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Effects of Weighted Blankets on College Students' Anxiety

Amy Clapp

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Abstract

Background: Many mental health disorders, including anxiety, are identified during young adulthood when students are beginning college. Therapies such as weighted blankets may provide anxiety relief, but information about the use of weighted blankets for students is lacking.

Purpose: To compare the effect of weighted versus regular blankets on anxiety, sleep, and GPA in a sample of undergraduate students. **Conceptual framework:** Measurements were operationalized through the Overall Anxiety Severity and Impairment Scale (OASIS).

Methods: A pilot study using a convenience sample with random assignment was conducted. Participants ($N = 32$) self-identified as belonging to one of three groups: not experiencing anxiety, having anxiety and not taking medication, and having anxiety and taking medication. Participants were randomly assigned to use a weighted or standard blanket throughout the Fall 2018 semester and asked to complete three online surveys including items about sleep and the OASIS. SPSS Version 25 was used to analyze descriptive and parametric statistics. A 2 (Blanket type: weighted, regular) x 3 (Anxiety type: no anxiety, anxiety without medication, anxiety with medication) mixed-model ANOVA was completed to analyze the effects of blanket type on sleep, anxiety, and GPA. **Findings:** There was a statistically significant relationship between blanket type and quality of sleep. There was also a potentially, clinically significant relationship between blanket type and level of anxiety. **Conclusions:** Weighted blankets may be helpful in improving sleep quality and decreasing anxiety among college students. The findings provide insight into how complementary and alternative therapies could be aligned with care provided for students by university health and counseling services, and evidence-based practice in mental health nursing.

Effects of Weighted Blankets on College Students' Anxiety

Many mental health disorders, including anxiety, are identified during young adulthood when students are beginning college (Beiter et al., 2015; Saeed et al., 2017). Mental health issues are increasingly becoming recognized as influential in academic difficulties in college, when students are faced with psychosocial and intellectual challenges while preparing for their future careers (Posselt & Lipson, 2016; Saeed et al., 2017). Anxiety is one of the most frequently diagnosed psychiatric disorders among university students, with anxiety-related visits to university counseling centers more than doubling in five years (Beiter et al., 2015). The anxiety and associated stress among college students due to academic challenges may lead to poor sleep quality, which plays a direct role in decreasing quality of life. While some students utilize prescribed anti-anxiety medications for symptom relief, many medications do not provide immediate relief and have undesirable side effects (Ackerley, Badre, & Olausson, 2015; Farach et al., 2012). Complementary and alternative therapies are becoming increasingly sought out by college students to reduce anxiety and cope with academic stressors (Versnik et al., 2015). Weighted blankets, a form of deep pressure therapy, are an increasingly popular treatment modality to address anxiety and sleep disorders. The purpose of this study was to explore the effect of weighted blankets on anxiety, quality of sleep, and grade point average (GPA).

Review of the Literature

The literature was searched to gain an understanding of the scope and impact of anxiety among college students, as well as the methods college students use to control and/or cope with anxiety. Search engines included: PsycINFO, ScienceDirect, CINAHL Plus with Full Text, Academic OneFile, Academic Search Complete, ProjectMUSE, and EBSCOhost. Keywords

included: “weighted blankets”, “anxiety”, “college students”, “mental health disorders”, “sleep”, “deep pressure therapies”, and “complementary and alternative”.

There is a growing body of knowledge describing the prevalence of anxiety in college students. Reasons behind high rates of anxiety in college students and evidence regarding the use of pharmacologic, as well as complementary and alternative therapies to relieve anxiety in the general population was readily available. A gap in evidence was identified in describing the use and efficacy of weighted blankets to treat anxiety in college-aged students.

Anxiety in College-Aged Students

One of the greatest sources of anxiety for students is the competitiveness and pressure of the university environment, particularly for grades (Peleg, Deutch, & Dan, 2016; Posselt & Lipson, 2016; Saeed et al., 2017). Because quizzes and exams are primary methods of assessment in education, test anxiety has become a key problem for college students. As a result, a significant focus for university counselors and mental health centers is to provide awareness about mental health and to help students reduce test anxiety and improve academic performance (Beiter et al., 2015; Peleg, Deutch et al. 2016). In addition, college students may experience stress and anxiety due to pressure from parents, fear of failure, and perceived difficulties in obtaining a job in their chosen career field after graduation. Living far from family and established support systems, and the increasing financial burden of attending university, are also common stressors for college students (Saeed et al., 2017).

Students who are affected by anxiety report finding it difficult to concentrate during class, keep up with coursework, and maintain a competitive grade point average (Thomas, Cassady, & Heller, 2017). In addition, students who report high levels of anxiety may experience

altered professional and personal traits, including compromised academic honesty, strained relationships with peers, substance abuse, and overall health deterioration (Saeed et al., 2017).

