dealing with an older population of adults, which typically find that they do not sleep enough. However, as is also typically found in older samples, Hawkins et al. (1985) did find that depressed patient's had a longer initial REM period and that their fourth and fifth REM periods were shorter. Thus, this study suggests that age may interact with depression and sleep. Hawkins et al. suggested that depression and sleep disturbances are more severe in older patients and the hypersomnia found in depressed younger people might be a defense mechanism so the depression does not worsen. Also, the DSM-IV-TR states that, "younger individuals may be more likely to have episodes with atypical features, whereas older individuals may more often have episodes with melancholic features" (p.421). This offers more support to the Hawkins et al. (1985) study suggesting age may be an important factor.

It is further possible that because there are subtypes of depression, each subtype could be associated with a different sleep disorder. Specifically, melancholic depression appears to be more typically associated with insomnia, while atypical depression is more associated with hypersomnia. Matza, Revichi, Davidson, and Stewart (2003) studied atypical depression and the different components of it. One defining element for atypical depression is usually hypersomnia. There are different diagnostic approaches, but

according to Matza et al. (2003), "the reversed vegetative approach identifies atypical depression based on hypersomnia and hyperphagia, in contrast to the insomnia and weight loss commonly found in melancholic depression" (p.818). Their study used this diagnostic approach. The findings from their study suggest that there is a significant difference between people that have atypical depression and other depressed people. They found that people with atypical depression tended to have an earlier age of onset which would be consistent with the study by Hawkins et al. (1985), where they found that younger depressed people tended to oversleep instead of suffering from insomnia. Thus, age or time of onset may play a role in distinguishing those who have depression with insomnia versus those with hypersomnia. Matza et al. (2003) also stated that atypical depression can be severe and may be associated with increased distress and disability. Thus it should not be taken any lighter than the melancholic type is. According to the DSM-IV-TR (2000) the specific criteria for the atypical features specifier are:

"A. Mood reactivity (i.e. mood brightens in response to actual or potential positive events)
B. Two (or more) of the following features:
(1) significant weight gain or increase in appetite
(2) hypersomnia
(3) leaden paralysis (i.e. heavy, leaden feelings in arms or legs)
(4) long-standing pattern of interpersonal rejection sensitivity (not limited to episodes of mood disturbance) that results in significant social or occupational impairment
C. Criteria are not met for With Melancholic Features or With Catatonic Features during the same episode" (p.422).

Also relevant here is the finding that depressed suicidal patients also have sleep difficulties. According to Chellappa and Araujo (2007), suicidal people may also suffer from insomnia, hypersomnia, and nightmares. "Dream variables collected during rapid eye movement (REM) interruptions and REM sleep abnormalities have also been related

to suicidal tendencies in depressed patients, as well and the frequency of nightmares has been directly related to suicide risk" (Chellappa & Araujo, 2007, p.132). Many sleep disturbances associated with depression are also associated with suicidal risk. Chellappa and Araujo stated that when a person is first diagnosed with depression and they have severe insomnia at the time, then there is a high chance of a completed suicide by that person. Also, depressed people with insomnia are more likely to have suicidal ideation than those without the insomnia.

Chellappa and Araujo (2007) found that in patients with depression suicidal ideation can be associated with and sleep disorders, especially insomnia. The depressed patients with insomnia scored higher on the Beck Scale for Suicidal Ideation (SSI). They also accounted for medication intake and only insomnia was significantly associated with suicidal ideation when this was accounted for. According to Chellappa and Araujo, "the main clinical implication of the suicidal ideation/sleep disorders relationship is that sleep assessment can contribute to the evaluation of suicidal risk in patients with major depressive disorder" (p.135). When dealing with depression it appears to be important to account for sleep disturbances. This may help with treatment and with assessing suicide risk.

Sleep, Anxiety, and Stress

Anxiety is another psychological disorder that is affected by sleep. Jasson-Frjmark and Lindblom (2008) studied the direction of the relationship between depression, anxiety, and insomnia. In their study participants were given a questionnaire and then a year later they were given a follow-up questionnaire. Jasson-Frjmark and Lindblom findings indicated a bidirectional relationship between these variables.

Insomnia was related to future depression and future anxiety, and both depression and anxiety were correlated with future insomnia. "Of anxiety and depression, anxiety was the most prominent mechanism in explaining future insomnia, and the results showed also that insomnia had a stronger predictive power in relation to future depression compared to anxiety" (Jasson-Frjmark & Lindblom, 2008, p.447). Therefore, insomnia increases the risk for both anxiety and depression, but conversely anxiety may be a risk factor for insomnia. However, there are still mixed results on whether depression is a risk factor for future insomnia.

Neckelmann, Mykletum, and Dahl (2007) also studied insomnia with depression and anxiety. In their study all participants were given two general health surveys that were performed 11 years apart. According to Neckelmann et al. (2007) they, "found significant relations between the longitudinal course of chronic insomnia and the development of anxiety disorders" (p.877). All participants with any reported insomnia had an increased tendency to having developed anxiety disorders. They reported that their findings imply that a trait marker for people at risk for developing any anxiety disorders may be chronic insomnia. In their study the group that had an increased association for having depression was the group that reported insomnia in the second survey. They inferred that a state marker for depression and for anxiety disorders is chronic insomnia. However, their study did not account for any depression or anxiety disorders that were in between the 11 year interval.

Stress is another variable that may come into play when talking about sleep, depression, and anxiety. Wheatley (1993) stated, "although all variants of insomnia may occur in both anxiety and depression it is generally accepted that delayed sleep onset and

frequent nocturnal wakings typically occur in the former, and frequent wakings and early morning waking in the later, according to the International Classification of Sleep Disorders" (p.127). He found that when stress was associated with anxiety and depression there was almost always a sleep disturbance present. The most disturbed sleep pattern in both anxiety and depression was the state of waking and he found the least disturbed sleep parameter in anxiety to be sleep onset. There was a disturbance in all sleep parameters when it came to depression. Wheatley (1993) also stated that there is a cycle when stress provokes depression because coping decisions are gradually impaired as the person becomes more and more depressed. He also believes the type of sleep disturbance needs to be taken into consideration when deciding in the drug treatment for a patient.

Depressive symptoms also may play a mediating role between anxiety and insomnia. This concept was studied by Buckner, Bernet, Cromer, Joiner, and Schmidt (2008) between social anxiety and insomnia. They stated that a risk factor for anxiety disorders is having a history of sleep disturbances. In their study participants were undergraduate students in college who completed a series of questionnaires. Their main finding was that severity of insomnia was correlated with social anxiety and that depressive symptoms may play a large role as the underlying link between the two. It may be important to take into consideration current depressive symptoms to explain sleep disturbances in people with social anxiety. Buckner et al. (2008) also stated that usually in mood disturbances insomnia appears before or at the same time as the disturbance; whereas in anxiety disorders insomnia appears at the same time as the disorder or after it. Therefore, their findings, "provide support for the contention that social anxiety may

increase risk for depressive symptoms that lead to insomnia" (Buckner et al., 2008, p.128).

Summary and unresolved issues on the relations between depression and sleep

As reviewed above, research suggests that hypersomnia may be more common among younger people with depression (specifically atypical depression), whereas insomnia may be found more often in older adults with more severe (melancholic) depression (Hawkins et al., 1985; Matza et al., 2003). However, there are surprisingly few studies that have investigated these relations in depth. Thus, many questions remain concerning; 1) the generalizability of these results (e.g., beyond clinical samples), 2) the relationship of DSPS to depression, and 3) the role of anxiety.