Quality of Sleep in College-Aged Students

The anxiety and associated stress due to academic challenges may lead to poor sleep quality among college students. Although the recommended amount of sleep for young adults ages 18-25 is seven to nine hours per night, many students do not meet this recommendation (National Sleep Foundation, 2019). College-aged students report different types of sleep disorders and issues, including difficulty falling and staying asleep, feeling tired during the daytime, and having poor quality of sleep (Lund, Reider, Whiting, & Pritchard, 2010). Changes that occur in the hypothalamic-pituitary-adrenal axis during adolescence result in increased peri-sleep secretion of cortisol, which may contribute to a hyper-arousal state, thereby delaying sleep onset and contributing to feelings of anxiety among college students (Lund et al., 2010). Sleep issues are associated with many different mental health disorders, including generalized anxiety disorder (GAD), poor physical health, academic difficulties, and generally poor mental health (Beiter et al., 2015; Lund et al., 2010; Nyer et al., 2013).

Lund et al. (2010) surveyed a cross-sectional sample of college students ($N = 1,125$; $M = 20$ years) using an online survey to describe sleep patterns and predictors of poor sleep quality. Sleep, mood, and stress were measured using five published scales: The Pittsburgh Sleep Quality Index (PSQI), the Epworth Sleepiness Scale (ESS), the Horne-Ostberg Morningness Eveningness Scale (MES), the Subjective Units of Distress Scale (SUDS), and the Profile of Mood States (POMS). Participants reported poor sleep quantity overall, with a mean total sleep time of about 7 hours per night. Of the participants, 25% reported getting less than 6.5 hours of sleep per night. Participants also reported poor sleep quality, which was associated with higher

rates of self-reported negative moods, such as anger, confusion, depression, fatigue, and tension, and higher levels of stress during the week and weekend. Participants with poor-quality sleep were more than twice as likely to utilize over-the-counter (OTC) medications to stay awake during the day and fall asleep at night. These participants also reported a high incidence of illness, falling asleep in class, and missing class at least three times over the last month.

Taylor, Bramoweth, Grieser, Tatum, & Roane (2013) evaluated the prevalence and correlates of insomnia in a large sample of college students ($N = 1,074$, $M = 20.39$ years). Participants completed a variety of surveys related to sleep and mental health, including a one-week sleep diary. In the sleep diaries, participants were asked to record total sleep time in minutes (TST), sleep efficiency (SE), and quality of sleep (SQ). MANOVA revealed significant differences between the chronic insomnia and normal sleeper groups based on the sleep diary estimates. Participants with chronic insomnia reported significantly worse symptoms on all three of the above estimates. In addition, participants who met *DSM-V* criteria for chronic insomnia also reported greater clinically significant levels of depression (26.3% vs. 8.6%) and anxiety (15.2% vs. 5.4%) than those without chronic insomnia. The relationship between poor sleep quality and anxiety suggests the need for an intervention to improve sleep and decrease anxiety in college students.

Pharmacologic Therapies for Anxiety

Both pharmacologic and non-pharmacologic therapies have been used to treat anxiety. According to Farach et al. (2012), common pharmacologic options include selective serotonin reuptake inhibitors (SSRIs), serotonin-norepinephrine inhibitors (SNRIs), and anxiolytics. Examples of medications in these classes are displayed below in Table 1.

Table 1: *Examples of Anti-Anxiety Medications*

Selective serotonin reuptake inhibitors (SSRIs)	Serotonin-norepinephrine inhibitors (SNRIs)	Anxiolytics
Citalopram (Celexa)	Desvenlafaxine (Pristiq)	Alprazolam (Xanax)
Fluoxetine (Prozac)	Duloxetine (Cymbalta)	Diazepam (Valium)
Escitalopram (Lexapro)	Venlafaxine (Effexor XR)	Lorazepam (Ativan)
Paroxetine (Paxil)		
Sertraline (Zoloft)		

While these medications have provided anxiety relief for some users, between one-third and one-half of patients taking antidepressants do not achieve sustained remission from anxiety (Farach et al., 2012). The SSRIs, first-line medications for depression and anxiety, do not provide immediate relief, can take up to two weeks to gain full effect if the proper dose is not initially prescribed, and have many side effects such as nausea, diarrhea, headaches, insomnia, and restlessness (Ackerley et al., 2015; Farach et al., 2012). Benzodiazepines, such as Diazepam (Valium) and Lorazepam (Ativan) are primarily intended for short term relief of anxiety. Chronic benzodiazepine use is associated with physiologic dependence and short-term cognitive and psychomotor impairment (Farach et al., 2012). While use of pharmacologic interventions may be helpful for some college students experiencing anxiety, there is evidence that the use of non-pharmacologic, complementary and alternative medicine (CAM) may provide additional benefits with fewer negative side effects.

Non-Pharmacologic Therapies for Anxiety

McPherson and McGraw (2013) used a quasi-experimental, pretest-posttest design to evaluate the benefits of non-pharmacologic therapies for participants with GAD ($N = 25$, $M =$

35.5 years) seeking treatment at a military treatment facility. The Depression Anxiety Stress Scale-21 (DASS-21), was used to assess depression, anxiety, and stress. Participants ranked a series of 21 items representing a negative emotion state on a Likert-type scale of 0 to 3 (0 = “did not apply to me at all”, 3 = “applied to me very much or most of the time”), The DASS-A subscale measures symptoms of hyper-arousal, such as situational anxiety. Participants received acupuncture treatments once per week for six weeks, and engaged in yoga breathing exercises, massage therapy using scented oils, episodic journaling, nutrition counseling, and exercise. Paired *t* tests were used to assess the continuous pre- and posttest measures. There was a significant reduction in each subscale, including a statistically significant reduction in the pre- and post-DASS-A. The researchers concluded that the CAM multi-therapy program was effective for the treatment of GAD in this sample.

While few researchers have investigated the use of CAM among university students, the use of CAM for anxiety among college students appears to be more prevalent than in the rest of the population. In a study by Versnik et al. (2015) with undergraduate and graduate university students ($N = 2,553$), 82% of participants reported using at least one form of CAM in the past 12 months. The most popular of 32 reported modalities included the use of non-vitamin/non-mineral products, such as fish oil and herbal dietary supplements, yoga, deep breathing exercises, massage therapy, and meditation. Of the participants, 77% agreed that having many different types of therapies available to university students is a good idea.

Use of Deep Pressure Stimulation to Treat Anxiety

Deep pressure stimulation has been used as a complementary or alternative treatment modality in the past, under the assumption that deep pressure can result in relaxation from physiologic arousal. The stimulation may influence both parasympathetic and sympathetic

nervous system activity by increasing vagal tone and reducing activation of the stress response (Champagne, Mullen, Dickson, & Krishnamurty, 2015; Lane, Mullen, & Reynolds, 2015).

Occupational therapists often recommend deep pressure therapy to dampen the sympathetic nervous system response, therefore increasing emotional regulation and decreasing anxiety (Champagne et al., 2015). The application of pressure by a weighted blanket or vest has shown to produce a calming effect for individuals with autism spectrum disorders, attention-deficit hyperactivity disorder, and pervasive developmental disorders (Ackerley et al., 2015). Weighted blankets have become increasingly popular as the prevalence of mental health issues, including anxiety, has increased (Champagne et al., 2015).

Much of the research conducted to understand the effects of deep pressure has been completed with the pediatric population. However, Lane et al. (2015) used a cross-sectional, repeated-measures, repeated-baseline design to evaluate the effects of the Vayu Vest on autonomic arousal and performance in a normative adult population ($N = 50$, $M = 24.5$ years). The Vayu Vest is a wearable, noninvasive medical device with an internal bladder and hand pump. Participants inflated the vests until they experienced a feeling like a “firm hug”, and kept the vests inflated for three minutes. Participants performed a brainteaser game, the Moron Test (DistinctDev Inc, Seattle, WA) in which they were asked to complete a series of questions involving calculating, matching, memorizing, sequencing, and identifying during two tests – before and after wearing the vest. A total of seven distinct periods of time, or epochs (3 baseline epochs, 2 test epochs, and 1 Vayu Vest epoch) were recorded. Baseline data were collected before and after each test, and a paired t test was used to compare pretest and posttest scores on the Moron Test. Electrodes placed on the participants’ skin during the study revealed a statistically significant change in skin conductance level (SCL) across epochs, indicating a

decrease in sympathetic activity. SCL values were the lowest while the participants were wearing the vest, during the Vayu Vest epoch. Respiratory sinus arrhythmia (RSA) also differed across epochs, indicating an increase in parasympathetic function. RSA was highest during the Vayu Vest epoch. Participants also made statistically significant fewer errors during the game after wearing the vest. The researchers concluded that wearing the vest, even for only a few minutes, led to decreased sympathetic and increased parasympathetic activity, creating an overall calming autonomic response for the young adult population.

Use of Weighted Blankets to Treat Anxiety and Improve Sleep Quality

Weighted blankets are an additional form of deep pressure therapy. Consistent sensory input supplied by a weighted blanket has been suggested to reduce physiological levels of arousal and enhance emotion regulation (Ackerley et al., 2015; Champagne et al., 2015). While weighted vests are typically worn while the user is ambulating or in a seated position, the use of a weighted blanket requires a seated or recumbent position (Mullen, Champagne, Krishnamurty, Dickson, & Gao, 2008). Previous clinical experience indicates that a blanket weighing more than 10% of the user's body weight is preferred (Ackerley et al., 2015; Mullen et al., 2008).

Mullen et al. (2008) found that the use of a 30-pound blanket by adult participants ($N = 32$, $M = 31$ years) whose weight ranged between 112-234 pounds ($M = 165$ lb, $SD = 27.8$ lb) did not adversely affect oxygen saturation, heart rate, or blood pressure when applied for five minutes. Data were collected with and without the weighted blanket, while each participant was lying down. During the intervention, oxygen saturation for all participants did not drop below 90% and heart rate for all participants stayed below 100 beats per minute. Only one participant had a systolic blood pressure out of normal range, and no participant had a diastolic blood pressure out of normal range. In addition, 78% of the participants reported that they felt more

relaxed while using the blanket, indicating an overall calming effect. These researchers' results suggest that weighted blankets are a safe treatment modality. However, a major limitation to this study is that the weighted blankets were applied for only five minutes.