Many college students have sleep disturbances due to their differing schedules and social lives. Specifically, circadian rhythm disorders appear prevalent. Brown, Soper, and Buboltz (2001) found an 11.5% prevalence of DSPS in their college student sample. Given this finding, the late morning/early afternoon waking of DSPS might be the most generalizable explanation for college students sleeping patterns, given that circadian rhythms are very hard to change and once a student gets into this routine it is hard to break. Thus, college students might have no difficulty getting adequate sleep when their schedule allows, but their natural "night owl" sleep/wake patterns may result in sleep debt due to frequently having to wake early for academic and occupational obligations. If so, college students may mistakenly appear to have insomnia, but a more careful analysis of their circadian rhythms and sleep habits would indicate DSPS.

The present study was designed to simultaneously examine the prevalence of insomnia, hypersomnia, and DSPS among college students, while also examining the

relation of depression (atypical and melancholic). Furthermore, because anxiety also frequently co-occurs with both insomnia and depression, but there is scant research on the relation between anxiety and hypersomnia, the present study also investigated the degree to which anxiety relates to the sleep habits and depressive symptoms of college students.

Hypotheses

Given the above, in this study it was hypothesized that:

1). Melancholic depression symptoms will be negatively correlated with sleep duration and sleep efficiency, but positively correlated with anxiety, sleep latency and insomnia.

2). Atypical depression symptoms will be positively correlated with anxiety, sleep duration, and sleep efficiency, but negatively correlated with sleep latency and insomnia.

3). Those who meet the clinical cutoff for depression with melancholic symptoms will score significantly higher on sleep latency than those classified as atypical.

4). Those who meet the clinical cutoff for depression with atypical symptoms will score significantly higher on sleep duration and sleep efficiency than those classified as melancholic.

5). Significantly more students classified as melancholics than atypical will be classified as insomniacs.

6). Lower scores on the Composite Scale of Morningness, which indicate the eveningness type, will be correlated with longer sleep latency. Also, lower Composite Scale of Morningness scores will related to later night times and morning times on the weekends or a day off versus sleep times on week days.

Method

Participants

Participants were recruited from the Department of Psychological Science participant pool at Ball State University in the Spring semester 2010. All participants received course credit for their participation. There were 355 participants that completed the study. They ranged in age from 18 to 44 years old, with a mean of 20 years old ($SD=$ 9.58). There were 200 female and 155 male participants.

Measures

Demographics Sheet. The demographic sheet included 15 questions about the participant and about their daily schedules, academic information, work and other commitments. This provided a general background about the participants.

Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). The PSQI consists of ten items, some of which contain multiple parts. The total score on the PSQI can range from 0 to 21, with higher scores indicating worse sleep quality. In addition, there are seven component scores that Buysse et al. (1989) report share a high internal consistency (Cronbach's α= .83), and good overall test-retest reliability (r= 0.85). The PSQI seven component scales are sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleeping medication, and daytime dysfunction. For the present study there was a stable internal consistency (Cronbach's α= .71).

Buysse et al. (1989) report that all seven component scores were significantly able to discriminate between depressive patients ($r = 0.38$ to 0.83, $p's < 0.01$), patients with disorders of initiating and maintaining sleep ($r = 0.31$ to 0.79, $p's < 0.02$), and patients

with disorders of excessive somnolence ($r = 0.38$ to 0.76, p's < 0.01) from one another as well as from the control group ($r = 0.44$ to 0.70, p's < 0.001). However, the sleep disturbance component scale scores were not significantly different for both the depressive patients group and the patients with disorders of excessive somnolence. Also, the use of sleeping medication component scale scores were not significantly different for the control group and the patients with disorders of excessive somnolence group (Buysse et al. 1989).

Epworth Sleepiness Scale (ESS; Johns, 1991). The ESS is an eight-item questionnaire that assesses daytime sleepiness. This measure has eight scenarios in which it is asked how likely one is to fall asleep during each situation. All eight situations are responded to with a four point Likert scale ($0 =$ "would never doze", $3 =$ "high chance of dozing"). Scores on the ESS range from 0 to 24, with scores of greater than 16 indicating a high level of daytime sleepiness (Johns, 1991). The ESS has a significant correlation with the respiratory disturbance index (RDI) ($r = 0.55$, $p < 0.001$). This finding showed that the ESS was able to measure average sleep propensity as well as other more timing consuming procedures.

Johns (1992) found the ESS to have high test-retest reliability ($r = 0.82$). In this study of medical students and a group of patients with obstructive sleep apnea syndrome (OSAS), an item analysis revealed good internal consistency ($\alpha = 0.88$ for the patient group and 0.73 for the student group). The results of a factor analysis showed there was one main factor in this scale for both the patient and student group, with eigenvalues of 3.95 and 2.07 respectively. For the present study there was a stable internal consistency (Cronbach's $\alpha = .75$).

Insomnia Symptom Questionnaire (ISQ; Okun et al., 2009). The ISQ was used to assess for insomnia. The authors created this scale to be consistent with the criteria for primary insomnia as seen in the DSM-IV. The ISQ consists of thirteen items. The first five items are measured on a six point Likert scale ranging from 0 to 5, and then they are also asked to rate how long the symptom has lasted in either weeks, months, or years. Questions six through thirteen are measured on a five point Likert scale ranging from 0 to 4. Internal consistency was found to be high for this measure, with a Cronbach α of 0.89. For the present study there was high internal consistency (Cronbach's α= .86).

Composite Scale of Morningness (Smith, Reilly, & Midkiff, 1989). This scale is a 13-item measure which assesses circadian rhythms, specifically inclinations for morning or evening activities. It was derived from previous scales by Horne and Ostberg (1976) and Torsvall and Akerstedt (1980), which had a correlation coefficient of 0.79. The items with the best psychometrics from these two scales were chosen for the composite scale and the number of items fell in between the number of items on the other two scales. Scores on the composite scale range from 13 which indicates extreme evening type to 55 which indicates extreme morning type. Scores between 13 and 22 are evening type, between 23 and 44 is considered intermediate, and scores 44 and above are morning type. High internal reliability was reported ($\alpha= 0.87$). The composite scale had high convergent validity with both Horne and Ostberg's scale ($r = 0.95$) and Torsvall and Akerstedt's scale ($r = 0.79$). The composite scale had a 0.35 to a 0.43 correlation with Folkard et al. Morningness and Flexibility subscales along with other morningness scales. For the present study there was high internal consistency (Cronbach's α= .83).

Sleep Timing Questionnaire (STQ; Monk et al., 2003). This scale consists of 18 items measuring typical good night times and good morning times for participants, and if these times are consistent between week days and days off. Monk et al. (2003) conducted four studies to assess the reliability and validity of the questionnaire. High test-retest reliability was reported for both the good night times and the good morning times ($r = 0.71$, $r = 0.83$). Significant correlations between the STQ and wrist actigraphic measures showed good convergent validity for good night and good morning times ($r = 0.59$, $r = 0.77$). Also, convergent validity was shown through correlations between the STQ and 2-week sleep diary measures for good night and good morning times ($r = 0.84$, $r = 0.86$). Finally, the fourth study showed strong convergent validity through correlations between the STQ and the Pittsburgh Sleep Diary measures within a diverse sample of participants ($r = 0.79$, $r = 0.81$).