Ackerley et al. (2015) used a repeated-measures design with participants acting as their own controls to evaluate the effectiveness of a metallic chain, weighted blanket on insomnia in a population of adults with chronic insomnia ($N = 31$, $M = 47$ years). Participants slept in their normal environment for one week, during which the researchers gathered pre-test data. Participants then used a metallic chain, weighted blanket of more than 12% of their body weight (6, 8, or 10 kg) every night for two weeks. During the last phase of the study, participants returned the blanket and slept again in their normal environment for one more week. Objective data (total number of waking minutes after initial sleep onset, total sleep time, sleep efficiency, sleep latency, latency to deep sleep and rapid eye movements (REM), and number of awakenings) were collected using an actigraphy watch with an accelerometer, worn on the subject's wrist. While using the weighted blankets, participants showed a significant increase in mean sleep bout time, a significant decrease in the mean activity score during time in bed, and a decrease in the mean number and duration of movements in the next-to-last hour prior to waking up. Participants reported enjoying sleeping with the blanket, feeling more refreshed in the morning, and that they did not find that the blanket affected their temperature in bed. The researchers concluded that the use of a chain-weighted blanket greater than 12% of the user's total body weight had a positive impact on sleep, and that an evenly distributed chain-weighted blanket was effective, both subjectively, and objectively, in improving sleep quality in insomniacs.

Champagne et al. (2015) conducted a pilot study with adults ($N= 30$, $M = 30.53$ years) who used a 30-pound weighted blanket while hospitalized for acute mental health care. Data collected included pre- and post-vital signs, skin conductivity, a 0-10 self-rating anxiety scale, and the STAI-10 questionnaire, a self-administered test that measures perceived anxiety. Participants completed the STAI-10 and 0-10 anxiety scale before lying down and applying the 30-pound blanket for five minutes. After participants wore the weighted blanket for five minutes, vital signs, STAI-10, and 0-10 anxiety scale were repeated. Participants then walked up and down the hall for five minutes, before lying down again for five minutes without the blanket when data were collected again. For all participants, oxygen saturation did not fall below 90% at any point, and both systolic and diastolic blood pressure stayed within normal ranges during treatment and control phases. Although analysis of skin conductance levels and STAI-10 did not yield any conclusive evidence, there was a statistically significant improvement in the 0-10 self-rating anxiety scale. The researchers concluded that a 30-pound weighted blanket is safe for adult users in a mental health unit and may effectively reduce anxiety among this population.

Current Study

College students are at significant risk for developing sleep issues and disorders, which may play a role in decreasing quality of life (Beiter et al., 2015; Lund et al., 2010; Nyer et al., 2013; Taylor et al., 2013). The correlation between poor sleep quality, anxiety, and poor academic performance suggests a need for interventions to improve sleep quality and reduce anxiety in college-aged students. Despite an increase in use of weighted blankets by therapists and mental health facilities, and anecdotal reports that weighted blankets can help to reduce anxiety and improve the ability to focus, a clear understanding of the safety and efficacy of the use of weighted blankets in achieving anxiety reduction in college-aged students is lacking.

The purpose of this study was to explore the effect of weighted blankets on anxiety, quality of sleep, and GPA by comparing the effects of weighted versus regular, un-weighted blankets in a convenience sample of undergraduate students. In addition, the specific aim was to test the reliability and validity of the Overall Anxiety Severity and Impairment Scale (OASIS) in a population of students at a small, private, Midwestern university.

Methods

Study Design and Recruitment of Participants

This study was carried out with random assignment of a convenience sample. Because this was a pilot study, power analysis was not used to determine appropriate sample size. The researchers' goal was to achieve a total enrollment of 36 participants; five participants to each group, with enrollment of a sixth participant to each group to allow for attrition. The attributes and final composition of each group are described in Table 2. Approval from the University's Institutional Review Board was obtained before recruitment of participants began.

All students enrolled at a small, private, liberal arts university in the Midwest were sent an email invitation to participate in the study at the start of the Fall 2018 semester (Appendix A). In this invitation, the non-weighted blanket was referred to as "typical"; throughout this paper, the non-weighted blankets will be referred to as "regular". Paper and electronic flyers with contact information for the faculty co-principle investigator who screened and enrolled participants were also posted around campus. Students contacted that faculty member, who screened, obtained informed consent, assigned each participant to an appropriate group, and randomly assigned the use of a weighted or regular blanket. Students who reported taking anti-anxiety medication on an "as needed only" basis (not taking a regular, scheduled dose) were excluded. Data were collected from August 27, 2018, to January 20, 2019, to allow the faculty

advisor to retrieve updated GPA data for all participants after the close of the Fall 2018 semester. Participants were not charged for the blanket they received and were allowed to keep the blanket after completion of the study. Participants were given the choice to provide their name and phone number after completing each of the three surveys for up to three chances to win one of three, \$50.00 VISA gift cards in a drawing that was held at the end of the semester.