Zung Self-Rating Depression Scale (Zung, 1965). The Zung Self-Rating Depression Scale was used to assess the level of depressive symptoms. This scale consists of 20 items in which participants are instructed to check whether the item pertains to them a little of the time, some of the time, a good part of the time, or most of the time. Of the 20 items ten are worded positively and ten are worded negatively. Values of 1, 2, 3, and 4 are given to the item responses and are reversed when the item was worded positively. Lower scores on this measure indicate lower levels of depression and higher scores indicate higher levels depression. Scores range from 20 to 80. Those who score 50 or higher typically have depression.

Zung, Richards, and Short (1965) found that there was a strong correlation between the Zung Self-Rating Depression Scale and the clinical scale Depression (D) on

the Minnesota Multiphasic Personality Inventory (MMPI) ($r = 0.70$). This finding was replicated with the MMPI-2 in a study by Thurber, Snow, and Honts (2002) ($r = 0.77$). Knight, Waal-Manning, and Spears (1983) found the Zung Self-Rating Depression Scale to have satisfactory internal consistency in their community sample ($r = 0.79$). For the present study there was high internal consistency (Cronbach's α= .86). Also, the present study reversed scored some of the items on this measure to account for atypical depression features, which is explain in the results section in further detail. The internal consistency for the measure with five items reversed scored was not as strong (Cronbach's α= .57).

Zung Self-Rating Anxiety Scale (Zung, 1971). The Zung Self-Rating Anxiety Scale was used to assess the level of anxiety symptoms. This scale consists of 20 items in which participants mark whether the item pertains to them none or a little of the time, some of the time, a good part of the time, or most or all of the time. Of the 20 items some of them are worded positively and some are worded negatively. Values of 1, 2, 3, and 4 are given to the responses depending on if the item is worded positively or negatively. Scores range from 20 to 80. Participants with lower anxiety will have lower scores and participants with higher anxiety will have higher scores.

Zung (1971) found a substantial correlation between the Zung Self-Rating Anxiety Scale and the observer rated Anxiety Status Inventory (ASI) ($r = 0.66$) and the correlation between these two scales was found to be even stronger among patients with a diagnosis of anxiety ($r = 0.74$). Also, Zung (1971) found a strong split half correlation among the even and odd items ($r = 0.71$). Jegede (1977) found a high internal consistency for this scale among two different participant groups, specifically a non-patient group

(students) and a patient group ($r = 0.69$; $r = 0.81$). For the present study there was high internal consistency (Cronbach's α= .81).

Closing Questionnaire. The closing questionnaire contained 11 items that assessed for any treatment of mental health problems. Also, covered in the questionnaire was any medications previously or currently taken for any mental health problems.

Procedure

Each participant responded to the measures via Ball State University's Integrated Network Quizzing, Surveying, and Interactive Testing (inQsit) system. They first read and either agreed or declined to participate via an online consent form.

Each participant then responded to the demographic, sleep, depression, and anxiety measures (presented in a counterbalanced order). Once they completed the measures, debriefing information was provided.

Results

Pearson's correlations involving the depression measures for the first two hypotheses are displayed in Table 1.   As predicted, melancholic depressive symptoms were significantly associated with shorter sleep duration ($r = 0.17$, $p = 0.003$), poorer sleep efficiency ($r = 0.22$, $p < 0.001$), longer sleep latency ($r = 0.37$, $p < 0.001$), greater insomnia ($r = 0.45$, $p < 0.001$), and anxiety ($r = 0.36$, $p < 0.001$). To simultaneously examine the relations among these variables a multiple regression analysis was conducted with melancholic depression as the criterion. Histogram, scatter plot, and Q-Q plot examination indicated that the assumptions for normality and homoscedasticity were met. As shown in Table 2, anxiety ($p = 0.014$), sleep latency ($p = 0.006$), and insomnia ($p < 0.001$) were all significant independent predictors (all p's < 0.05). However, sleep

duration and sleep efficiency were not significant independent predictors. The overall regression model accounted for 25.6% of the variance in melancholic depressive symptoms, $F(5,225)= 16.48$, $p < 0.001$, $\alpha = 0.05$.

To examine the second hypothesis on atypical depression features there were five items on the Zung Self-Rating Depression Scale that were reversed scored to account for atypical depression symptoms versus melancholic based on the criteria that the DSM-IV-TR has laid out for depression with atypical features. The items reversed scored included: "I have trouble sleeping at night", "I eat as much as I used to", and "I notice that I am losing weight". In addition "I still enjoy sex" and "I still enjoy the things I used to" were reversed scored based on the fact with atypical depression a person's mood could be raised by positive stimuli and anhedonia is not a characteristic of depression with atypical features. Insomnia is measured with ISQ and excessive daytime sleepiness is assessed by the ESS with scores greater than 16.

Also as predicted, atypical depressive symptoms were associated with anxiety ($r = 0.42$, $p < 0.001$) and excessive daytime sleepiness ($r = 0.28$, $p < 0.001$). However, contrary to what was predicted atypical depressive symptoms were associated with greater insomnia ($r = 0.40$, $p < 0.001$), shorter sleep duration ($r = 0.13$, $p = 0.19$), poorer sleep efficiency ($r = 0.16$, $p = 0.003$), and longer sleep latency ($r = 0.35$, $p < 0.001$). To further examine the relations among these variables a multiple regression analysis was conducted with melancholic depression as the criterion. Histogram, scatter plot, and Q-Q plot examination indicated that the assumptions for normality and homoscedasticity were met. As shown in Table 3, anxiety ($p < 0.001$) and sleep latency ($p= 0.003$) were both significant independent predictors (all p's < .05). However, excessive daytime sleepiness,

sleep duration, sleep efficiency, and insomnia were not significant.   Overall, the regression model accounted for 24.3% of the variance in melancholic depressive symptoms, $F(6, 220)= 12.75$, $p < 0.001$, $\alpha = 0.05$.

A series of independent samples t-tests were conducted to test the third and fourth hypotheses concerning differences between those who met the cutoff for atypical depression and those who met the cutoff for melancholic depression. The established depression cutoff score for the Zung Self-Rating Depression Scale is 50 out of a possible 80 (Zung, 1965). However, because the current study sought to distinguish between melancholic and atypical subtypes of depression, the scale was first reduced to 15 items that are indicative of both subtypes of depression (e.g., "I feel hopeful about the future"). The total possible score for these 15 items is 60, and based on the ratio of 50:80 for the full 20-item scale, scores above 38 were judged as indicating depression. The internal consistency of these 15 items was high (Cronbach's $\alpha= .85$). For those scoring above 38, the other five items of the scale were used to indicate which subtype of depression (melancholic or atypical) the person was classified as. Specifically, these items were: "I have trouble sleeping at night", "I eat as much as I used to", "I notice that I am losing weight", "I still enjoy sex", and "I still enjoy the things I used to". These five items were scored in the direction of atypical symptoms. Out of a possible 20, a 13 or higher indicated atypical symptoms and a 12 or under indicated melancholic symptoms. These five items had a weaker internal consistency (Cronbach's $\alpha= .45$).

The Levene's test for equality of variances was nonsignificant when comparing the types of depression on the sleep latency scale on the PSQI ($p= 0.118$), on the sleep duration scale on the PSQI ($p= 0.978$), on the sleep efficiency scale on the PSQI ($p=

0.932), and on anxiety symptoms measured by the Zung Anxiety Scale ($p= 0.762$).