Table 2: *Study Groups*

Group 1 (n = 5)	Group 2 (n = 5)	Group 3 (n = 6)
No anxiety No medication Regular blanket	Anxiety No medication Regular blanket	Anxiety Medication Regular blanket
Group 4 (n = 6)	Group 5 (n = 6)	Group 6 (n = 4)
No anxiety No medication Weighted blanket	Anxiety No medication Weighted blanket	Anxiety Medication Weighted blanket

Procedure

Written, informed consent was obtained from all participants before they took part in the study. Based on student self-report of having or not having anxiety, and whether or not they were taking anti-anxiety medication, the co-principle investigator assigned them to the appropriate group based on condition (no anxiety, anxiety-no medications, anxiety-medications). Then each student was asked to draw a slip of paper from one of three jars (one jar for each condition; no anxiety, anxiety-no medications, anxiety-medications). Each jar included six slips labeled “weighted” and six slips labeled “regular” to determine blanket type and study group (Table 2). Each participant was instructed to sleep with the blanket every night for the duration of the Fall 2018 semester. Participants were asked to complete three, on-line surveys (Appendix B: Research Instrument) at the beginning, middle, and end of the semester, with instructions to complete the first survey before starting to use the blanket.

Participants were instructed to create a personal code at the beginning of each survey, so that the student researcher would be blinded to participant identities. The first survey consisted of 23 items: five demographic items (age, gender identity, ethnicity, and major), four items about the use of anti-anxiety medication, five items about symptoms of anxiety (Overall Anxiety Severity and Impairment Scale; items 11-14), and nine items about amount and quality of sleep (items 15-23). The midterm and final surveys did not include the demographic items, but did include an item asking participants to affirm the type of blanket they were using, for a total of 19 items. Each survey took the participants approximately 15-minutes to complete. With each participant's permission, GPA data were obtained by the faculty advisor at the start of the Fall 2018 and Spring 2019 semesters from the university's Office of the Registrar.

The Overall Anxiety Severity and Impairment Scale (OASIS)

The OASIS is a five item, self-report measure that assesses the frequency and intensity of anxiety, as well as the degree of impairment anxiety causes an individual (Campbell-Sills et al., 2009). Each item is coded 0 to 4 (0 = little to no symptoms, 4 = extreme symptoms). Responses to all five items are totaled to obtain a score ranging from 0 to 20, with higher scores indicating more severe anxiety symptoms. Because answering each of the items requires participants to consider a variety of experiences, including panic attacks, flashbacks, and physical symptoms, the scale is appropriate to use with individuals who have different types of anxiety disorders. The brevity of the scale allows the user to complete the questionnaire in a short period of time and enhances its use in many clinical settings and research studies (Campbell-Sills et al., 2009). The OASIS has demonstrated good reliability ($\alpha = .80$ and $.84$) in previous samples (Campbell-Sills et al., 2009; Norman, Cissell, Means-Christensen, & Stein, 2006).

Data were analyzed with descriptive and parametric statistics using SPSS Version 25. Descriptive statistics were used to analyze demographic data, and a 2 (blanket type: weighted, regular) x 3 (anxiety type: none, anxiety-no medication, anxiety-medication) mixed-model analysis of variance (ANOVA) was used to analyze the effects of weighted versus non-weighted blankets on anxiety, sleep, and GPA in the sample of college students.

Results

The faculty co-principle investigator received over 200 responses to the campus-wide email invitation within the first 48 hours of recruitment. Six participants were successfully enrolled to each group, resulting in a total sample size of 36 participants. Four participants did not complete all three surveys, yielding a final sample size of 32 participants. Only data from the final sample of 32 participants were analyzed to answer the research question. The OASIS demonstrated good reliability ($\alpha = .87$) in the current sample. A p value of 0.05 was considered significant.

Demographics

The study sample ($N = 32$, $M = 19.75$ years) was 25% male, 68.8% female, 3.1% non-binary/third gender, and 3.1% gender fluid; no participant identified as transgender. The ethnicity of the sample was 78.1% White, 6.3% Hispanic/Latino, 12.5% Asian/Pacific Islander, and 3.1% other. The most common majors listed among participants were Business Administration and Nursing (Appendix C, Table 3).

Effect of Blank Type on Quality of Sleep

To compare the effect of weighted versus unweighted blankets on quality of sleep over the semester, responses to survey items 15, 16, and 17 were combined to generate a sleep score. Response options for item 15 were coded in reverse order, so that a lower score in all three

questions indicated a better quality of sleep, and a higher score indicated a worse quality of sleep. Sleep scores were compared between users of all weighted versus unweighted blankets, and between users of each blanket type within matched groups (Group 1 compared to Group 4; Group 2 compared to Group 5; Group 3 compared to Group 6).

There was a statistically significant relationship between all users of each blanket type and sleep scores over time ($F(2, 29) = 6.248; p = .01$; Appendix C, Table 4). Sleep scores increased on average for non-weighted blanket users (pre: 1.98, mid: 2.10, final: 2.21) and decreased for weighted blanket users (pre: 2.19, mid: 2.04, final: 1.88), indicating a better quality of sleep for weighted blanket users (Appendix C, Table 5). Participants who were provided with a weighted blanket throughout the semester received a greater amount of sleep each night, took fewer naps each week, and woke up fewer times throughout the night. Although statistical significance was shown when comparing all users of each blanket type, statistical significance was not detected in the comparison of scores between matched groups (Groups 1 and 4, $p = .12$; Groups 2 and 5, $p = .14$; Groups 3 and 6, $p = .48$).

Effect of Blanket Type on Anxiety Levels

To compare the effect of blanket type on anxiety over the semester, OASIS scores were compared between users of all weighted versus unweighted blankets, and between users of each blanket type within matched groups. No statistically significant relationship was found between blanket type and OASIS scores ($F(2, 29) = .72; p = .50$; Appendix C, Table 4). However, OASIS scores increased over time in Groups 1, 2, and 3 (indicating increasing anxiety over the semester for regular blanket users), and decreased over time in Groups 4, 5, and 6 (indicating decreasing anxiety over the semester for weighted blanket users) (Appendix C, Table 6). Differences

between matched groups were also not statistically significant (Groups 1 and 4, $p = .48$; Groups 2 and 5, $p = .81$; Groups 3 and 6, $p = .84$).

Effect of Blanket Type on GPA

To compare the effect of blanket type, and a hypothesized change in anxiety levels on academic performance over the semester, GPA was compared between all users of weighted versus unweighted blankets, and between users of each blanket type, within matched groups. No statistically significant relationship was found between blanket type and GPA ($F(1, 23) = .907$; $p = .35$; Appendix C, Table 4). In addition, GPA increased over time for all participants (Appendix C, Table 7). Differences between matched groups revealed one value that demonstrated significance between Groups 2 and 5, which were comprised of participants who identified as having anxiety, but not taking anti-anxiety medication (Groups 1 and 4, $p = .30$; Groups 2 and 5, $p = .05$; Groups 3 and 6, $p = .92$). However, the average GPA for Group 2 increased from 2.975 to 3.225, whereas the average GPA for Group 5 increased from 3.513 to 3.547. Because the group using unweighted blankets started with a much lower average GPA, it is reasonable to conclude that the group's average GPA could increase more than the group using weighted blankets, in which the participants started with a much higher average GPA. In addition, 11 participants were first-year students, and began the semester without a GPA to analyze.

Discussion

The findings of this study indicate that weighted blankets may be helpful in improving sleep quality among college students. In addition, the improvement in sleep quality may be related to the decreased anxiety in weighted blanket users. OASIS scores decreased (indicating decreasing anxiety) over time for the weighted blanket users but increased over time for the non-weighted blanket users. One explanation for these data may be that as the workload of the

semester increased, the participants who were provided with weighted blankets were better equipped to handle their stress; improved quality of sleep in these participants may have prepared them for the busy schedule typical of a college student. Improvement in sleep and reduction in anxiety could play a significant role in improving quality of life for college students. In this way, the results that were not statistically significant may have been clinically significant. Furthermore, the OASIS scores from Group 5 (anxiety-no medication, weighted blanket) and 6 (anxiety-medication, weighted blanket) decreased from the pre-survey to the mid-survey but remained the same from the mid-survey to the final survey. These findings may suggest that the weighted blankets initially helped to decrease participants' anxiety, and then facilitated a consistent emotional state.

The lack of statistically significant findings from the GPA data suggest that one semester was not an adequate amount of time to measure changes in GPA. Because first-year students were included in the study, pre-GPA data were not recorded for a significant portion of the sample. In addition, because the weighted blanket users began the semester with a higher average GPA than the non-weighted blanket users, it is not surprising that weighted blanket users' average GPA did not increase as much as the non-weighted blankets users' GPA due to a ceiling effect.

Limitations

There were several limitations of this study that limit the generalizability of the findings. The sample size in this pilot study was small, and the study was conducted at only one university over a single semester. The data were collected from a convenience sample of students who may not have been completely representative of the university population. Because data consisted of a self-report survey, the reliability of the results depended on the quality and amount of time the

participants gave in considering how they answered the items. The survey also did not include an item to verify that participants were still actively using their blankets each night. Participants may have continued to complete each survey throughout the semester while not actually using the blanket.

There were no attempts made to control students use of use of prescribed anti-anxiety medications, use of over the counter sleep aids or illicit substance use, such as alcohol or marijuana, to decrease anxiety or potentiate sleep. In addition, the sleep score generated from three of the survey items was not a tool that had been tested for validity or reliability in previous samples. Therefore, results should be interpreted with caution. Due to time and funding restraints, the researchers were not able to provide blankets that were exactly 10% of each participant's weight. As a result, the weighted blankets were pre-ordered at a weight of 12 pounds each. Finally, multiple factors contribute to college students' anxiety, all of which cannot be controlled or analyzed.

Disclosure

The weighted blankets were purchased from Mosaic Weighted Blankets at a 50% discounted rate and varied in length (either five or six feet), and color and pattern.