Therefore, equal variances were assumed. There was not a significant difference between those classified as atypical ($M = 1.81$, $SD = 1.08$) versus melancholic ($M = 1.83$, $SD= 0.79$) on sleep latency, $t(37)= 0.08$, $p > 0.05$. There was a nonsignificant finding between those who met the cutoff for atypical depression ($M= 0.68$, $SD= 0.84$) and melancholic depression ($M= 0.67$, $SD= 0.84$) on sleep duration, $t(38)= -0.057$, $p > 0.05$. A nonsignificant difference was found between those that classified as atypical ($M = 0.82$, $SD= 1.01$) compared to those classified as melancholic ($M= 0.722$, $SD= 1.09$) on sleep efficiency, $t(38)= -0.298$, $p > 0.05$. Finally there was a nonsignificant difference between those who met the cutoff for atypical depression ($M= 42.80$, $SD= 7.48$) and melancholic depression ($M= 48.56$, $SD= 7.10$) on anxiety symptoms as measured by the Zung Anxiety Scale $t(36)= 0.740$, $p > 0.50$.

To assess the fifth hypothesis on if there was significantly more college students that were classified as depressed with melancholic features that were classified as insomniacs compared to those classified as depressed with atypical features a chi-square test of independence was conducted. The numbers of the groups were quite small and the chi-square was not significant, $\chi^2 (1) = 0.03$, $p > 0.05$. This hypothesis was not supported and future research is needed with larger numbers.

For the sixth hypothesis the Composite Scale of Morningness total score correlated with sleep latency ($r = -0.29$, $p < 0.001$), later night times during the week ($r = -0.38$, $p < 0.001$), later night times on the weekends or a day off ($r = -0.39$, $p < 0.001$), later morning times during the week ($r = -0.30$, $p < 0.001$), later morning times on weekends or a day off ($r = -0.44$, $p < 0.001$), and the difference between morning times

on weekends versus the weekdays ($r = -0.17$, $p = 0.003$), as seen in Table 4. There was not a significant correlation between the Composite Scale of Morningness total score and the difference between night times on weekends versus the weekdays ($r = -0.06$, $p = 0.26$). To further examine the relations among these variables a multiple regression analysis was conducted with the Composite Scale of Morningness score as the criterion. Histogram, scatter plot, and Q-Q plot examination indicated that the assumptions for normality and homoscedasticity were met. As shown in Table 5, sleep latency ($p < 0.001$), later night times during the week ($p < 0.001$), later night times on the weekends ($p < 0.001$), and later morning times on the weekends ($p < 0.001$) were all significant independent predictors (all p's < 0.05). However, later morning times during the week was not significant. Overall, the regression model accounted for 34.1% of the variance in melancholic depressive symptoms, $F(5, 305) = 32.52$, $p < 0.001$, $\alpha = 0.05$. The Composite Scale of Morningness total score was also significantly correlated with both melancholic depressive features ($r = -0.18$, $p = 0.002$) and atypical depressive features ($r = -0.23$, $p < 0.001$) as measured by the Zung Self-Rating Depression Scale and the subsequent revisions made to assess for the atypical symptoms.

Discussion

Summary of Findings. This study was designed to examine the relations among college student sleep habits, depression, and anxiety. The results support previous findings that depression is correlated with anxiety and insomnia (Buysse et al., 2008; Jasson-Frjmark and Lindblom, 2008; Neckelmann et al., 2008). However, unlike previous studies, this study aimed to separately examine the differences between melancholic depression features and atypical depression features. As hypothesized,

insomnia, anxiety, poorer sleep efficiency, longer sleep latency, and shorter sleep duration were all significantly correlated with melancholic features of depression. Furthermore, a regression analysis found that anxiety scores, insomnia scores, and sleep latency scores were the strongest predictors of the melancholic depression scores.

Also in line with the hypotheses, anxiety and excessive daytime sleepiness were significantly correlated with atypical depression features. However, in contrast to the predictions, insomnia, shorter sleep duration, poorer sleep efficiency, and longer sleep latency were also all correlated with atypical depressive features. The regression analysis for atypical depressive features revealed anxiety and sleep latency to be the strongest predictors for atypical depressive symptom scores.

The present study employed the Zung Self-Rating Depression Scale (Zung, 1971) to measure melancholic depressive symptoms and created a revision of the scale to assess for atypical depressive symptoms. This measurement approach yielded 41 participants who classified as depressed; 19 with melancholic symptoms and 22 with atypical symptoms. Several independent samples t-tests were conducted to evaluate the differences between those who met the cutoff scores for melancholic depression compared to those who met the cutoff for atypical depression. The results revealed no significant differences between those that were classified as depressed with melancholic features compared to those classified as depressed with atypical features on sleep latency, sleep duration, sleep efficiency, and anxiety symptoms. Despite these nonsignificant results, there were roughly equal numbers of participants in each group, which is at least partially suggestive evidence for the existence of two different subtypes of depression in

college students; for example, when assessing sleep efficiency there were 18 participants who were classified as melancholic and 22 who were classified as atypical.

Sleep latency, later night times during the week, later night times on the weekends or prior to a day off, later morning times during the week, later morning times on weekends or a day off, and the difference between morning times on weekends versus the weekdays all correlated with the Composite Scale of Morningness total scores. These were all negative correlations, which indicated that these correlated with lower scores on the Composite Scale of Morningness which indicates the eveningness type as predicted. However, there was not a significant correlation between the Composite Scale of Morningness total score and the difference between night times on weekends versus the weekdays. A regression analysis revealed that sleep latency, later night times during the week, later night times on the weekends, and later morning times on the weekends were all significant independent predictors. However, later morning times during the week was not a significant predictor of the Composite Scale of Morningness scores. The Composite Scale of Morningness total score also significantly correlated with both melancholic and atypical depressive features as measured by the Zung Self-Rating Depression Scale and subsequent revisions made to assess for atypical symptoms.

There were 46 participants that classified as being the evening type on the Composite Scale of Morningness score by having a score of 22 or less, which is approximately 13% of the participants. By comparison, only 3 participants had a score of 44 or higher which indicated the morning type and all other participants fell into the intermediate section. This suggests that more students are "night owls" versus morning people and is consistent with the Brown, Soper, and Buboltz (2001) finding of an 11.5%

college student prevalence of DSPS. The results from the present study can at best indicate that the Composite Scale of Morningness scores along with the later sleep times and later morning times could be a sign of DSPS in those participants and may warrant further explanation into their sleeping habits to make a definite diagnosis.

Consistent with previous research (e.g. Buysse et al., 2008) insomnia was a significant predictor of melancholic depressive symptoms. However, a unique finding of the present study was that insomnia was not found to be a significant predictor of atypical depressive symptoms among college students. This finding was predicted based on studies of depression in late adolescent – young adult populations. For example, Hawkins et al. (1985) found that depressed 17 to 25 year olds tended to oversleep, rather than get too little sleep, and suggested that age interacts with depression and sleep. Furthermore, the DSM-IV-TR states that younger people might be more likely to experience depression with atypical features, while older adults experience depression with melancholic features more. The present studied consisted of college students (M= 20), which is generally a younger population. Although close in numbers, there were a few more participants that classified as depressed with atypical symptoms (N= 22) than depressed with melancholic symptoms (N= 19). Hawkins et al. (1985) study supports the notion that there may be a stronger prevalence of atypical depressive features in a college population. Matza et al. (2003) also found that those with atypical depression tended to have an earlier age of onset and that there was a significant difference between people with atypical depression compared to other depressed people. Again the present results indicate that college students may be more likely to exhibit atypical depression, possibly even more than melancholic depression. However, Matza et al. (2003) study points

toward there being significant differences between atypical depression and other types, but this study did not have any significant findings to add support to that statement.