Implications for Practice and Recommendations for Future Research

The statistically significant effect of blanket type on sleep quality suggest that weighted blankets may be a positive addition to the complementary and alternative therapy options available for college students with and without anxiety. Although the changes in OASIS scores were not statistically significant, the scores suggest that changes in anxiety levels between groups may have been clinically significant. In the future, university student health and counseling services could provide weighted blankets to students struggling with anxiety to

facilitate a greater quality of sleep that may result in decreased anxiety throughout the semester. These blankets might be made available at a discounted rate for students, or available for rent through the student health center.

The findings of this pilot study validate the need for further research with a larger sample size over a longer period of time. Future studies could include a large cohort of first-year students whose data are collected prospectively, using a longitudinal design throughout their entire college career. Qualitative data could be collected from participants in order to gain an understanding of any additional benefits or challenges of regularly using a weighted blanket. The findings of this study add to the evidence on use of weighted blankets to treat anxiety in college-age students, and provide insight into how complementary and alternative therapies could be aligned with care provided by university student health and counseling services and evidence-based practice in mental health nursing.

Appendix A: Recruitment Tool

Dear Student,

You are invited to participate in a research study about the effects of weighted blankets on college-aged students' anxiety. You were selected as a possible participant in this study because you are currently enrolled at Illinois Wesleyan University. If you choose to participate in this study, you will be randomly assigned to use (and provided with) a weighted blanket, or a "typical" non-weighted blanket, for the duration of the Fall 2018 semester. You will be asked to complete three, 23-item, on-line surveys at the beginning, middle, and end of the semester. Each survey will take approximately 15-minutes to complete. You will be allowed to keep the blanket you receive (either weighted or non-weighted).

Each time you complete a survey, you will be given the option to enter your name and telephone number for a drawing that will be held at the end of the semester after the third survey has closed for the opportunity to win one of three, \$50.00 Visa Gift Cards. This information will not be linked to your survey data; it will be downloaded from the server, printed as one hard-copy, and kept in a locked cabinet in the office of the faculty PI until the drawing is held. This information will be destroyed immediately after the drawing has been held, and the winners have been notified.

If you wish to participate in this study, please contact Dr. Wendy Kooken (wkooken@iwu.edu) to determine your eligibility, by (date).

Sincerely,

Dr. Noël Kerr & Dr. Wendy Kooken, Co-Primary Investigators, & Amy Clapp, Student Investigator.

Appendix B: Research Instrument

Please create a personal code with the following elements: your 2-digit birth month (use leading zero for January through September), first initial of your mother's maiden name, and the four digits of your IWU graduation year. Ex: 12J2018.

1. What is your age?

- 17
- 18
- 19
- 20
- 21
- 22

2. What is your gender identity?

- Male
- Female
- Non-binary/third gender
- Prefer to self-describe: _____
- Prefer not to say

3. Do you identify as transgender? (Yes/No)

4. Please specify your ethnicity:

- White
- Hispanic or Latino
- Black or African American
- Native American or American Indian
- Asian / Pacific Islander
- Other

5. Please specify your major:

(Drop-down list of all majors offered at IWU)

6. Are you currently taking any antianxiety medications? (Yes/No)

7. If "Yes", please indicate the medication(s) you are taking

- alprazolam (Xanax)
- clonazepam (Klonopin)
- diazepam (Valium)
- lorazepam (Ativan)
- oxazepam (Serax)
- chlordiazepoxide (Librium)
- other: _____

8. How often do you take this medication?

Once per day

Two times per day

Three times per day

Other:

9. Do you find this medication(s) effective to control your symptoms of anxiety? (Yes/No)

The following items ask about anxiety and fear. These symptoms may include panic attacks, situational anxieties, worries, flashbacks, hypervigilance, or startle. Include all of your anxiety symptoms when answering these questions. For each item, select the choice that best describes your experience over the past week.

10. In the past week, how often have you felt anxious?

No anxiety in the past week.

Infrequent anxiety. Felt anxious a few times.

Occasional anxiety. Felt anxious as much of the time as not. It was hard to relax.

Frequent anxiety. Felt anxious most of the time. It was very difficult to relax.

Constant anxiety. Felt anxious all of the time and never really relaxed.

11. In the past week, when you have felt anxious, how intense or severe was your anxiety?

Little or None: Anxiety was absent or barely noticeable.

Mild: Anxiety was at a low level. It was possible to relax when I tried. Physical symptoms were only slightly uncomfortable.

Moderate: Anxiety was distressing at times. It was hard to relax or concentrate, but I could do it if I tried. Physical symptoms were uncomfortable.

Severe: Anxiety was intense much of the time. It was very difficult to relax or focus on anything else. Physical symptoms were extremely uncomfortable.

Extreme: Anxiety was overwhelming. It was impossible to relax at all. Physical symptoms were unbearable.

12. In the past week, how often did you avoid situations, places, objects, or activities because of anxiety or fear?

None: I do not avoid places, situations, activities, or things because of fear.

Infrequent: I avoid something once in a while, but will usually face the situation or confront the object. My lifestyle is not affected.