Jasson-Frjmark and Lindblom (2008) not only studied depression and insomnia, but also anxiety. They also found that insomnia was related to future depression and future anxiety. Among their findings was that compared to anxiety, insomnia had stronger predictive power for future depression. Again, the present study supports that insomnia is a predictor for depression, but only for depression with melancholic symptoms and not atypical symptoms. Also, the present study supports the finding that insomnia was a stronger predictor for depression than anxiety.

Limitations. The present study had several limitations. One of the main being that there are not substantial measures that assess for some of these mental health problems. Firstly, although structured interviews exist, the lack of a self-report measure that specifically assess for atypical depression features was a challenge to the present study. More commonly it has been seen that depression is associated with a lack of or inability to sleep and loss of weight, which classify as the melancholic symptoms. Recently, hypersomnia has been more apparent in the research, but the prominent traditional depression measures do not account for atypical features. To address this challenge, five items from the Zung Self-Rating Depression Scale (Zung, 1971) were reverse scored to better match the nature of atypical depression. Unfortunately, the results from this measure generally did not conform to the hypotheses. At the theoretical level, the fact that the mood of those exhibiting atypical depression can be elevated in response to positive stimuli, or as the DSM-IV-TR (2000) calls it, "mood reactivity", likely makes assessing for atypical features difficult. Also, the reversed scored items on the Zung Self-

Rating Depression Scale (Zung, 1971) to account for the differences between atypical and melancholic features raises questions about the reliability of the measure. The reverse scoring also did not take the items to the opposite extreme. For example, when "I eat as much as I used to" was reverse scored it does not necessarily indicate that the person is eating more than they used, they are just not eating less than normal for them. Future research should be conducted to develop valid and reliable atypical depression.

Furthermore, a self-report measure is needed that accounts for hypersomnia. There was a scale that specifically assessed for insomnia, but nothing that accounts for its opposite. In this study hypersomnia was inferred from the ESS measuring excessive daytime sleepiness, having long sleep durations, and a shorter sleep latency. However, only excessive daytime sleepiness correlated with atypical depression features. None of the measures assess unavoidable napping or differentiates daytime sleepiness due to hypersomnia versus insomnia. Again, future research should be designed to develop better measures of hypersomnia.

In addition, DSPS was not measured clearly and was only inferred from a circadian rhythm questionnaire that assesses morningness. Like atypical depression and hypersomnia, a measure does not exist that explicitly assesses the characteristics of DSPS. Previous DSPS research has predominately asked participants to keep sleep journals. Future research should be designed to develop a more formal measure of DSPS. A sleep journal may be needed to fully assess for DSPS, but a measure could possibly assess for those that are at risk, have lifestyles that may be more associated with DSPS, or assess for potential symptoms of DSPS.

Another limitation of the present study is the generalizability of the findings. The sample was drawn from a general college population and the results may not extend to clinical populations of college students or older adults. However, it could reasonably be argued that stronger relations among depression, anxiety, and sleep habits would emerge from clinical samples. Also, the results may be limited by other demographic and cultural factors. The participants were primarily Caucasian, from a Midwestern university in the U.S. and most would be considered middle-class. Thus, future research using varied populations of participants is needed. This study was also conducted online and all the measures were formatted for the online site. This may also alter the reliability of the measures, since most previous research had been paper and pencil format. Again, future research would need to be conducted via the internet to find any discrepancies between the paper and online versions.

Future Research. There are numerous avenues for future research. As indicated above, new measures of atypical symptoms of depression, hypersomnia, and DSPS are needed to more thoroughly explore the relations among the depression subtypes, sleep problems, and anxiety. Also, research should investigate the depression subtypes and sleep problems in different populations.

A particularly interesting focus for future research is the degree to which the college lifestyle makes college students more susceptible to sleep disorders such as DSPS. DSPS may explain some of the sleeping problems with college students as opposed to having a sleeping disorder such as insomnia or hypersomnia in contrast to a circadian rhythm disorder. Future research could focus on distinguishing the differences between a circadian rhythm disorder like DSPS and sleeping disorders. Many college

students are "night owls" and go to bed later, but need to awaken early due to obligations whether academic or work related. Therefore, college students may be fighting their natural circadian rhythms which is leading to sleep distress. This in addition to late nights due to studying and partying among this lifestyle may exacerbate their susceptibility for DSPS. The relationship between DSPS and depression should also be researched; more specifically if one of the subtypes of depression is more commonly found with DSPS.

Once there are some sort of established norms for assessing atypical depression exploring the prevalence of atypical depression in the college population is another possible line of research. Further exploration of the characteristics of hypersomnia and how they correlate with atypical depression could also be included in this potential research.

Conclusion. Depression has had a growing awareness in society in the recent years. More and more people are seeking treatment for depression and there are continually new discoveries for treatments and medications for depression. The present study was designed to examine the relations among depression, sleep disorders, and anxiety among college students. Depression was broken down into two subtypes and attempted to assess for the differences between them to obtain a better understanding of what depressive symptoms college students endorse. Two different sleeping problems were also assessed for in order to gain a better understanding of what college students endorse. In order to determine the proper course of treatment, knowledge of the specific symptoms a person exhibits is important. Awareness of any comorbid sleeping disorders and treating them independently of a mood disorder can aid in the development of the most effective treatment plan and potentially lead to better treatment results.

The present study had several findings which included depression being correlated with anxiety and insomnia. Insomnia, anxiety, poorer sleep efficiency, longer sleep latency, and shorter sleep duration were all significantly correlated with melancholic features of depression and insomnia scores, and sleep latency scores were the strongest predictors of the melancholic depression scores. Anxiety and excessive daytime sleepiness were significantly correlated with atypical depression features. However, insomnia, shorter sleep duration, poorer sleep efficiency, and longer sleep latency were also all correlated with atypical depressive features. Anxiety and sleep latency were found to be the strongest predictors for atypical depressive symptom scores.

Also, sleep latency, later night times during the week, later night times on the weekends or prior to a day off, later morning times during the week, later morning times on weekends or a day off, and the difference between morning times on weekends versus the weekdays all correlated with the Composite Scale of Morningness total scores. However, there was not a significant correlation between the Composite Scale of Morningness total score and the difference between night times on weekends versus the weekdays. Sleep latency, later night times during the week, later night times on the weekends, and later morning times on the weekends were all significant independent predictors. The Composite Scale of Morningness total score also significantly correlated with both melancholic and atypical depressive features.

Despite the fact the t-tests revealed nonsignificant results between the two groups, there were indeed people who fell into both groups. This shows that there are college students who exhibit both depression with atypical features or melancholic features. The present study made apparent that there are not adequate means of self-assessment for the

subtypes of depression and various sleeping problems. The full range of depression subtypes are not consistently being accounted for. Also, because the predominant depression measures do not differentiate between melancholic and atypical symptoms initially not all symptoms may be adequately addressed in treatment plans. Also, having the specific symptoms on the depression measures can help better track treatment progress by assessing if the specific symptoms are lessening throughout treatment.

Overall, this research can help identify specific symptoms which may enhance treatment for those with the less common subtypes of depression. It can also do the same with sleeping disorders. This study can help awareness of differences among depressed college students and further exploration into these differences is warranted. Much of this study was exploratory and it calls for future research among the variables studied to gather a better understanding of the disorders college students are facing and how to more effectively help them.

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Table 1

Melancholic and Atypical Depression Correlations

	Atypical Depression	Melancholic Depression	Anxiety	Sleep Duration	Sleep Efficiency	Sleep Latency	Epworth
Zung Self-Rating Scale							
Atypical Depression	1	.822**	.418**	.131*	.164**	.347**	.275**
Melancholic Depression		1	.364**	.17**	.217**	.368**	.216**
Anxiety			1	.038	.075	.211**	.282**
PSQI							
Sleep Duration				1	.524**	.229**	.061
Sleep Efficiency					1	.237**	.088
Sleep Latency						1	.118*
Epworth Sleepiness Scale							1

*p < .05 **p < .01

Table 2

Predictions of Melancholic Depression Features

Variable	B	SD	β	t	95% CI
Constant	27.69	2.57		10.77	[22.62, 32.75]
PSQI Sleep Duration	-.65	.90	-.05	-.73	[-2.42, 1.12]
PSQI Sleep Efficiency	1.27	.69	.12	1.83	[-.10, 2.64]
PSQI Sleep Latency	1.95	.70	.20**	2.80	[.57, 3.33]
Anxiety	.18	.07	.16*	2.48	[.04, .33]
Insomnia	6.16	1.68	.28**	3.67	[2.85. 9.47]

R^2 .27

F 16.48**

Adjusted R^2 .26

*p < .05 **p < .01

Table 3

Predictions of Atypical Depression Features

Variable	B	SD	β	t	95% CI
Constant	32.80	1.97		16.65	[28.92, 36.68]
ESS	.15	.09	.11	1.68	[-.03, .32]
PSQI Sleep Duration	.13	.57	.02	.23	[-1.00, 1.27]
PSQI Sleep Efficiency	.04	.44	.01	.09	[-.82, .90]
PSQI Sleep Latency	1.30	.44	.21**	2.95	[.43, 2.17]
Anxiety	.19	.05	.26**	4.03	[.10, .28]
Insomnia	1.72	1.08	.13	1.60	[-.40, 3.84]

R^2	.26				
F	12.75**				
Adjusted R^2	.24				

*p < .05 **p < .01

Table 4

Composite Scale of Morningness Score Correlations

	Composite Scale	Sleep Latency	Night Time Weekdays	Night Time Weekends	Morning Time Weekdays	Morning Time Weekends	Night Time Difference	Morning Time Difference	Melancholic Depression	Atypical Depression
Composite Scale	1	-.29**	-.38**	-.39**	-.30**	-.44**	-.06	-.17**	-.18**	-.23**
Sleep Latency		1	.12*	.10	.07	.07	.02	-.01	.37**	.35**
Night Time Weekdays			1	.45**	.41**	.38**	.46**	.02	.09	.12*
Night Time Weekends				1	.28**	.43**	.59**	.19**	-.003	.06
Morning Time Weekdays					1	.46**	-.08	.45**	.05	.08
Morning Time Weekends						1	.07	.60**	.07	.14*
Night Time Difference							1	.17**	-.09	-.06
Morning Time Difference								1	.01	.07
Melancholic Depression									1	.82**
Atypical Depression										1

*p < .05 **p < .01

Table 5

Predictions of Composite Scale of Morningness Scores

Variable	B	SD	β	t	95% CI
Constant	51.45	1.77		29.02	[47.96, 54.94]
PSQI Sleep Latency	-1.40	.33	-.20**	-4.28	[-2.04, -.75]
Night Time-Weekdays	-.33	.12	-.15**	-2.71	[-.58, -.09]
Night Time-Weekends	-.42	.11	-.20**	-3.67	[-.64, -.19]
Morning Time-Weekdays	-.23	.13	-.10	-1.79	[-.48, .02]
Morning Time-Weekends	-.53	.12	-.25**	-4.34	[-.77, -.29]

R^2 .35

F 32.52**

Adjusted R^2 .34

*p < .05 **p < .01

Appendix A

Please answer the following questions about yourself.

1. How old are you? _____ (years)

2. Your Height: _____ feet _____ inches

3. Your Weight: _____ pounds

4. Your biological sex (please circle one):   Male   Female

5. Your race/ethnicity (please circle the one group with whom you identify the most):

   Black/African-American   Asian/Pacific Islander   Hispanic

   White/Anglo-American   Native American   Other

6. Relationship Status (please circle one):   Single   Married   Divorced   Widowed
   Separated

7. Are you a primary caregiver for any children?   YES   NO

   a. If YES, number of children: _____   b. Age(s) of children: _____
   _____

8. Your academic class (please circle one): Freshman   Sophomore   Junior   Senior
   Graduate

9. Your academic major (if undecided leave blank):
   _____

10. Number of academic credits enrolled in this semester: _____

11. Time of earliest class: _____

12. Your current place of residence is (please check one):
    _____Dormitory with no roommate
    _____Dormitory with one roommate
    _____Dormitory with 2 or more roommates
    _____Fraternity/Sorority House
    _____Off-campus rental apartment
    _____Off-campus rental house
    _____Parents or other Relatives Home
    _____Other (please describe): _____

13. Do you currently work for pay on a full or part-time basis? (please circle)   YES   NO

    a. If YES for how many hours a week? _____

      b. If YES what shift do you work?   First   Second   Third   Varies

14. Does your family provide you with additional financial support? (please circle)   YES NO

15. Do you have any other commitments during the week? (i.e. practice, club meetings, volunteer work) (please circle)   YES   NO

      a. If YES please state the time the activity(s) take place: _____

Appendix B

Pittsburgh Sleep Quality Index

Instructions:

The following questions relate to your usual sleep habits during the past month only.

Your answers should indicate the most accurate reply for the majority of days and nights

in the past month.

Please answer all questions.

1. During the past month, what time have you usually gone to bed at night? BED TIME

    _____

2. During the past month, how long (in minutes) has it usually taken you to fall asleep

    each night? NUMBER OF MINUTES _____

3. During the past month, what time have you usually gotten up in the morning?

    GETTING UP TIME _____

4. During the past month, how many hours of actual sleep did you get at night? (This

    may be different than the number of hours you spent in bed.) HOURS OF SLEEP

    PER NIGHT _____

For each of the remaining questions, check the one best response. Please answer all

questions.

5. During the past month, how often have you had trouble sleeping because you . . .

    a. Cannot get to sleep within 30 minutes

Not during the	Less than once	Once or twice a	Three or more

past month _____	a week _____	week_____	times a week _____

b. Wake up in the middle of the night or early morning

Not during the past month _____	Less than once a week _____	Once or twice a week_____	Three or more times a week _____

c. Have to get up to use the bathroom

Not during the past month _____	Less than once a week _____	Once or twice a week_____	Three or more times a week _____

d. Cannot breathe comfortably

Not during the past month _____	Less than once a week _____	Once or twice a week_____	Three or more times a week _____

e. Cough or snore loudly

Not during the past month _____	Less than once a week _____	Once or twice a week_____	Three or more times a week _____

f. Feel too cold

Not during the past month _____	Less than once a week _____	Once or twice a week_____	Three or more times a week _____

g. Feel too hot

Not during the past month _____	Less than once a week _____	Once or twice a week_____	Three or more times a week _____

h. Had bad dreams

Not during the past month ____	Less than once a week ____	Once or twice a week____	Three or more times a week ____

i. Have pain

Not during the past month ____	Less than once a week ____	Once or twice a week____	Three or more times a week ____

j. Other reason(s), please describe

_____

_____

_____

k. How often during the past month have you had trouble sleeping because of

this?