Occasional: I have some fear of certain situations, places, or objects, but it is still manageable. My lifestyle has only changed in minor ways. I always or almost always avoid the things I fear when I'm alone, but can handle them if someone comes with me.

Frequent: I have considerable fear and really try to avoid the things that frighten me. I have made significant changes in my life style to avoid the object, situation, activity, or place.

All the Time: Avoiding objects, situations, activities, or places has taken over my life. My lifestyle has been extensively affected and I no longer do things that I used to enjoy.

13. In the past week, how much did your anxiety interfere with your ability to do the things you needed to do at work, at school, or at home?

None: No interference at work/home/school from anxiety

Mild: My anxiety has caused some interference at work/home/school. Things are more difficult, but everything that needs to be done is still getting done.

Moderate: My anxiety definitely interferes with tasks. Most things are still getting done, but few things are being done as well as in the past.

Severe: My anxiety has really changed my ability to get things done. Some tasks are still being done, but many things are not. My performance has definitely suffered.

Extreme: My anxiety has become incapacitating. I am unable to complete tasks and have had to leave school, have quit or been fired from my job, or have been unable to complete tasks at home and have faced consequences like bill collectors, eviction, etc.

14. In the past week, how much has anxiety interfered with your social life and relationships?

None: My anxiety doesn't affect my relationships.

Mild: My anxiety slightly interferes with my relationships. Some of my friendships and other relationships have suffered, but, overall, my social life is still fulfilling

Moderate: I have experienced some interference with my social life, but I still have a few close relationships. I don't spend as much time with others as in the past, but I still socialize sometimes.

Severe: My friendships and other relationships have suffered a lot because of anxiety. I do not enjoy social activities. I socialize very little.

Extreme: My anxiety has completely disrupted my social activities. All of my relationships have suffered or ended. My family life is extremely strained.

Please answer the following questions about your sleep experience:

15. On average, approximately how many hours of sleep have you been getting each night?

1-2 hours

3-4 hours

5-6 hours

7-8 hours

9-10 hours

16. On average, approximately how many days per week have you taken a nap?

0 days

1-2 days

3-4 days

5-7 days

17. On average, approximately how many times have you been waking up each night?

0 times

2-4 times

5-7 times

8+ times

18. In the recent past, have you taken any medications in order to fall asleep? (For example: Benadryl or Melatonin?) Yes/No

19. If “Yes”, on average, in the recent past, how many nights per week have you needed to take a medication to help you sleep?

- 1
- 2
- 3
- 4
- 5
- 6
- 7

20. In the recent past, where have you typically slept?

- Residence hall
- Sorority or Fraternity house
- Apartment
- House

21. Do you have a roommate? (Yes/No).

22. Describe the activity you have usually completed immediately before going to bed in the recent past:

- Using electronics
- Reading a book
- Taking a shower
- Listening to music
- Watching TV

23. Select the option(s) that best describes you (Select all that apply):

- I feel alert and awake throughout the day.
- I feel mildly drowsy in the morning, but am able to “wake up” throughout the day
- I feel tired and irritable throughout the day.
- I find it difficult to concentrate on school work throughout the day.
- I find myself frequently dosing off during class.

Appendix C: Data Analysis and Results

Table 3: Demographics

	<i>N</i>	%
Gender		
Male	8	25.0
Female	22	68.8
Non-binary/third gender	1	3.1
Gender Fluid	1	3.1
Age		
18	8	25.0
19	5	15.6
20	7	21.9
21	11	34.4
22	1	3.1
Ethnicity		
White	25	78.1
Hispanic or Latino	2	6.3
Asian/Pacific Islander	4	12.5
Other	1	3.1

Table 4: Effects of Weighted vs Regular Blankets on Sleep, Anxiety, and GPA

	Hypothesis df	Error df	F	Sig.	<i>N</i>
Effects of blanket type on sleep scores over time	2.000	29.000	6.248	.006	32
Effects of blanket type on OASIS scores over time	2.000	29.000	.718	.496	32
Effects of blanket type on GPA over time	1.000	23.000	.907	.351	25

Table 5: Changes in Sleep Scores Over Time

	Type of Blanket	Mean	SD	<i>N</i>
Pre Sleep Score	Weighted	2.188	.486	16
	Regular	1.979	.429	16
Mid Sleep Score	Weighted	2.042	.485	16
	Regular	2.104	.359	16
Final Sleep Score	Weighted	1.875	.529	16
	Regular	2.208	.437	16

Table 6: Changes in OASIS Scores Over Time

	Type of Blanket	Mean	SD	N
Pre OASIS Score	Weighted	11.63	3.612	16
	Regular	11.44	3.999	16
Mid OASIS Score	Weighted	11.06	3.642	16
	Regular	11.63	3.284	16
Final OASIS Score	Weighted	10.94	4.139	16
	Regular	12.31	4.270	16

Table 7: Changes in GPA Over Time

	Type of Blanket	Mean	SD	N
Pre GPA	Weighted	3.517	.298	11
	Regular	3.306	.519	14
Post GPA	Weighted	3.543	.307	11
	Regular	3.383	.408	14

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