Not during the past month ____	Less than once a week ____	Once or twice a week____	Three or more times a week ____

6. During the past month, how would you rate your sleep quality overall?

Very good _____

Fairly good _____

Fairly bad _____

Very bad _____

7. During the past month, how often have you taken medicine to help you sleep

(prescribed or "over the counter")?

Not during the past month ____	Less than once a week ____	Once or twice a week____	Three or more times a week ____

8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

Not during the past month ____	Less than once a week ____	Once or twice a week____	Three or more times a week ____

9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

No problem at all _____

Only a very slight problem _____

Somewhat of a problem _____

A very big problem _____

10. Do you have a bed partner or roommate?

No bed partner or room mate _____

Partner/roommate in other room _____

Partner in same room, but not same bed _____

Partner in same bed _____

If you have a roommate or bed partner, ask him/her how often in the past month you have had . . .

    a. Loud snoring

Not during the past month ____	Less than once a week ____	Once or twice a week____	Three or more times a week ____

b. Long pauses between breaths while asleep

Not during the past month ____	Less than once a week ____	Once or twice a week____	Three or more times a week ____

c. Legs twitching or jerking while you sleep

Not during the past month ____	Less than once a week ____	Once or twice a week____	Three or more times a week ____

d. Episodes of disorientation or confusion during sleep

Not during the past month ____	Less than once a week ____	Once or twice a week____	Three or more times a week ____

e. Other restlessness while you sleep; please

describe_____

_____

_____

Not during the past month ____	Less than once a week ____	Once or twice a week____	Three or more times a week ____

Appendix C

Epworth Sleepiness Scale

How likely are you to doze off or fall asleep in the
following situations, in contrast to feeling just
tired? This refers to your usual way of life in recent
times. Even if you have not done some of these things
recently try to work out how they would have affected
you. Use the following scale to choose the most
appropriate number for each situation:

0 = no chance of dozing
1 = slight chance of dozing
2 = moderate chance of dozing
3 = high chance of dozing

SITUATION	CHANCE OF DOZING
Sitting and reading	
Watching TV	
Sitting inactive in a public place (e.g., a theater or a meeting)	
As a passenger in a car for an hour without a break	
Lying down to rest in the afternoon when circumstances permit	
Sitting and talking to someone	
Sitting quietly after a lunch without alcohol	
In a car, while stopped for a few minutes in traffic	

Appendix D

Insomnia Symptom Questionnaire

> **Instructions:** Below is a list of common sleep complaints. **During the past month,** how many nights or days per week have you had, or been told you had, the following symptoms? If you have experienced any of these symptoms please indicate how long it has lasted in weeks, months or years.

During the past month ...	Never	Do not know	Rarely Less than once per week	Sometimes 1-2 times per week	Frequently 3-4 times per week	Always 5-7 times per week	How long has the symptoms lasted? (# of weeks, months or years)
1. Difficulty falling asleep.	0	1	2	3	4	5	☐ wks ☐ mos _____ ☐ yrs
2. Difficulty staying asleep.	0	1	2	3	4	5	☐ wks ☐ mos _____ ☐ yrs
3. Frequent awakenings from sleep.	0	1	2	3	4	5	☐ wks ☐ mos _____ ☐ yrs
4. Feeling that your sleep is not sound.	0	1	2	3	4	5	☐ wks ☐ mos _____ ☐ yrs
5. Feeling that your sleep is unrefreshing.	0	1	2	3	4	5	☐ wks ☐ mos _____ ☐ yrs

If you checked "never" or "do not know" for **all of these symptoms** YOU MAY STOP.

If you checked "rarely" to "always" for **all of these symptoms** please continue with questions 6-13.

Instructions: If you have experienced **any** sleep symptoms **during the past month** please circle the appropriate number to let us know how your sleep is affecting your daily life?

	Not at all	A little bit	Moderately	Quite a bit	Extremely
6. How much do your sleep problems bother you?	0	1	2	3	4
7. Have your sleep difficulties affected your work?	0	1	2	3	4
8. Have your sleep difficulties affected your social life?	0	1	2	3	4
9. Have your sleep difficulties affected other important parts of your life?	0	1	2	3	4
10. Have your sleep difficulties made you feel irritable?	0	1	2	3	4
11. Have your sleep problems caused your to have trouble concentrating?	0	1	2	3	4
12. Have your sleep difficulties made you feel fatigued?	0	1	2	3	4
13. How sleepy do you feel during the day?	0	1	2	3	4

Appendix E

Composite Scale of Morningness

*Directions: Please **check** the response for **each** item that best describes you.*

1. Considering only your own "feeling best" rhythm, at what time would you get up if you were entirely free to plan your day?
5:00-6:30 a.m.	_____
6:30-7:45 a.m.	_____
7:45-9:45 a.m.	_____
9:45-11 a.m.	_____
11:00 a.m. – 12:00 (noon)	_____

2. Considering only your own "feeling best" rhythm, at what time would you go to bed if you were entirely free to plan your evening?
8:00-9:00 p.m.	_____
9:00-10:15 p.m.	_____
10:15 p.m. – 12:30 a.m.	_____
12:30-1:45 a.m.	_____
1:45-3:00 a.m.	_____

3. Assuming normal circumstances, how easy do you find getting up in the morning? (Check one.)
Not at all easy	_____
Slightly easy	_____
Fairly easy	_____
Very easy	_____

4. How alert do you feel during the first half hour after having awakened in the morning (Check one.)
Not at all alert	_____
Slightly alert	_____
Fairly alert	_____
Very alert	_____

5. During the first half hour after having awakened in the morning, how tired do you feel? (Check one.)
Very tired	_____
Fairly tired	_____
Fairly refreshed	_____
Very refreshed	_____

6. You have decided to engage in some physical exercise. A friend suggests that you do this one hour twice a week and the best time for him is 7:00-8:00 a.m. Bearing in mind nothing else but your own "feeling best" rhythm, how do you think you would perform?

Would be in good form   _____

Would be in reasonable form   _____

Would find it difficult   _____

Would find it very difficult   _____

7. At what time in the evening do you feel tired and, as a result, in need of sleep?

    8:00-9:00 p.m.   _____

    9:00-10:15 p.m.   _____

    10:15 p.m. – 12:30 a.m.   _____

    12:30-1:45 a.m.   _____

    1:45-3:00 a.m.   _____

8. You wish to be at your peak performance for a test which you know is going to be mentally exhausting and lasting for two hours. You are entirely free to plan your day, and considering only your own "feeling best" rhythm, which ONE of the four testing times would you choose?

    8:00-10:00 a.m.   _____

    11:00 a.m. – 1:00 p.m.   _____

    3:00-5:00 p.m.   _____

    7:00-9:00 p.m.   _____

9. One hears about "morning" and "evening" types of people. Which ONE of these types do you consider yourself to be?

    Definitely a morning type   _____

    More a morning than an evening type   _____

    More an evening than a morning type   _____

    Definitely an evening type   _____

10. When would you prefer to rise (provided you have a full day's work – 8 hours) if you were totally free to arrange your time?

    Before 6:30 a.m.   _____

    6:30-7:30 a.m.   _____

    7:30-8:30 a.m.   _____

    8:30 a.m. or later   _____

11. If you always had to rise at 6:00 a.m., what do you think it would be like?

    Very difficult and unpleasant   _____

    Rather difficult and unpleasant   _____

    A little unpleasant but no great problem   _____

    Easy and not unpleasant   _____

12. How long a time does it usually take before you "recover your senses" in the morning after rising from a night's sleep?

    0 – 10 minutes   _____

    11 – 20 minutes   _____

    21 – 40 minutes   _____

More than 40 minutes   _____

13. Please indicate to what extent you are a morning or evening *active* individual.

Pronounced morning active (morning alert and evening   _____
tired)
To some extent, morning active   _____
To some extent, evening active   _____
Pronounced evening active (morning tired and evening alert)   _____

Appendix F

Sleep Timing Questionnaire

This questionnaire asks about when you normally sleep. We are interested in getting as accurate a picture as we can of the times when you normally go to bed and get up. Please think carefully before giving your answers and be as accurate and as specific as you can be. Please answer in terms of a recent "normal average week," not one in which you traveled, vacationed or had family crises. Thanks.

Please think of GOOD NIGHT TIME as the time at which you are finally in bed and trying to fall asleep.

1.   On the night before a work day or school day, what is your earliest GOOD NIGHT TIME? ____:____ pm/am

2.   On the night before a work day or school day, what is your latest GOOD NIGHT TIME? ____:____ pm/am

3.   On the night before a work day or school day, what is your usual GOOD NIGHT TIME? ____:____ pm/am

4.   How stable (i.e., similar each night) are your GOOD NIGHT TIMES before a work day or school day? (Circle one)

0-15mins	61-75mins	2-3hours
16-30mins	76-90mins	3-4hours
31-45mins	91-105mins	Over 4hours
46-60mins	106-120mins	

5.   On a night before a day off (e.g. a weekend), what is your earliest GOOD NIGHT TIME ?____:____ pm/am

6.   On a night before a day off (e.g. a weekend), what is your latest GOOD NIGHT TIME ?____:____ pm/am

7.   On a night before a day off (e.g. a weekend), what is your usual GOOD NIGHT TIME ?___:____ pm/am

8.   How stable (i.e., similar each night) are your GOOD NIGHT TIMES on a night before a day off (e.g. a weekend)? (Circle one)

0-15mins	61-75mins	2-3hours
16-30mins	76-90mins	3-4hours
31-45mins	91-105mins	Over 4hours
46-60mins	106-120mins	

Please think of GOOD MORNING TIME as the time at which you finally get out of bed and start your day.

9.   Before a work day or school day, what is your earliest GOOD MORNING TIME ?____:____ am/pm

10.   Before a work day or school day, what is your latest GOOD MORNING TIME ?____:____ am/pm

11.   Before a work day or school day, what is your usual GOOD MORNING TIME ?____:____ am/pm

12.   How stable (i.e., similar each night) are your GOOD MORNING TIMES before a work day or school day? (circle one)

0-15mins	61-75mins	2-3hours
16-30mins	76-90mins	3-4hours
31-45mins	91-105mins	Over 4hours
46-60mins	106-120mins	

13.   Before a day off (e.g. a weekend), what is your earliest GOOD MORNING TIME ?____:____ am/pm

14.   Before a day off (e.g. a weekend), what is your latest GOOD MORNING TIME ?____:____ am/pm

15.   Before a day off (e.g. a weekend), what is your usual GOOD MORNING TIME ?____:____ am/pm

16.   How stable (i.e., similar each night) are your GOOD MORNING TIMES on a night before aday off (e.g. a weekend)? (Circle one)

0-15mins	61-75mins	2-3hours
16-30mins	76-90mins	3-4hours
31-45mins	91-105mins	Over 4hours
46-60mins	106-120mins	

These questions are about how much sleep you lose to unwanted wakefulness:

17.   On most nights, how long, on average does it take you to fall asleep after you start trying? _____minutes

18.   On most nights, how much sleep do you lose, on average, from waking up during the night (e.g. to go to the bathroom)? _____minutes

Appendix G

Zung Self-rating Depression Scale
Please read each statement and decided how much of the time the statement describes how you have been feeling during the past several days.

	A little of the time	Some of the time	Good part of the time	Most of the time
1. I feel down-hearted and blue	1	2	3	4
2. Morning is when I feel the best	4	3	2	1
3. I have crying spells or feel like it	1	2	3	4
4. I have trouble sleeping at night	1	2	3	4
5. I eat as much as use to	4	3	2	1
6. I still enjoy sex	4	3	2	1
7. I notice that I am losing weight	1	2	3	4
8. I have trouble with constipation	1	2	3	4
9. My heart beats faster than usual	1	2	3	4
10. I get tired for no reason	1	2	3	4
11. My mind is as clear as it use to be	4	3	2	1
12. I find it easy to do the things I used to	4	3	2	1
13. I am restless and can't keep still	1	2	3	4
14. I feel hopeful about the future	4	3	2	1
15. I am more irritable than usual	1	2	3	4
16. I find it easy to make decision	4	3	2	1
17. I feel that I am useful and needed	4	3	2	1
18. My life is pretty full	4	3	2	1
19. I feel that others would be better off if I were dead	1	2	3	4
20. I still enjoy the things I used to do	4	3	2	1

Appendix H

Zung Self-rating Anxiety Scale

*Listed below are 20 statements. Please read each one carefully and decide how much of the statement describes how you have been feeling **during the past week.** Circle the appropriate number for each statement*

	None or little of the time	Some of the time	A good part of the time	Most or all of the time
1. I feel more nervous and anxious than usual.	1	2	3	4
2. I feel afraid for no reason at all.	1	2	3	4
3. I get upset easily or feel panicky.	1	2	3	4
4. I feel like I'm falling apart and going to pieces.	1	2	3	4
5. I feel that everything is all right and nothing bad will happen.	1	2	3	4
6. My arms and legs shake and tremble.	1	2	3	4
7. I am bothered by headaches, neck and back pains.	1	2	3	4
8. I feel weak and get tired easily.	1	2	3	4
9. I feel calm and can sit still easily.	1	2	3	4
10. I can feel my heart beating fast.	1	2	3	4
11. I am bothered by dizzy spells.	1	2	3	4
12. I have fainting spells or feel like it.	1	2	3	4
13. I can breathe in and out easily.	1	2	3	4
14. I get feeling of numbness and tingling in my fingers, toes.	1	2	3	4
15. I am bothered by stomach aches or indigestion.	1	2	3	4
16. I have to empty my bladder often.	1	2	3	4
17. My hands are usually warm and dry.	1	2	3	4
18. My face gets hot and blushes.	1	2	3	4

19. I fall asleep easily and get a good night's rest.	1	2	3	4
20. I have nightmares.	1	2	3	4

Appendix I

Closing Questions

Please answer the following questions about yourself.

1. Have you ever been treated for depression?   YES   NO

2. Have you ever been treated for anxiety?   YES   NO

3. Have you ever been treated for a sleeping disorder?   YES   NO

4. Have you ever been treated for another psychological disorder?   YES   NO

     a.   If YES, what disorder? _____

5. Are you currently being treated for any psychological disorder including depression, anxiety, and sleep problems?   YES   NO

6. Have you ever taken medication for a psychological disorder?   YES   NO

7. Are you currently taking medication for a psychological disorder?   YES   NO

8. Are you currently taking medication for depression?   YES   NO

     a. If YES are you currently taking an antidepressant?   YES   NO

9. Are you currently taking medication for anxiety?   YES   NO

10. Are you currently taking medication to help you sleep?   YES   NO

11. If you are currently on any medication, does it affect your sleep?   YES   NO